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The Financial Implications of Sustainable Pension Reform:

Theory and Scheme Specific-Options for the Jordanian Social Security Corporation

Doctoral Dissertation

By

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To my Mother and Father, Sisters and Brother,

for their encouragement and help

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Acronyms

ALE	**Average Life Expectancy**
CCM	**Cohort Component Method**
COLA	**Cost of Living Allowances**
CV	**Coefficient of Variation**
DA	**Disability**
DB	**Defined- Benefit**
DC	**Defined- Contribution**
FF	**Fully Funded**
GDP	**Gross Domestic Product**
IMF	**International Monetary Fund**
IRR	**Internal Rate of Return**
JD	**Jordanian Dinar**
JSSC	**Jordan Social Security Corporation**
LFPR	**Labor Force Participation Rate**
MR	**Mean Return**
ND	**Natural Disability**
NDC	**Notional Defined Contribution**
NDP	**Natural disability Pension**
NPV	**Net Present Value**
OA	**Old Age**
OECD	**Organization of Economic Co- operation and Development**
PAYG	**Pay As You Go**
QA	**Quasi Actuarial**
RDR	**Real discount Rate**
ROR	**Rate of Return**
RR	**Replacement Rate**
RSF	**Rürup Sustainability Factor**
SSC	**Social Security Corporation**
STD	**Standard Deviation**
TFR	**Total Fertility Rate**
UN	**United Nation**

1. Introduction

As is the case with other retirement insurance provisions around the globe, the Jordanian Social Security Corporation (JSSC) was established in 1980 to provide its participants with acceptable degrees of certainty regarding their future income after retirement. Without such a provision, workers will most likely underestimate and disregard the funds needed to finance their needs during old-age. The relative youthfulness of the scheme's members has allowed the accumulation of huge amounts of funds to the extent that they have already exceeded one quarter of the Jordanian national income. Although this is a key requirement from both the financial management and pension insurance perspectives, it has resulted in undesirable financial challenges to the system. The benefits awarded under most of the provisions provided by the JSSC have proved to be neither rationally designed, nor financially viable. These challenges, however, are scarcely recognised by the scheme's sponsors since the low scheme's dependency ratio helps the scheme to achieve financial surpluses and hence accumulate more funds. The moral hazard effect inherent in our argument provides no strong reason why policy makers with a short term perspective should think intensively and seriously about the long term financial viability of pension schemes.

From a pure financial point of view, this will not continue forever as the scheme dependency ratio will continue increasing as a result of falling-down in mortality and fertility rates in which retirees will stay longer in retirement while less workers would be available to financially support their benefits. Frankly speaking, these variables shouldn’t receive so much attention if the system insurable benefits were well designed. This theoretically can be done through combining a better elemental mixture between solidarity aspects of pension insurance and equity principle among the scheme sponsors. If the latter principle is regarded as an essential component of the members' benefits at retirement, the solidarity rules can then take place as a complementary component rather than a reciprocal one. In that sense, scheme participants who couldn’t accomplish, for any acceptable reason, an adequate level of retirement benefits according to their equity fair should be supplemented with complementary elements. The latter elements, however, are most likely and rationally to come to the expense of other participants whose benefits at retirement are

more than adequate. Thus, the resulted sight can be generally viewed as all members getting as much as financially fair, but getting or sharing some complementary needs.

The most vexing and challenging reason for reforming the JSSC is not only due to the fact that most of the scheme members are getting far more than fair but also the financial viability of the scheme has been subject to their behavior. Ignoring the religious and ethical influences on the behavior of some participants, other scheme participants are always thinking about the possible ways to maximize the utility of their participation. Although it is not easy for all participants to reach the best decision regarding this fact, they still can approach inevitable consequences from the perspective of the scheme's financial viability.

We should admit here that the optimal combination between solidarity and equity elements is not viable any more in the context of JSSC as it would be for newly established schemes. The main difference between the two cases is the unfunded liabilities that have implicitly appeared on the scheme balance sheet in which they should be financed by someone. Under the absence of external financing, these liabilities should find a way in order to be internally financed via the contributions of subsequent participants, the accumulated reserves and the general cost reduction policies. Although this is likely to result in distorting the optimal split between equity and solidarity, a well designed reform strategy would arrive on better consequences than those that would arise when continuing with the current conditions. Thus the measures of any reform strategy should reflect the best achievable combination between the different insurable and financial aspects such as, participants' equity, adequacy, intergenerational fairness and last not least importantly, the scheme's future financial viability.

Most of the studies done on the JSSC were completely technical and confidential but none of them was even partially theoretical. The main concern of these studies is on how to improve the medium-term financial viability of the scheme without giving the requested requisite attention to other insurance aspects. These studies have resulted in incessant recommendations and implementations of only minor changes to the scheme parameters, as a result of which uncertainty became the main character of the scheme. Frankly speaking, the major concern of the JSSC reforms was oriented towards increasing the level of future revenues and/or decreasing the level of expenditures regardless of the consequences on the members of different cohorts. Thus, the present study meets the necessity for a reform strategy based on a theoretical framework. Moreover, to my

knowledge, this study is the first of its type for Jordan as well as for other Arabian countries.

As regards the thesis' specific interest, it attempts to answer two main questions: The first one particularly relates to JSSC and asks whether gradual transition to Fully Funded or Quasi Actuarial schemes could result in better insurance and financial conditions. The second question, on the other hand, is more theoretically oriented and has a general perspective. It inquires into whether all reform strategies (in Jordan or elsewhere) that imply a complete transition to a fully funded scheme could result in a better combination of financial viability, efficiency, adequacy of participants and intergenerational equity, or whether each scheme has its own specific criteria that constrain the extent of reform.

To motivate interest and methodological understanding regarding the issue of pension sustainable reform strategies, **Chapter One** of this thesis spots on some of the basic financial facets of pension schemes such as financing methods, retirement benefit calculations, risk and return aspects. The globally implemented sustainable reform approaches are concisely presented in this chapter in order to figure out the extent in which pension schemes have been successfully reformed and how the schemes specific characters affected the paths and options for reform. Lastly in this chapter, a series of arguments and literature discussions regarding the consequences of sustainable pension reform are presented according to their thematic consequences.

The first section of **Chapter Two** reviews and analyses the financial experiences of the scheme as well as the development of scheme's participants from the time the JSSC was established until two years before the study was completed. The second section of this chapter performs some financially-based evaluation measurements of the scheme reserves with respect to domestic and international benchmarks.

Chapter Three presents an empirical modeling framework that is entirely developed by the author to analyze the structural weaknesses and advantages that are inherent in the design of different insurance provisions provided by the JSSC. These aspects are considered with respect to two measures of generosity. The first measure, on the one hand, mirrors the generosity from a pure adequacy standpoint represented by the replacement rates promised by the current law to a hypothetical participant. The second measure for generosity, on the other hand, signalizes the extent in which benefits accrued under the JSSC's current law diverge from the full equity principles and among the scheme's

participants with respect to several variables. The measures considered for such a judgment are the implicit Internal Rate of Return (IRR) on pension contributions, the Net Present Value (NPV) of benefits and contributions, the implicit contribution rate and the generosity ratio. After the scheme's features are being diagnosed by these measures, the chapter poses some reform criteria's and performs general equity and adequacy implications of two proposed strategies. The first strategy acquires benefits to be fully funded by the own contributions of hypothetical participants in the sense that rates of return continuously accrue on the remaining contribution balance. While the second reform strategy implies that rate of returns is awarded on contributions only along the accumulation phase.

Chapter Four switches the perspective from the participant's level into the scheme's aggregate level. As in the previous chapter, the empirical outcomes are entirely produced by self developed models that are based on the actuarial methodologies. The first model in this chapter intends to forecast the future population (until 2050) of Jordan structured on sex and one-years age increments. The outcomes of this model are then used as the main inputs of the labor market model in which the employment level of both genders are projected for the rest of this decade and along the coming four decades. The last model of this chapter which is the Financial Model interacts the scheme financial, distributional and legal characteristics to generate long term forecasts regarding the scheme's financial conditions under the status quo and both proposed reform conditions. In addition to that, the chapter performs the development in the adequacy and equity measures of the insured participants according to the current law and reform scenarios. Lastly in this chapter, a sensitivity analysis is held to estimate how the outcomes of the baseline assumptions would differ if some of them are changed.

The concluding chapter of this thesis summarizes the outcomes and the implications of the entire study. It also presents some guidelines to reform the JSSC with their theoretical entailments.

2. Pension Financing and Reform: Theory and Practice

2.1 Financial Aspects of Pension Schemes

2.1.1 Pension Financing

Nearly half of the mandatory pension schemes around the globe are financed on the basis of Pay As You Go (PAYG) (Palacios and Pallares-Miralles, 2000). In such schemes, current workers are responsible to pay the benefits of current pensioners. The key parameter for this sort of funding scheme is that workers contribute a fraction of their income which is capable to cover all the proceeds accrued toward current retirees. The following funding equation simply shows how funds are transferred directly from the income base of employed participants to the pockets of pensioners.

It can evidently be ascertained from the above definitional equation that the financial features of a pure **PAYG** system depends upon a five sets of variables in which some are determined exogenously out of the funding equation and others might be set endogenously within the equilibrium condition of this equation. For instance the employed population, that is the only contributor of a pure PAYG scheme, affects the system balance more than vice versa. Such a conclusion is more applicable once the degree of mandating the employed population is high, and the level of contribution rate is low that it cannot have a substantial effect on the labor market stability. Other variables such as the level of benefits and in most often cases the contribution charges are endogenously determined by the funding equation.

For fewer burdens on the working generation and more stable benefits for the retired one, PAYG requires a continued rapid population and wage growth rates (Davis, 1998). The system dependency ratio which is often defined as the ratio of retired population to the working one, and the system replacement rate which reflects the ratio of average insured income to the average pension, puts forward the stability of financing the system in a major

view. The increase of either ratio implies some extent of difficulties, unless proportionally, the increase of one is being offset by the fall of another.

However, in a fully funded scheme, pension benefits are always financed through the pensioners' own assets. Contributions are invested either individually or centrally by the scheme sponsors and afterward annuitised at the time of retirement to entirely cover the participant expected life span after retirement. Thus, there is no explicit relation between the system dependency ratio and replacement rate on the one hand, and the level of replaced benefits. Contrary to the former mentioned scheme, a fully funded scheme is financed internally via the assets that have already accumulated in the pension fund or in the participant's own account if contribution reserves are held individually. Despite the way these accounts are held, collected contributions in such a scheme are deemed as savings while in the PAYG they are considered as transferred taxes.

2.1.2 Benefit Calculation

After the short illustration on how pension systems meet their financial obligations, a view must be shown on the approaches used to determine these obligations. Most commonly, PAYG schemes depend ultimately on **Defined Benefit (DB**) formulas, in which an eligible retiree receives a pension amount that is determined by a specified benefit formula which links an individual reference salary and years of service to a payout function. In practice, there are three forms of DB plans. The first form is the **fixed fee- PAYG** system, where the gross system cash proceeds are distributed equally among all beneficiaries. In such a plan, individual's pension salary is endogenously determined by the systems' funding equation. Consequently, the level benefits adjust periodically to ensure the exact distribution of the system total revenues on the current retirees. The following equation indicates how the system dependency ratio, replacement rate, and contribution rate integrate all together to determine the level of benefits:

$$B_t = \theta_t \cdot Nc_t \cdot Yc_t / Np_t \qquad (2.1)$$

Where B is the flat benefit at time t, Nc: number of contributors, Yc: Average income of contributors. Np: the number of pensioners. Assuming θ_t and Yc are constant. For example, the increase in the number of contributors proportionally more than the increase of pensioner would result in an increasing level of benefits.

The second form of DB formulas is the **Earnings-based** PAYG system. This form works in an opposite manner of the Fixed-fee PAYG form since benefits paid to retirees are a fixed fraction (b) of their earnings in the preceding period. The rate of contribution, on the other hand, regardless how much is paid by contributors and by their employees has to adjust endogenously to ensure the system overall balance. In addition to the above mentioned forms of benefit determination, benefits could also be fixed to an absolute term. In such a case, contribution rate has to move exactly as in the latter mentioned case.

Most of the funded pension schemes, on the other hand, apply another type of pension benefit formula which is known as **Defined Contribution** (DC) formula (Mitchell and Fields, 1996). According to such a sort of pension calculation, benefits for pensioners at the time of retirement are linked directly to the contribution made by them and by their employers.[1] In a DC plan, these contributions are invested, typically by professional money managers. As a result, relatively highly-paid workers who pay more into their pension accounts would have higher retirement accumulations than do those who earn less and consequently pay less into the plan. Also, since under a DC plan the pension benefits are linked directly to what is contributed, these plans tend not to guarantee minimum benefits nor redistribute across pay and service categories. At retirement, the DC benefits are payable in one of two forms. Some DC plans provide for the annuitization of investment accumulations so as to guarantee retirees a steady stream of retirement payments until death. Alternatively, some systems provide for retirees to take some or all of their accumulations in the form of a lump sum defrayment. Finally, several systems offer a choice between the annuity and lump-sum forms (Blostin, 2003). Moreover, aside from the form benefits are paid, the present value of benefits should be close to the corresponding value of the contributions being

[1] In some countries schemes, regardless how benefits are calculated, the employers do not share the contributions of their employees e.g. Croatia and Kazakhstan, Argentina, Chile. In some others, employers pay all the contribution imposed on their employees for pension insurance purposes, e.g. Lebanon, Turkmenistan, and Cuba. (ISSA, 2002; ISSA, 2003b).

paid by each participant at the time of retirement.[2] Thus, the Net Present Value (NPV) of benefits and contribution for each participant at any point of time must equal zero or at least not far from it.

2.1.3 Risk

Situation of risk arises when agents are not sure what state of nature among several possible states will take place in the future. Agent only knows the probability with which each state can occur (Starmer, 2000). Pension schemes plans are no exception in this context, since uncertainties are the major fear and concern of all agents participating in them. However, the types of risks associated with each pension plan differ from those appearing in others. Thus, it is worth mentioning the main risk types that might impede some of the participants from contributing to any of the mandatory pension plans inspite of their importance.

2.1.3.1 PAYG Scheme Risks

♦ **Demographic Risk.** As mentioned in advance in this chapter, the stability of both contribution rates and pension benefits largely depends on the size of the contributing population and the retired one. From there on, demographic changes play an imperative role in shaping the future of such schemes. From an individual point of view, this sort of risks initially originates from the uncertainty and instability of their pension benefits as the response of pension sponsors to demographic changes is hard to be guessed. From the global experience, unfunded schemes sponsors have handled the burden of increasing dependency ratios in different ways. Some countries have raised the level of contribution to offset the unwanted increase in the pension benefits bill; others for instance, reduced the level of replaced income for pensioners. Many other policies have been implemented around the glob to absorb the financial burden of demographic changes. therein a general overview on how the financial imbalances facing the unfunded pension provisions due to demographic transitions can be met:

[2] We cannot say that the NPV of benefits and contributions exactly equals zero. it might be less or greater than zero depending on several factors in which the selection of annuity contract and the ratio of actual life span after retirement to the expected one are among them. if the scheme member chooses to get a lump sum amount at the time of retirement, however, NPV for benefits and contributions is likely to approach zero.

a) Increase the burden on the working population as well as their employers by raising-up the contribution rates that have to be paid by the employees on behalf of their employers to maintain the system's financial neutrality. Such a solution would imply some extent of uncertainties for the working participants regarding their disposable income, while the employers might face some uncertainties regarding the cost of their production and thus their profitability.

b) Decrease the level of replacement rates by reducing the level of pension benefits. Therefore, the certainty of today's pensioners and today's workers (future Pensioners) about their living standard would not entail enough probabilities.

c) The scheme sponsor can combine both options in order to distribute the costs among the scheme agents. In such a case, income uncertainties would spread over the scheme agents (Pensioners and Contributors) since both of them are not sure about the policy choice on how the burden of demographic changes would be distributed between them.

The above general measures discern how the wide range of policy options in response to demographic instability, have put the scheme agents under a shadow of uncertainty in which neither the scheme contributors know how much they will pay in contributions and receive as pension in the future, nor the pensioner could surely guess how the level of his benefits are likely to remain protected. Generally speaking, the negative demographic changes, the upward moving dependency ratio in our context, would always imply a deadweight loss for the schemes' members in terms of the net present value of their own benefits over contributions, regardless workers or pensioners would bear the loss (Börsch-Supan and Reil-Held, 1998).

♦ **Economic Risk.** This kind of risk arises from a set of factors which might affect the systems' sustainability through different routes and paths. One of the most important channels of affection comes from the fact that the general base of pension contribution in most countries, if not all, is highly correlated with the performance of the economy. Thus during the recession periods, system average wages tends to grow in low rates or even decline to lower levels. Accordingly, the average replacement rate of the system which affects inversely its revenues will rise up and call for some adjustment in the system parameters. Moreover, the higher degree of income

uncertainty would be reflected mostly on pensioners whenever the system they belong to applies a fixed-fee benefit formula. Any vulnerability in the contribution proceeds would touch directly the level of individuals' pension benefits. In an endogenously determined contribution rate with exogenously specified benefits, the major part of risks would be carried out by contributors more proportionally than by pensioners. Another channel of risks appears when the scheme agent's structure is highly affected by the state of the economy. The uncertainties regarding the future economic prospects and specially the level of employment would never put the schemes' participants in a good insight about their future disposable income.

Another example on the influence of economic instability on the income uncertainty for both contributors and pensioners is inflation. The less the pensions salaries are indexed with inflation, the more risks are borne by pensioners. For instance, the hyper inflation in Argentina, Eastern Europe, and East Asia among other countries has eroded the real value of pension benefits (Mitchell and Fields, 1995). Even though pension salaries are fully indexed with inflation, some degrees of income uncertainties may arise for contributors if their wages are not fully indexed with inflation.

♦ **Political Risks**. Many economists have defined political risks as the vulnerability of the rate of return paid explicitly or derived implicitly on workers contributions via the promised benefits due to political decisions or acts. Some others define such types of risks as the changes in benefits rule before or after retirement that are induced by political process (McHale, 2001). It is important here to distinguish between the induced political risks and the pure risks (Blake and Turner, 2003). The political uncertainties can actually follow the uncertainties in economic and social measures exactly as in the case of uncertainties motivated by demographic instability. While the pure uncertainties are those induced directly by political interests in which governments move in the favor of majority in the presence of democracy, or according to their own interest in the absence of majority rules. For instance, according to the median voters theory, if the majority of the pension scheme participants are more close to the retirement age than they are from the average age of joining the scheme, then the uncertainties becomes more for contributors than for pensioners. That can be logically explained if the votes are rationally used to serve the interest of their voters. From a pure financial point of view, it can be said that rational workers always try to

maximize the profitability of their current and future contributions by regarding past contributions as pure sunk cost (Leers et al 2001). Therefore, majorities in democratic countries use their best efforts to conserve minimum degrees of uncertainties at the expense of higher ones for the minorities.

2.1.3.2 Funded Scheme Risks

The way that fully funded schemes are financed and benefits are calculated, has put these schemes under different sorts of uncertainties from those observed in the unfunded schemes. Some kinds of risks, however, may arise in both sorts of schemes as their sources and affection channels spread widely among market conditions and agents positions. Generally speaking, funded pension provisions are more likely to face the following forms of uncertainties that might affect in a way or another the profitability's of the scheme participants, more precisely, the explicit and implicit rate of return on their contributions:

♦ **Investment Risks.** In the funded schemes, retirement benefits depend substantially on the market performance of the assets that the pensioners' contributions are invested in. Attempting always for a higher rate of return does not seem to be as an efficient behavior in the respect of certainty. If the pensioner tries to virtually boost his retirement benefits, he should then recognize that such an aim would be always at the expense of doubtfulness. Even though his aim is unbiased to a higher level of returns, uncertainties will still occur, however, in a lesser extent.

Completely diversified pension portfolios could put the assets only subject to market risks instead additionally the assets specific ones. The market prompted risks comprise the uncertainty that faces all the assets invested in the market in the same direction such as inflation and economic recession, etc. Pension benefits or more specifically the returns on pension assets are also subject to timing risk. This type of risks corresponds to the uncertainties that collegiate the selected time for transacting assets. For instance, a pensioner purchases fixed income securities just before interest rate jumps up (Macnicol, 2004). Nevertheless, the degrees at which risks are exchanged with return vary between countries and correlate with others.

♦ **Mortality Risks**. This type of risks originates mainly by the funded pension system, when the individual takes the risk of under-estimating his own life expectancy and by then allowing for some probabilities that his pension assets would be outlived early before his death (Chen and Milevsky, 2003). From an individual point of view, this would most possibly force the pensioner to reduce his standard of living as one of the sequences of the depletion in retirement oriented assets (Lin and Cox, 2004).

The continuing improvement in the health and living standards on the one hand, and the heterogeneity of mortality rates among individuals on the other, has put the issue of longevity risk in a front priority and concerns of many policy makers as well as funded schemes' participants. The uncertainty of the participant regarding whether he will live below, on or above the average life expectancy has been designated by some risk management literature as an individual mortality risk (Valdes-Prieto, 1998). This sort of risk can be, however, eliminated by purchasing life annuities that provide frequent income streams for the pensioner along his retirement, regardless how long the pensioner would stay alive. These annuities as widely practiced, can be classified as one of the financial tools that transfers the longevity risks form the individuals to private insurers or annuity issuers (Drinkwater and Sondergeld, 2003). Many pension and risk specialist raise several critical issues regarding the avoidance of longevity risk through in bidding annuities. Among them, is the adverse selection that emerges when only high income earners who likely live longer than average tend to buy annuities, while low income earners under-estimate their value and prefer to insure against this sort of risk by themselves (Bodie, 1990).

♦ **Political Risks.** At first glance, fully funded schemes in general, and particularly those who apply a defined benefits formula appear far from being subject to political risks. This view seems logical if we know in advanced that pension accumulated assets in such schemes are individual rights rather than government wealth. Thus governments have no real access to these funds to finance the needs of other parties or programs.

A deeper look to these schemes discerns some unseen political impacts on either the participants or the governments themselves. As regards the government, the underperformance of financial market that the participants' contributions are invested in, may generate a never wanted pressure on governments to supplement those who

couldn't have accumulated adequate assets for their retirement. The participants' accumulated assets on the other hand, could inversely and indirectly be influenced by some political, economical and institutional facts. For instance, governments may seek to lower the level of interest rate and thus indirectly affect the rate of return on the market assets (Turner 1997, Parnczky, 2002). The most common experiences on how political risks can affect fully funded schemes is the reserves depletion of the former German funded pension scheme after the hyper inflation in 1923 and during the second war .

2.1.4 Rate of Return (ROR)

As initially stated by Samuelson (1958) and Aaron (1966), the PAYG financed schemes compensate the participants contribution with an implicit rate of return that equals the growth rate of their total wage bill. However, one can show by simple mathematical instances that such a conclusion might not always persist in the context of differently stylized PAYG schemes. For illustrative purposes, assume that there are only two periods with two retiring and two working generations. According to the fixed- Fee PAYG system, as being clarified in advance, the total receipts collected from the working generation by an exogenously determined salary fraction are distributed equally among pensioner. Putting that directly in our illustrative example, the working population (A) at the first period pays a (Cr) fraction of his salary as pension contributions that are totally and directly distributed to the retired generation (A) in that period. Mathematically speaking, the first step of our derivation takes the following form:

$$TC_A^t = Cr_A^t \cdot Nc_A^t \cdot Yc_A^t = Np_A^t \cdot Yp_A^t \qquad (2.2$$

Where: TC_A^t Total contributions paid by generation A. Nc: is the number of working generation in period t. Yc: The working generation average Income. Np: The number of pensioners. Yp: the average income of pensioners.

Since the average pension in a Fixed-Fee scheme is endogenously determined by the funding equation (2.2), YP can be calculated as follows:

$$Yp_A^t = \left(Cr_A^t \cdot Yc_A^t\right) \cdot \left(\frac{Nc_A^t}{Np_A^t}\right) \tag{2.3}$$

The last parenthesized part of the above equation represents the inverse of Dependency Ratio (DR), the fraction that indicates for the ratio of retired participants to the working generation. While the first part of the same equation stands for the average contribution paid by each worker of the working generation A in period t.

Now imagine the situation where the working generation of period (t) to retirement at period (t+1). The pensions of this generation as our example assumes would be paid by the new working generation (B).

$$TP_A^{t+1} = Cr.Nc_B^{t+1}.Yc_B^{t+1} = Nc_A^t.Yp_A^{t+1} \tag{2.4}$$

The right side of the above equation comprises the number of contributors of generation A as they were contributor in period t and got retired in the period directly after. The average pension of each retiree of generation A would exactly be determined by the same way that average pension in the first period is being calculated:

$$Yp_A^{t+1} = Cr_A^t \cdot Yc_B^{t+1} \cdot (Nc_B^{t+1} / Nc_A^t) \tag{2.5}$$

To simplify the understanding of our example, let us assume that the average income of generation B in period t+1 comprises the average income of generation A in period t indexed by its periodical growth rate, and the sum of generation B is proportionally related to the sum of generation A:

$$Yc_B^{t+1} = Yc_A^t \cdot (1 + \lambda_t) \tag{2.6}$$

And

$$Nc_B^{t+1} = Nc_A^t \cdot (1 + \rho_t) \tag{2.7}$$

Where ρ_t: The growth rate of working generation. λ_t: Wage growth rate.

Before going through our derivations, two connotations of ROR should be distinguished in this context. The first should reflect the generational rate of return that each generation gets over the total contributions it has paid for the retired generation one period before:

$$ROR_{G,A}^{t+1} = (TP_A^{t+1} / TC_A^t) - 1 \qquad (2.8)$$

Substituting mid of equation (2.2) and right side of (2.4) in the equation (1-6), considering equations (2.6) and (2.7), the generational ROR would take the following form:

$$ROR_{G,A}^{t+1} = \lambda_t + \rho_t + \underbrace{\lambda_t . \rho_t}_{\text{Neglible}} = \lambda_t + \rho_t \qquad (2.9)$$

From the above equation, one can find that the generational ROR under a fixed-Fee PAYG approximately equals the sum growth rates of participants' average wage and their size (number). This simplified conclusion seems similar to Samuelson and Aaron attribute to the ROR awarded under a PAYG schemes.

The second concept of ROR, which is also necessary to be expressed here, is the individual ROR which reflects the participant profitability when contributing to Fixed-Fee PAYG scheme. Mathematically speaking, the individual ROR comprises the proportional difference of what participant pay as contribution and the amount he gets as pension:

$$ROR_{I,A}^{t+1} = (Yp_A^{t+1} / Cr.Yc_A^t) - 1 \qquad (2.10)$$

By substituting equations (2.5), (2.6) and (2.7) in the above, we get the following simplified expression which symbolizes the implicit ROR awarded on the individual pension-oriented contributions:

$$ROR_{I,A}^{t+1} = \lambda_t + \rho_t \qquad (2.11)$$

As being ascertained on the generational level, the individual's ROR that is implicitly given on his contribution according to such a presided scheme comprises the growth rate of contributors wage bill. From that on, it can be said that under a Fixed-Fee based PAYG system both concepts of ROR seem to be consistent with the former view about the ROR accrued on the pension contributions paid under a pure PAYG system.

The next step of our analysis switches now to derive the same concepts considered for the fixed fee PAYG based system to the Earning based one, where the individuals' pensions are exogenously determined by their own historical earning levels and the contribution rate is endogenously and periodically adjusted to restore the equilibrium of the PAYG funding equation.

To do so, we have to reformulate our illustrative example to simply perform the latter case of PAYG system. First, let us assume that there are two generations and two periods. At the first period, the working generation B pays the benefits of the retired generation A. Thus, the funding condition in period 1 can be formulated as follows:

$$TC_B^t = Cr_t.Yc_B^t.Nc_B^t = Np_A^t.Yp_A^t \tag{2.12}$$

At the second period, generation (B) becomes retired and is paid by the subsequent working generation (c) in period 2.

$$Tp_B^{t+1} = Cr_{t+1}.Nc_c^{t+1}.Yc_c^{t+1} = Nc_B^t.Yp_B^{t+1} \tag{2.13}$$

Consequently, the implicit ROR given on generation B contributions can be performed as follows:

$$ROR_B^{t+1} = (Tp_B^{t+1} / Tc_B^t) - 1 \tag{2.14}$$

By substituting the right end terms of equation (2.12) and the right end in equation (2.13) in equation (2.14), the generational ROR can be expressed by the following term:

$$ROR_{B}^{t+1} = \left(\frac{Nc_{B}^{t}}{Np_{A}^{t}}\right).\left(\frac{Yp_{B}^{t+1}}{Yp_{A}^{t}}\right) = \frac{\overbrace{(1+\theta^{t+1})}^{\text{Average Pension Growth Index}}}{\underbrace{RR_{t}}_{\text{Dependency Ratio}}} \qquad (2.15)$$

Where θ^{t+1}: is the average pension growth rat in period t+1 . RR_t : Dependency ratio in period t.

What can be followed from the above equation is that, the generational implicit rate of return depends mainly on the lagged dependency ratio and also on the growth rate of average pensions. This looks a bit different than the general view about the ROR accrued on contributions that are charged under PAYG financed pension schemes.

Regarding the individual ROR under such a scheme, one can derive it by imagining the proportional rewards on the contributions paid during his employment through the benefits he gets as pension. Simplifying that in the context of our example, each individual of generation (B) would be supplemented with an extra amount of money which comprises the difference between his average pension in period (t+1) and the contribution he has paid to finance the pensioners of period (t). To rationally perform that, the ROR on the individual's level should be interpreted with respect to the number of pensioners at period (t), their average pension and the number of contributors (generation B) at period (t).

$$ROR_{I,B}^{t+1} = \left(\frac{Yp_{B}^{t+1}}{Cr_{t}.Yc_{B}^{t}}\right) - 1 \qquad (2.16)$$

Given that $Cr_{t}.Yc_{B}^{t} = \frac{Np_{A}^{t}.Yp_{A}^{t}}{Nc_{B}^{t}}$, and by substituting it in the above equation, the individual ROR would take the following expression:

$$ROR_{I,B}^{t+1} = \left(\frac{Nc_B^t}{Np_A^t}\right).\left(\frac{Yp_B^{t+1}}{Yp_A^t}\right) = \frac{\overbrace{(1+\theta^{t+1})}^{\text{Average Pension Growth Index}}}{\underbrace{DR^t}_{\text{Dependency Ratio}}} \qquad (2.17)$$

Equation (2.17) indicates that when the PAYG system is implementing the earning based approach for calculating pensions, the Implicit ROR on pension contributions, either on the generational level or on the individual one, would ultimately depend on the average pension growth and the system dependency ratio. What is worth to mention here, is that the average pension growth rate under such scheme, follows exogenously many factors at which the individual's historical earning profile is one.

However, if the individuals' benefits in a PAYG financed schemes are exogenously fixed by the scheme sponsor, then the generational and individual ROR would identically take the following form:

$$ROR_{I+G,B}^{t+1} = \frac{1}{DR^t} \qquad (2.18)$$

If the sponsors of the latter mentioned type of PAYG index the individuals' benefits with a pre-specified rate, let say for instance the cost of living index, then the generational and individual ROR would look exactly as in equation (2.17) except that θ^{t+1} would reflect the indexation factor instead of average pension growth rate.

As regards the awarded ROR under the Notional Defined Contribution (NDC) schemes, it can be easily recognized that both measures of ROR, either on the individual level or on the generational one, would follow explicitly the notional interest that the participant contributions are marginalized with.[3] If for instance the notional interest rate is measured by the economic growth rate, then the ROR given on participants' contribution would mirror that rate. What is worthy to remind here, is that the ROR equals the notional rate only if that rate is awarded on contributions during the accumulation phase and on the remaining balance during the withdrawing stage

[3] This NDC pension scheme type is more clarified in section 2.2.2

(retirement period). Otherwise, the implicit rate would for most, be lower than the notional rate.

Funded schemes with centralized managed reserves provide the participants with a ROR that fully reflects the financial profitability of the contribution assets after the cost of running-out the scheme activities is being deducted. If the participant contributions are individually invested, however, then ROR would most likely vary among the scheme participants as contributions can be invested in different tools and by different agents. In addition to that, the risk exposure may differ between the funded schemes participants as well as their investment agents, making their pension assets subject to different rates of return.

2.2 Pension Reform in International Context

No one can confute the fact that public pension schemes around the globe have been reformed by many methods and approaches. To the extent of our knowledge, most of these reforms have aimed in a way or another to prevent the failure of financial viability of the scheme they were applied on and in some cases to improve the adequacy and the equity measures of their participants. Generally speaking, reform strategies have been classified under two major approachable groups according to their comprehensiveness and frequency, the parametric reforms and structural ones.

Parametric reforms, on the one hand, refer to the changing in one or other of the pension rules parameters such as adjusting the eligibility requirements, contributions size and distribution, and accrual rate, etc. Such adjustments comprise the majority of reform strategies that pension schemes around the globe have experienced during the last century and throughout the first half of this decade. Few countries, however, have altered their schemes structurally in the sense that the way to which these schemes are financed and benefits are calculated, is totally changed.

The main concern of this study, however, is not essentially on the way those schemes were reformed rather how these reforms are financially sustainable. Although sustainable reform strategies inherent mostly in the structural ones, there are some evidences that they can result within small parametric changes.

2.2.1 PAYG-Defined Benefit to Fully Funded

Prior to the ninth decade of the last century, most of the Latin America countries were running their scheme on the basis of one pillar DB-PAYG system (Schmidt-hebble, 1999). But as in many other countries, such a system had proved impertinent, unstable and inefficient, among many other challenges.

In 1981, Chile took a brave decision to make a revolutionary switch of their PAYG system to privately managed fully funded scheme. From this year on, the Chilean pension system has been administered by several private fund companies, namely Administradoras de Fondos de Pensiones (AFP).

The participation of new members, who joined the system after the reform strategy was firstly implemented, has been mandatory regardless whether they are employed by public or private entities. The only exception in this matter is the self employed persons who have been given the choice to participate or not. As regards the old participants who joined the system prior to the reform process, the Chilean government gave them the opportunity to choose between staying under the rules of the old pension scheme or to switch to the reformed scheme. If the latter option is considered by any participant, the government awards him a recognition bond with a value that is capable to make the member receive, at the normal age of retirement, a pension that comprises 80% of his taxable salary he received between the mid-1978 to mid-1979 multiplied by the proportion of actual contributory period to the full one (Acuña and Iglesias, 2001).

Each participant of the reformed system has to contribute from 12.5 % to 13.3% of his monthly taxable income to the pension fund he chooses, in which 10% is intended to finance the old age benefits while the rest is divided between AFP commission and a premium for disability-survivors insurance (Müller, 1999).[4] Participants, however, could optionally contribute for their old age pension account, but for a limited extent. Both mandatory and voluntary contributions as well as their investment rewards are tax exempted while pension benefits are subject to the same tax structure of other types of income (Vittas and Lglesias, 1998).

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[4] Actually, the employer collects the contributions from his employees and then distributes them to the private pension funds upon the choice of participants.

When participants reach the eligible age of retirement, they have to choose between either options to convert their accumulated contribution and the investment returns on them to pension benefits.[5] According to the first option, each member can purchase a life annuity that provides him with life-long monthly benefits. If the participant's is not interested in such a way, he could then keep his account at the AFP and withdraw his monthly benefits from that account according to a predetermined plan. If the participant's own accumulated assets, however, couldn't provide him with a monthly annuity that comprises one-quarter of his average income (or three-quarters of minimum wage) then the Chilean government is obliged to support him with the remainder (GBO, 1999).[6]

Other Latin countries experiences, generally speaking, haven't gone so far from the Chilean approach. The other experiences, however, are found in Peru (1993) and Columbia (1994) where the political resistance and bureaucratic procedures have prohibited them from applying a large portion of Chilean module. Workers in both countries had and still have the choice to select between the government provision and the new individual account system.

The Mexican's approach was a bit closer to the Chilean's one since all private sector workers have been obliged to join the new funded scheme. A more comprehensive and diversified reform module took place in Argentina in 1994 through the implementation of what is called Multi-pillar reform approach.

The newly initiated two-pillar scheme in Argentina provides participants with two types of benefits. The first type which is provided by the first pillar dominates to support all participants who accomplish the minimum age of retirement and have contributed to the system for thirty years at least, with a flat benefit that comprises 28% of their average wage (Rofman, 2002).[7] As regards the second pillar, scheme members are given the choice to opt either the following options:

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[5] The retirement age in the Chilean reformed pension scheme is 65 for men and 60 for women.

[6] This is only available for those who have contributed to the scheme at least for 20 years.

[7] The contribution rate for this pillar is 16% of participant gross insurable salary, paid by his employer.

a) They can join the new PAYG government pillar at which each contributory year intends to generate for each participant an additional monthly salary of about 0,85% of his reference salary.

b) A fully funded benefits in which the accumulated contributions (with their investment returns) of each participant after the administrative costs and the disability–survivors insurance fees are being deducted, are converted to life-long annuity.

Table 2.1 shows some basic elements of approaches that have already been the reform implemented in some Latin American countries.

Table 2.1: FF reform features in selected countries

	Chile	**Peru**	**Colombia**	**Argentina**	**Uruguay**	**Mexico**	**Bolivia**	**El Salvador**
Start of Reform	1981	1993	1994	1994	1996	1997	1997	1998
PAYG Scheme	Closed	remains	remains	remains	remains	closed	closed	closed
Private funded System								
Affiliation of New Workers	Mandatory	Voluntary	Voluntary	Voluntary	Voluntary	Mandatory	Mandatory	Mandatory
Contribution Rate %	10	8 *	10	7,5	7,5	6,5 +subsidy	10	4,5 *
Commision and Insurance%	2,94	3,72	3,49	3,45	2,62	4,42	3	3,5
Past Contributions	RB	RB	RB	CP	No recognition life time switch		CP	RB
Dissability& Survivors Pension	Private	Private	Private	Private	Private	Public	Private	Private
Minimum Rate of Return	Relative	Unregulated	Relative	Relative	Absolute	NO	No	Realtive
Minimum Pension	Yes	No	Yes	Yes	Yes	Yes	No	Yes

Source: Queisser (1999).
*: Contribution rate will be increased gradually to 10%.
RB: Recognition Bonds. CP: Compensatory pension.

2.2.2 PAYG-DB to PAYG-DC

Instead of changing both the way that benefits are calculated and financed in order to maintain the future financial viability of pension schemes, some countries have switched less comprehensively than we observed in some of the Latin American's countries and have only altered the way benefits are calculated within their schemes. In such a reform approach, benefits are no more determined by defined benefit formulas but rather more on the funded elements. The main differences between this approach and the fully funded one, is that benefits of the former remain financed via the ongoing contributions receipts from the working participants and it has no actual assets to accumulate in scheme fund nor in the participants own accounts. The second main difference is that the rate of return that pension contribution is exaggerated with, does not reflect the actual market rate of return on contribution assets, as the case of fully funded, but rather reflects other benchmarks such as the growth rate of GDP or wage bill, etc. since the contributions accounts and the rate of return on them are both notional (not actual) and the benefits are determined by a defined contribution formula, such schemes are called Notional Defined Contribution (NDC) schemes.

The methodological sense of this approach was firstly proposed by Buchanan (1968) as a general framework to reform united state pension system at that time. However, more than a quarter century latter, European countries, and particularly Sweden were the first to implement such an approach. Such a reform is well thought by several economists to expand the length of the schemes financial viability as it allows for an automatic adjustment mechanism to changes in demographic and economic parameters (Normann and Mitchell, 2000; Boersch-Supan, 2003).[8] Another crucially requested advantage inherent in this strategy is the minimization labor supply distortions due to partial elimination of the tax included in pension contributions (Lasagabaster, 2002; Franco, 2002). Sweden was the first country to go further with such a reform approach. In 1994, 1998 and finally 2001, the Swedish parliament had legislated the reform of the Swedish old pension system by replacing it by as totally

[8] This fact appears when the increase in system dependency ratio that is induced by the increase in life expectancies, for instance, do not affect the schemes financial viability at the same extent that PAYG schemes with a defined benefit formula are affected by. The main explanation for this fact is that the increase in life expectancy for an individual at a given age of retirement would result in reduced pension benefits since his accumulated contributions would be distributed among a longer life span.(Williamson, 2004). What is likely to happen in such a case, participants face the increase in their own expected life expectancy by postponing retirement in order to accumulate more contributions and distribute them in reasonable life span after retirement.

new two-pillar scheme (Settergren, 2001). The smallest pillar, on the one hand, intends to supplement the pensioners with a defined contribution benefits that are financed via 2.5 percentage points of their monthly salary charged throughout their entire career life. According to the newly legislated pension law, participants are given the choice to opt the pension fund they desire their pension contributions to be utilized with.

The largest pillar, on the other hand, charges a 16 percentage points of the participants monthly wages to finance the current retirees, exactly as the case of PAYG system in the sense that today's pensioners are financed by today's contributors. The newfangledness with this scheme is that the benefits of pensioners are calculated on the basis of defined contribution formula with a notional rate of return that mirrors the growth rate of nominal wages rather than being calculated according to the old defined benefits formula.

Similar approaches have been also implemented in Poland (in 1999), Latvia (2001) and Russia Federation (2002) (Brooks).The what is called Dini reform in Italy replaced a singular NDC pillar, instead of multi-pillar, for the old system but with a long transition period. Table 2.2 provides some information about how countries have moved partially or fully to NDC system.

Table 2.2: Selected NDC reform features in selected countries.

Country	Italy	Kyrgyz Republic	Latvia	Mongolia	Poland	Sweden
Year Adopted	1995	1997	1996	2000	1999	1999
Annuity Formula	Unisex life expectancy at the time of retirement	Unisex life expectancy at the time of retirement	Unisex life expectancy at the time of retirement	Unisex life expectancy at the time of retirement	Unisex life expectancy at the time of retirement	Unisex life expectancy at the time of retirement
Notional Interest Rate	Five year-moving average of GDP growth	75% of the change in wage level	Wage Sum	Average trends in wage levels	75% of the quarterly growth in the wage bill	Average trends in wage levels
Indexing of Pension	By inflation rate	None	By the growth rate in consumer price index	Unknown	By inflation rate plus 20% of real wage growth	By both inflation rate and changes in the rate of economic growth.

Source: Williamson and Williams (2003).

2.2.3 Sustainable Parametric Reform

To the extent of my knowledge which is based on an extensive global survey, reform approaches aim at maintaining the financial viability and sustainability of pension schemes via small parametric changes has only been implemented in Germany, just one year ago. Throughout the what is called " Rürup Sustainability Factor" (RSF), after the name of the chairman commission that proposed this factor, the German pension system would be self financed without allowing the contribution rate to exceed a targeted level (Willmore, 2004).

The core idea of this factor is to internally absorb the financial pressure on the system that is induced by the ageing population, via an automatic aggregate benefits adjustment. Since the sustainability factor refers mainly to the periodical adjustments in the members structure (ratio of pensioner to contributors), pensioners benefits, regardless the time their earners have retired, would be linked to the relative annual changes in the number of members who receive benefits from the system and those who provide the system with the required funds. (Boersch –Supan et al., 2003).

$$\mathrm{AF_t} = \mathrm{OF_t} \cdot \left[\left(\frac{\mathrm{SD_{t-1}}}{\mathrm{SD_{t-2}}} \right) \cdot \frac{5}{4} \right] \tag{2.19}$$

Where AF_t: The Adjusted benefits with respect to sustainability factor.

OF_t: Benefits calculated according to the Old Formula.

SD_{t-1}: One year lagged dependency ratio (Number of equivalence pensioners to equivalence contributors).

With respect to the above equation, the benefits of all retirees would be adjusted annually to reflect quarter the proportional change in the scheme dependency ratio. The rest burden which is not intended to be counterbalanced by lowering the level of pension benefits would be financed through a smooth and gradual increase in contribution rate, to the extent that it should not surpass 22 percentage points of the participant aggregate income by 2030 and afterward. In order to control the impact of

ageing population on the pensioner standard of living, the implementation of RSF would be accompanied by a gradual increase of the normal age of retirement from 65 to 67 years, to be introduced on a monthly steps over 24 years starting by 2011.

What is necessary to mention here is that benefits of pensioners are not always subject to reduction, unless the dependency ratio continues to increase. If the dependency ratio remains constant or decreases, however, pension benefits would remain unchanged or automatically step-up, respectively.

Another advantage of the RSF, from the author's point of view, is likely to appear in times of economic depression as the fall in pensioners' nominal benefits that is induced by the falling down in employment level, might be partially or fully counterbalanced by the downfall in prices. Contrary to the case of depression, the sustainability factor might be more harmful in times of long- lasting stagflation , as the pension benefits tend to decrease and the prices are more likely to increase, thus worsening the real value of pensioners' benefits.

2.3 Literature Review

2.3.1 Tradeoffs: Financial Viability, Risk and Return

The issue of pension schemes' financial viability has been discussed by many academic researchers and policy makers. The emergence of pension reform debates has originally followed the fact that most unfunded schemes around the globe would never come to stability. Thus, researchers spent great efforts to help interested policy makers to arrive at the best outcomes, or at least the less badly-off ones.

Although some Latin American countries have successfully privatized their pension schemes, the potential outcomes of such a reform approach, from a multi-dimensional perspective, is still debatable.

Starting with the optimistic view about privatizing unfunded pension schemes, Feldstein (1996) presents several dimensional advantages of privatizing pension schemes. At first glance, shifting to fully funded schemes eliminates the future

deprivations that most likely to result by the continuous growth in the scheme unfunded liability as when no reform take place. In an attempt to acquaint more comprehensive implications, Feldstein fences multi periodical gain scenarios of implementing a transition towards fully funded provision. In each year the net effect of such a policy basically depends on the offset between the real adjusted return on the increase in capital stock and the loss of returns that are given implicitly on pre-reform paid contributions. The net effect of these contrastingly influencing streams passes through three main stages. During the first stage, the extra returns generated via the increase in capital could not surpass the implicit rate of return on pre-reform contributions and hence the net effect tends to be lower than zero. As time passes, the returns on extra accumulated capital stock continue increasing while implicit returns on previously paid contributions commence decreasing. After the system stop paying benefits to those who contributed to the scheme before the implementation of this strategy and the returns on capital stock continue increasing, the scheme then would end-up by never ending positive gains.

In a more comprehensive study, Feldstein et al. (1999) analyze the possible multidimensional- financial outcomes of a reform strategy that demands a complete or partial transition to an investment based pension provision where contributions collected for financing the funded benefits portions are invested in a stock and bond mutual funds. The approach they have considered aims at providing the participants with a benefits level that is constrained with a minimum floor that is at least as large as the level of benefits promised by the pension law pre to reform.

In the fully funded scenario, the authors suggest an additional supplement of contribution rate only of less than one-third of the current contribution rate.[9] Over time, the combined contribution rate will decline gradually until it finally ends with a contribution rate that is only needed to finance the participants own pension. The probability of maintaining the same promised level of benefits however, took a considerable attention in the author's discussions, particularly for younger participants who would rely mainly on benefits that are directly subject to market risks.[10] To avoid

[9] The status quo contribution rate is 12.4%, and the proposed increase above this rate is 3%.

[10] At the beginning of reform implementation, the old aged participants, as the authors simulate, get proportionally more of their benefits according to the rules of old system and the rest as an investment based benefits.

such an uncertainty, they initially suggested to increase the level of saving contributions for younger cohorts to a level that is capable to absorb some of the future unexpected negative fluctuations in the portfolio rate of return, instead of been fully absorbed by the pension benefits. However, coping with the financial market risks via charging extra contribution seems not as the first best solution, since it will come at the expense of younger generations and does not completely eliminate risks. From there on, they proposed a governmental guarantee which provides a participant with the difference between the benefits he expects to get according to the old system rules and the benefits provided with the reformed one. These guarantees can, as the authors argue, be financed jointly by additional taxes and the incremental capital tax revenues that result from additional savings.

In order to avoid interpreting less sensible conclusions about the worthiness of reform strategies that involve a transition to funded schemes, Quinn (1997) elucidates that pension insurance should never be evaluated only by the angle of returns. Other aspects must also be considered in the design of any reform strategy such as providing participants with indemnity against certain types of risks and bypass them from the large extents of inequalities and inequities. From that on, he proposes to take the individual equities, adequacy, security and economic growth on the top of the reform targets agenda.

Miles (1998) reports that the longer run implications of the permutation of funded schemes in the place of unfunded ones will prove quite beneficial. But how long it takes to reach that longer term position in the privatized pension provisions considerably depends on the ability of these provisions to accumulate more funds. Another central aspect the author presents in his work is that problematic issues inherent in such a reform approach arises more when the reformed scheme incorporates more generous features and if it implies greater extents of insurance and redistributive characteristics in the sense that either the scheme sponsors or the government have to seek for means of financing such features.

Bosworth and Burtless (2002) examines the foresighted implications of two reform strategies aims at prefunding part of unfunded liabilities and also increasing the level of national savings. The core idea of the first reform option he has examined is to bring the expected actual actuarial imbalance to zero via an immediate increase in the

level of contributions collected from the scheme participants.[11] He suggested investing these additional receipts in a special trust fund that would generate the adequate assets required to close-down the actuarial imbalance (advance funding). The second option, on the other hand, intends to induce the gap between pension outlays and contribution receipts to the level zero through reducing correspondingly the scale of pension benefits. The implementation of the latter approach, as the authors suggest, should be accompanied with an establishment of individual accounts that can provide future pensioners with an additional income stream to compensate them for the losses in benefits, as one of the consequences of implementing the second reform strategy. Both approaches, as they argue have a similar positive impact on boosting savings, but they appear different in their entailments on future cohort of retiring workers. Nevertheless, their simulations have shown some surprising implications in the context of risk perspective.

By utilizing the historical volatility of equity returns as a scenic for market financial risks, the performed findings have shown some surprising implications. For instance, the volatility of participants' annuities that are generated by equally distributed portfolios of bonds and equities exceeds 40% of the expected annuity. The more equity is invested in participant portfolio, the more the uncertainty regarding the expected annuity. Some assumable sorts of risks, as they argue, might be even greater if the extra funds generated by advanced funding are invested and utilized in the social security trust fund. Although the backbone of their argument originates initially from an optimistic view, their final conclusion arrives at an unhappy ending. They believed that despite the fact that advanced funding through trust fund would have more influence on national savings and output than it would be in the case of individual accounts, the unexpected high returns on invest might induce schemes sponsors to reduce the level of contributions. The rest of their pessimistic story proceeds by their believe that such a policy response would be followed with a fall in the level capital stock, increased rate of return and thus further reductions in the contribution rate. The unpredictable upward and downward fluctuations in rates of return and contribution rates crucially influence the stability of pension benefits, participants earning levels and accordingly the system itself in away that it is hardly to avoid in the context of

[11] Actuarial balance implies that the net present value of benefits paid to pensioner during the coming 75 years matures exactly discounted value of the scheme total assets over the same period.

financial market risks. Building on these arguments, they conclude that strategies that involve advanced funding via individual accounts are less vulnerable to financial risks than if they are done through trust fund. The only way to avoid that extent of risks of the latter strategy, as the authors suggest, is by adjusting rationally and prudently the contribution rates in response to investment returns.

Geanakoplos et al. (1998a) use money worth measures to reach general conclusions regarding the question of whether privatizing pension plans would increase the rate of return for all retirees. They tried to compass his termination by simulating a privatization approach on the U.S. pension funds in which the already incurred unfunded benefits of the pre-reform generations are financed via the subsequent ones. Their findings suggest that the extra rate of return given for individuals' contributions after reform would be dissipated by the transition cost. One way to keep the extra returns not surceased, however, can take place through inheriting the unfunded liabilities to the government or depleting them via cutting- down accrued benefits. Following both or either of these solutions, the extra expected returns for future generations will come at the expense of either future generations or of today's retirees.

The authors imagine four superior conditions in which if they exist, the money's worth measures can be utilized to net-score the outcomes of privatizing reform schemes: (i) the house holder optimally use the available investment opportunities in the market. (ii) Intra and intergenerational tradeoffs should be neutralized among beneficiaries before and after reform,(iii) the comparison of the cost and benefits of alleged reform should basically be based on the money's worth measures. (iv) Finally, with addition to the previously remarked conditions, scheme agents must be able to replace all pension streams (benefits and contributions) through utilizing money fluxes

Geanakoplos et al. (1998b) reaches a conclusion well-nigh their ratiocinations but from another attribute. Three approachable steps of reforming pension schemes were testified by them to reach a conclusion on the salutary of privatization. First, if we privatize the unfunded pension planes via creating individual accounts that are invested in safe bonds that award a rate of return higher than the implicit rate honored under the pre-reformed scheme, then the extra returns on participants' contributions would wipe out by their implicit share in financing the transition cost. Considering some sorts of idiosyncratic risk factors in the computation of expected returns accrued

under the privatized system brings down the rate of return to levels that are lower than those observed before reform. They also argue that even if individuals choose to invest their pension-oriented assets in market equities that yield higher rates of return, the final outcomes will not look as initially observed. This fact is being ascribed by the authors to two main arguments. First, adjusting market rates of return to the initial risk of bond yield would bring down the level of returns premium. Second, even if the market risk adjusted rate of return is optimally raised through diversification strategies, the general equilibrium process with a large number of equity bidders would most likely land up with a jump in stock prices and hence lowering their yield.[12] Nevertheless, if any effort is made to step-up the finally awarded returns for the forthcoming future generations through out increasing the funding level of the scheme, then these future gains will most likely be at the expense of the current generations. Making upon the above mentioned arguments, as they state, social security reform debates shall give more attention to the trade-off of generational returns, the risk aspects of enlarged stock traders and the issue of choosing the better approach for utilizing the privatized accounts.

Aaron and Reischauer (2000) favor solving the financial challenges of social security schemes without any fundamental changes. They diagnose the features and avails of pension schemes as crucially requested, since they provide assured and adequate income support to old age and disability pensioners as well as their survivors. Pension plans also cater a just risk dissemination among different types of participants who are subject to various forms of uncertainty such as assets price fluctuations, inflation and longevity, among others. However, the problem of financial collapse, according to them, can be redressed through optimally utilizing the wealth accumulated in the pension schemes buffer funds in a way that maximizes the level of return for satisfactory levels of risk.

Munnell (1999) provides groundbreaking features for pre-funding pensions and equity investment. He tried to show that defined contribution approaches are not the only stipulation to achieve the goals of prefunding and portfolio optimization, it can also be accomplished through defined benefit plans. From that on, he argues that the attention

[12] It is also argued that higher demand for stocks, relative to bonds, should increase the price of stocks relative to bonds and thus decreasing the equity premium. For more detailed analysis see (Blommestein, 2002).

should be agitated to the events of retirement income. However, his sentiment is a bit biased toward defined benefits plans as they allow risk sharing and efficient cost management and adequate income security lines for relatively low income earners as well as disabled ones. Concurrently, Munnel admits that the assessment of pension plans is not a facile task to discuss from the stand point of uncertainty, particularly regarding political risks that are hard to imagine in pure PAYG defined benefit plans and partially funded DB plans.[13]

Throughout their ten myths about social security reform, Stiglitz and Orszag (2001) put forward some critical arguments against the World's Bank multi pillar reform approach. The World's bank approach which is proposed in averting the Old age crises recommends a reform process that entails (i) a publicly managed, unfunded DB pillar (ii) privately managed, funded DC pillar and (iii) a voluntary private pillar.

The ten myths they raised throughout their paper come out with a pessimistic view concerning the extent in which a second pillar, of a privately funded DC pillar can be favored over a well structured DB pillar. For instance, the argument which is often raised by many economists, that the rates of return are higher under individual accounts may prove not true. Once the cost of financing the unfunded liabilities and the cost of managing these accounts are considered, particularly the small accounts, the resulted and implied ROR under DB pillar is more likely to exceed that of individual accounts. Not far from this myth, the authors indicate that even though competition reduces the administrative costs under private DC plans, no one should conclude that such a cost would always arrive below its level in DB pillar. The latter argument is built upon the experience of Chile and U.K. in which the three major types of costs (i) the accumulation cost (ii) alteration cost and (iii) annuitization costs have jointly registered a significant level. The other myths in a way or another criticize the suitability of having a privately managed DC pillar and recommend a wider range view when deciding about the shape of second, in which, all the raised myths have to be considered.

Pennacchi (1998), however, introduces some possible solutions to the issue of income uncertainty that has apprehended the attention of Munnell throughout supplementing

[13] For a wider knowledge on the political risks inherent in unfunded schemes, see for instance, Mchale (1999).

the reformed schemes with additional guarantee provisions. His simulations have considered three distinct types of individual fund rate of return guarantees that are evaluated in the context of Option- Pricing theory. The first option is to provide the participants with a guarantee of fixed minimum rate of return. As a second applicable option, the author also testified the appropriateness of introducing a minimum rate of return guarantee that is linked to an index of wide funds performance. The third option, is to provide the participants of a mandatory defined benefit plans with a minimum pension benefits guarantee. What his simulations have shown is that among all sorts of governmental guarantees, participants tend to select adversely and have a moral hazard behavior. The best way to eliminate such distortional virtues, as the author suggests, is through establishing a risk-based insurance premium. This means that riskier individuals have to pay higher insurance premium.

Therefore, they propose confirming portfolio diversification principle and to pose another pillars to the initially unfunded one. Contradicting themselves, the authors have finally ended on a pessimistic vista regarding their proposed reform measures. they indicate that as time passes away with the multi tier system, high income earners will use their best efforts to scale down some of the redistribution characteristics of the reformed scheme in order to step-up their own pension rewards. Believing that this scenario is most likely to happen, reformers should stimulate a greater attention to solidarity issues when they ever think of such an approach.

Burtless (2000) explains the misconception of the expected consequences of transferring retirement schemes from PAYG to systems that are basically based on individual accounts. Such a strategy, as he finds, would in most often cases combine two major problems. At first, it ignores the burden of dual contribution rates: the contribution needed to finance the participants own pension accounts and the implicit contribution required to pay for the unfunded liabilities. The second problematic issue, he has cogitated in, is the type of risks that accompany the defined benefits system and defined contribution ones. In a defined benefits system, risks are allocated and distributed among generations so that participants born at the same year having the same earning records are equally subject to the same levels of risk. While in a defined contribution system, risks can range differently among individuals even though they

have the same earning profiles and identical investment strategies.[14] Thus, DB plans, according to the authors view, tend to expose a wide variability in outcomes, regardless whether participants are homogenous or heterogeneous either in their earning records or in the strategy they follow to manage their pension assets. From that on, they bet on prudent reserve management strategies in order to make reform options that involve advance funding more successful.

Miles and Cerny (2003) indicate that it is not necessary that any reform strategy which combines more funded elements implies always a greater profitability for the schemes' participants, especially if profitability is estimated according to the price of factors scarcity.[15] The core of his conclusion is initially based on the fact that participants tend to invest a relatively high proportion of their pension assets in risky tools when their future pension income comprises more funded elements than unfunded ones, vice versa. Switching the investment strategy of pension wealth towards safer financial tools aftermath the reliance on more funded elements, depends ultimately on how the returns on safe assets and the risk premium on risky ones would move with respect to the change in capital to labor ratio. If the proportional drop in risk free rate of return is higher than the rate of deterioration in risky ones, then the switch to safer tools should be in a lesser extent, vice versa.

Williamson (2004) does not fully agree with Miles and Cerny since he thinks that moving from unfunded pension plans to plans with more funded elements would face many challenges to which the transition cost is among the most significant driver. A better alternative reform strategy can be done by following NDC approach. The reasons for being optimistic about this option, as the author argues, is that transition costs in such a system are internally financed throughout PAYG mechanism. In addition to that the author thinks that NDC implies lower administrative costs and the pensions of beneficiaries are not vulnerable to the volatility of financial markets.

Gruber and Wise (2002) emphasize on the future implications of pension reform. Their conclusions were based on the question whether the reform strategy would be

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[14] In such a case the main source of dissimilarity, as the author attributes, is the timing of retirement.

[15] The higher the availability of production factors, the lower is their prices relative to the prices of other scarce factors. For more comprehensive view on how the degree of factors scarcity has affected their prices, see for instance O'Rourke et al. (1996).

temporary or permanently fix, and how it could affect the overall national saving. Parametric reforms as their study finds can alleviate the financial imbalances of the unfunded schemes but well have little influence on national savings. In addition to that, parametric reforms do not mean that reformed schemes will be isolated from any future financial crises. On the other hand, fundamental reforms with the introduction of personal accounts are most likely to increase the level of personal saving and hence national savings. Such a scenario, according to the authors, is being supported by many researchers who found that personal accounts in most cases, do not substitute that much for personal savings. Contributions under this sort of schemes are more profitable since the investment in the equity market yields greater returns on assets when compared with the implicit rate of return provided by PAYG schemes. The major risks of transferring to personal accounts scheme, as they conclude, relate to the redistribution principle that might be less maintained than it is in the PAYG system. Fluctuations in financial markets are also another type of risk at which the benefits of some group of participants step rather unstable.

Sinn (2000) considered the issue of privatizing pension schemes from an anoher angle. His finding basically apposes the market funded schemes since theoretically, both explicit and implicit taxes before and after reform would be the same. That said although market based pension schemes provide a high rate of return, the net present discounted value of pension benefits is similar to those achieved under the unfunded schemes. The only change pension reform can do, as he argues, is to alter the time path of burden across generations, as reforms are always no more than a zero- game mechanism.

Modiglian et al.(2000) support the gradual replacement of PAYG system by fully funded one. They show by simulating the U.S. social security scheme that introducing funded elements will permanently preserve the welfare objectives of the former PAYG and at the same time maintain the current promised benefits. Their conclusion is initially drawn on the fact that contributions paid under a pure PAYG are transferred directly to finance current consumption. While with new funded elements, contributions can be invested in financial tools that will most likely grow largely by the time of retirement and yield a return that is capable to bring down the financing

needs of the PAYG system.[16] Keeping on PAYG, as they suggest, not only finically unsound, but it might also imply high degrees of insolvency risk especially in the case where demographic and productivity movements are less stable than the market rate of return on financial assets.

Through the evaluation of the advisory council plans that aims at ameliorating the future financial solvency of the U.S. social security system, Devine (1997) resolves that he is not sure enough whether the labor supply can be eventually influenced by the mechanism in which the link between individual own contributions and benefits is tightened through privatization process. His argument relies principally on a general conclusion regarding the workers behavioral responses that follow in different routes the workers own characteristics, including age, gender, and skills level. As regards age, for instance, younger workers might react to the changes in future prospective levels of income in a trifling matter, simply because they discount their own retirement income over a long period of time. Such a weak response can also be attributed to the probability of being alive until retirement. Devine reports that since this probability is positively related to the age of workers, the uncertainty concerning remaining life span becomes in a lesser extent young employees when comparing its level for older ones. This living fact of the latter argument, anyhow, is evidently supported by widely standardized life tables, since they indicate explicitly that mortality rate (Survival rate) relates inversely (positively) to someone's age.[17]

In addition to the factors mentioned above, Devine thinks that the job offering decision of workers in some cases can be influenced by the portion of social and funded elements in the initial plan and after privatizing it. To illustrate that, the author indicates that if the redistributive characteristics of the former plan have been reduced at the advantage of more contribution based benefits, then participants might take this as a sign of retirement income variability. This as the author believes could make them

[16] This, however, should not be considered as a general principle since the authors have assumed that part of the transition cost is supplemented through: 1) the reserves accumulated in the trust fund. 2) The future expected surpluses in the scheme total balance. 3) A portion of government surpluses. 4). optimally managed pension reserves.

[17] Sometimes it is called death rate. This concept refers to the probability of dying at a specific age. the rates found in life tables usually denote for the number of people who die of a certain disease compared with the total number of people at each age bracket. Mortality is often stated as death per 1000 inhabitants.

more pessimistic about their living standard during the retirement life span and hence more reluctant to pay mandatory contributions.

2.3.2 Incentives and Savings

James (1999) seeks for the trade-off between efficiency and equity that might occur as a consequence of moving from unfunded to funded pension schemes. Before calling some of his results regarding this issue, it is worth mentioning the inefficiencies the author raises as the sources that advocate the need to reform PAYG-DB benefits. the author argue that the absence of clear link between benefits and contributions is most likely to result in a decreasing level of employment and reallocating labor from the formal to the informal sector, among others. Another dimension of inefficiency the author contends appears in defined benefit schemes with buffer funds that are badly managed. As regard equity, the distortions may arise from two dimensional facts. The first comprises the better treatment of high income earners over lower earners.[18] While the second reflects the present values transfer from young to older generations.

Arguing optimistically, James thinks that a great portion of unfunded schemes inefficiencies can be alleviated via the transition to fully funded schemes. The clear link between participants' benefits and their contributions in funded schemes encourages them to contribute more rather than escaping the payment of implicit taxes incurred in the unfunded schemes. This of course would remove a great portion of the labor market distortions and also enhance participation. Concerning the equity based distortions, the author comments that funded schemes enhance capital formation that fuels the economic growth and hence contributing in the possible increase of the future earnings for the middle and low class earners. Funded schemes also remove some types of extra benefits that are implicitly honored to prerogative groups.[19] Some pre-reform equity problems in the privatized scheme, however, still prevail and some others may also arise. The random fluctuations in the profitability of market traded

[18] At first glance, it might be thought that lower income earners get more generous returns than the high income earners get on their contribution. The author however, presents some possible facts that might bring back this perception to a reverse conclusion. Among them is that rich participants live more than the average life expectancy of poor participants and they also have more opportunities to join pension –credited university periods.

[19] These groups include those who can financially benefit from special sorts of features and opportunities such as those who retire early and not discounted fairly.

assets during the contributory life, the unpredictable levels of interest rate at the time of retirement and the administrative costs implications are among the most important equity problematic aspects that have to be considered after implementing such a reform strategy. In sum-up, James concludes that while the efficiency gains are more likely to appear in the privatized pension scheme, the identity of winners and losers reckons on how participants exploit the available opportunities and on how the equity principle is regarded.[20]

Lindbeck and Persson (2003) assure that any reform strategy that implies a stronger link between participant's benefits and contributions than it is implied in the pre-reformed scheme would surely result in efficiency gains in the sense that implicit tax wedges would partially be reduced. However, this conclusion should not be seen for all generations since that the efficiency gains by any generation would mostly occur at the expense of other generations.

Via using what is known Auerbach-Kotlikoff dynamic life cycle model, Kotlikoff (1995) concludes that efficiency gains are likely to be inherent when pension schemes are privatized. The extent of gains or losses(in particular cases) depends mainly on several factors among which the way incomes are taxed before the reform process, benefits correlate with participants own contributions and the tax instruments used to finance the transition cost are the most important. For instance, the maximum level of efficiency gains as Kotlikoff finds in his model can be achieved under the following conditions and circumstances:

- A progressive income tax system is initially implemented before reform.
- The pre-reform linkage between benefits and contributions is low.
- Consumption taxes are used to finance the transition cost.

If these conditions were all to exist, the level of initial welfare might increase by almost 4.5 percentage points. This level, however, would most likely fall if either of these conditions alternatively occurs:

[20] The consideration of equity principle differs among participants and scheme sponsors. Sometimes it is regarded as financial neutrality, reducing inequalities or eliminating poverty, among others.

- The income tax rate before implementing the reform was independent from the level of income base.
- Income tax rates are increased to finance the transition cost instead of the consumption taxes.
- A perfect pre-reform linkage between individual's pension benefits and contributions.

When Katlikoff has simulated the existence of all the above conditions, the welfare level appeared lower than the initial welfare level by roughly 3 percentage points.

Miles (2000) states that the optimal degree of funded and unfunded elements (flat pension) in pension schemes should mainly follow two factors. The first comprises the nature of the distribution of rates of return while the other relates to the development and efficiency level of annuity markets. The combinational mix between the market generated rates of return on behalf of their volatility on the one hand and the extent to which the financial market provides perfect annuity contracts, determines the degree of reliance on the funded elements. Assuming for instance the contract market perfection is constant, the higher rate of return on market assets even though when associated with more uncertainty, it is more efficient to include more unfunded elements, vice versa. If on the other hand we assume the rate of return on a given level of volatility is constant, then it is worth increasing the reliance on the funded elements whenever the financial markets became more efficient to provide annuity contracts. However, the final combination of both elements should also take into account how explicit market rates of return might differ from the implicit ones inherent in the unfunded.

Mitchell and Zeldes (1996) seem not very optimistic regarding the ability of reform strategies that involve more funded elements to motivate participants own savings. Since precautionary savings positively relate to the degree of uncertainty[21], the net effect of introducing fairly actuarial elements fundamentally depends upon the extent of how political risks abridge and market risks increase. If the scale down in political

[21] Some evidences on this fact can be found in Irvine and Wang (2001) and Murata (2003), among several others. A contrast evidences have also been concluded by other literatures.

risks via the more funded benefits exceeds the jump-up in the market based risks, participant's savings are more likely to increase, and vice versa.

Empirically speaking, Coronado (1998) studied the impact of the Chilean well known experience in pension privatization at the beginning of the ninth decade of the last century on the individual savings of participants. His findings confirm the perception that pension privatization enhances savings since the move of the Chilean pension system from PAYG to the fully funded one has resulted in increasing saving rates for participants who have joined the reformed scheme by almost 7.5% points.[22] If the above mentioned arguments of Mitchell and Zeldes (1996) apply in the context of Chilean experience, then one can conclude that the impact of reduced political influence on participants was lower than the impact of increasing market uncertainty. This conclusion, however, has not been confirmed by Coronado himself, since he admits that such a ratiocination cannot be corroborated unless the asset allocation among the household is studied.

A contrast conclusion nevertheless found in an experience that is geographically not so far from Chile. Aguila (2003) encounters that the replacement of Mexico old PAYG scheme by the fully funded private system in 1997 has not led to an increase in private savings. From that she he proposes additional procedures in order to make the implemented reform strategy more influential to promote private savings. An example on such procedures is to provide the employers and employees with preferable fiscal treatment in such a way that enhances their voluntary savings.

2.3.3 Financial Markets Preconditions

In an attempt to initiate a better environment for pension reform, Blake (2003) puts forward some financial requirements that are needed to enhance a successful shift towards fully funded schemes. The most important condition, in his view, is to have financial instruments that accomplish the following two criterias: (i) they should be highly correlated with the growth of earnings during the early life of pension fund and

[22] He used the output data from the household income expenditure survey conducted by the National Institute of Statistics in Chile. The data were collected over a period of twelve months, from December 1987 through November 1988. Saving as the author defines is the household tax-deducted income minus expenditures.

(ii) have greater capital value certainty as the retirement date approaches. Both features are crucially requested to help targeting the future pension benefits at the time of maturity. Further supporting elements, the author proposes, can be guaranteed by the government through issuing bonds indexed to the changes in the national average earnings.

More responsibilities on governments for providing a better environment for a successful transition to fully funded schemes are classified by Blake under two main stages. During the first stage, namely the accumulation stage, governments should encourage the introduction of appropriate incentives such as assuring a greater transparency in the published performance data in order to promote the efficient investment management of pension assets. During the distributional (Payout) stage, the requirements seem to be more financial than regulatory. For instance government might be requested to issue instruments that enable the annuity providers to hedge risks that are beyond their ability. These instruments should be designed in a way that enables those providers to hedge special types of risks effectively and economically e.g. survivors bonds.

In another perspective, the investment in information technology projects that aims at establishing a better registration system for contributions, monitoring performance standards and program efficiency as Mitchell (1997) argues is crucially requested for privatizing pension schemes. In addition to these conditions, major steps must be considered when the reliance on the funded elements increases. Among these steps is to strengthen the banking and insurance sector in order to increase the participants confidence in the system. As Blake (2003) did, the authors appoint two major responsibilities on governments to support the success of pension privatization. the first reflects the liberalization of foreign investment of pension funds whenever the domestic financial markets are not functioning well in terms of capability, risks and returns.

A second alternative or additional responsibility on governments is to increase the issues of government insured bonds when the degree of liberalizing global funds is low. The authors aspire from the latter responsibility to expand the functions and the capabilities of domestic market.

Vittas (1999) however, disagrees with the overestimation of the feasibility preconditions that facilitate reaching the desired goals of privatizing pension provisions. He thinks that the impacts are more likely to act the one way or another as the gradual accumulation of pension fund assets supports the development and efficiency of the financial markets. The most important demanding issue in the context of feasibility preconditions is to guarantee and maintain macrofinancial stability in order to assure the efficient functionality of market securities and institutional investors. In order to safely handle the participants accounts and secure a better supply of reliable insurance contracts, among others, the author accents that countries subject to reform should nurture the more efficient as well as solvent banking and insurance institutions. The impact preconditions, as Vittas defines, include the attainments of critical mass, the adoption of tributary regulations, the quest for optimizing policies and the prevalence of pluralistic structure.

3. The Social Security Corporation: Historical and Analytical Facts

3.1 The Pension Insurance System in Jordan

Before going through the detailed analyses of the insurance coverage of the Social Security Corporation (SSC), the concerned provision in our study, a brief overview on the pension system is worth mentioning here. Before the SSC has already been established in 1980, the government pension system was the only provision that provides a career based Old-Age benefits. The coverage of this fund, however, was only provided to civil servants working for the government as well as for all members of the armed forces and the public security, civil defence and intelligence services.

The absence of complementary schemes that cover none public employees and employers has forced the efforts toward announcing the social security law in 1978 which was the root for establishing the SSC in 1980. This law has given the corporation a full independency status on a basis of self financing. The commencement of the corporation activities had been launched on the basis of mandatory coverage for market based economic activities that hire more than 50 employees. But one year later, the government decided to expand the coverage umbrella of this corporation to comprehend all companies that employ no less than 20 persons. In order to increase the role of the SSC in providing old age security as well as other insurable services, the legal authorities took two steps further to expand the coverage of the scheme through mandating all companies that engage more than ten persons by year 1984 and 5 persons by 1987 to insure their employees and employer according to the legislative conditions of the scheme. In addition to that, the scheme has started to cover all universities, municipalities and civil employees of the armed forces under the same conditions that entitle the private sector participants.

During the last decade of the past century, the Jordanian government felt the expected future financial challenges of continuing with its pension system as the proceeds towards civil and military servants started to increase dramatically with a negligible increase of

contribution receipts.[23]Accordingly, the less politically viable solution was to shift all new recruits who have begun their work as civil servants in the public sector to the SSC. Further steps were taken afterward during the second year of this century; among them is the permutation of all persons hired after 2003 in the non-civil government branches to the SSC.[24]

The initial SSC law of the 1978 and it is modified version in 2001 allows the corporation to provide six types of insurance:

I- Insurance against natural disability old age and death.
II- Insurance against work injuries and occupational diseases.
III- Insurance against temporary disability due to sickness or motherhood.
IV- Health insurance for the worker and his/her dependent.
V- Family allowances.
VI- Unemployment.

Although the SSC provides only the first two types of insurance coverage, the attention toward this corporation has increased substantially from the time it was established especially if we know that the substitute provisions are absent and the private insurance system in Jordan is still immature and needs imminent reform.[25]

3.1.1 Members Structure

As in other pension schemes, the SSC embodies two types of participants. The first type comprises the active members of the scheme. We named them active here in the sense that those agents are still participating in the production process of different market based activities and paying contributions to the scheme. The other type of members_reflects the non active participants who are getting financial benefits from the scheme regardless of the insurable category they belong to.

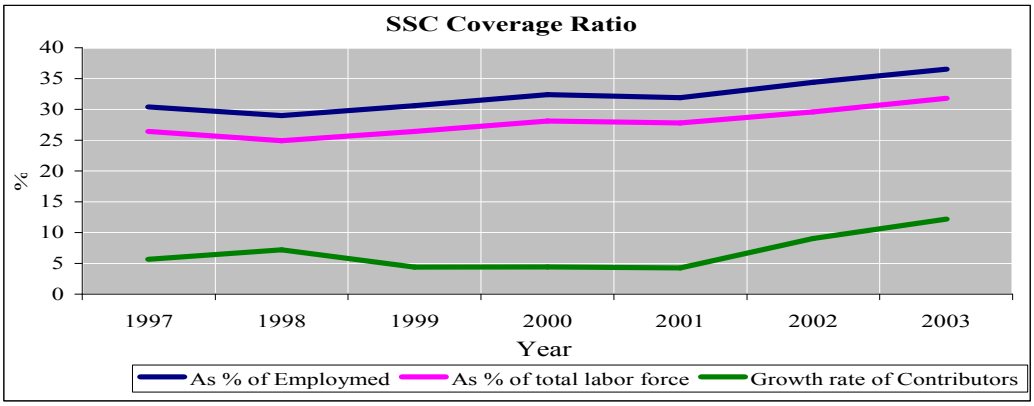
As regards the first type of members, the SSC has experienced a drastic increase in the number of active participants. From the beginning of the nineties of the last century until

[23] It should be noted that the contribution rate for the public pension scheme is 8.75% out of total income. The operational annual shortfalls in the public pension obligations balance have been always financed from the general budget.

[24] Officers, however, are still covered under the rules of the old system.

[25] For a deeper overview about the insurance system in Jordan see Vittas (2004)

the end of 2003 the number of contributors has almost doubled. The main cause of such a rapid increase in their number relate by a way or another to the increase in mandatory coverage, the displacement of new government servants from the public scheme to the SSC and the increase in employment level, among others. The proportional increase of the employment level, however, was in some years higher and some others lower than the proportional increase of covered persons since the proportion of persons who are insured under the SSC's umbrella has unsystematically fluctuated during the period 1997-2003, as Figure 3.1 depicts. Generally speaking, the SSC seems to be on the right track in terms of coverage development as the ratio of employed persons who participate in the SSC increased by almost one-quarter within only five years. When the rate of unemployment is also considered, the coverage ratio seems a bit lower than observed in terms of actual employment.



Source: Author's Calculations depending on the SSC annual reports, different issues.

Figure 3.1: The development of the scheme's parameters

It can be seen also from the above figure that the growth rate of contributors has fluctuated moderately during the same period with no less than four and not more than twelve percentage points.[26]

What is important to state here is that the number of male contributors largely exceeded the number of female contributors over the last twenty five years. Such a feature can mainly be attributed to the lower female labor force participation rate to which cultural, social barriers have apposed to females to share the labor supply in measure of their counterpart males. The second possible reason for this feature basically reflects the high proportion of active females who are not employed when compared with males. In 2003 for instance, the

[26] For detailed date regarding the development of contributors see appendix.

unemployment rate of females was almost 21% while only 12% of the male active labor force were unemployed. The coverage ratio for females, on the other hand, unexpectedly appears higher than their male counterpart. The possible explanation for this fact combines the social and cultural conditions and the SSC's law clauses. To put this in simpler manner, some of the cultural barriers prohibit females to work with small enterprises where the number of staff is relatively low and motivate them more to work with intensive labor activities. Given the fact that SSC's coverage is mandatory for the latter sort of activities, females tend to appear more institutionally obligated to participate with the scheme insurable services.

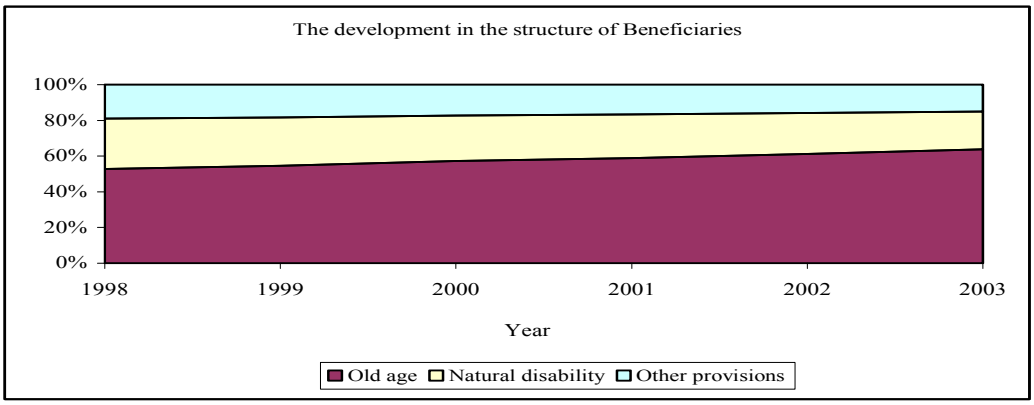
The number of beneficiaries, on the other hand, has also developed considerably from the time the SSC was established until recently. The stock of beneficiaries from the old-age provision who retired on the normal and early retirement basis have already started to increase in accelerating rates by the beginning of the last decade of last century as many participants have started to fulfill the minimum vesting period required for retirement. [27] The average annual growth rate in the number of old age beneficiaries has registered almost 16% during the period (1998-2003) while the corresponding rate in the number of contributors couldn't have exceeded 7%. This of course as we will see later in this study caused part of the increase in the systems' dependency ratio.[28]

The number of natural disabled beneficiaries has also increased all along the studied period but in a lesser extent than we have observed in the old age provision[29]. Beneficiaries of other types of provisions such as with death and disability caused by work were no exception in respect to the above observed trends. Figure 3.2 shows conspicuously how the relative importance of old age beneficiaries has increased at the expense of other types of retirement provisions during the period (1998-2003).

[27] Vesting period is a widely used pension concept in which it reflects the minimum period the pensioner should have contributed to the scheme at the time of retirement. Usually vesting period conditions are associated with a minimum age of retirement.

[28] We mean by the system dependency ratio: the ratio of pensioners to active contributors.

[29] This can be attributed to the fact that disability pensions are less optional for beneficiaries since they have to pass many procedures in which an independent medical committee is involved among others.



Source: Author's calculations based on the SSC annual reports, different issues.

Figure 3.2: The development of the scheme's beneficiaries structure

3.1.2 Financial Balances

Generally speaking, the SSC has two main sources of funds, the insurable revenues the scheme generates via the contribution rate levied on contributors, and the investment revenues from utilizing the reserves that have already accumulated in its fund. As regards the contribution part of revenues, the SSC collects two types of contributions. The first type represents the monthly fees imposed on participants to insure them against old age, death and disability, while it charges the second type to insure them against work accidents and injuries.

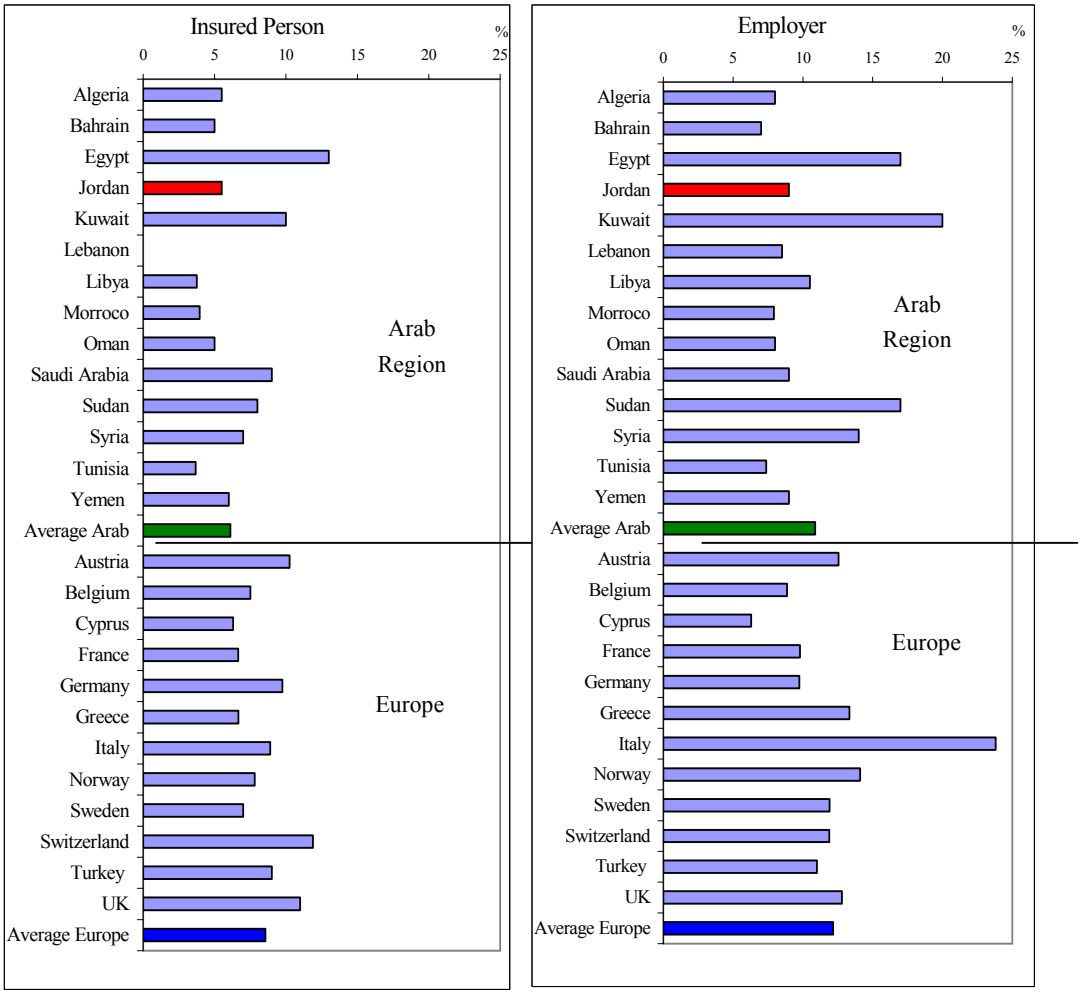
According to the SSC's law, a contribution rate of 14.5% of participants monthly wage bill which intends to cover them with the above listed provisions of old age security has to be shared unequally by the covered participants and their employers. The employee pays only 5.5% and the remaining part is paid by his employer. From a global perspective, as Figure 3.3 clearly shows, such rates either the one paid by the employees or by their employer can still be considered fair when compared with other countries.

Among the selected Arab countries, only in Bahrain, Libya, Morocco, Oman and Tunisia the insured participant pays less than the Jordanian participant. Lebanon as the only case, charges no insurance contributions from the main contributors. None of the selected European countries, on the other hand, deduct less than the SSC does from the salary bills of it is participants.

The sentiment differs a bit when the contribution rate imposed on the employer to insure his employees in the old age insurance provision is considered. Compared with respect to

the contribution rate charged from the insured persons, more Arabian countries charge a higher contribution rate from the employers than SSC. These countries are Algeria, Bahrain, Lebanon, Morocco, Oman and Tunisia. Among the selected European countries, only in Belgium and Cyprus the employers pay a lower proportion than the Jordanian employers pay to insure their own employees.

Benefits on the other hand are given on the basis of several statuses. In terms of the number of beneficiaries and the outlays given for them, old age insurance can be considered as the most important provision provided by the scheme. Participants can fully acquire their accrued benefits without any deductions if they retire on the normal age of retirement.



Source: Author's own representation based on: ISSA (2004) for the selected European countries; ISSA (2003a) for the selected Arab-African countries; ISSA (2002) for the selected Arab-Asian Countries.

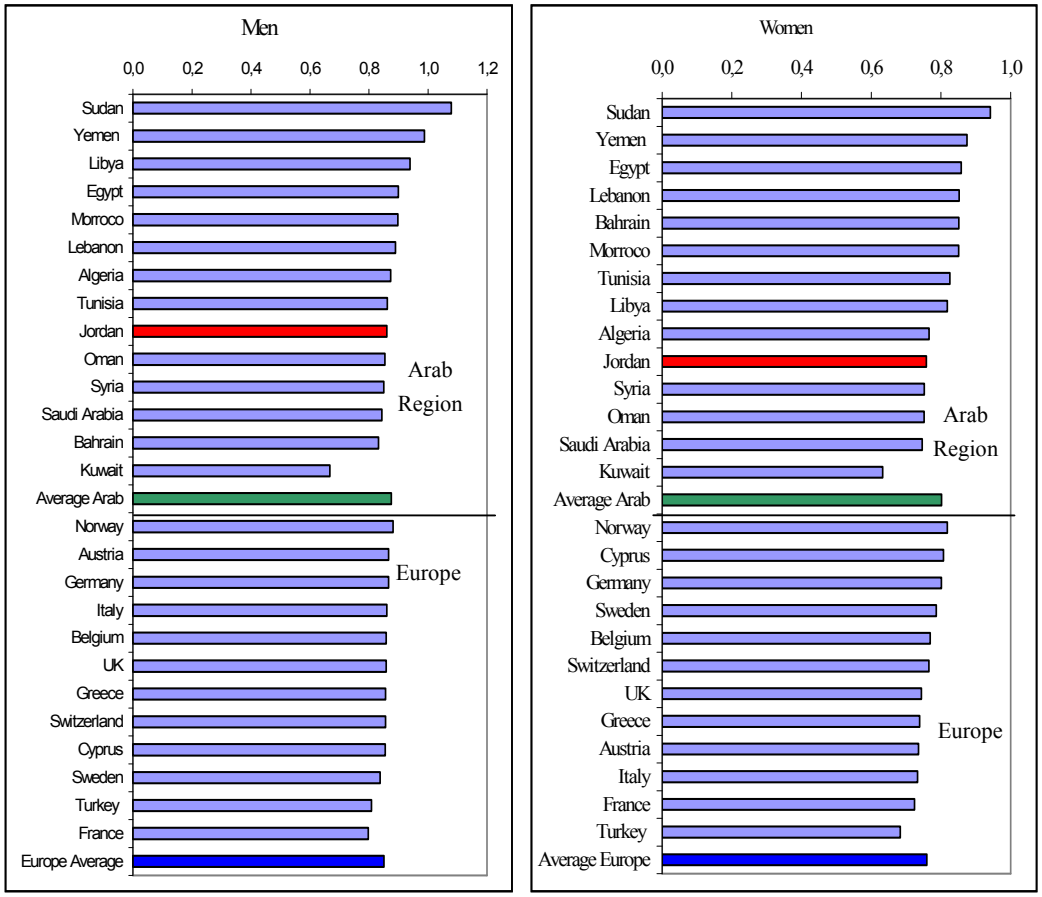
Figure 3.3: The level of pension contribution rate in selected Arab and European countries

As in many other countries, the normal age of retirement differs between both genders. However, sixty years for males and fifty-five for females seems a bit lower than those observed in other European countries but well-nigh similar to Arabian countries. To make our judgment more reasonable, the life expectancies must be introduced to figure how normal retirement age proportionally ranks compared to them. The only data we could obtain is life expectancy at birth. Although considering life expectancies at the age of retirement makes more sense in our context, the use of life expectancies at birth can still be meaningful. The logic behind introducing this factor is to evaluate the extent to which the normal age of retirement is far from the average end of life spans. Starting there, we divide the normal age of retirement by the life expectancy at birth in each country. The higher the resulting ratio is, the more coveted is retirement age from the perspective of the financial health of the system. If participants live longer after their normal retirement age, they would probably absorb more funds from their pension providers. This figure, however, shouldn't be considered for more than a general purpose of international comparison. Figure 3.4 reports how such a ratio differs among the selected Arabian and European countries. The retirement age for men covered under the SSC old age insurance transpires below the average of Arab countries and expectedly lower than for other European countries. This in terms of insurance measures means that SSC participants are allowed to retire normally at earlier ages than participants in other countries when life expectancies are considered for this judgment. Putting this statement in a clearer sense, SSC participants spend more time in retirement than participants of pension schemes in most other countries spend.

The extent of disparity increases for women when their after retirement life span is compared with counterpart women in other Arab countries as well as in many European countries. For instance, a woman in Jordan lives on average seventeen years after retirement. While women in Lebanon, Egypt, for instance, live only for eleven and ten years, respectively after retirement. In other European countries the possibility to live more years after retirement seems to be in contrast to the ones observed in the case of men. Generally speaking, although the normal age of retirement for women in the selected European countries is slightly higher than of the SSC, women in these countries live longer after retirement than Jordanian women do.

Concerning the possibility of early retirement, fifty percent of the country schemes reviewed in our study do not allow their participants to retire early. Pension schemes in

Sudan and Kuwait, for instance, apply the same possible earliest retirement age as the SSC currently does. The early retirement age of forty-five years in these schemes, however, is far less than those observed in other European countries. Except for Greece, the earliest retirement age in the selected European countries is not less than sixty. [30]



Source: Author's own representation based on the same sources of Figure 3.3.

Figure 3.4: The ratio of normal retirement age to the life expectancy at birth in selected Arab and European countries

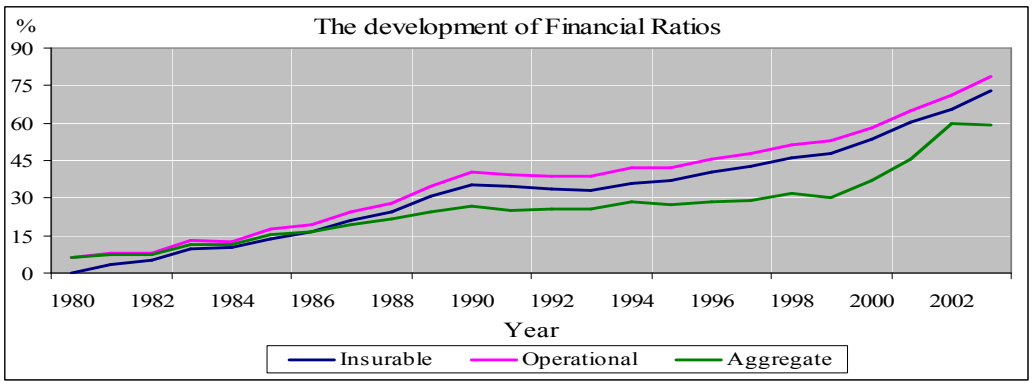
In attempt to flash out a general view about the development of the scheme financial conditions, three concepts are used to do so. Firstly, the insurable balance ratio which reflects the proportional level of insurable expenditures to the level of contribution receipts, gives a useful signal on the extent to which the proceeds toward beneficiaries are covered by other ongoing contributions. Our second concept, namely the operational balance, contemplates the ability of insurable revenues to cover the scheme total outlays. The last measure we use in our brief analysis of the development in the scheme financial

[30] For country specific data regarding normal and early retirement ages, see appendix.

measures is the aggregate ratio. This ratio is a bit similar to the operational ratio except that it combines the investment revenues with the insurable ones to totally show how the scheme in general is able to cover both the insurable and the administrative expenditures.

Figure 3.5 renders how the above three measures have developed from the time the system was established until the end of 2003. The curves that represent the historical trend of the three concepts have typically been sloped upwardly all along the studied period. This of course indicates that the dominator increased proportionally more than the nominator. The first ten years after establishing the SSC has experienced continued high growth rates in insurable and total expenditures when they are compared with insurable ones. The aggregate ratio, on the other hand, had sloped less steeply as the proportional growth in investment revenues partially substituted the higher growth rate in total expenditures.

After 1990, all factors became relatively more stable as the curves that represent them look flatter than in the previous decade. This can mainly be attributed to the large increase in the number of contributors during the nineties of last century to which the contributions collected from them had increased substantially. By the beginning of this century, however, the three factors started to accelerate increase as many participants went into retirement, particularly on early retirement basis. Broadly speaking, the scheme has already commenced to face unwanted financial conditions as the insurable and operational ratios on the one hand and the aggregate ratio on the other, exceeded three and two quarters, respectively. In 2003, for instance, only one quarter of the system's insurable revenues has remained in the SSC's buffer fund.



Source: Author's own representation based on SSC annual report, different issues.

Figure 3.5: The development of the scheme's aggregate financial measures (1980-2003)

3.2 The Management of SSC Fund Reserves

As globally observed, the reserves of mandatory pension schemes are managed by either three ways. The first one stands for the partially funded schemes of countries with young population where contribution rates are (or had been) set above the implicit PAYG contribution rate, which has already allowed them to accumulate reserves in their schemes. These schemes have been defined as partially funded since their potential and actual assets fail to cover the future implicit liabilities. In such schemes, national governments take the responsibility of managing and utilizing the scheme assets. To the extent of our knowledge, most of the Arabian countries fall under this type of fund management of which is Jordan. Pension schemes of other countries such as Sweden and Switzerland in Europe, Japan in Asia, United States in America and Ghana in Africa fall also under this type of fund management.

The assets of fully funded schemes that comply with defined contribution rules, on the other hand, are managed either centrally by one management establishment or by multiple sponsors. As regards the centrally managed funds, namely known as provident funds, a central institution collects the contributions of its members and invests them aggregately without any option left for the members to choose the level of risk and return they desire. Thus, within the same time interval no heterogeneity occurs between the scheme participants with respect to the rate of return they get on their contributions.[31] Such provisions are mostly found in East Asian countries and more particularly in emerging markets e.g. Malaysia, Indonesia, and Singapore.

The last case in our context mostly exists in Latin America and few European countries where the scheme members have the choice of the contribution management sponsors they think that would satisfy their own interest. The structure and the rules that regulate those schemes differ from one country to another.

Table 3.1 depicts the pension funds reserves to GDP ratio in selected countries arranged under the management and funding types. Saudi Arabia which has a partially funded DB scheme accumulated more than one and one third of its GDP as pension reserves to face part of the future liabilities. The second largest pension assets proportion to GDP appears in the privately managed-fully funded schemes in Switzerland with almost six-fifth the

[31] We mean here that the ROR participants get in a specific year over their accumulated contributions in the same year. .

nominal level of GDP. Concerning provident funds, only Indonesia and Malaysia have accumulated more than half of their national output as pension oriented assets, while other countries implementing the same sort of schemes couldn't have accumulated as much as one-fifth of their GDP. The SSC in terms of pension assets relative to GDP, however, still stands above the average of the observed partially funded schemes as more than one quarter of Jordan's GDP have already accumulated its buffer fund.

Table 3.1: The pension funds reserves proportionally to GDP in selected countries

Type of Funding and Management					
Partially Funded Defined benefits		Fully Funded with Decentralized Management		Fully Funded with Private Management	
Saudi Arabia*	135,2	Singapore*	64,9	Switzerland	117
Egypt	33,1	Malaysia**	57,3	Netherlands	87,3
Sweden	32	Sri Lanka*	15,8	UK	74,7
Jordan	27	Kenya*	12,1	Australia	61
Philipines	11,2	Tanzania	9,4	Chile**	53,5
Canada	11,1	Swaziland	6,6	Denemark	23,9
Gambia	11,1	Nepal*	4,7	Argentina **	11,2
Morocco*	9,6	India	4,5	El Salvador**	7,6
Ecuador	9,4	Indonesia	2,8	Bolivia**	7,3
Ghana	9,4	Brunei	2,4	Uruguay**	7,2
U.S.*	9,4	Uganda*	1	Colombia**	6,7
Costa Rica*	8,2	Zambia	0,7	Khazakstan**	6
lebanon	7,2			Mexico**	5
Switzerland	7,1			Hungary**	4,5
Tunisia	6,9			Czech Republic*	2,5
Swaziland	6,6			Peru**	8
Jamica	5,7			Poland**	3,5
Japan	5,4			Hong Kong**	0,4
Guatemala	1,7				
Peru	1				
Yemen*	1				

Sources:*: Palacios (2003), **: Chan-Lau (2004), for Jordan: By the author, the rest countries: Leglesias and Palacios (2001).

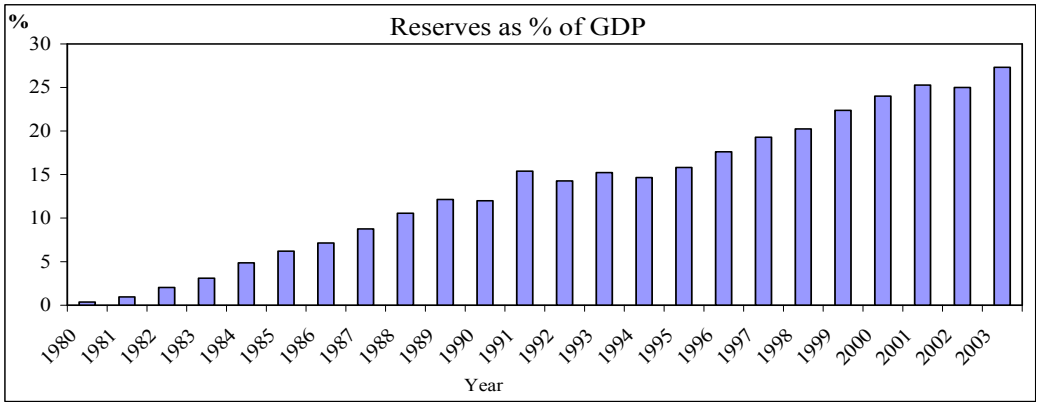
3.2.1 Portfolio Composition

The portfolio structure of pension funds serves the attention of contributors, pensioners and sponsors, among others. For instance, the increase of members responsibility in fully funded schemes with a decentralized managed accounts, pushes them further, particularly the more financially educated ones, to worry about the portfolios

construction and performance of the portfolios of fund sponsors as it implies in a way or another the tradeoff between risk and return they would likely get on their own contributions (Arnone, 2004). [32]

This attention, however, is less observed in centralized managed fully funded or partially funded funds. In the partially funded ones that belong to schemes implementing a defined benefits formula, such an attention and concern switches substantially from contributors to a prudently thinking scheme sponsors (Blake, 2003). This arises since the fail to achieve the optimal combination between different types of investment tools can result in decreasing credibility and pension future viability.

Before analyzing the portfolio construction of the SSC, it is worth spotting on the development of its reserves from the time it was established until the most recent available data. Figure 3.6 depicts in an apparent sense how the SSC has shared the constitution of national savings through the continuous increase not only in the absolute levels of reserves but also there proportional levels to GDP.[33]



Source: Author's own calculations and representation based on SSC annual report, different issues.

Figure 3.6: The development of the SSC's fund reserves proportionally to GDP

Within only five years after establishing the scheme, the reserves have accumulated to almost 6 percentage points of GDP. During the second five years, the scheme has continued accumulating additional reserves in its fund to which they have contributed almost one-eighth the level of GDP in 1990. From that year afterward, the relative

[32] This issue relates mainly to the degree of individual choice, for a more detailed view on the participant choice in such a type of scheme management, see Vittas (1999).

[33] The increase in their absolute levels is not ascertained in that figure. The absolute figures, however, confirms that conclusion.

importance of the scheme funds with respect to GDP gradually increased with only three little folds of declination until it reached three tenth the national output in year 2003.

During the whole period of consideration these funds were mainly invested in short and medium term investment tools. This appears clearly in Table 3.2 as three-quarters of the scheme aggregate assets were on average invested in bank deposit accounts and securities.[34] The rest fraction has been none systemically distributed between holding some shares of other companies and investing in real estate sector. The whole period average, however, indicates a relative preference of holding market shares rather than holding real estate investments.

By the beginning of this decade, however, the fund strategy seems that it has started to change the composition and the preference between the main investment categories. This can be implied through tracking the changes in the portfolio construction to which the proportion of reserves that are put in bank accounts decreased from almost 69 % in 1999 to 41% in 2003. By contrast, permutation took place in the securities category as roughly one third of the aggregate portfolio in 2003 was invested in securities instead of less than one-fifth in 1999. As regards the proportion held in stock and real estate investment, the average holding of these both categories during the last four year of comparison has increased by 10 percentage points when compared with whole period average.

The relative biasness toward bank deposits and securities can be attributed to three main facts. The first one reflects the absence of investment and professional bodies within the SSC to take the responsibility of utilizing and managing the excess reserves that have particularly accumulated during the establishment phase. The concern was more oriented towards the insurance and general managerial issues of the scheme. The second reason one can imply, is that the accumulation of these funds was and still is associated with never ending of general government needs to cover its continuous deficit as well as to finance some development projects (Zaghloul, 2004**;** Augusto and Palacios, 2001).[35] The third debatable fact can be reported to the weak domestic financial market performance particularly during the ninth decade of the last century.

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[34] It is worthy mentioning here that neither the government nor the private sector entities have established a long term maturity bonds in Jordan.

[35] In addition to that, the government has already started to replace some external debt through borrowing internally from the domestic market.

Table 3.2: The development of the SSC portfolio composition 1980-2003)

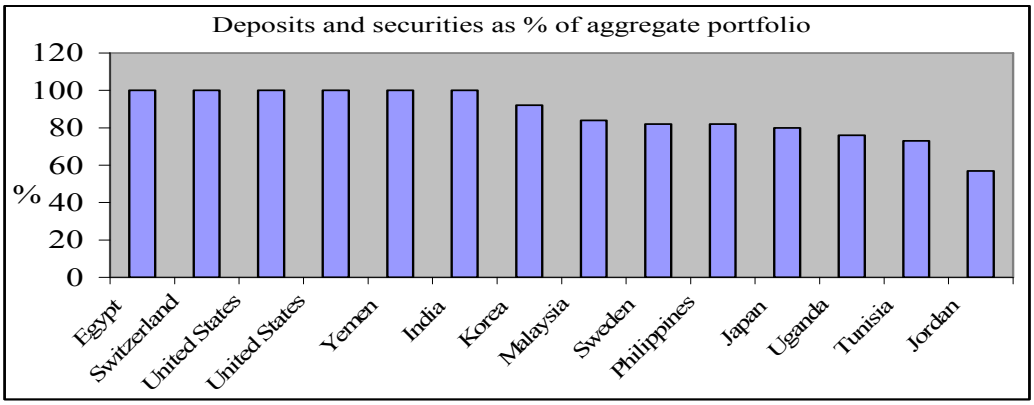
Year	deposit	security	stock	Real Estate	Total portfolio
1980	74	24	1	1	100
1981	58	9	33	0	100
1982	67	11	21	1	100
1983	60	17	22	1	100
1984	39	21	18	22	100
1985	43	26	14	17	100
1986	39	36	10	15	100
1987	35	43	10	12	100
1988	36	40	14	10	100
1989	39	33	19	9	100
1990	42	32	18	8	100
1991	45	36	12	7	100
1992	52	31	11	6	100
1993	49	29	15	7	100
1994	52	26	15	7	100
1995	51	25	17	7	100
1996	52	25	17	6	100
1997	51	26	18	6	100
1998	53	25	17	5	100
1999	59	18	18	5	100
2000	52	20	24	4	100
2001	50	15	30	5	100
2002	41	23	30	6	100
2003	24	33	37	6	100
Average	48	27	18	7	100

Source: Author calculation with accordance to SSC annual report, Different Issues.

The way that public pension reserves are composed among different investment categories seems not to be an exceptional feature in Jordan in terms of the biasness toward bank deposits and securities. Figure 3.7 reports how publicly managed pension funds in selected countries have invested a great portion of their assets in that category.

The perception that underdevelopment and illiquidity of financial markets serves as a barrier against the investment in equities is surely less applicable in countries with highly developed financial markets e.g. Malaysia, U.S., since many financials argue that such a

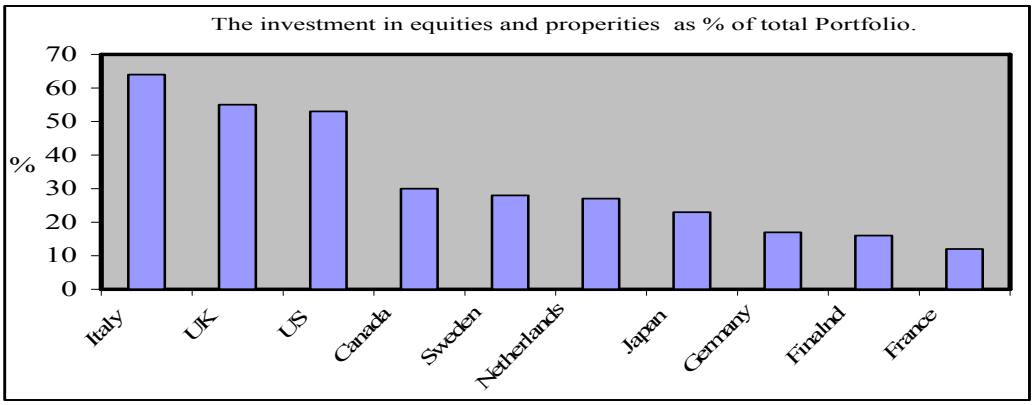
factor could mainly encourage the allocation of capital particularly toward the investment in market stocks (Wurgler,2000; Cesar, 2001). Among the remaining possible reasons for this shared feature is the limited independency in managing these funds aside from the government control and needs.



Source: For Malaysia Thillainathan (2004), Jordan SSC annual report (2003), other countries from Leglesias and Palacios (2001).

Figure 3.7 The proportion of public pension fund portfolios invested in securities and bank deposits

Such a distribution pattern, however, does not exist in pension funds that are privately managed across several countries. A sample of portfolio composition of privately managed pension assets in 10 countries shows how their managers have relatively more reliance and preference to hold domestic shares and properties. Three out of these countries, as Figure 3.7 depicts, have invested more than half of their portfolios in such tools. Six countries held more than one-quarter and all of them have invested not less than 10% of their portfolios in these tools. What should be added in this context is that these figures exclude the acquired foreign equities and prosperities held by these portfolios. If these were also considered the figure might appear rather greater. This of course supports the view that portfolio compositions are most likely dependent on managerial and institutional aspects rather than on market based issues.



Source: Author's own representation based on Davis (2002).

Figure 3.8: The portion of portfolios invested in equities and prosperities in selected privately managed pension funds

3.2.2 Profitability

The rates of return on pension based assets as well as the degree of their security, deserves great attention of several parties regardless how the scheme is financed or managed. Scheme members can be affected directly or implicitly by the profitability achieved on their own contribution (in the case of defined contribution schemes) or on the scheme aggregate fund (Defined benefits schemes). The direct effect in the defined contribution schemes appears as the pension benefits upon retirement depend essentially on the rate of return raised on their contributions, given the fact that higher benefits could mainly be associated with higher degree of insecurity in contrast to more secure ones, offer them lower benefits (Byrne, 2004). In partially defined schemes, pensions over a long term would implicitly be affected by the returns that are generated on the scheme fund, since both risks and return influence the future viability of such schemes and hence the time when benefits are cut or rate of contributions are raised.

Some economists argue that most publicly managed pension schemes face two kinds of challenges, the poor investment performance and the never ending growth in liabilities (Yang and Mitchell, 2005; APPFU, 2001). From that on, it is crucially requested in our context to review the performance of the investment strategy of the SSC from the time it was established. The importance of such a request is to figure out whether the scheme insurable features are the only part to reform or the investment strategy has also failed to help the avoidance of greater reforms.

In this section we take the effort to analyze the performance of the SSC fund according to three criteria's:

- The domestic Perspective
- The Global Perspective.
- Assets and Liability management.

3.2.2.1 The Domestic Perspective

Such a methodology to evaluate the performance of publicly managed pension reserves has been used in many literatures. The use of domestic benchmark performance to judge on the viability of funds activities can be useful in the sense that the former basically reflects the extent to which the internal investment opportunities could provide the investors with the returns they require and more importantly to figure out how the profitability of pension funds underperforms or outperforms that benchmark.

Before proceeding any further with the evaluation process, it would be a good idea if we present some facts about the general performance of the SSC's buffer fund during the whole accumulation period. Table 3.3 reports the actual nominal and real rates of return generated on the main categorical portfolio composition over twenty-two years of historical annual observations. It is obvious that nominal terms give slightly different judgments on the development and performance of the different tools at which pension assets were invested during the comparison period than the real terms would imply for the same period. This of course can trustily be attributed to the instability of price levels that have eroded the real values of the observed returns.[36] During the five years after establishment, only money market tools and deposit accounts had generated a positive ROR on the money invested in them. In 1989, the aggregate portfolio as well as all investment categories had experienced an extremely bad performance as the real ROR dropped to almost 18 percentage points below zero. That extent of under-performance, however, was associated with the highest inflation rate registered in Jordan during the last two decades of the last century which was mainly caused by the domestic economic crises that happened in that year.[37]

[36] During that period, the inflation rate had always a positive sign except in year 1987 at which the general price index has proportionally declined by only 0.2 percentage points than the year before.

[37] For more information about this crises see Autom and Rahahleh (2003).

Surprisingly, even though the investment in bonds have been perceived by many literatures as a sign of inefficiency, the historical fact about the real rewards on the bonds acquired by the SSC proves exactly the opposite when compared with returns on other acquired tools. Ranked as the second in terms of profitability, deposits had added roughly two real percentage points on their initial values all along the considered period. Other investment tools as clearly appear in the real average figures at the bottom of the same table caused deterioration in the real value of money invested in them. Aggregately speaking, the portfolio has succeeded to surpass the level of real losses and achieved almost a whole period average of one percentage points of real ROR. The revision of ROR generated during the last three years of our trend implies some optimistic signs of the new investment policy of the SSC since almost all portfolio categories achieved positive and high real ROR.

The central questions remains here, why the SSC’s sponsors didn’t response to the frequent losses in the real value of their investments in the market equities and real estate? Another question appears in this context; have the SSC's sponsors failed to choose the appropriate or optimal combinations of stocks and real estate properties?

As regards the first question, either the sponsors couldn’t have recognized the facts mentioned above, although they were sufficiently apparent, or they were forced to continue investing in loosing companies and real estates. It might also be that the banking sector was not capable to absorb huge funds as interest earning deposits or the lending market particularly the government needs were below the funds supply. If either case had really existed during the same period, interest rates could have fallen to lower levels than those actually observed during the studied period. Other possible explanations could also take place.

Table 3.3: The difference between the performance of SSC investment instruments and the corresponding market benchmark

Year	Stock		Deposits		Securities		Real Estate		Aggregate Portfolio	
	Nominal	Real	Nominal	Real	Nominal	Real	Nominal	Real	Nominal	Real
1980	0	-10	3	-7	9	-2	0	-10	3	-8
1981	0	-11	8	-4	11	-1	0	-11	6	-6
1982	2	-4	8	2	7	1	0	-6	7	0
1983	2	0	8	6	6	4	0	-2	7	5
1984	1	-3	9	5	6	2	0	-4	5	1
1985	2	-1	8	5	7	4	0	-3	5	2
1986	2	2	7	7	7	7	0	0	5	5
1987	2	2	8	8	9	9	0	0	6	7
1988	2	-5	7	1	6	-1	0	-6	5	-1
1989	3	-18	8	-14	9	-13	4	-18	7	-15
1990	4	-11	8	-7	10	-5	5	-10	8	-7
1991	4	-4	8	0	9	1	2	-6	7	-1
1992	5	0	7	3	8	3	6	1	7	3
1993	3	0	6	2	11	7	7	3	7	3
1994	2	-1	7	3	9	5	5	1	7	3
1995	2	0	6	4	9	6	8	5	6	4
1996	2	-4	10	3	9	2	6	-1	8	1
1997	3	0	10	6	10	7	3	0	8	5
1998	2	-1	8	5	13	9	7	4	8	5
1999	2	1	9	8	9	9	1	0	7	7
2000	2	2	6	6	8	7	1	0	5	5
2001	2	0	5	4	9	7	1	-1	5	3
Average	2	-3	7	2	9	3	2	-3	6	1

Source: Author's own representation based on Zaghloul (2003).
Note: The real figures are calculated by the author.

Concerning the second question of whether the SSC have failed to choose an appropriate portfolio mix of real estate and equities, the following analyses would verify this argument with a respect to general market benchmark performance. We compare first the equities investment of the SSC according to their sectoral distribution with those achieved within the Amman Stock Exchange. The latter are measured through implementing the weighted average approach. This is similar to the Capital Assets Pricing Model which suggests that

an optimal portfolio can be achieved through holding assets proportionally to their market value. Thus, we assume that market portfolio holds all the market traded assets with a proportion that comprises the value of each asset relative to the market value of all traded assets.

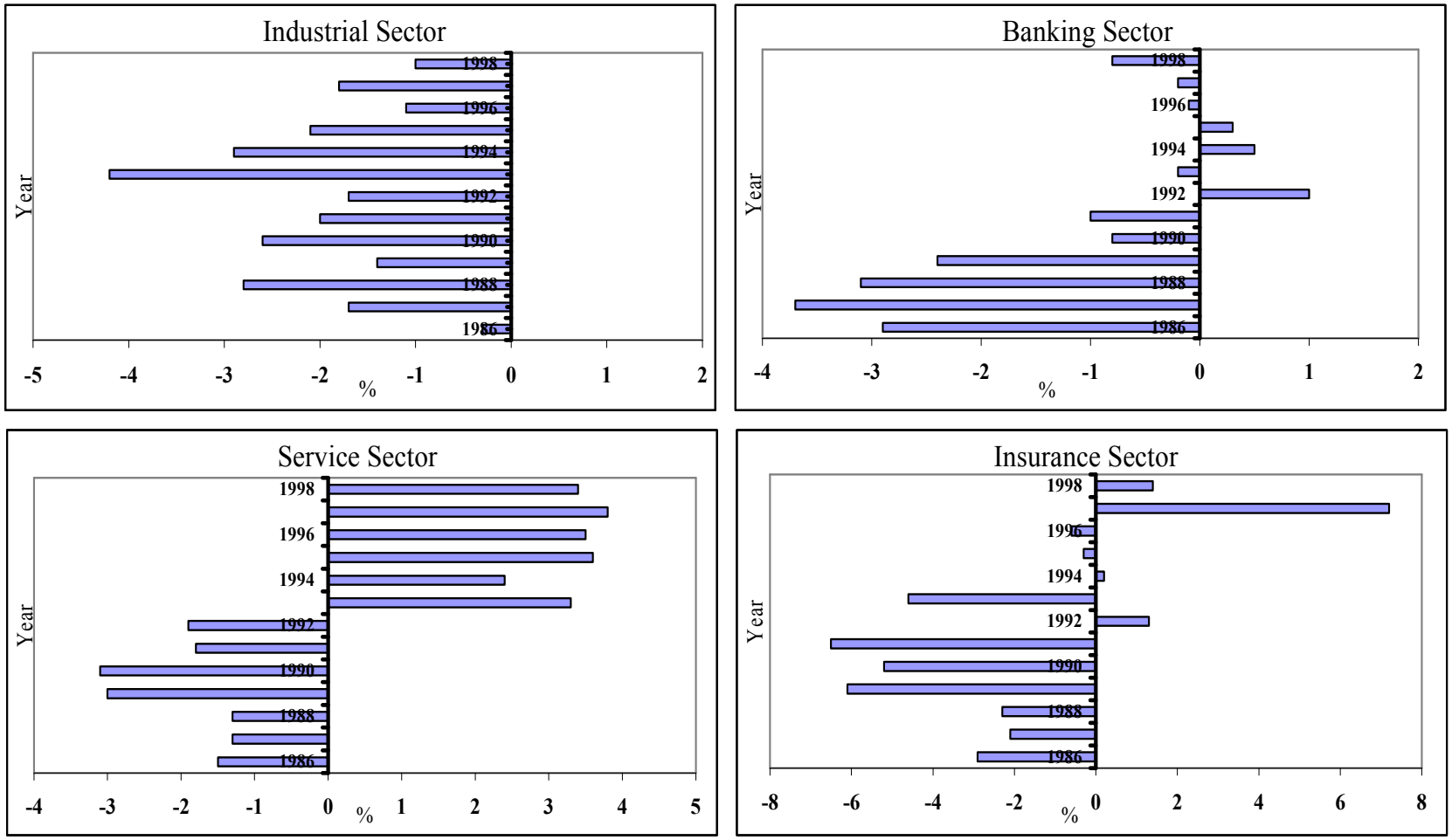
The equity sectors considered for comparison are distributed under four categories:

i. Industrial sector.
ii. Banking sector
iii. Services sector.
iv. Insurance sector.

Data considered for comparison cover the period from 1986- 1998. Figure 3.9 depicts the annual differences between the nominal returns the SSC raised on their equities from each sector and those of the market portfolio during the same year.

The most surprising implication appears in the figures which represent the difference between the ROR generated by of the SSC equities that refer to industrial companies and those would occur if the SSC had allocated the industrial equities as market portfolio since it was negative across all the considered years. The maximum fail was in 1992 when the market industrial portfolio generated almost five percentage points more than the SSC corresponding ROR. The case for banking sector based equities is not that much different. In ten years out of thirteen, the banking portfolio of the SSC had underperformed the market portfolio. For the remaining years, the gap on the favor of SSC portfolio didn't exceed a one percentage point. However, the investment of the scheme in such equities has relatively improved in the last seven years of the covered period

The last five years of our covered period indicate some hopeful implications of the SSC investment in the equities of the service sector. The returns on the SSC equities of this sector exceeded the return that market portfolio would have had to achieve on its equities.



Source: Author's own calculations and representation based on Zaghloul (2003).

Figure 3.9: The gap between ROR on the SSC sectoral portfolio and the corresponding market rates

The insurance sector portfolio of the SSC indicates some pessimistic signs and assures that the service sector was only an exception in this context. Except only for four years, the SSC's portfolio in that sector again failed to reach the market's portfolio performance with greater gaps than those observed in other sectors.

If we alter our analyses to perform some financial performance measures, the picture would not change but would rather imply more unwanted conclusions. Table 3.4 reports the Mean Return (MR), Standard Deviation (STD) and the Coefficient of Variation (CV) calculated for the SSC and market sectoral portfolios (Brighan, 1999; Farrell, 1997).

Table 3.4: Selected performance measures for the SSC and market sectoral portfolios

Sector	Industrial		Banking		Services		Insurance		Portfolio	
	SSC	Market	SSC	Market	SSC	Market	SSC	Market	SSC	Market
MR	3,0	5,0	2,5	3,5	4,1	3,6	5,5	7,1	2,9	4,2
STD	1,2	1,3	1,3	0,6	2,7	1,6	2,8	2,3	0,9	1,0
CV	0,4	0,3	0,5	0,2	0,6	0,4	0,5	0,3	0,3	0,2

Source: Author calculations considering Zaghloul (2003).

The whole period MR, as a first fold, implies that market portfolio in all sectors except for the service sector had performed better than the actual SSC portfolio did. The over-market performance of SSC investments in service sector equities, however, could not be considered as a substantial advantage over the market portfolio, since the gap is only a half percentage point. To the contrast of that, the underperformance of the SSC investments appears enough to serve a significant attention. The gap between the ROR on the industrial sector equities held by the SSC and those on the market portfolio, for example, was almost minus two percentage points. Interpreting generally, the SSC aggregate portfolio of equities belonging to all sectors had failed to generate a return that a market portfolio could have had to generate.

Integrating the MR with volatility measured by the standard deviation of the annual MR indicates for an extent of inefficiency when compared with those implied in market portfolios. An efficient portfolio implies that sponsors choose the optimal combination of asset classes to which MR cannot be raised without an associated increase in volatility, or it can be said that there is no way to reduce the degree of volatility without pulling down the level of returns (Statman, 2001; Davis, 2001). Thus, if the CV in any SSC sectoral

portfolio is greater than of the market portfolio, one could say that SSC's portfolio is not on the efficient frontier line. For all sectors and hence for the aggregate portfolio, the calculated market's CV appears lower than any of the SSC. Consequently, the SSC performed less efficiently than the market did and even far less if other prudently structured portfolios are considered.

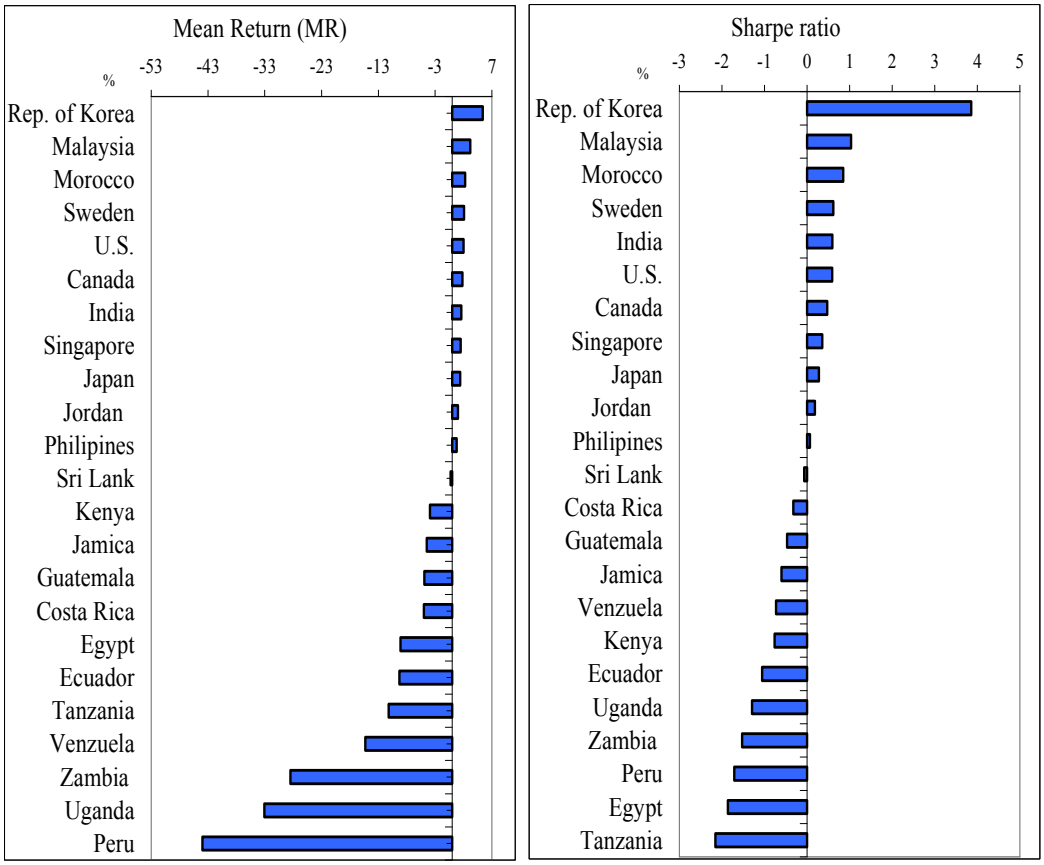
3.2.2.2 The Global Perspective

If we move further with our analyses to a global perspective, one can ask whether the performance of SSC is an exception or a general case when compared with the performance of other publicly managed pension funds.

The available data on the real MR raised through overseas publicly managed pension funds indicates a wide disparity. Almost half of the countries in which data have been available on them have had a positive real MR on pension assets. While the remaining funds of other countries have failed to prevent deterioration of the real value of their initial assets. In Peru for instance the real MR on the publicly managed pension was roughly minus forty percentage points. This in terms of finance means a lot and signalizes for early bankruptcy. The real profitable funds as the figure shows are managed in either OECD countries or emerging market countries, Morocco and Jordan were only an exception. In terms of real performance, Jordan stands exactly before the last (Philippine) among the countries that have generated positive real returns on their publicly managed pension funds.

Unexpectedly, the tradeoff between returns and risk when the cross sectional aspect is considered as a base for judgment seems to differ from investment theories postulates. By calculating the Sharpe ratio (MR/Std) for these funds who have achieved a positive MR, one can recognize that the above conclusions would not change that much. Korea, Malaysia, Morocco and Sweden remain at the top list since they had not only generated the best performance in terms of real MR but they had also minimized the level of volatility when compared with other countries that appear in the figure. The rank of India in terms of MR, for instance, is within the best performed fund, but considering volatility step her up to the best five performing funds. That said, India had generated each MR unit with more certainty than the U.S. did.

In sum, the SSC's portfolio performance stands in the middle of international figures. Most of the emerging and all OECD countries considered in our analyses performed better than the SSC in respect of return and risks. It is unfair, however, to list the SSC as one of the worst publicly managed pension reserve around the globe.



Source: Own representation based on 1) Leglesias and Palacios (2001) 2) Zaghloul (2003).

Figure 3.10: Comparison between MR and Sharp ratio of the SSC fund and publicly managed pension funds in selected countries

3.2.2.3 Assets Liability Management

A partially funded system in principle faces two main financial stages. The first stage refers to the accumulation period where the system continues to attain ongoing financial surpluses as its total revenues from the insurable provision and the investment revenues generated by the accumulated reserves exceed the level of the scheme total expenditures. During the second stage, namely the decumulation phase, assets are used to cover the scheme outlays that are not funded by its aggregate revenues.

Both the assets and liability in defined benefit schemes will hardly remain on their estimated levels especially over a longer time horizon. The liability side is subject to many variables among which is the change in the system dependency ratio and the growth of aggregate wage bill. The assets side, on the other hand, does not involve any higher degree of stability and predictability. It is even subject to more sources of volatility such as the economic conditions, political stability, confidentiality, even for demographic changes as well as for several others (Ross, 1976; Shanken, 1982; Roll and Ross, 1995; Cagnetti, 2002). Thus, the scheme sponsors should always have in mind how to allocate the assets in a way that matches the size and volatility of future liability (Blake, 2003).

Contrary to the Modern Portfolio theory, risks and returns relation in the context of ALM approach is defined in terms of the financial health of the pension plan rather than in terms of portfolio performance (Hewitt, 2004). In other words, pension schemes who follow this approach allocate their assets and choose their contribution policy in a way that guarantees the scheme solvency along the planning horizon (Drijver et al., 2000).

Generally speaking, the SSC' fund policy seems far from the main principles of this approach. Although the system has experienced and is still facing over-solvency conditions, most of the reserves were invested in short term matured investment tools. from a logical perspective, there is no contradiction between investing in short term matured assets and the ALM approach unless yields could have been improved if the fund had invested in longer maturity tools. From the of finance theory, Zaghloul (2003) concludes that the SSC fund has failed to implement an investment policy that matches its assets and the scheme liability, the thing which has caused pure opportunity cost losses. These funds if were invested in longer maturity instruments might have had a greater extent of profitability. At the same time, we should admit here that the long-term security market in Jordan is still not well developed till today. However, other financial market investment instruments do exist.

The main point to express in this context is that as we proceed further with time, the level of the scheme solvency falls down and hence the possibility to exploit the extra returns that could be achieved through investing in longer term instruments would fall accordingly. Anyhow, if the SSC’s sponsors start really to think about matching the scheme assets with liability, tactical and strategic assets allocation strategies must also be considered in order

to reach a better combination between returns, the size of assets and liability as well as their volatility.

3.2.3 Challenges Facing Optimality

3.2.3.1 Governance Structure

Many of the observed publicly managed pension funds around the globe have suffered from the lack of independence to which investment decisions were taken on an inefficient basis besides from prudently behaving managers, the thing which has worsened their performance. This view is being supported by several facts; among them is the lower performance of these funds when compared with the privately managed pension funds even at the same level of governance, drawn on legal finds to which privately managed pension systems reward more real returns on their reserves than a publicly managed pension systems can give at the same governance index.[38]

In the absence of governance, it is hard to avoid the influence of political factors on choosing the appropriate portfolio composition that maximizes the profitability for each unit of uncertainty. Several publicly managed funds have invested in development oriented projects that privately managed ones would never invest in since they generate lower levels of returns.

As regards Jordan, the degree of independency has never been an exception in the case of SSC. Prior to 2001, reserves were fully controlled by the Board of Directors. The head of this board, deputy and other five members out of totally ten are appointed by the ministerial cabinet. After 2001, however, the government decided to separate the insurance and investment administration through an established independent investment unit. Despite of the target to initiate this unit on a professional basis, the majority of its board of directors is still being selected by the central government.

The great hope of this unit is built upon the new law which was jointly associated with this unit. The articles of this law indicate explicitly that the unit should perform a prudent management strategy that would provide the scheme with a high rate of return with an

[38] Mok (2000) argues that evidences on this feature do not really exist when other facts are considered, e.g. financial crises. for more detailed analyses on the impact of governance on pension fund performance, see for instance, Hsin and Mitchell (1994), Useem and Mitchell (2000).

acceptable range of certainty (SSC investment law, 2001). At the same time, one of the law articles advises the unit to contribute in the financing process of national projects. Such a conflict between targets and conditions on the one hand, and the absence of performance measures and guarantees on the other, might induce some tough consequences inherent in their performance.

3.2.3.2 International Investments

From a financial point of view, the diversification of returns uncertainty can principally be done by investing in assets that do not move jointly in the same direction (Bugar and Maurer, 2002). At the time it is possible to eliminate non-systematic risk components of any domestic portfolio through diversification, the only way left to minimize the systematic risks is to be done via investing in global assets and hence improve the efficient frontier of risks versus returns (Bodie and Merton, 2001).[39] The logic behind this argument is that country specific shocks on market returns might move in the opposite direction of those originate in others (Solnik, 1974; Brooks and Negro 2002). Others argue that the demographic features play an imperative role in this context as they affect the return and volatility of investment across other countries. The most common observed perception regarding this issue explains the falling down of equity returns in some countries by the opposite correlation with population growth (Mackellar, 1998). Accordingly to their perspective, prudent investors should seek for markets with less rapidly growing populations.

Another argument prefers easing the restrictions on international investment. It builds its suggestions on the fact that domestic markets might be not well developed in the sense that they don't allow for a wide range of investment instruments. The existence of such a feature restricts the extent of domestic diversification and the possibility to increase the returns for each unit of uncertainty or decreasing the risk for each unit of returns.[40]

The SSC with regard to some of the facts mentioned above seems more required to invest internationally than many others for several reasons. First, domestic market instruments are

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[39] Some economists argue that the risks of international investment should also comprise the institutional factors. For more details see Batraum and Dufey (2001).

[40] Some studies have verified that investment returns correlate positively the degree of financial development. For instance, Dellas and Hess (2002) study on emerging and mature markets of 49 countries that stock returns significantly and positively relate to the degree of financial development.

till yet not sufficient to absorb all the accumulated assets of the fund in the way that is appropriate to the matching principle between assets and liability. Second, besides from the efficiency of the sponsor's management of the scheme fund, the historical observations have approved that Jordanian financial market instruments have relatively failed to generate a competitive return/risk measures when compared with other countries, particularly emerging markets. Lastly, but not at least, the Jordan economy in general and the financial markets in more particular have been more affected by the political instability in the region than many other countries.[41] Thus it makes sense to seek for more stable markets with lower degrees of country-specific risks.

Before the SSC investment law has become effective by the end of 2000, the SSC sponsors were not allowed to invest any portion in international investment instruments. The new law, however, allows the SSC to invest internationally under several conditions. In 2003, the ministerial cabinet has allowed the SSC investment unit to employ no more than 12% of it is aggregate portfolio in the global financial markets. Although this may comprise a step towards improving the performance of the fund through international diversification, some literatures argue that imposing quantitative restrictions on investment portfolios may weaken their performance.

[41] For instance, the tourism sector had largely affected by the war against Iraq and the instability in the West Bank during the first three years of this century.

4. Measures of Generosity and Potentials for Reform

4.1 Overview

The concept of generosity has gained considerable attention from many policy makers as well as in much of the literature about pensions. Generally, the concept of generosity differs in the dimensions of considerations among the pension schemes sponsors and agents. From the financial point of view, sponsors condense on pension benefits in the context of monetary value measures e.g. rates of return, present values, etc., since these measures accurately address the financial viability of their schemes and the fairness of the benefits structure. While for some groups of participants, social adequacy measures that are often generalized by the replacement rate criterion, sit at the top of their priorities, some other groups of schemes' participants, withal, might be also more concerned with the monetary value measures besides the replacement rate.

For both concepts, there is either an implicit or an explicit benchmark at which pension benefits can be classified as to whether they are generous or not. For instance, the PAYG system is financially generous as long as the implicit Rate of Return (ROR) given on contributions throughout the pensions they receive, greater than the growth rate of contributors wage bill. Replacement rate as a measure of adequacy, in another context, compares the level of pensioner income satisfaction during retirement to the level he had exactly before retirement.[42]

As has been done for other countries, this chapter attempts to analyze the benefits provided by the Jordanian Social Security Corporation (SSC) with respect to generosity measures in the context of scheme sponsors and agents. The importance of that sort of analysis stands mainly behind the issue of how these measures interact with each other to jointly alter the participants' retirement behaviour and the financial parameters of the scheme.

[42] In some cases, replacement rate is measured by dividing the pension salary on the average salary of the entire career life, or the average income of wide economy.

In this chapter, we simulate the above-mentioned measures for hypothetical individuals with varying earning profiles, ages, gender and marital status. These simulations are crucially requested to assess the influences of the unequal treatment of the scheme participants on the distributional and financial aspects of the scheme design. Accordingly then, we analyze various reform strategies to figure out their theoretical consequences beside their empirical implications.

4.2 The Importance of Generosity Measures

It is obvious that mandated pension schemes that rely mainly on human capital besides other types of capital, need to be reformed according to changes in the demographic structure of their agents. This fact as widely noted is more sensible for countries running their pension schemes on a PAYG financing basis where funds needed for financing the scheme on-going liabilities are generated through the contributions of human assets. In such schemes, the increase in dependency ratio would explicitly affect the balance between contributions collected form the working generation and benefits paid to pensioners in the direction toward financial deficit. The change of demographic age-structure has forced, as broadly noticed, many countries to take some actions and adjustment in order to restore the funding ability of their schemes. For instance, some countries had to increase the contribution rate to meet the additional liabilities, others were more concerned about the unwanted sequences of increasing the obligation on the working population and therefore they preferred to reduce the level of benefits. However, the latter instances represent only two among many parametric reform strategies that have been implemented to meet the financial challenges of an ageing population.

In fully funded schemes, however, the alterations in the old age insurance members' (pensioners and contributors) structure deserves less attention when compared with the unfunded ones. The assets at any point in time exactly match the value of pension liabilities. The step up in funded schemes benefits payments that result from the increase in the ratio of old people (pensioners) to the younger people (workers) would be absorbed internally via the already accumulated contributions of pensioners. At any point in time and in all cases, the change in pension outlays is always at the expense of pensioners own contribution assets rather than workers pooled funds. Thus, the value of assets at any point in time, regardless of the ratio of beneficiaries to contributors, equals the total value of current pension salaries and the accrued future liability. However, several pieces of

literature have argued that an aging population might have an indirect impact on some of the financial features of fully funded schemes. For instance, the increase in the ratio of old aged people to the younger people, as some argue, would positively affect the capital/labor ratio. As a result, the availability of capital will increase relative to labor, and thus diminishing the yield on capital relative to wages for labor (Boersch-Supan et al., 2003). On the other hand, the relative increase in the number of beneficiaries to the number of contributors would result in an increasing supply of non-liquid assets forcing their prices to fall. Nevertheless, the matching principle still exists, since in such a case the liabilities of the system would proportionally tumble to reflect the actual value and payoffs on pension assets. In other words, the fall in the profitability of the accumulated contribution affects only the participant's pension and has nothing to do with the system's unfunded liabilities. What one could conclude from our brief description of the interaction between fully funded scheme parameters and the market-wide ones is that the fluctuations of the latter parameters affect only scheme participants rather than system financial balance. While in a PAYG scheme, the direction of effects could pass through scheme participants and in the same manner, the scheme viability.

Some other types of pension schemes finance their ongoing pension liabilities neither on a PAYG mechanism nor through entirely pre-funded assets. They can be classified under Defined Benefits (DB) partially funded schemes.[43] Under these types of schemes, the scheme sponsors set the contribution rate above the PAYG equilibrium rate. The extra contributions collected from the scheme participants accumulate in a buffer fund to meet part of the scheme future obligations. Over time, this fund will be drawn down to zero, so there is no expectation that such schemes will have capital forever. Thus, maintaining the scheme becomes a matter of changing the parameters in order to insure that it never fails to have enough money to pay the promised benefits. Depending upon the nature of demographic trends and the state of the economy, the buffer fund could disappear, reappear, and disappear again depending on favorable or unfavorable trends in cash flows.

The following stages describe briefly how the financial life cycle of partially funded schemes develop over the time horizon:

[43] In partially funded schemes, a part of current contribution receipts are used to finance the on-going pension obligation for current pensioners. Once the contributions shortfall to pay pensions, the trust fund will be used as an additional source of revenues to finance current retirees. It is called partially, because the planned assets never match liabilities. For more details, see partially.

I. At the first stage, the contribution rate is set to a level, which is above the implicit rate needed to exactly match the pension benefits proceeds with contribution receipts. As a result, the extra amount of money collected from the working population is placed and invested in the buffer fund. The fund during this stage is backed with cash flows from the insurance surplus and through the return on its assets. It should be clarified here that the profitability of buffer fund invested assets matters crucially to the outstanding assets balance at the end of the reviewed period, even though the net insurance revenues are positive. For instance, if the rewards generated by the fund's outstanding reserves are negative, then the marginal assets accumulation would be less than the insurance surpluses. However, to simplify the case we assumed that the average return on the fund reserves during this stage is zero at worst.

II. At the second stage, the implicit contribution rate starts to exceed the actual exogenously determined rate, and therefore the insurance revenues from the working generation would be insufficient to finance the benefits of the retired one. However, the pension liabilities at this stage are still financed through the current cash inflows that comprise the investment revenues from the buffer fund and the insurance revenues from contributions.

III. At the third stage, the total pension receipts are insufficient to face the fast-growing expenditure toward beneficiaries. As a consequence, the difference between current liabilities and current assets during this stage would be covered by selling some of the fund assets.

IV. At the fourth and last stage, assets disappear due to the acceleration of financing needs that cannot be covered by the scheme's own assets and the system starts to face funding obstacles.[44] In such circumstances, the system would look for some external financing, or it starts to work on a PAYG basis in which the deficit would be matched eventually by changing some of the system parameters.

[44] Assets refer here to: 1).the current assets that comprise contribution receipts and investment rewards, 2).the remaining reserve balance of the pension buffer fund.

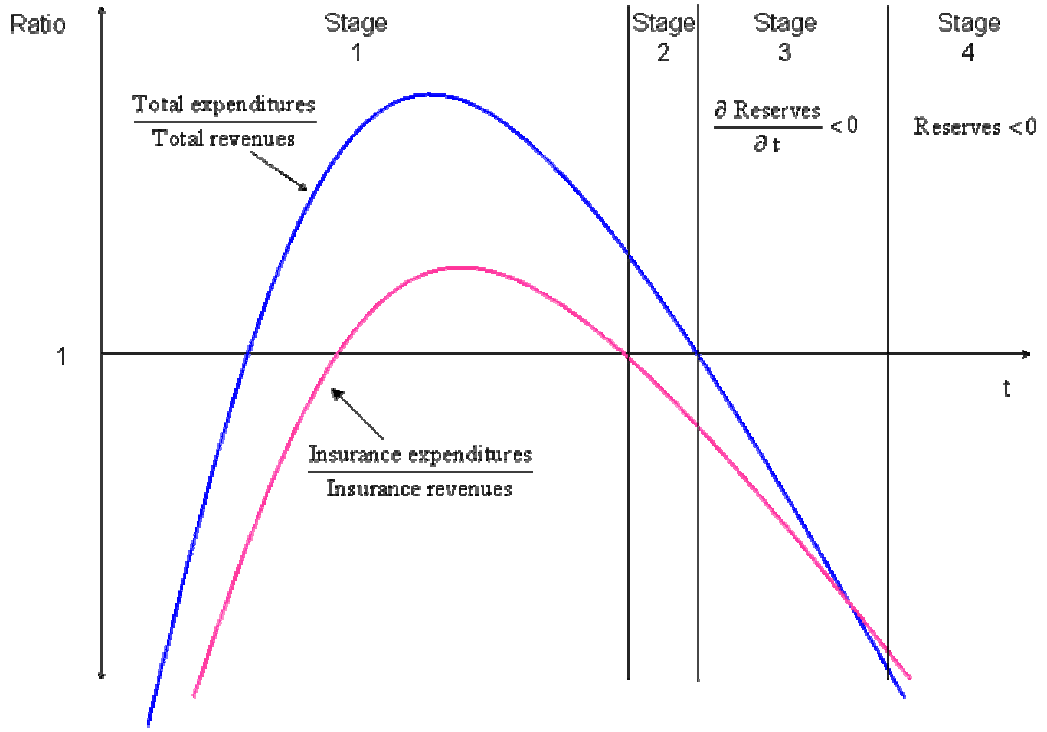


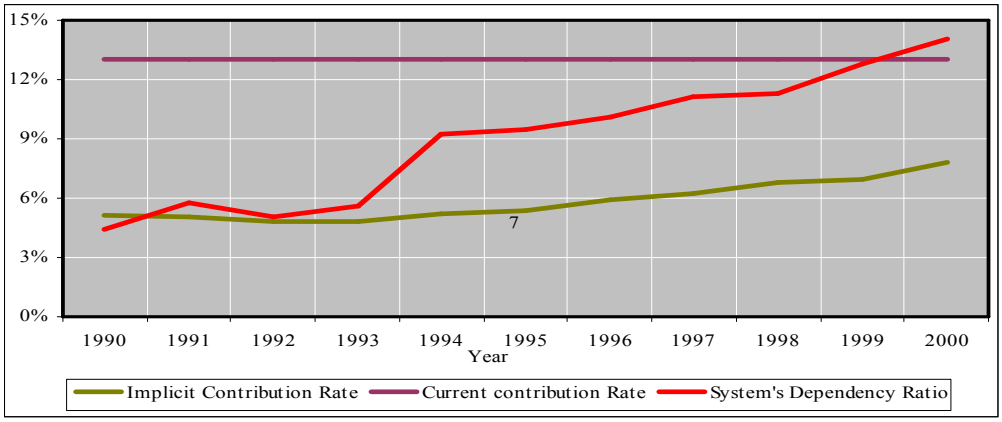
Figure 4.1: The financial life cycle of partially funded pension schemes

It is worth mentioning in this context, that several factors might affect the length of the above-mentioned stages. First, the bad design of a benefits formula in which it implies some degree of generosity toward different groups of beneficiaries. The appearance of such appropriateness is stimulated through many factors; among them the upward movement in the system dependency ratio. Second, bad investment performances also matter, as the returns on investment are a major part of the system assets and flows. Thirdly, the state of the economy also influences the financial viability of the DB schemes as the deviation of economic parameters from their estimated levels means that the scheme has failed to optimally design its features. For instance, if the accrual rate used to calculate the old age pension benefit is set at 2 percent for each year of contribution, and if this rate was determined by assuming a 6% rate of return on the buffer fund, a half actual ROR than assumed would surely affect the financial viability of the system.

Among the questions that might arise here, is how the financial viability of pension schemes and their life cycles relate to measures of generosity. Although it is too early to answer such a question, it might be possible to think about some paths of influence that can take place here, either directly or implicitly. A generous pension benefit in terms of money

worth definition, for instance, affects the pension scheme's financial viability in both directions. The first one, is directly through adding unfunded liabilities to the scheme's balance sheet, since generous here means that there is a portion of benefits that is not covered by the pensioner's own contributions. With regard to the second possible scenario, generous benefits can affect the scheme's financial cycle indirectly through influencing the participants' behavior toward early retirement and thus increase the system's dependency ratio sooner than it should be.

This brief overview on how partially DB schemes work financially, makes the analysis of the Jordanian pension system as one of the provisions that runs its activity on the same basis, more understandable. Consequently, this paper is intended to demonstrate the structural weakness of SSC scheme at the individual level, since some technical studies have already warned the system about a lack of funds to finance its future obligation toward some of today's contributors (tomorrow's beneficiaries). The relative youth of the system participants has focused less attention on the bad design of the system. A major proportion of contributions collected from the participating employed population has been accumulating since the SSC launched its work in 1980. However, the future prospects of the SSC' buffer fund seems to be quite pessimistic, as we have seen in the previous section of our thesis i.e. revenues collected from active workers have already started to grow at rates lower than those out-flowed to the pensioner. Although the system is still running under the first stage of the partially funded-DB schemes financial cycle, it seems clear that it will not last that long. If the system finances its ongoing liabilities (Pension and other insurable obligations) on a pure PAYG basis, the implicit contribution rate needed to zero-net the total contributions with total benefits has been increasing over the course of the last twenty years. As shown in Figure 4.2, the gap between the actual exogenously determined contribution rate and the endogenously PAYG implicit contribution is narrowing as time passes. One of the factors that have brought this conclusion to the fore is the increase in the system dependency ratio. In general, however, there should be no fear from this phenomenon in that individual benefits are awarded on fair bases which reflect implicitly the term value of their contributions.



Source: Author's own calculations and representation based on SSC annual report, different issues.

Figure 4.2: Development of the scheme's parameters

4.3 Model Overview

The author has considered the financial and distributional approach of Bender, to develop a model that demonstrates the financial and distributional implications of the Jordanian pension scheme.[45] These models are often used by the World Bank and the International Monetary Fund (IMF), among others, to analyze wide range aspects of pension schemes. As other models, this model relies essentially on a set of assumptions that serve significantly the analysis and the major fold of our research. As widely recognized by many researchers, assumptions regarding life probabilities are essential for modeling some of the financial and distributional aspects of pension schemes. The life expectancies that are derived from the population mortality tables are indispensable in making predictions regarding the length of the pensioner's life cycle. This of course is a crucial part of our model structure, since without such information, our estimation and analysis would be misleading. The figure shows the age and gender based remaining life expectancies used in the model for the Jordanian population as extracted from the mortality tables taken from both the SSC's most recent actuarial study and the united nation demographic database. It is clearly shown in that figure that the life expectancies for Jordanian women at any given age are higher than for men. This sort of sexual heterogeneity in life expectancies is widely observed in many countries. For instance, in developed countries the gap in life expectancy between females and males ranges from roughly 5 years in Sweden and United Kingdom, to 8 years as observed in France and

[45] For a detailed view about Bender approach see Khasawneh and Rahahleh (2002).

Finland (Gjonça et al., 1999). In developing countries, however, the gaps are slightly lower than those observed in developed ones. In Africa, women outlive men by only two to three years and have the same life expectancy as men in southern Asia (Shrestha, 2000). In Jordan as one of the most developed countries within developing regions, the difference is almost three years in favor of women. This sort of sexual heterogeneity can be explained by biological and behavioral differences between genders (Waldron, 1995).

Table 4.1: Age- Gender specific remaining life expectancy

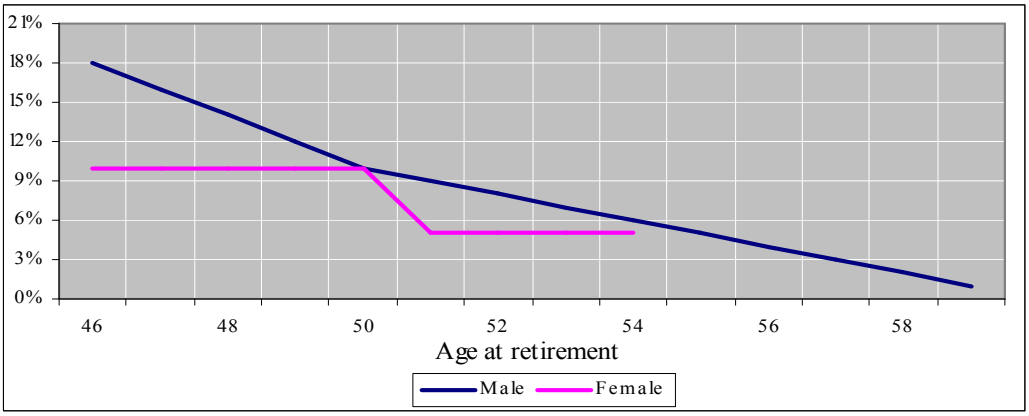
Age	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67
Male	30	29	28	27	26	25	25	24	23	22	21	20	20	19	18	17	17	16	15	14	14	13	12
Female	32	31	30	29	28	27	26	25	25	24	23	22	21	20	19	19	18	17	16	15	15	14	13

Source: Author's calculations.

The financial assumptions we use in the distributional model, comprise the Real Discount Rate (RDR) and inflation rate. The RDR as assumed in the baseline scenario reflects the historical facts about the development of the real interest rate on the Jordanian government medium-term bonds taking into account the future prospects about the capital market as well as monetary policy. In addition to that, the real rate of return on the SSC's buffer fund is also considered. The inflation rate used in our model to back-count nominal values of contributions and benefits in real terms reflects the average rate at which the consumer price index has grown over the last five years. In the baseline scenario, individuals are assumed to enter the labor force and pay contributions at the age of 27, regardless of their gender status. At the time of retirement, each beneficiary is modeled on the basis that he has three dependents since the family allowances under the SSC's law are awarded based on the number of dependents. However, a scenario that hypothesizes no dependents is also being simulated.

The model constructs gender-age profiles that calculate dynamically an individual based contributions and retirement benefit over his entire career and retirement life, respectively. The pre-retirement career salary, according to the baseline scenario, is indexed to an assumed annual nominal growth rate of 1%. Moreover, two other scenarios regarding the latter assumption were considered. The entire financial obligation accrued by the three agents, the SSC, contributors and beneficiaries are modeled according to the current law parameters. The contributions are calculated on the basis of the individual total annual salary and considering an aggregate contribution rate of 14.5% paid by employer on behalf of their employee to cover the old-age insurance fees as stated by the current law. Pension

benefits on the other hand, are calculated on the basis of a reference salary that represents the average salary of the last twenty four months of contributions prior to retirement. The model applies predetermined early retirement penalties on the old-age monthly pension benefits of those who retire before the normal age of retirement. The eligibility of early retirement, however, is constrained by the minimum allowable age of early retirement exactly as stated in the SSC law. Figure 4.3 shows the rate at which early retirement benefits are back-counted with.



Source: Authors's own representation based on the SSC law.

Figure 4.3: Early retirement age- gender based discount factor

After the above-mentioned step, a Cost of Living Allowances (COLA) that comprises 10% of the first step product, is added to that product. If the JD value of COLA is less than 30 JD the difference is added as a scheme subsidy and if the corresponding value exceeds 50 JD then the remainder is deducted from the final product. The last measure, which is considered for benefit determination according to the SSC's current law, represents the family allowances for dependents that are under the financing responsibility of the original pensioner. If the pensioner has one dependent, then he can get one-tenth the sum of the old age basic benefits and COLA allowances. However, if he has more than one dependent, he gets 5% extra family allowance for a maximum of two dependents.[46]

Concerning the hypothetical individual earning levels over his entire participation life, the model simulates three arbitrary levels of pre-retirement income (half the system average insured income, one average, and double average) in a way that benefits and contribution accrued to each insured individual depend on the development of his earning profile as

[46] See Table 4.2.

well as the participant's own character. The initial level of average insured salary for both genders, which has been considered in our model, is obtained from SSC's published data for the financial year 2003.

4.4 Generosity: The Adequacy Perspective

Many economists and pension specialists argue that the ratio of pension benefits at the time of retirement to the level of last earned salary, which is often defined as a replacement rate, indicates an extent of generosity (Pestieau, 2003). Their definition of generosity denotes mainly the tendency of pension schemes to minimize the retiree income losses when compared with his earning level before retirement. The more generous pension benefits are viewed according to their capability to substitute a greater portion of the pensioner's pre-retirement earning level with after retirement ones. However, as the dimension of judgment might differ, some economists argue that replacement rates should be cited as a limited indicator of the generosity, or more precisely, the fairness of pension schemes benefits (Whiteford, 1995). Those who think in that manner believe that generosity from the viewpoint of social and adequacy measures is less correlated from that of money worth observers. The gap between these views, however, attenuates differentially among different types of pension schemes depending on the extent to which participants earning levels over their entire career lives correlate with each others and with the pension benefits. Thus, If the actuarial fairness is regarded as a dimension of consideration, RR should be carefully considered for generosity judgment when cost and benefit measures are meant.

To continue with our clarification of the concept of social generosity, we refer here to the retirement income adequacy. We initially start from a definition of RR in equation (4.1) which can tell most of the story.

$$\text{Replacement Rate} = \frac{\text{Montly Pension Salary}}{\text{Last Monthly Pre-Retirement Salary}} \tag{4.2}$$

Both variables composing the concept of RR are observed one-point at a time. Benefits on the first fold, tackle the value of a pension at the time of retirement, but neglect the length of retirement, while the other variable under consideration reflects only the last pre-retirement salary recorded in the pensioner salary profile. The reliance on only these

variables crowds out some factors that can be imperative in determining the level of generosity from the perspective of monetary value, among them, the actual contributions being paid to the system. The latter factor can make the concept of RR less relevant to the issue of pension neutrality if the reference wage for benefit calculation is less correlated with the development of the pensioner salary over the course of his employment. In addition to that, the pension formula (the dominator of equation) by itself could matter further in this context. The less correlated accrual rates are with market returns on money, the greater is the divergence of benefits from actuarial equilibrium. Thus, comparing pension systems across others, in the context of replaced income, does not precisely reflect the disparities of plans fairness.

Nonetheless, RR could still be a superior measure for inter-schemes and cross-schemes comparisons, and more importantly, it can serve the exegesis of participant's behavior. The issue under consideration should change to reflect the principle of adequacy instead of generosity. Generally, pension literature has classified the concept of adequacy into three measures. The first, known as Absolute Adequacy, involves an absolute income threshold to provide a certain standard of living for their earners. The benchmark for such a measure varies from one system to another, and through policies among others. Generally, the most commonly used floor for that sort of benefit is the national poverty line or the cost of essential goods and services (ABI, 2003). The advantage in providing an agreed level of consumption is the protection of some people from living in hunger, while others could suffer from a standard of living worse than they had before. This follows the fact that guaranteeing a minimum level of consumption does not imply a level of stability in the quality of life for those who were consuming far more than this threshold. Thereby, a relative adequacy, the second concept being considered, in some schemes aims at providing a proportional level of income for beneficiaries relative to their pre-retirement career income. Consequently, such a concept reveals a smooth level of consumption over the course of beneficiaries careers and retirement lives. This can to some extent raise the motivation to enjoy the social security plans that meditate this approach since many factors, among which is the appropriateness of the provided benefits, influence individual's involvement in pension provisions. In that sense, this measure seems to be more consistent with the Life Cycle hypothesis of Ando and Modigliani that saving is motivated only by the goal of an intertemporal income distribution stable enough to permit a steady flow of consumption during the life cycle (Banterle, 2002). One of the disadvantages of this measure is that it might be possible that a relative adequacy measure could not guarantee

an absolute adequacy level of income to a range of beneficiaries. Therefrom a third concept was developed in an attempt to overcome the disadvantages of the above-mentioned concepts. A mixed approach has been implemented across many countries by considering both the absolute and relative bases for benefit determination. Choosing an appropriate weight for both concepts calls for many considerations. Among them are the income distribution of all beneficiaries and the financial viability of the pension provisions.

It is worth mentioning here that some defined contribution schemes guarantee an absolute minimum rate of return on pension contributions, regardless of the investment performance of these contributions. Other schemes guarantee relative returns pegging them to a specific market benchmark (Turner and Rajnes, 2002). Although the last two measures are more monetary value guarantees than adequacy, they still have some interesting implications in the context of the above discussions.

4.4.1 Old-Age Pension

If we consider RR as a superior measure for the stability of the quality of life, this tells much in the case of Jordan. Table 4.2 reports how Old-Age (OA) pension benefits are calculated according to the SSC current benefits law. The basic pension depends initially on the pensioner service credit, reference salary and system accrual rate. The second component of pension benefits comprises the cost of living allowances (COLA) and family allowances. Each OA retiree acquires 10% of his basic pension as COLA. These allowances, however, are subject to a lump sum increase if one-tenth of basic pension is less than 30 JD, and also subject to a maximum floor of 50 JD For example, if one-tenth of a retiree's basic pension equals 20 JD, then he gets extra 10 JD to place him on the minimum COLA floor. If one-tenth equals 40, there should be no change. But if his basic pension is more than 500 JD, then he is subject to COLA of no more than 50 JD.

Table 4.2 The benefit rules under the Old-Age insurance provision

Categories		Old-Age Insurance Benefits	
		Conditions	Benefits
Normal Retirement	Basic Pension	Male: Age 60, minimum 15 years of contributory service. Female: Age 55, minimum 15 year of service.	2% multiplied by the Reference Salary and with the Contributory Years; with a maximum 75% of reference salary. Reference Salary: Average salary during the last two contributory years.
	COLA	No Specific Conditions.	For both genders: 10% of basic pension salary; minimum 30 J.D. and maximum of 50 J.D.
	Family Alloawnces	No Specific Conditions.	For the first dependent 10%, Second dependent 5%, Third dependent 5% of (Basic pension + COLA); maximum 3 dependents.
Early Retirement	Basic Pension	Male:age 46; minimum 18 contributory years. Female: age 46; minimum 15 contributory years.	For both genders: basic pension multiplied by (1- age-gender early retirement penalty rates).
	COLA	No Specific Conditions.	For both genders:10% of the basic pension salary discounted for early retirement penalty; minimum 30 J.D. and maximum of 50 J.D.
	Family Alloawnces	No Specific Conditions.	For the first dependent 10%, Second dependent 5%, Third dependent 5% of (Discounted Basic pension + COLA); maximum 3 dependents.

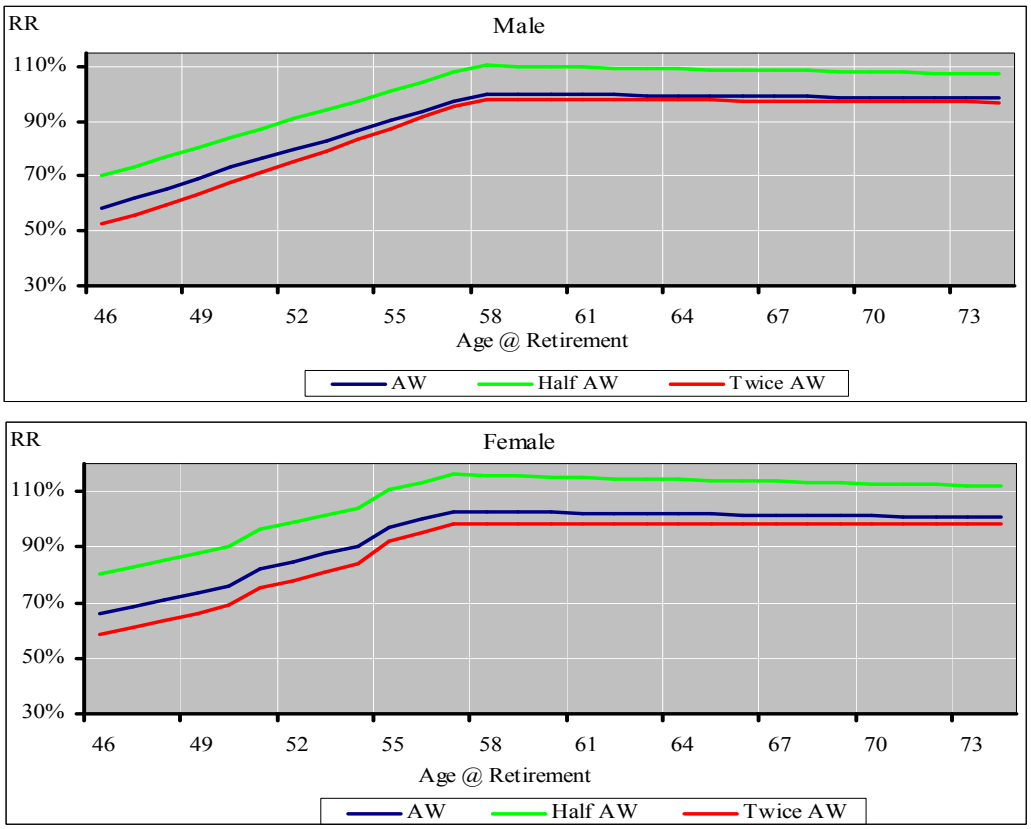
Source: Author's own representation, based on SSC law (2002).[47]

As shown in Figure 4.4, the Old-age replacement rate is an increasing function of the age at which the pensioner chooses to retire. This happens in Jordan as well as in other countries, since pensions for participants whose age is less than the normal age of retirement, 60 years for male and 55 for female, are deflated by predetermined penalty rates.[48] However, lump pension margins that are added via the means-tested income policy and minimum allowances thresholds, can offset part of the pension income deductions that result from early retirement penalties. In terms of the adequacy of replaced income, the smooth slope of replacement rate curves over the early retirement age space indicates that the level income is an inferior factor affecting the retirement decision. For instance, the opportunity cost of retiring at 46 years of age instead of the normal retirement age of 60 for men, is only thirty percentage points of the last income earned by the pensioner.

[47] The total growth rate of a participant career salary considered for calculating the reference salary should not exceed 60% over the last five years of the participant-contributory period.

[48] See Figure 4.3.

Requisitely, if the standard of living is a major concern for pensioners, the RR margins with respect to retirement age might appear quite high to influence their tendency toward later retirement. This appears conspicuously as the RR at the minimum allowable age of retirement is almost 40 percentage points less than at the normal retirement age. Surprisingly, such an influence might collapse as the lowest level of replaced income among others is considered. To clarify this, if the retiree considered that the benefits guaranteed by the scheme at early retirement ages fulfills his own adequacy satisfaction, a relatively low replacement margin with respect to age of retirement is less likely to pursue his retirement. For instance, a man who earns as much as the system average insured income and signs off his job at age 46 for early retirement purposes, gets, as the model shows, 60 percent of his pre-retirement salary as monthly pension benefits. If he is more concerned about the portion of replaced income over other measures and thinks that such a level fulfills his own adequacy or needs, a one and half percentage point's margin associated with an additional year of contribution is less likely to act as a disincentive factor against early retirement.



Source: Author's Calculations, Hazmomics distributional Model.

Figure 4.4: The Replacement Rate with respect to the Age of Retirement and income level scenarios

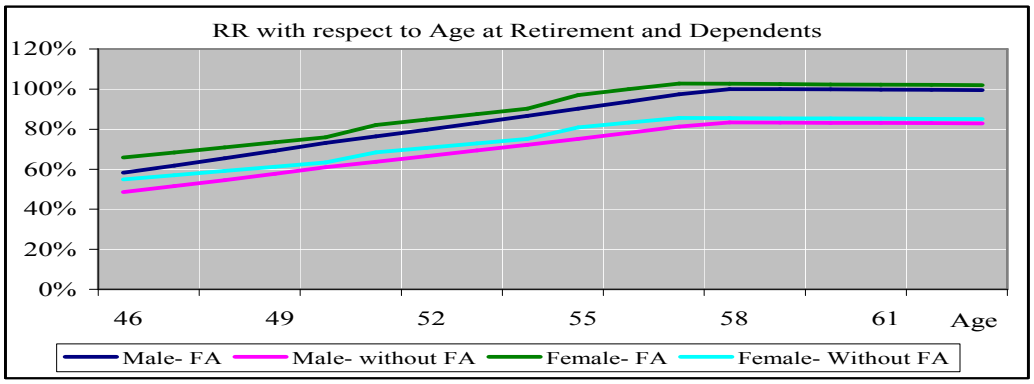
Another issue is that the SSC's law as shown in the above figures discriminates financially between genders. The level of replaced income across early retirement ages is relatively high for females when compared with males. The replacement gap between both genders, as the model shows, decreases gradually with respect to the age of the retiree, but returns back after the normal retirement age of women. For average earners, women who retire at 46 years of age could replace their career income with almost 7 percentage points more than their male counterparts could get, while a 5 year delay of retirement for both genders, brings this gap down to only 3%. This could be justified by the fact that gap in penalty rates imposed on early retiring participants of both genders decreases as the age of retirement increase. In addition to that, part of the high gender RR gap at the earliest age of retirement can be attributed to the extra COLA margins given to women since their insured income is relatively lower than their male counterparts, and hence they benefit more from the minimum allowances floor.

Another factor affecting the level of replacement rate is the level of participants' earnings (income). Some economists refer to such a feature as a case of progressivity, which means that the degree of pension income substitution negatively relates to the level of participant-insured income (Orszag et al., 2000; Kakwani, 1984). The above figure shows that if a pensioner whose earnings over the course of his career is lower than system average insured income, then it is possible for those who retire after the second half of their fifties to replace their career income with an equal pension salary or even more. That could happen as some groups of participants can benefit from the mean tested income policy as well as the generous dependents allowances. An example of that is the half-average income earners who can get as much as one and one tenth times their pre-retirement salary as monthly pension benefits. While those who retire at the same age but earn double the average insured income of participants, can only get a bit less than their pre-retirement salary. This finding not only discerns the progressivity extent of the current law but also how the system is creating clear incentives for early retirement and income under-reporting for those who earn around the system average insured income.

Although dependent allowances indicate some social advantages, they generate at the same time a sort of heterogeneity in the level of adequacy among the scheme participants. Some opponents of this view argue that the latter feature should not be considered as a source of heterogeneity, since family allowances add nothing to the concept of generosity but only help the deepening of adequacy for the pensioner himself aside from his financial

responsibilities toward others. As an alternative view, one can argue that earning based benefits do not ignore the issue of individual adequacy in the presence of dependents, since initially career income is used to finance the same dependents. Referring again to our analyses, the model has shown that family allowances contribute largely to pensioner adequacy. The proportional significance of these allowances increase with the age of retiree because of the decrease in early retirement penalty rates. The significance of these allowances, however, diminishes as the extra JDs given to pensioners to fulfill their minimum COLA threshold falls. Consequently, the maximum COLA starts to work effectively. The gap between the replaced income level for a male average earner with full dependents and for another male with the same circumstances but no dependents, for instance, increases from 10 % if they retire at age 46 to roughly about 17 % if they choose to retire at the normal age Another sort of heterogeneity that arises via family allowances appears apparently with respect to the level of participant-insured salary. The higher the average income of a pensioner over his entire career life, the lower is the influence of family allowances on his retirement income. Figure 4.5 reports precisely how family allowances make some difference in terms of pensioner adequacy when the initial levels of insured income are non-homogenous across scheme participants. The difference between the RR for a participant, who opts to retire at the normal age of retirement, has three dependents and earned the system average insured salary and the RR of a counterpart retiree with the same features but has no dependents, is almost 17% points of the last earnings exactly before retirement. With regard to female employees, the effect of family allowances on the level of replaced income via pension benefits has the same features as for males. The only difference that arises here between both genders is that family allowances replaces a petty more pension income for females than it does for males, over a benchmark of no dependents. This can be accounted for by the heterogeneously implemented penalty rates on early retirement as well as the non-assorted levels of insured salaries among counterpart genders. Another sort of RR heterogeneity with respect to family allowances appears when the level of the insured salaries is also considered. For example, full family allowances step-up the RR for those who choose to retire at age 46 by 9%, 10% and 12% if the participant's career-earning level is twice, on average and half average the SSC insured salaries, respectively.[49] The gap, however, decreases with respect to the age at which the participant chooses to retire, for the same reasons we have clarified early in this section.

[49] This example, however, is not shown in Figure 4.5. See Appendix.



Source: Author's Calculation, Hazmomics Distributional Model.

Note: FA denotes with family allowances.

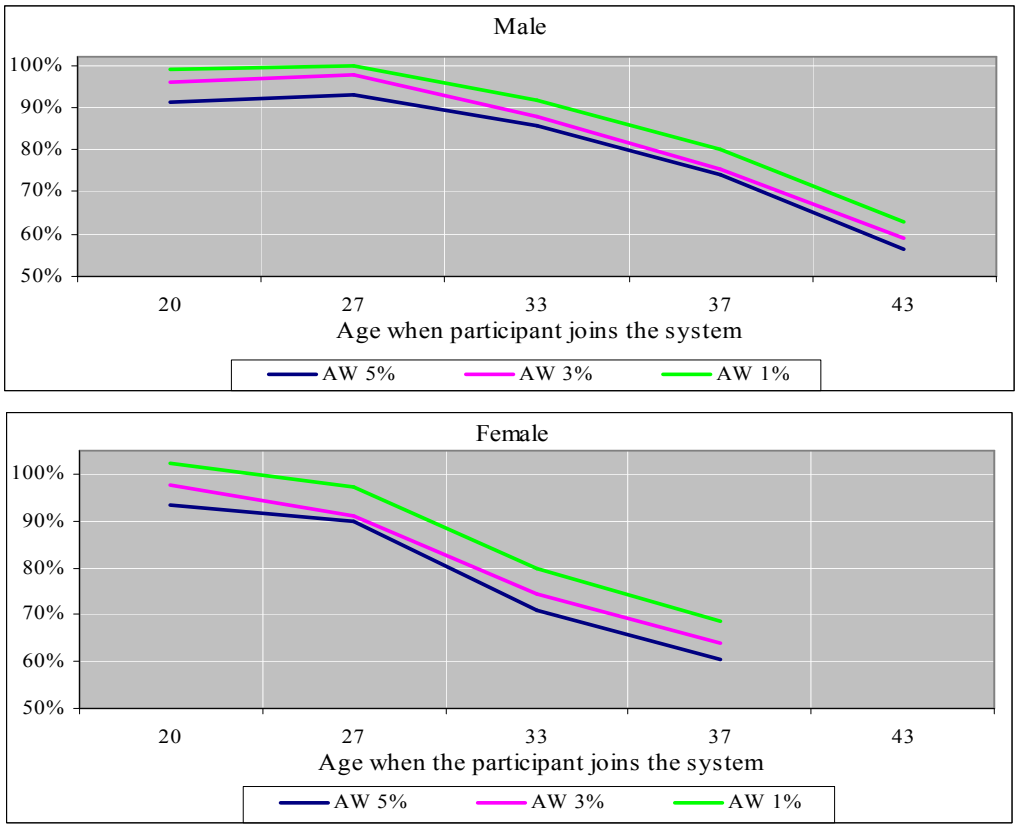
Figure 4.5: Replacement rate for average earners with and without the family allowances

Moreover, evidence of system's encouragement for late participation appears in Figure 4.6 as the slope of replacement rate curves with respect to the age at which the participant joins the system is relatively low.[50] Tautologically, the elasticity of RR to the length of the contributory period might not be enough to encourage participants to contribute more, or even if they work for longer, their attempt to cheat the current rules is strongly expected. They can do so, by evading the system at the beginning of their career and contributing later. The opportunity cost of such a stylized decision is not set as it should be "fairly or neutrally" constructed. For instance, a one year less contributory period considered for pension calculation, would count only for 1.7 percentage points of a lower replacement rate.

Plotting career earning growth rates on the corresponding RR, shows how participants with a high income growth history could replace their career income with a lower proportion than can be replaced by a pensioner with a lower income growth history. This can be explained by the fact that a major part of pension benefits are subject to a maximum limit of three quarters of the reference salary. In addition to that, the marginal increase in pension salary as a sequence of family allowances diminishes with respect to income level, since the marginal gain for a pensioner benefiting from the minimum level of family allowances decreases as the growth of his pre-retirement income increases. On the other hand, the slope of the RR curve for both genders as the figure shows is relatively flat when

[50] When subtracting the age at which the participant joins the system from the normal age of retirement (60), we then get the contributory period that is considered for pension calculation.

it is analogous to early ages of joining the system. This of course has some unwanted implications in the context of participation behavior. The normal age of retirement RR gap between a male participant who joins the system at the age of 20 and counterpart participants who join the system seven years later is only 2 percentage points of pre-retirement income. It would seem that prudently thinking participants would not contribute for an extra seven years in order to get two extra percentage points of replacement rate upon retirement. This however applies only in the case where the participant has 30 contributory years or more credit at the time of retirement. This comes into effect due to the restriction on the basic pension at which it should not exceed three quarters of the reference salary considered for benefits calculation. From that on, and since the accrual rate is 2,5 % for each contributory year, periodical contribution credits that are above 30 years would not be considered for basic pension calculation. The only issue in this would be the possible increase in the participant career income and thus his reference salary for pension benefits formula. Such a feature has the same extent of influences on the pensions of females although it rarely occurs in reality, especially if we know that only women who joined the system before the age of 25 are subject to basic income restrictions compared to 35 year old men. However, if the pensioner has less than 30 years of contributory credits, then any delay in system participation would result in a decreasing RR at the time of retirement. This looks advantageous from the angle of scheme sponsors, since the latter case would reduce the incentive for participants to not postponing their membership in the scheme's insurable activities thus generating more revenues for them. The net impact, however, depends ultimately on how participants observe the marginal change of RR with respect to service credit from an adequacy viewpoint.



Source: Author's calculation, Hazmomics Distributional Model.
Note: (1) This figure considers the normal retirement age that is currently applied according to the current SSC law: (60) for Male and (55) for female.
(2) AW: Denotes the average growth rate career earnings.

Figure 4.6: RR with respect to the age when joining the Scheme and the growth of insured income

4.4.2 Disability Pension

The SSC provides other types of insurance benefits for participants who have permanently terminated there careers for medical reasons. There are actually two types of natural disability: (1) Total natural disability (2) Partial natural disability. It is worth mentioning here that our analysis only applies to the extent the SSC provides naturally disabled participants with adequate pension benefits for the rest of their lives. The incentive implications should not be seen as in the OA insurance provision, since acquiring Natural Disability Pension (NDP) is more institutional and natural than it is optional for participants. In addition to other eligibility criteria, the disability cases have to be approved by a centralized medical reference. Table 4.3 describes the conditions and the parameters considered for determining the NDP benefits upon participant retirement.

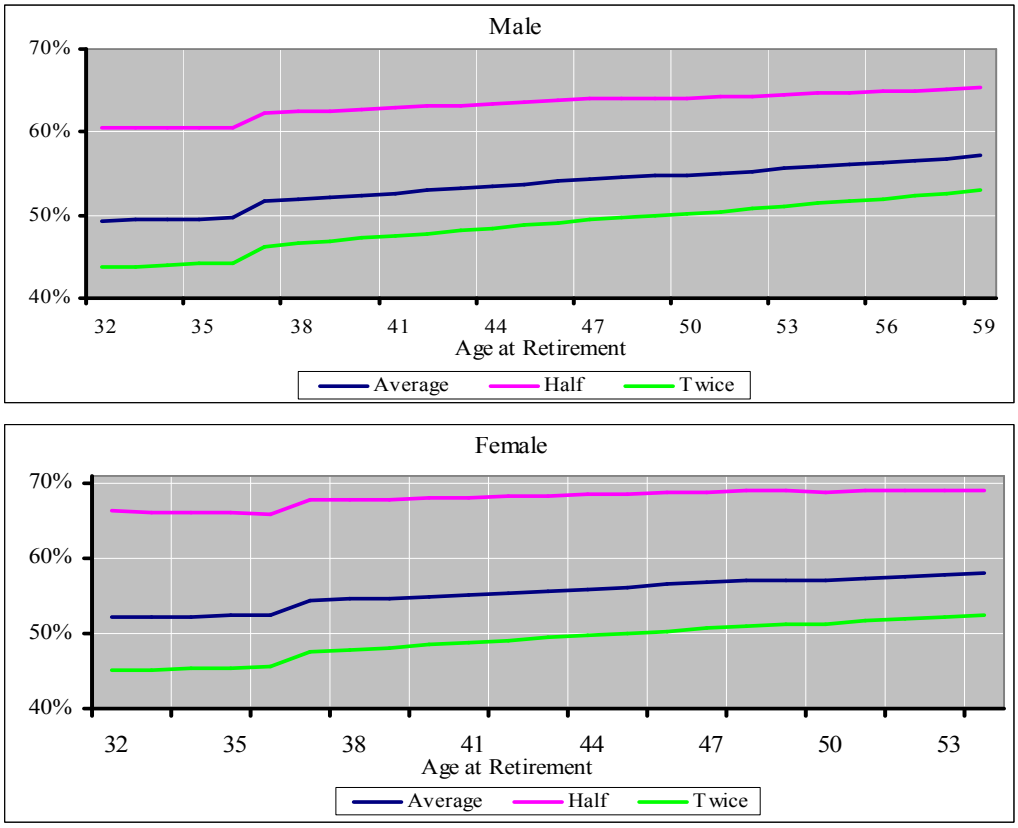
Table 4.3: Natural disability benefit rules

Categories		Disability Insurance Benefits	
		Conditions	Benefits
Total Disability	Basic Pension	1. A total disability certification of SSC reference medical committee. 2. Age at the time of acquiring total disability pension should be less than the normal retirement age for both genders. 3. The participants should have contributed for at least (5 Years) in which (3 Years) are consecutive. 4. Job termination should be attributed to health causes.	50% of average monthly salary of the last 36 contributory months, with a minimum of 50 J.D.
	COLA	No Specific Conditions.	For both genders: 10% of basic pension salary; with a minimum 30 J.D. and maximum of 50 J.D.
	Other Allowances	No Specific Conditions.	The participant receives either of these benefits: i). 0,5% of each contributory years if his total contributory credit dose not exceed 119 months. ii) 1% of each contributory years if he had contributed for more than 119 months. In addition to that if the medical reference decides that the pensioner needs additional care during retirement, he acquires a 25% increase of the sum benefits (basic+ COLA+ other allowances)
Partial Disability	Basic Pension	Same as total disability except that the medical reference should verify the case of partial disability instead of total one.	37,5% of average monthly salary of the last 36 contributory months, with a minimum of 50 J.D.
	COLA	No Specific Conditions.	Same as for total disability
	Family Alloawnces	No Specific Conditions.	Same as for total disability except that there is no additional care allowances (the 25% increase)

Source: Author's own representation based on the SSC law.

Utilizing the above parameters and conditions in the distributional model, provides us with some surprising results in terms of pensioners adequacy. An average earner participant, who becomes partially disabled after fulfilling the minimum period of contributing to the system (5 years), gets permanent monthly pension benefits that give him almost half of the salary level he was earning just before retirement. The following figure shows how a

hypothetical participant of either gender is supported with a pension income in respect of his last earned career salary.



Source: Author's Calculation, Hazmomics Distributional Model.

Figure 4.7: RR with respect to age of retirement and earning level for partially disabled pensioners

The NDP curves as seen above are relatively flat with respect to the age at which the participant becomes disabled. This means that the proportional increase in the age of retirement has little influence on the portion of career income that is replaced with lifelong pension benefits. The difference in the RR for a 10 years gap in retirement age, for instance, is no more than 3 percentage points.

As one of the consequences of the minimum allowances considered in benefit calculations, the pensioner earning level while working affects to some degree his disability RR. Demonstrating that, the degree of RR that a pensioner would probably get during his disability retirement negatively relates to his earning level before retirement. For example, the difference between the RR for participants who have earned as much as the system average insured salaries bill and those who earn twice as much as the system average, is

always positive regardless of the starting age of retirement and gender status of the pensioner. It is worth mentioning here that the latter gap, as the model shows, is always greater for females than for males. This is, of course, because the average wage for females is less than that for males and thus, they benefit from the minimum allowances floor more proportionally than males do.

One important characteristic we interpret here is that as the age at which a disabled participant retires reaches the minimum allowable age for early retirement, the relative adequacy of benefits that are calculated on the basis of early retirement becomes relatively higher than the case of partial disability.[51] This actually motivates him or her to acquire early retirement benefits rather than partial disability compensation. The most possible explanation for cases where participants, whose ages are above the minimum age for early retirement retiring on a NDP basis is that they could not fulfill the vesting period conditions of the SSC's law.[52]

4.5 Generosity: Money's Worth Perspective

4.5.1 Internal Rate of Return (IRR)

IRR is one of the most important money measures for pension schemes promises and contracts. This concept relates to some extent to the clear image of fairness from a pure financial point of view. The IRR is an imperative element for assessing the financial viability of pension schemes. It implies a hypothetical rate of return given on actual contributions that have been made by a participant during his career life, which makes the accumulated assets at the time of retirement sufficient to finance the promised benefits when he is elderly. Of course, in a pure PAYG where benefits are awarded on a fixed fee basis, fixed benefits or flat rate, no actual contribution or assets exist in reality since all proceeds from the working generations are transferred directly to pensioners. Despite the fiction of an actual contributions account, the internal rate of return is still a useful concept

[51] This can be observed if we compare the outcomes performed in Figure 4.4 with the ones that appear in Figure 4.7. RR for the three simulated levels of participants insured incomes, for ages of retirement that are above the minimum allowable age of early retirement is greater when the participants retire on the basis of early retirement than on natural disability pension.

[52] The vesting period for early retirement refers to the minimum contributory years required for early retirement.

because it allows us to compare social provision contracts with other types of investments that could provide retirement support.

From the pure view of finance, IRR is the rate that makes the present value of future promised benefits equal to the present value of all injected contributions in the system. Mathematically speaking, IRR is the discount rate (r) that solves the following equation:

$$\sum_{t=RA+1}^{LE_t} \frac{B_t}{(1+r_t)^t} = \sum_{m=EA}^{RA} \frac{Cr_m \cdot Y_m}{(1+r_m)^m} \qquad \textbf{(4.3)}$$

Where B_t is the value of benefits at age t, R_A represents the age at which the person retires, Cr_m: the contribution rate at age m, Y_m is the level of income on which the contribution is based on, and EA is the age at which the pensioner starts his career.

In view of the above equation, many factors might influence the algebraic value of our concept. Few of them are uncontrolled by the participants themselves, but others to some extent are determined on behavioral bases more than on institutional ones. Nonetheless, the favored value of IRR in a pension provision differs substantially from the point of view of pensioners and their scheme sponsors. A high IRR for the pensioner implies implicitly that benefits would be relatively high, while for the provisions sponsors it means an extent of generosity and a fear of financial difficulty.

Considering a benchmark for comparing returns remains a matter of debate among many pension experts. However, some actuaries and pension specialists often use the performance of investment funds, hedge funds, and the returns on pension buffer funds, among others as bases for comparison. Some others prefer to analyze returns in an international context. Anyhow, the concept regardless of the benchmark considered for comparison, is still valid.

4.5.1.1 Old-Age Insurance

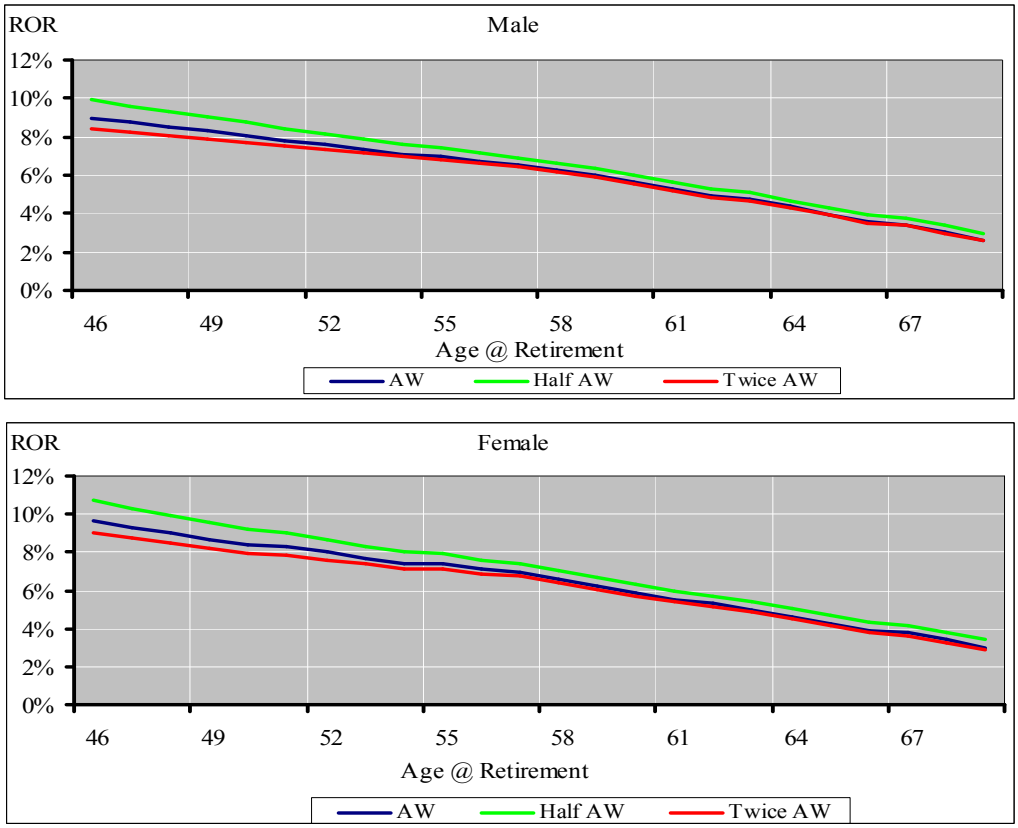
The simulation of the Jordanian pension scheme not only shows some evidences of generosity among all participants, but also a fresh carrot for participants to bail up the system as soon as it is institutionally allowable. As seen in Figure 4.8 the implicit rate of return given on participants contributions is extremely high if compared with either the rate

actually raised through the SSC's buffer fund. Interestingly, our simulation shows that the system is offering more incentives for early retirement than there are for normal retirement. Such a conclusion is drawn from the fact that IRR fall with respect to the age at which the pensioners choose to start their retirement, although there are fines imposed on the benefits for those retiring before the normal age of retirement (Legros, 2003). If a male participant earns as much as the average SSC insured salary over his entire career life and decides to retire at the minimum allowable age of retirement, the SSC awards him implicitly an 8 or 9% rate as an annual rate of return on the contribution he had paid to the system. If he postpones his retirement decision for five more years, he will get as much as 1% less than the rate he gets in the former case. Such a feature calls for special attention in our context. It is not debatable that the system is providing an implicit motivation for participants to retire early if they count on the monetary value measures in deciding on their retirement. In terms of net benefit measures, the defined benefits formula in Jordan ultimately provides an implicit subsidy that negatively relates to the age at which the participant chooses to retire. The earlier you retire, the more profitable your contributions are. Such a feature can work as an incentive engine which forces workers toward early retirement. Supporting our view with clear evidence, some participants have already started to recognize this finding and have decided not to wait for their normal retirement pensions. In 1996 for instance, only 17% of the newly retired participants decided to take their pension early. By 2000 and 2003 this ratio had increased to 57% and 64%, respectively. Aside from the motivational influences of the heterogeneously awarded ROR on pension contributions with respect to the age of retirement among both genders, the system is generously compensating the participants for their career based contributions, regardless of their level of income or age of retirement. This judgment, financially speaking, can be verified through comparing the IRR on pension contributions with the inflation-adjusted ROR on the SSC's buffer fund. This benchmark reflects exactly the expected returns on participants' contributions when the real performance of SSC's invested reserves remains unchanged as observed over the last 15 years.

Moreover, as Figure 4.8 indicates, the level of participant income mainly affects the profitability of contribution accounts. A participant who is earning half the system average insured salaries bill, is compensated relatively more for his contribution through his pension benefits, than a counterpart participant with the same features but earning more. The difference between the ROR given on the contributions of system's half- average earners and on those of system twice average, decreases from 1.5% and 1.7% at the

minimum allowable age of retirement to 0.4% and 0.8% at the normal age of retirement for males and females, respectively.

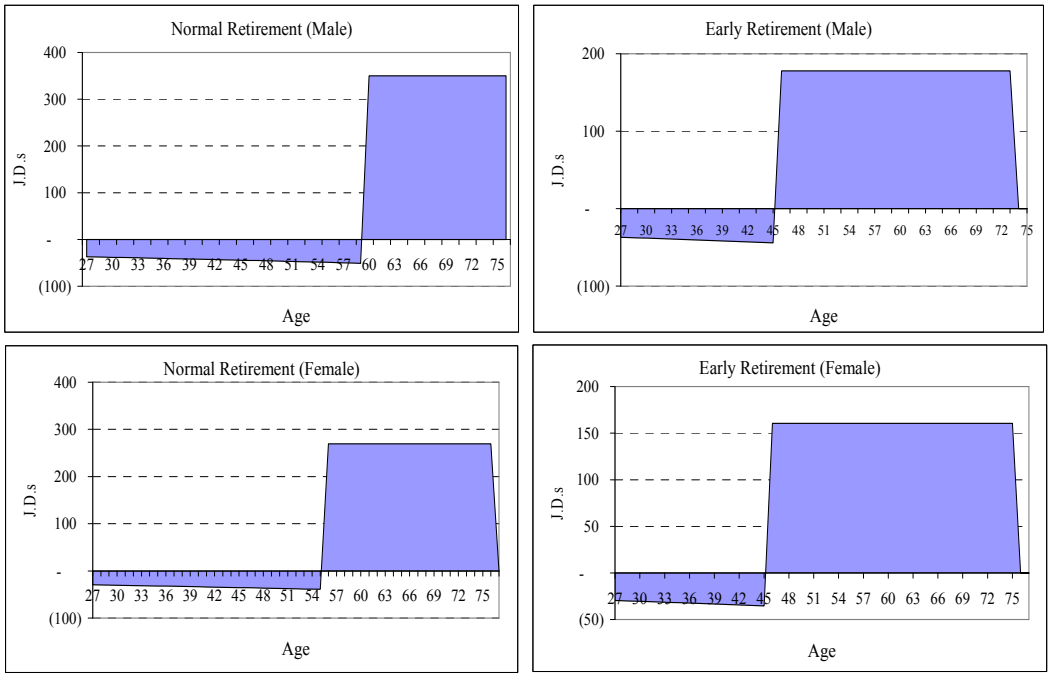
The logic behind this finding is that rates used to discount benefits for females retiring early are lower, and the normal age of retirement for females is five years less than of males. Moreover, as we have mentioned early in this chapter, the life expectancy for females as globally observed is higher than for males, and Jordan is no exception in this regard. However, if we consider the ROR on the Amman SE as a benchmark for setting up a neutral age of retirement, no males should be able to retire before the age of sixty-nine, and it would be even higher for females. Surprisingly, the required age of retirement to trim benefits with contributions is only 10 years less than the remaining life expectancy of males when the actual ROR on the SSC's pension fund is considered.



Source: Author Calculations, Hazmomics Distributional Model.
Note: (1) The SSC ROR represents the average real ROR generated by the trust fund adjusted for the inflation rate assumed in our model.
(2) AW denotes average wage earner

Figure 4.8: The ROR awarded implicitly on pension contributions under OA insurance

The problem of generosity with respect to the age of retirement is clarified in Figure 4.9. The area which represents the expected benefits for those retiring at the normal age of retirement when compared with the area of their contributions is smaller than for those with the same circumstances but retiring at the minimum allowable age of retirement. Although the absolute level of pension under normal retirement is greater than in the case of early retirement, the area of benefits in the former case when divided by the area of contribution is lower than in the latter case.



Source: Authors calculations, Hazmomics distributional model.
Note: The figures refer to a hypothetical participant with earning levels that equal average the system-insured salaries.

Figure 4.9: The area of contributions and benefits at normal and early retirement ages

To sum up, the incentives toward early retirement in the model are difficult to ignore. The implications of these incentives are enough to attract the attention of policy makers. The increase in the proportion of early retirees among total pensioners not only adds implicit liabilities to the system balance sheet as a sequence of generous benefits, but also works as an incentive for other workers to follow their counterparts' decisions, even though the wisdom of this hasn't yet been acknowledged by them. What is worth mentioning here is that, although pension contracts are more profitable for low-income earners, the probability of early retirement for those with high-income career profiles can be higher than for them. This conclusion is drawn from the fact that high-income earners are more concerned with the profitability of their pension contract and pay relatively less attention to adequacy

measures. In contrast, low-income earners pay more attention to the adequacy of their pension salary, which is positively moving, with the age of retirement. The low-income earners use a great portion of their incomes to finance ongoing life needs. Generally speaking, the tendency toward early retirement would push the system dependency ratio up and hasten the appearance of the problem.

The social signs of the current rules appear seemingly when the individually given IRR are considered. These signs emerge when IRR for low wage earners is higher than those how earn relatively more. Such a characteristic occurs because of the minimum-maximum COLA ceiling amount, and due to the means-tested income policy provided by the current rules. The relative importance of the absolute value of minimum allowances and the means-tested income is negatively related to pensioner pre-retirement income.

Within this context, pension schemes can have a range of objectives in addition to that of equity. As argued by many, the equity principle should not be considered as a top priority for pension schemes, but to some extent among the priorities. If the equity principle is not fully applied, the redistribution elements must definitely be instituted. In such a case, rates of returns are heterogeneously awarded with respect to several factors. The redistribution concept can range within the same generation and can spread over different cohorts. In the former sort of redistribution, it is more often that high-income earners solidarize with such of lower income. While in the latter one, fairness measurement varies across generations in a way that some will benefit financially from the provisions while others will lose. Moreover, both measures can take place within the same pension scheme. In such a case, the term of fairness is more important than if a single sort of redistribution exists. Briefly, the implications of each type of redistribution patterns can be grouped as:

- **Intergenerational redistribution**: Some cohort get more than fair, others might get as fair, and certainly, the remaining cohorts would get less than has been paid as contributions (Leimer, 1999). For instance, a PAYG that began with the baby boom generation and ended afterward with a slow growing population would imply a redistribution of income from the latter to the former generation. Such a case has already happened in Germany where the younger generation is paying part of the

benefits awarded to the baby boom generation after Second World War (Schnabel, 1999).[53]

- **Intra-generational redistribution**: In such a pattern of redistribution, participants within the same group get dissimilar returns on their pension contributions (Cohen et al., 2001; Oshio, 2004). Generally, this sort of redistribution affects the well-being of individuals who differ by gender, level of income, race and education, among others (Cubeddu, 2000). For instance, it is often that low-income earners are getting more proportionally than those earning relatively more. The degree of redistributions depends initially on the system design and objectives. If the social characters serve attention in this context, fairness variation among different groups of income earners increases.
- **Dual-form redistribution**: This form of redistribution entails both of the above patterns in that one-generation share the cost of another generation, and some groups of participants within the same generation share the cost of other generations relatively more than others.

The latter form of benefits redistribution applies clearly in Jordan as shown in Figure 4.8 Since the IRR given among most groups of earners is relatively high when compared with a wide range of benchmarks i.e. market rate of return, wage growth rate. On the other hand, pensioners with the lower historical income profile get more implicit rates of return than a pensioner with a higher income profile. That is to say, if all groups of earners within the same generation are getting more than they should fairly receive and the benefits of high career-earning pensioners are relatively fairer such of low career earning pensioners, then one could notice that the system is providing both forms of redistribution.

However, the relatively better benefits awarded to lower income earners when compared with higher ones, might prove untrue. As argued in some literature, the level of income as well as the level of education affects the quality and the standard of human life, therefore improving their mortality patterns (Kenkel, 1991; Evans and Montgomery, 1994; Snyder and Evans, 2002). If this fact is considered in this context, the intra-generational return

[53] Schnabel (1999) reports that rates of return that implicitly accrue on participants contributions of the German pension system would drop from 3.5% for groups born in 1930 to 0.5% for those who were born in 1980.

variation with respect to career income level diminishes among the different groups of earners (Aaron, 1977; Friedman, 1972).

Table 4.4 displays the ROR given implicitly on the contributions of hypothetical participants when their own life expectancy deviates from the average life expectancies derived initially in our model.

Table 4.4: Implicit ROR on pension contributions with respect life expectancy

Gender	Earning Level	ALE-3	ALE-2	ALE-1	Average Life Expectancy (ALE)	ALE+1	ALE+2	ALE+3
Male	Half Average	5,3	5,5	5,7	5,9	6,0	6,1	6,2
	Average	4,9	5,1	5,3	5,5	5,6	5,8	5,9
	Twice Average	4,9	5,1	5,3	5,4	5,6	5,7	5,8
Female	Half Average	7,6	7,7	7,8	7,9	8,0	8,0	8,1
	Average	7,1	7,2	7,3	7,4	7,4	7,5	7,6
	Twice Average	6,9	7,0	7,1	7,1	7,2	7,3	7,3

Source: Author's calculations, Hazmomics Distributional Model.
Note: This rate represents the ROR at the normal age of retirement; Male (60), Female (55).

Let us start our explanation of the above table, by assuming that high-income earners live more than the population average life expectancy (ALE), and low-income earners live below that average. If a high income earner lives one year more than the ALE and the half income earner lives for one year less for instance, then the latter would get 5.7% as an implicit ROR on his contribution while the former would get 5.6%. In this case, the system still favors lower income earners among others. Imagine a male with a twice-average income profile living two years more and another counterpart male with an earning level that is half the system average living two years less than ALE. As it appears in the above table, the privilege of the poor earner would switch to the richer one since the after retirement life span of the latter group is high enough to offset the predilection of low-income earners.[54] These are only to illustrate how variations in individuals' mortality patterns with respect to their income level changes the redistributive features of pension schemes in general, and the Jordanian system in particular.

Moreover, the system as the model shows in the Figure 4.8 discriminates financially between genders since the implicit rates of return awarded to females' career life

[54] Duggan and Gillingham (1995) analyzed the extent in which life expectancy differentials with respect to income level could reverse the perception that net returns of social security are progressive. Their find suggests that unequal life expectancies among participants have little influence on such a feature.

contributions are greater than those earned by males at all retirement ages. The justification of this result can be generalized by the following implications:

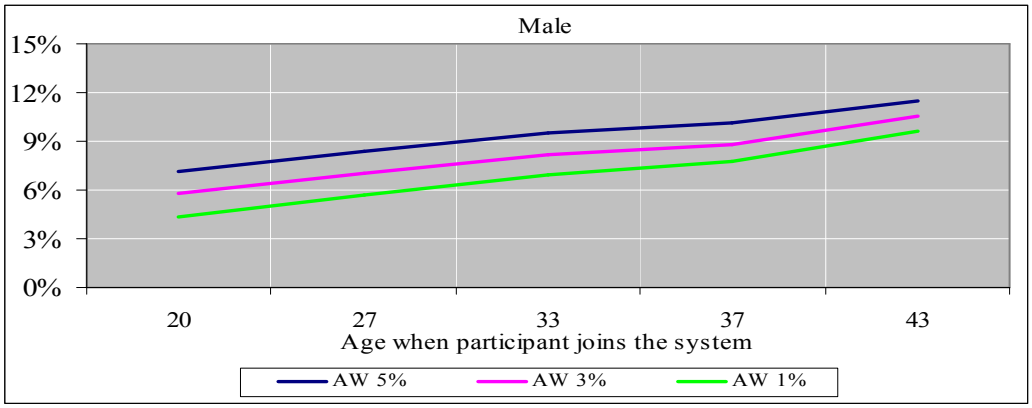
- The normal retirement age for a female is five years less than for a male.
- The remaining life expectancy at the normal retirement age is higher for females when compared with males. For instance, women who retire at the normal age of retirement are expected to live an average of 23 years after retirement, while the remaining life expectancy for men who retire at the allowable age is only 17 years.
- Aside from gender-based differences in the normal age of retirement, the discount rate used to penalize workers who want to retire early is greater for males than for counterpart females.

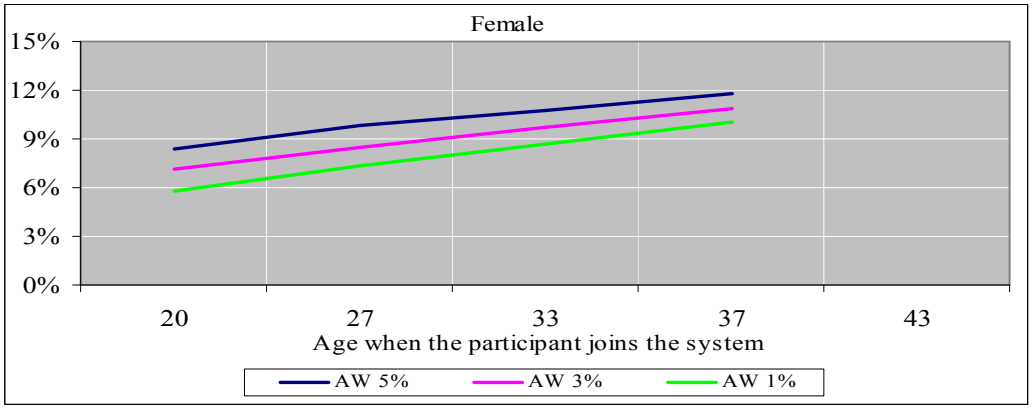
Consequently, women retire earlier, live longer and are penalized less than their husbands. This indeed implies relatively more profitable pension contracts for women as opposed to men. The implications of the above-mentioned points are more explicit than it is implicitly recognized by IRR.

Accordingly, considering all aspects of the analyses, the current rules of the SSC imply an implicit subsidy to all participants. This however is not foreseen in the future, as the insured population will get older and require more benefits that have to be financed via proportionally less contributors, and thus the system's financial viability will probably deteriorate. Such challenges appear to be slightly similar to those that have already appeared in some societies with a relatively high proportion of elderly persons at which the current generation has no way of escaping the burden of their parents.

The other important issues that emerge in this context are the implicit incentives for people toward playing the system at the beginning of their careers and contributing later. This can be a consequence of an increasing IRR as a function of the age at which the participant joins the system, or more precisely in such a case, when they decide to join. One example from Figure 4.2 shows how the implicit ROR awarded on contributions for those joining the system at age 20 can be 6 percentage points less than for those with the same features but join the system at the age of 43. From the perspective of a financial specialist, this gap means a lot in terms of fairness and profitability. Concretely, if participants give more attention to the profitability of their pension contributions over the expected level of

replaced income, then they might move to the informal economy and only contribute for the period that maximizes their profitability.[55]





Source: Author's calculations, Hazmomics Distributional Model.

AW: Denotes average growth rate of career earning.

Figure 4.10 IRR for OA insurance with respect to the age at which the participant joins the scheme

4.5.1.2 Disability Insurance

As we mentioned earlier in this section, redistributing benefits across participants according to their health conditions is a sort of intra-generational redistribution. The importance of analyzing and estimating the monetary value of disability pensions should never be regarded as among the factors that affect retirement behavior. This fact however, applies only for pension schemes where disability pensions are restricted by legal limitations, in which these benefits entitle only participants who are really disabled, and

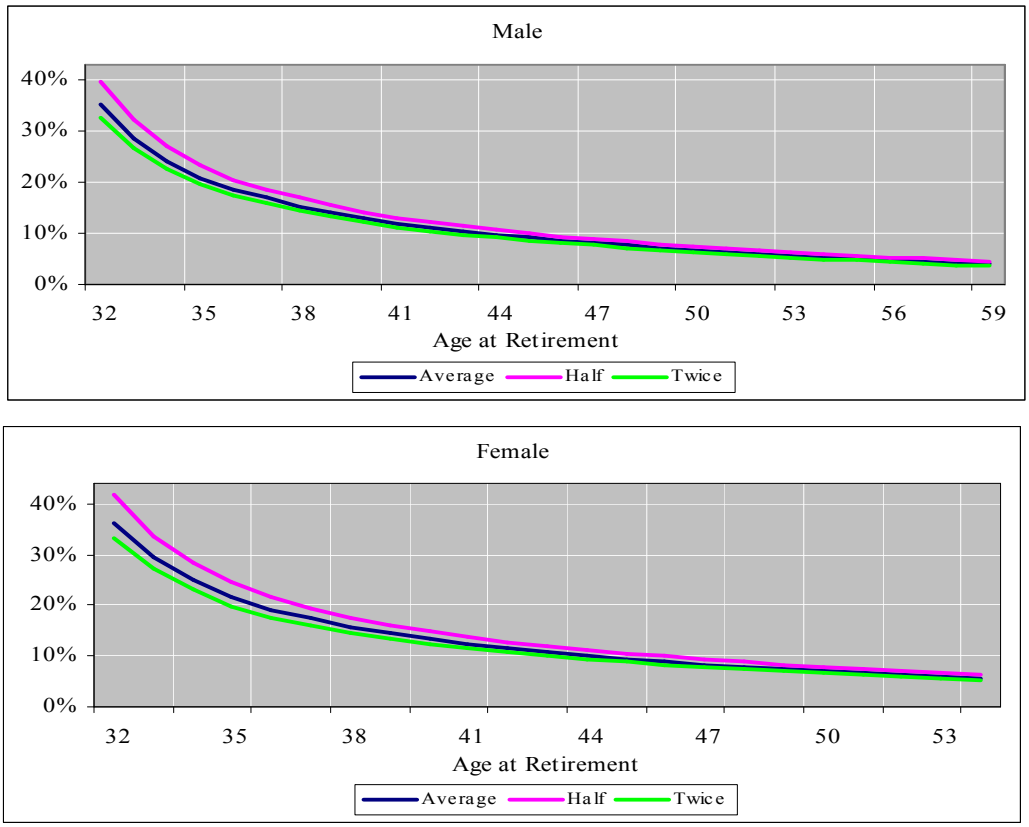
[55] This might be much easier in developing countries than developed ones. Schnider and Enste (2000) have reported that the size of shadow economies in developing countries ranges from 44% in Africa, 39% in Latin America and 35% in Asia. In Jordan, however, Schneider (2004) indicates that the size of underground economy is only one-fifth its GDP level, which is nearly half the average developing countries level.

Jordan is no exception with respect to this matter. Thus, a participant could not include the disability pension as one of the available options that maximizes his own utility unless he naturally becomes disabled during his career. Aside from the incentives issues, analyzing disability insurance should be performed in a way that informs policy makers as well as scheme sponsors about some of the financial implications of providing such a kind of insurance.

Although Natural Disability Pension (NDP) benefits provided through the Jordanian SSC are to some extent controlled and decided by an independent medical committee, the analysis of the lifelong benefits that a participant can get even if he has contributed to the scheme for only five years, demonstrates some surprising financial outcomes. Figure 4.11 reports how NDP inherent an extremely high ROR on the contributions paid by the corresponding pensioner. If the medical committee decides that a male participant, whose income approximately matches the system average insured wages, is eligible for NDP, then he would earn a monthly pension benefit that comprises almost half of his pre-retirement monthly income.[56] If a disabled person is not covered by the SSC, however, and he wants to have the same level of replacement rate that is provided for a covered counterpart male, then he should invest the same contribution streams that he has paid and the corresponding contributions that his employer has paid on behalf of him in financial tools that yield an annual ROR of almost 35%. This of course, is much more than can market assets generate in Jordan or even in other countries. Financially speaking, such a rate which comprises almost five times the average ROR attained on the SSC's buffer fund would never exist unless it is provided as a type of substance. The extent of anxiety decreases as the IRR dips sharply with respect to the age of retirement. As in the case of replacement rate, the implicit ROR on pension contributions through in NDP for participants who retire after the minimum allowable age for early retirement would be lower than if they retire on the basis of normal early retirement. This gap between the two cases, however, is not big enough to be recognized by the scheme participants. It looks more apparent through the measure of RR. Nevertheless, in 2003 the number of new disabled pensioners who retired at an age less than the minimum allowable age of retirement were only 39% and 2.4% of the total number of new disability and OA pensioners, respectively. From this on, one can say that the problem of extremely generous benefits for early retiring disabled persons should not be of great concern, since their number is relatively low when compared to other

[56] See Figure 4.7.

benchmarks. However, the most important thing to recognize here is that most of the disabled pensioners, who retire at ages above 45, could not have completed the vesting period that makes them eligible for early retirement. If this hypothesis were true in which it can be generalized for all participants, the observed high degrees of generosity would still exist. For example, if an average earner from either gender starts contributing to the system at 45 and becomes partially disabled 5 years later, then the SSC would award him a monthly pension benefit that implicitly yields more than 30% on his or her contributions.[57]



Source: Author's Calculation, Hazmomics Distributional Model.

Figure 4.11 Implicit ROR on the contributions of natural disability pension insurance

4.5.1.3 Lump-Sum Compensations

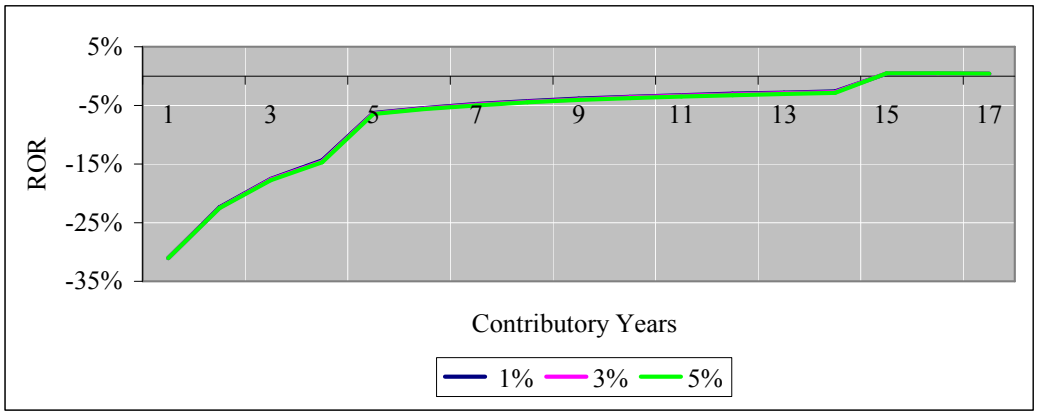
Under certain conditions at which a participant who retires before reaching the normal age of retirement, and at the same time cannot fulfill the minimum service length required for early retirement, he can acquire a lump sum amount for the contributions he has already paid throughout his participation in the scheme. This amount mainly depends

[57] This scenario is simulated via the distributional model but does not appear in the corresponding figure.

on the sum of annual amounts of the person's previous insured salaries during the period of participation. Once the sum is counted, then the participant could acquire as much as:

- 10% of this sum amount if the total number of contributory months is less than 60.
- 12% of this sum if he has contributed for more than 60 but less than 180 months.
- 15% outside of the above conditions.

Counting the above criteria and parameters, the distributional model has estimated the implicit ROR on this sort of insurable benefits. What should be clarified before moving to our analysis is that there is no difference whether the lump sum payments are provided for males or females, since gender, income and age based special treatment no longer exists in this type of insurance payments. Thus, we simulate the implicit ROR only with respect to the length of service credits and earning growth, though the latter as seen in Figure 4.12 has a weak effect on the estimated rate.



Source: Author's Calculation, Hazmomics Distributional Model.
Note: The legend refers to the average career growth rate.

Figure 4.12: The implicit ROR on lump sum benefits

At first glance, the cost-benefit analysis as the model explicitly indicates in the above figure seems to be favorable for the scheme sponsors. First, an extremely low ROR given implicitly on participants contributions' through a lump-sum payment upon retirement may discourage workers from retiring early, thus preventing the stability of agents structure, namely the dependency ratio. Secondly, even though participants sacrifice the monetary

losses they might incur and decide to retire on the basis of this provision, these losses would not negatively affect the financial position of the system but rather improve it.

However, if participants recognize these implications clearly and at the same time they are uncertain of whether they should remain employed or not, then the observed negative returns may encourage evasion rather than discourage early retirement.

4.5.2 Net Present Value (NPV)

Another approach for defining the concept of pension fairness is through estimating the present value of a pensioner's benefits that surpasses the present value of his own contributions. To clarify further, the latter measure calculates the current value of all expected benefits during a person's retirement life after the current values of all contributions made by the same person being subtracted. Although there is some extent of similarity between this measure and the IRR measure, the aggregation of NPV (social security monetary value) puts another image in our minds. The following formula shows mathematically how NPV for pension contracts is calculated:

$$NPV = \sum_{t=RA+1}^{LE_t} \frac{B_t}{(1+r)^t} - \sum_{m=EA}^{RA} \frac{Cr_m \cdot Y_m}{(1+r_m)^m} \tag{4.4}$$

where $RA =$: the age at which the pensioner retires; LE_t : participant life expectancy at the age of retirement; EA : the age at which the participant joins the system; Cr_m : the contribution rate at age m. Y_m : Participant income; r_m : the discount rate.

As apparent in the above formula, the NPV is sensitive to several variables, but it is more critical to the discount rate. This comes from the fact that contribution and benefits are both back-counted with the discount rate, while the life expectancy only affects the amount which a pensioner takes as benefits. Nonetheless, despite the extent of similarity between this measure and the latter used to reflect generosity (ROR), NPV can play an effective role in showing the net gains (losses) from joining the pension provisions. In this context, a neutral pension scheme provides its participants with lifelong retirement benefits, at which if they are discounted to their current value they will match exactly the discounted value of

the benefits they had actually paid to the scheme sponsors. Thus in such a case, the NPV of benefits and contributions for each retiree equals zero. While a positive NPV, means that the scheme is awarding retirement benefits that exceed contributions and implies a pure gift or subsidy from the system to participants. However, if NPV is none of both cases, the provision involves some costly measures for pensioners.

Moreover, the NPV in our paper is presented as a fraction of the last salary earned by the participant just before his retirement, exactly like the replacement rate, except that nominator is NPV instead of pension salary. This is done in an attempt to make the concept clearer for policy makers as well as for foreign researchers, since absolute measures might be less understandable under the unfamiliarity of the currencies exchange rates and the real value of money for developing countries, among others. The rate used here to discount future contributions and benefits is 5%. The selection of this rate seems to be reasonable if compared with the actual performance of Amman stock exchange, yield on bonds, money market tools and other investment funds in Jordan. However, if the actual rate of return on the SSC's pension fund is considered in this context, substantial positive differences would occur.

The distributional model has calculated the NPV of benefits and contributions under the current rules of SSC law, considering different scenarios about the earning level, wage growth rate, age of retirement, age of joining the system, as well as the number of dependents of the original pensioner. Initially, all participants regardless of the scenario they belong to are getting a pure gift from the system, except in the case where the average earner has no dependents, and has contributed for at least 33 years would be a net loser from participating in the system. However, the latter case rarely exists in Jordan. As noticed in the previous measures, the rate at which the benefits are discounted for early retirement pensions are lower than the actuarial fair rates. Even if we consider the normal of age retirement as a benchmark for discounting, despite its unfairness, the early retirement discount rates of the current law are still considered unrealistic. This conclusion can be drawn depending on the controversy between NPV measure and the age of retirement. For instance in the base line scenario, a male who retires at the age of 46 would actually get an additional 6 multiples of his last earning level as a pure gift from the system than if he retired 6 years later. The gender status also plays a crucial role in determining the net benefits from contributing to the system. Among all assumptions regarding the earning profiles, females get more salary multiples than males with the same conditions. This can

be justified by the higher life expectancy for females, 5 years less than the normal retirement age, and also a lower early retirement discount rate. Moreover, the Beveridgean character in this regard deserves attention (Borck, 2003). A male participant earning half the system average salary gets an additional six multiples of his last salary in today's purchasing parity as a net gain from the system when compared with those earning around the system average. The relative steepness of the NPV curve for the half-average earners reflects the diminishing role of the minimum COLA allowances in providing more than should proportionally be provided.[58] Such a feature can be replicated as a consequence of the increase in the reference salary accompanied by the delay of retirement.

Table 4.5: NPV of benefits and contributions as a multiple of pensioner's pre-retirement career salary

Age at Retirement			46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
NPV as % of Last Annual Salary	Half Average	Male	2,6	2,5	2,4	2,3	2,2	2,1	2,0	1,9	1,9	1,8	1,7	1,6	1,5	1,4	1,3
		Female	3,1	2,9	2,8	2,6	2,5	2,4	2,3	2,2	2,1	2,0	1,9	1,8	1,7	1,5	1,4
	Average Income	Male	2,2	2,1	2,1	2,0	1,9	1,9	1,8	1,7	1,7	1,6	1,5	1,5	1,4	1,3	1,2
		Female	2,5	2,4	2,3	2,2	2,1	2,1	2,0	1,9	1,8	1,8	1,7	1,6	1,5	1,4	1,3
	Twice Average	Male	2,0	1,9	1,9	1,8	1,8	1,7	1,7	1,6	1,6	1,5	1,5	1,4	1,4	1,3	1,2
		Female	2,2	2,1	2,1	2,0	1,9	1,9	1,8	1,7	1,7	1,7	1,6	1,5	1,4	1,3	1,2
NPV (000)s J.D.	Half Average	Male	4,6	4,5	4,4	4,2	4,0	3,7	3,5	3,2	2,9	2,8	2,5	2,2	1,9	1,6	1,1
		Female	4,8	4,5	4,4	4,1	3,8	3,8	3,5	3,3	3,0	2,9	2,6	2,5	2,1	1,7	1,3
	Average Income	Male	6,6	6,6	6,5	6,3	6,0	5,7	5,3	4,8	4,4	4,3	3,8	3,3	2,7	2,1	1,3
		Female	6,9	6,6	6,4	6,0	5,6	5,7	5,3	4,9	4,4	4,4	3,9	3,7	3,0	2,2	1,5
	Twice Average	Male	10,7	10,9	10,7	10,5	10,3	9,8	9,2	8,6	7,9	7,8	7,0	6,2	5,0	4,0	2,3
		Female	11,3	10,7	10,5	9,9	9,2	9,5	8,8	8,2	7,5	7,7	6,9	6,6	5,1	3,8	2,4

Source: Author's Calculations, Hazmomics Distributional Model.

By interpreting the above table, it is crucially important to show here how the use of this measure leads us to different implications from those observed in the IRR measure. One can decipher that in terms of relative measures in which the NPV as a percentage of the present value of participants last earned salary is among them, the system seems to discriminate slightly between genders as well as between different groups of income earners. These implications, however, have the same signals of those described in the IRR measure. If we switch our analyses to interpret the NPV in absolute value terms, the case would be completely different. While it is true that the implicit ROR given for low income earners and females is higher than that given on the contributions of high income earners and males, respectively, the absolute and present value of extra compensation given to the

[58] More proportionally means here that if the 10% COLA allowances is less than 30 JD, then he should get extra allowances to push him up to that level. Thus, he implicitly gets more than the 10%.

latter groups is higher than for the former. For instance, it is explicitly shown in the above table that if a participating male, whose earning level before retirement equals the system average insured income, retires at the minimum allowable age of retirement, then he would gain a pure compensation gift from the system that comprises 6.6 thousands of today's JD While a counterpart male with the same conditions but earning approximately half the system average gets only 4.6 thousands JD in today's value. If we switch our analysis to a gender based comparison, we would almost come to the same conclusion. We saw in the previous section that females get a higher implicit ROR on their contributions when compared with the rate given to their counterpart males, among all ages of retirement and the levels of income. According to NPV measure, however, males receive absolute compensation (gains) while females don't.

The only feature that has no conflict in its implication is the level of generosity with respect to the age of retirement. It is clear from the above table that the absolute and relative measures of NPV decrease with respect to older ages of retirement, regardless of the level of participant earning level before retirement. Such a feature indicates some consistency with the IRR measure, since the latter also decreases with respect to the age of retirement.

4.5.3 The Implicit Contribution Rate

If participants are more in favor of the current benefits level and expect to get it as exactly promised by the current rules, one may ask about the possible ways to offset the unfairly awarded benefits to their earners. It would be logical, among the suggested options, to increase the aggregate rate of contribution. The variation in the net present values of benefits over contributions with respect to the age of retirement as well as the years of contributions proves that in principle such a solution might be less viable. Nonetheless, if the individual specific contribution rate needed to finance his future pension benefits is quite high, the economic efficiency condition of the system will not be met. This condition implies that the level of contribution should be justified to a reasonable level to avoid the distortional spillovers on the economy of high contribution fees. Among these spillovers are the deterioration in producers' competitiveness and the decrease in consumers' disposable income.

However, although all measures mentioned above have clarified the issue of generosity, the analysis of this measure is important. The expected relation between the implicit contribution rate on the one hand, age of retirement and contributory period on the other hand has made the concept more relevant to the NPV term used in the previous section of this chapter.

The higher the NPV of future benefits, the higher the contribution rate needed to retrospect its value to zero. For instance, as shown in Table 4.6 those people retiring at age 46 as average earners over the course of their career life, should have been taxed at the rate of 31 which is 16.5 percentage points more than the current charged rate. While such a rate for the same person would only be 2.5 percent more if he chose to retire 14 years later. On another level, the less time the beneficiary participates in the system, the more contributions he should have paid in order to get the same level of benefits according to the current law, and visa-versa. It might be suggested, that a fair contribution rate that should be paid by a pensioner who retires after 17 years of employment is roughly 15 points more than the actual existing rate. Accordingly, from a financial point of view, some people are paying less than they should or it can be said that they are getting more than their fair share.

Table 4.6: The actuarial fair implicit contribution rate

Implicit Contribution Rate (%)				
Age@ Retirement	**46**	**50**	**55**	**60**
Male	31	28	23	17
Female	36	30	25	18

Implicit Contribution Rate (%) at the Normal Age of Retirement Male (60), Female (45)					
Age of Joining the Scheme	20	27	33	37	43
Male	12	17	22	24	30
Female	18	25	31	35	N.E.

Source: Author's Calculation, Hazmomics Distributional model.
N.E. denotes female participant is not eligible for retirement because she doesn't fulfill the minimum vesting period at the age of retirement.

4.5.4 Generosity Ratio

In addition to all measures of pension fairness mentioned earlier, it is worth developing a simple measure that relies on a standard benchmark for cross comparison.

The measure that we introduce in this context, states explicitly the extent to which benefits awarded to their beneficiaries are being self financed, more or less covered by contributions. In order to have such an explicit measure for generosity, several elements are essential for calculation. The following three definitions, although their values are identical, have different implications:

First, the ratio of implicit contribution rate sufficient to cover the promised benefits under the current law, to the current levels of contribution rates, as follows:

$$GR = \frac{Cr_{implicit}}{Cr_{current}} \tag{4.5}$$

Where GR: is the generosity ratio, Cr: contribution Rate.

The ratio of one, for instance, explicitly indicates that benefits are awarded to beneficiaries on a fair basis. In this sense there is no difference between the optimal level of benefits and the actual level in the sense of financial fairness. If such a level does not hold, either contrast has an opposite implication. For instance, half one ratio means that 50% percent of the contributions paid to the pension system over the course of employment were unfairly absorbed. In another way, the implicit tax rate on income imposed indirectly by the pension system constitutes 50% of the rate of contribution. While a ratio of two, for instance means that the contributions paid by the pensioner are sufficient for providing only half of the current benefits level.

Second, beyond the issue of contribution rate fairness, the generosity ratio can be calculated with a reliance on the level of benefits. For this, two definitions must be in use for this context. The following equation illustrates the case:

$$Gr = \frac{B_{Current}}{B_{Funded}} \tag{4.6}$$

Where B: is the benefit level awarded under the sub-system.

The dominator of the above equation presumes fully funded based benefits, in which they are calculated on the basis of actual contributions paid by the participant during his career

life beside the investment returns generated on them. The nominator represents the actual level of benefits awarded on the basis of current law. The ratio despite its similarity to the first case has another implication. For instance, if the calculated ratio is more, less or equal to one, then the benefit formula according to the current law provides more, less and fairly neutral benefits, respectively.

Third, the ratio of the present value of future expected pension benefits to the present value of all contributions paid to the system reflects the generosity ratio in the above mentioned methods. The explanation of this concept might be more understandable among others. Simply, if today's value of expected benefits awarded to a pensioner from the time of his retirement until his death, is more than the discounted value of all contributions, the provision in such a case is more than fair. Equal values of both discounted financial streams imply a value of one as can be clearly deduced from the following equation:

$$GR = \frac{PV_{Benefits}}{PV_{Contribution}} \tag{4.7}$$

$PV_{Benefits}$: stands for the present value of all expected benefits during the retirement life span.

$PV_{Contributions}$: The present value of all contributions collected during the course of career life.

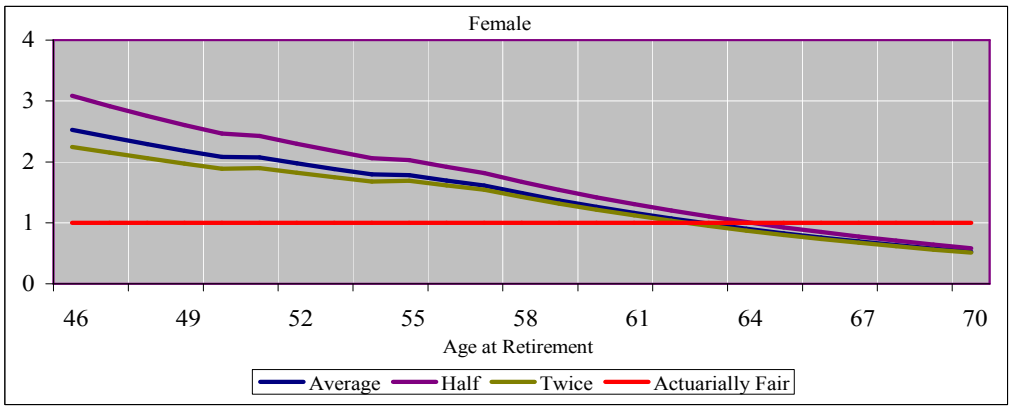
The distributional model has calculated the generosity ratio from an individual point of view based on the current rules of the SSC. Nonetheless, if the dominator and nominator of any the mentioned equations are given exogenously out of the model, the ratio can then can be calculated directly without the need for simulation.

The analysis has shown as expected, a high ratio of generosity for all average earners that retire between the earliest possible age for retirement and the normal age. The extent of generosity for those earning less than the system average seems more. For, it can be said that a generosity ratio of 2.2 for a baseline scenario person who retires at 46 has the following assessments which must be equally considered:

– The pensioner is only contributing at less than half the fair contribution rate needed to finance his pension salary during his retirement according to the current formula.

– If the current contribution rate is considered for calculating the pension salary on the basis of actuarial equality, the benefits awarded to their beneficiaries according to the current formula is more than double its fair level.

– The last assessment makes no difference to the others, unless in is clarity. The aggregate discounted value of all expected benefits for a participant during his retirement span is more than double the amount he had paid as contributions during his career life. .



Source: Author's Calculations, Hazmomics Distributional Model.

Figure 4.13: Generosity ratio with respect to age at retirement

However, as seen in the above figure, from an individual viewpoint, the less he contributes to the system, the more relatively generous benefits he will earn during his retirement. Beyond the implication of such a stream, the system provides a clear incentive for evasion, and might come from an idea in which the utility function of participants is a decreasing function of the contributory period. It should also be noted that, pension arrangement in Jordan provides more incentives for females to evade the system, since generosity ratios

relative to the contributory periods have initially higher levels when compared with males.[59]

4.6 Potentials for Reform

The fact that the system dependency ratio is on a desired level conceals the fact that generous benefits as consequences of bad scheme design has already made the system financially unviable.[60] Consequently, if no changes take place to solve the faults in this system, it will be more difficult to reconcile the system's unfavorable financial imbalances afterwards. Before considering the appropriate approaches to the reform of the pension scheme in Jordan, it is worth noting some aspects of a better design of a reform strategy:

- **Economic and financial affordability** A suitable design of a reform strategy entails the preservation of economic, social and political aspects. This might come as a result of stabilizing the contribution rates at reasonable levels (Gruat, 1997). There are several things which need to be protected, among them, the competitiveness of domestic against foreign producers and the stability of the labor market (Ney, 2003). The social aspects have no less importance in this context. Any upward changes in contribution rates in most cases have to be shared by employees and employers; the disposable income especially for lower paid earners would be insufficient to provide a suitable standard of living for them. Moreover, if the acceptable extent of the above-mentioned aspects is not met by the reform approach, the implementation of it would be politically challenging and hard to have accepted.
- **Equity fairness**: In this we mean that a strong link between contributions being paid during the career life and benefits to be awarded along the retirement period should be maintained. Sequences of such a link would have important implications for the viability and the efficiency of a pension scheme (Auerbach and Kotlikoff, 1985).
- **Adequacy and social solidarity:** Achieving the above condition might have different sequences if social aspects are considered. For instance, a stabilized contribution rate and contributions based benefits would provide the low-income earners with a pension benefit which is probably insufficient to meet the minimum standard of living. Thus, it

[59] The figures that represent such a scenario do not appear in the text. However, this can implicitly be concluded from the discussions of previous sections.

[60] This fact is proved in chapter five.

is crucial to keep on some of the solidarity features that provide insurable benefits i.e. disability pension, work death, minimum income, etc. (Casey, 2004; Howse, 2004). Therefore, a better reform strategy should ensure acceptable levels of income to avoid poverty through enhancing the principle of intergenerational and intragenerational solidarity (Council, 2003).

- **Intergenerational fairness**: In a pure PAYG system with a steadily growing population, the implicit rate of return awarded on pension contributions are identical across all generations. It is worth mentioning here that such a conclusion is only valid for a PAYG system in which the contribution rates are exogenously fixed while the pension benefits are endogenously determined through the system funding equation which equates the total contributions receipts with aggregate pension expenditures. However, in a partially funded system with a defined benefits formula the implicit IRR violates across generations. Beyond the overall financial viability, the latter generation will receive higher IRR if compared to the former ones since their mortality rates are lower than those of their parents. But considering the expected future financial challenges, such a feature would less likely to exist.

4.7 Approaches for Reform

Before discussing the reform design, it is worth pointing out here some general conclusions we have reached from the above analyses. As discussed in the above sections, SSC law is badly designed in many respects. The old age insurance as a major part of the corporation activities seems to be financially unviable for a number of reasons. Firstly, the old age formula tends to create implicit incentives for the scheme participants to outplay the scheme in order to maximize their benefits with respect to their actual contributions. This of course leads to heterogeneity in the scale of rewards among all contributors. Secondly, as the means-tested income as well as the minimum and maximum COLA is embodied in the old age benefits formula, the probability of ‘income under reporting’ by some groups of participants' increases. For instance, those who earn relatively less might always have the potential to under report their income to benefit from the lower contributions that have to be paid because of lower declared income and from the minimum threshold of income and allowances.

Another sort of income under-reporting can arise in this context from the fact that the final wage used for pension calculation is subject to an adjustment mechanism based on the ratio of worker's final wage to his or her wage as recorded sixty contributions months before retirement. This comes out as one of the implications of article (43-D) of the SSC's law which states that if the final salary is more than 1.6 times his or her wage as it was sixty months of contributions prior to retirement, that difference must be subtracted from the reference wage used in pension formula.

The following sections provide brief discussions regarding some reform options and their implications on several scheme aspects.

4.7.1 The Parametric Reforms

The parametric reform strategy, which depends ultimately on changing system parameters, seems to be unrealistic and less sustainable in the context of JSSC. As explained already, measures of fairness and neutrality are sensitive to several factors, with the rates of return on assets, life expectancies among them. If new changes to system's parameters were based on the expectations of such variables, the effects of the reforms will be sensitive to the deviations from expectations. However, one can recognize that the above analysis has implicitly shown some important implications of parametric reforms. On the benefits side for instance, the model shows how benefits awarded under the current law are financially generous. The level of generosity as previously clarified is subject to many factors, among them the age of retirement, the age at which the contributor enters the system, and the rate used to discount future contributions and benefits. Generally speaking, decreasing the level of generosity for all beneficiaries can be done in different ways:

- **Increasing the age of retirement**: Logically, this would imply that the contributor has to pay more in contributions and get less lifelong benefits. On the other hand, delaying the age at which participants are able to retire normally, may result in increasing the reference wage that the pension formula is based on and certainly the contributory period considered in this formula. The net effect therefore, would depend on the net balance of the contrast implications. If the present value of the additional contributions which have to be paid by contributors plus the present value of benefits saved due to delaying the eligible age of retirement is greater than the present value of the increase in the level of benefits, it would be financially viable to do so. If the case is the

opposite, such strategy would be either less worthy or more costly to implement. This can be clarified by using the following mathematical expression to assess this reform option:

$$OV = \frac{\partial PVB}{\partial Ra} - \frac{\partial PVC}{\partial Ra} \tag{4.8}$$

Where OV denotes the option value for postponing the normal age of retirement. PVB: the net present value of future expected pension benefits and PVC: the present value of the participant's contributions. Ra: Retirement age.

If the OV is less than Zero, this implies that it would be financially profitable to the pension scheme to delay the retirement age. However, implementing such an option regardless of its pure financial implications would not solve the heterogeneity in the rates of return among all groups of beneficiaries and would be less effective in preventing people from cheating the system.

- **Increasing penalties for early retirement**: Early retirement in most countries has contributed to pushing pension schemes toward bankruptcy. The cost of early retirement in OECD countries, as estimated by Herbertsson and Orszag (2003), is roughly 7.5 % of their potential output. This brings us to a conclusion on how early retirees burden their pension provider earlier in their lives. Jordan in this context is no exception. The ratio of early retirees has increased considerably over the last ten years. In 1996 for instance, only 17 percent of new old age pensioners retired early. In 2003, this percentage increased to almost 66%. The fear of early retirement would not exist if benefits are penalized fairly, but as the model shows for Jordan, the penalty rates on early retirement benefits are insufficient to neutralize the rate of returns awarded on pensioner's contributions, regardless of the age they retire at.

  A new revision of the penalties imposed on early retirees may improve the system. Nevertheless, one adjustment will not solve the problem forever, since any adjustments in the penalty rates would be based on the net returns accrued in the buffer fund. The implementation of actuarial neutral penalty rates definitely needs a frequent revising as the performance of this fund might change periodically. This might be institutionally challenging and politically unacceptable.

- **Increase contribution rates**: Few economists advocate the increase in contribution rates as a first resort in finding a solution to sustaining pension provisions. One of the reasons that economists prefer other reform options over an increase in contribution rates, is that the latter approach may result in an increase in the informal economy especially if the system has some distributional characteristics which provide the beneficiaries with minimum allowances and means-tested income. Also, if this option is considered in matching the individual discounted value of retirement benefits with his own pension assets, the implementation would be applicably difficult.

  Generally speaking, the heterogeneously awarded rate of returns among different participants is subject to many variables in which the scheme parameters have to be changed and revised as these variables start to deviate from their initial estimations.

3.7.1. Switching to Fully Funded

Strategies that aim at shifting to more funded schemes in order to make the unfunded ones more viable have been debated and in discussion for some time. The principal idea of implementing such a strategy is to strengthen the link between the individual's benefits and his/her own contributions in order to remove the distortions that are often associated with the design of defined benefits provisions. Many economists argue that in the absence of external funds to finance the unfunded liabilities of the preceding generations, the net present value of the future gains from getting a market rate of return that is above the PAYG implicit rate of return would exactly match the discounted values of the unfunded obligations of other generation. Thus, a transition to a more funded pension scheme would only impact the intergenerational distribution of income and it affects the work incentive among generations (Lindbeck, 2002). Others think that the transition to more funded schemes increases the welfare of the scheme participants, since such a strategy can provide a substantial reduction in tax wedges while maintaining or increasing retirement benefits (Feldstein, 1997). However, the consequences of pre-funding a partially funded scheme are slightly different than those for a pure PAYG scheme. The major difference between both cases is that the implicit rate of return in a PAYG system is more likely to be lower than the market rate of return. The case would be different, of course, for a PAYG system with a lower dependency ratio which has already started to be financed through the contributions of a booming generation. Otherwise, the growth rate of the wage bill, which is an approximate indicator for the PAYG return, is in

most countries lower than the proportional return on investment. In general, the latter case is one of the facts about unfunded schemes in more developed countries where the population is growing smoothly and average wages are moving steadily. In partially funded systems, however, the rate of return that impacts implicitly on pension contributions depends initially on the system's own parameters. In Jordan for instance, the rates of return in spite of their heterogeneity among different groups of participants, are greater than the weighted average of the market rate of return on the domestic financial instruments and exceeds also the system wage bill growth rate. Thus it cannot be said that the welfare level for the subsequent generations, measured by retirement benefits, would be greater than today's observed level for current pensioners.

Thinking over a longer term, however, indicates that any reform that involves a stronger link between benefits and contributions would improve the initial welfare of the following generations as concluded by Feldstein (1997). This can logically be recognized by the fact that such reform would reduce the future welfare losses that are likely to result when the scheme would not have enough money or assets to finance all beneficiaries. Continuing with the current rules, as we will see in the coming chapter, would result in a deep reduction of the benefits of future pensioners or sharp increase in participant's contributions. However, the sooner the reform is done, the less burden has to be paid by future participants.

Consequently, the outcomes of such a reform strategy on a partially funded scheme are multiple. First of all, aside from the issue of transition cost, there will be a drop in the benefits level for some or all groups of beneficiaries as their pension benefits will precisely reflect the actual contributions and the market rate of return instead of the implicit rate of return they get according to the current law. Secondly, the transition cost inferred by the stock of current pensioners, or more generally, for those who keep getting their benefits in line with the pre-reform parameters, must be paid by somebody . If the government takes responsibility for these liabilities, the post-reform participants would only have to bear the burden of a lower rate of return that they will get via more fairly awarded benefits. Thirdly, if the intra-generational solidarity elements keep appearing in the reformed scheme, the extra allowances given to some beneficiaries above their equitable actuarial benefits would come at the expense of other participants.

4.7.2 Switching to a Quasi-Actuarial System

To introduce a new type of reform strategy in which some of the distortional outcomes of the current scheme can be eliminated, some actions have to be implemented:

- Strengthening the link between benefits and contributions, as a straightforward way to remove the heterogeneity of rates of returns given to most participants and to reduce the generosity of benefits, in which they can integrate together to remove the unwanted and costly behavior of some groups of participants.
- Funding the implicit debt that has already occurred and keeping on solidarity elements in such a way that fulfills Pareto optimality.
- Prevent the low-income earners from being supported with insufficient benefits during their retirement span. Thus, any reform strategy should internalize the concept of solidarity.

As we noticed in previous discussions, neither parametric reforms nor a fully-funded strategy can achieve the above-mentioned criteria jointly. Therefore, one could think about a quasi- actuarial pension scheme, in which benefits are over funded by contribution at the time where the strong link between an individual's own pension assets and liabilities is still maintained.

Nevertheless, one might ask on how could benefits be over funded and at the same time be directly correlated to contributions? This is easier than many think. Firstly, if we want to achieve the equity principle as a primary rule of reform, the present value of all expected future benefits for the pensioner must be a fraction of the discounted value of his contributions. Mathematically speaking:

$$\sum_{t=RA+1}^{LE_t} \frac{B_t}{(1+r_t)^t} = (1-\eta) \sum_{m=EA}^{RA} \frac{Cr_m \cdot Y_m}{(1+r_m)^m} \tag{4.9}$$

η: represents the fraction to which benefits have to be reduced in a way that represent the participant share of the system's additional costs, definitely, the transition and solidarity costs.

Among the possible ways to automatically reflect the above condition is through computing the ROR only on the pre- retirement accumulated contributions rather than additionally on the decreasing balance during retirement as done by the annuitization process in fully funded schemes. The reasons behind choosing such an approach are twofold. First, it is assumed that the difference between the discounted value of benefits under a fully funded approach and the discounted value of benefits under the proposed one, would cover part, if not all, the transition cost as well as the cost of solidarity. However, the net influence crucially depends on many factors, in which the size of the implicit debt, the number and structure of future contributors, future probabilities of retirement and investment returns on the SSC's reserves are the most important among them. Secondly, if we set the rate of return on a pension contract to reflect only the rate of return on contributions' assets before retirement, this would more likely increase the incentives to retire later. The longer the participant stays in employment, the greater the returns he would get on his own contributions. Thus, benefits at the time of retirement according to this approach can be calculated as follows:

$$B_{monthly} = \frac{\sum_{m=EA}^{RA} (Cr_m \cdot Y_m) \cdot (1 + r_m)^m}{12 \cdot (LE - RA)} \tag{4.10}$$

While benefits in a fully funded scheme can be calculated as follows, (Harvey and Gray, 1997):

$$B_{monthly} = \frac{\left(\sum_{m=EA}^{RA} (Cr_m \cdot Y_m) \cdot (1 + r_m)^m \right) \cdot (1 - Z)}{12 \cdot Z \cdot (1 - Z^{LE-RA})} \tag{4.11}$$

Where $Z = \frac{1}{1+r}$, (r) denotes the annual compound nominal ROR or interest rate. If the ROR or interest rate is monthly compounded, and m stands for month instead of year, for instance, the multiplication by 12 in the dominator of the above equation should not be considered.

The condition necessary for the system's future viability, in which the transition cost is internally financed via scheme participants, is confirmation that the ratio of pension

benefits under the proposed approach to the benefits level under a fully funded one, is equal or greater than the ratio of assets at the time of reform of the system's implicit liabilities. Mathematically,

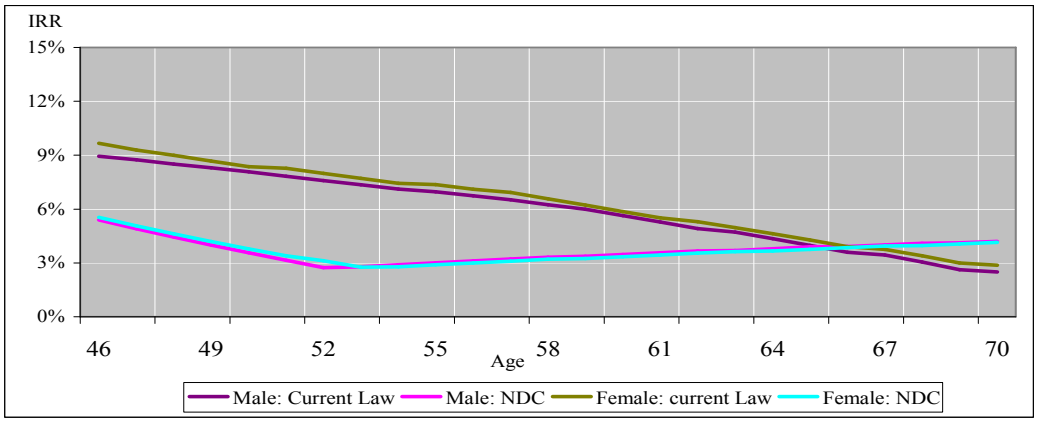
$$\frac{B_{qa}}{B_f} = \frac{\text{Total Discounted Assets}}{\text{Total Discounted Liabilities}} \tag{4.12}$$

Where B_{qa} : is the average benefits level under the Quasi Actuarial reform scenario. B_f : Benefits when they are fully financed through participants own contributions. Such a condition applies only if the reform strategy is fully implemented at one point at time.

Aside from the implications of this condition, this approach seems slightly similar to the Notional Defined Contribution (NDC) system where a participant's benefits are directly linked to his own contributions. The contributions in such a scheme are awarded (indexed) with a notional interest rate, that is in its turn a major part of the benefit formula. However, choosing the appropriate notional interest is not an easy task, since there is no clear methodology on how such a rate is selected. International experience has shown that there is no identical methodology in choosing the notional rate. For instance, within the notional part of the Italian pension scheme, contributions paid by participants are indexed with the growth rate of GDP and annuitizied for the remaining life expectancy at the time of retirement (Disney, 1999). Other countries, Sweden and Latvia, have tied the notional interest to the growth rate of the total wage bill covered by their schemes (Poland preferred the per capita income to other indexes). Nevertheless, those countries clearly have no real accounts or funds on their NDC scheme in which the rate of return can be considered among other options for the notional rate determination. However, the case of Jordan is slightly different, since the SSC scheme as previously mentioned has been launched on partially funded basis in which the system's financial surpluses were continuously accumulating and an unspecified portion of the individual's own contributions still exists in the fund. Therefore, considering the actual rate of return on fund assets would be logical to some extent, in the sense that it connects the system's ongoing liabilities with the actual performance of the fund. Moreover, once the participants' old age benefits have some links with the actual performance of the fund, the participants would most likely supervise and evaluate the investment performance of their own contributions. This of course would positively influence the fund's profitability.

Figure 4.14 shows some of the implications of transferring from the current system to a quasi-funded one. The notional interest considered for benefits calculation is the same as the rate of return on the pension buffer fund which is given only to the pensioner's pre-retirement accumulated contributions. Moreover, a means-tested income that equals the minimum wage in Jordan is also considered in our analyses. As expected, the post-reform outcomes imply a lower IRR on contributions when compared with the base line scenario and with the fully funded approach.

However, this is not all. The implicit IRR accrued after implementing a NDC moves increasingly with the age at which the participant chooses to retire. Although this result is expected, the reflection of the IRR curve for the NDC from a decreasing path with respect to the age of retirement to an increasing one, calls for some optimistic implications. Interestingly, the gap between returns under the baseline scenario and those under the NDC apparently shows how the system would financially benefit after introducing our proposed approach.



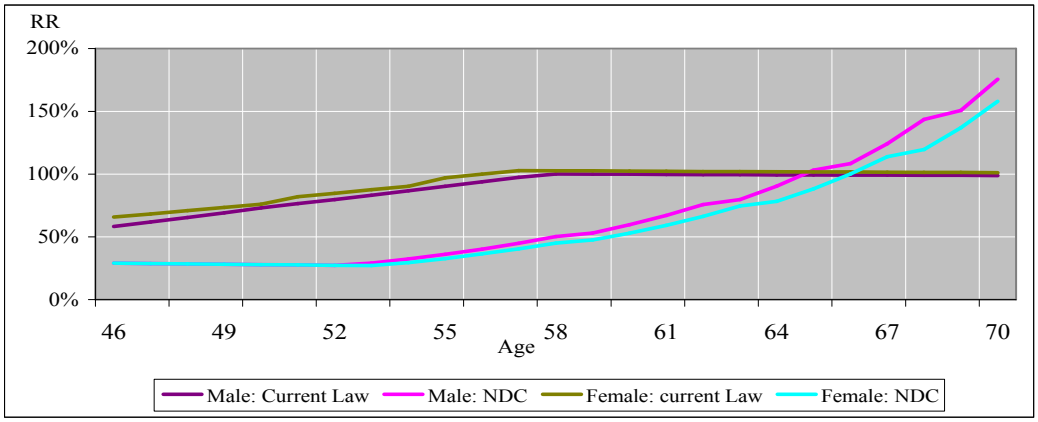
Source: Author's Calculations, Hazmomics Distributional Model.
Note: The notional rate of return considered for the reform scenario is 6%.

Figure 4.14 IRR under the current law and reform scenario

A further comparison between the proposed system and the existing one can take place in the context of replacement rates as well. As stated earlier in this section, this can be regarded as an important measure for policy designers to take into consideration, since it is easier for the majority of the scheme participants to recognize the differences in the level of replaced income rather than calculating or worrying about their implicit IRR. Empirically speaking, the model reports some interesting implications when we compare the RR awarded under the current scheme and those awarded under the proposed approach to reform. The replacement rates in either case are upward moving with the age of

retirement. However, the RR curve under the NDC scheme is convex to the X-axis while the curve that reflects the RR under the current rules is convex to the Y-axis. The mathematical explanation for the former case states that IRR increases in an accelerating margin with respect to the increase in the age of retirement. This, in theory and perhaps in reality, increases the incentive for participants to retire later (Breyer and Kifmann, 2001).

Aside from the characteristics of both curves, the level of replaced income after implementing the proposed approach for those retiring at the normal age of retirement is roughly 40 percentage points less than under the current law. The latter conclusion implies a lower adequacy satisfaction when implementing the reform approach, but the satisfaction would be even lower if current rules kept unchanged.



Source: Author's Calculations, Hazmomics Distributional Model.

Figure 4.15 Replacement rate under the current law and reform scenario

Adapting the proposed strategy might also have another impact in the context of intergenerational fairness. In a base line scenario, if we assume that the contribution rate is kept constant over the next fifty years, the main factor that affects the IRR, neglecting the possible consequences of the expected future financial shortfalls, would be the change in life expectancy. A fall in mortality rates must be carefully considered as one among other challenges in the face of the system. Since an increase in life expectancy involves a longer period of retirement, more benefits will be awarded. Accordingly, the IRR generated by the current law is upward moving with the increase in life expectancy, although there are no hopes, as we will see in the next chapter, that either the rate of contribution or the level of benefits would be preserved at its current level as the need for extra financial inflows to finance future expected imbalances will emerge.

5. The Future Outlook of the SSC: Status Quo and Reform Assessments

5.1 Introduction

In this chapter, the study attempts to answer several policy oriented questions regarding a wide range of issues that would determine the future viability and compatibility of the SSC in Jordan. The most demanding issue in this context is how the scheme financial conditions would look like over the first half of this century if the current law remains unchanged. Without quantitative measures, the judgment on the future viability and appropriateness of the concerned scheme in our study as well as on the implications of any reform options would be unconvincing.

Many pension specialist and academics have used actuarial methodologies to outperform their future forecasts regarding the financial sustainability, stability and distributional dimensions of pension schemes over long time horizons.[61] In our context, the main purposes of using actuarial model are manifolds. First, such a methodological approach is well thought to afford us with a clear image about the periodical movements of the SSC's financial receipts as well as its expenditures. The need for these estimates is to assess the financial viability of the pension system on a year-by-year basis and to appraise their distributive implications on the scheme main members as there are no reform steps taking place. Second, estimating future financial flows can even be better understood when the different stages of pension systems life cycle, particularly partially funded ones, are clearly defined. Third, the projection model is crucially required to testify the theoretical perception concerning the optimal reform strategies in their general context, and to demonstrate how scheme-specific conditions would eventually change the applicability of some reform arguments.

[61] See for instance, Palacios and Rocha (1998) and Oksanen (2002).

5.2 The Population Projection Model

5.2.1 Overview

As it is widely recognized, demographic parameters are among the most important factors that formulate and respond to the economic, environmental and social changes. The future prospects of the population age and sex structure, beside many others, devote considerable attention of many researchers and academics that might benefit to a different extent by putting them in greater use. For instance, commercial institutions benefit largely from the more accurate future population projections classified according to the socioeconomic categories such as the individuals' income distribution and their consumption preferences. These figures as they are actually used are employed by this sort of institutions to shape the future of their production and marketing strategies in such a way to maximize their profits. Governments might also be concerned with the same or different types of demographic data to set up their medium-long term fiscal and development plan (O'Neill et al., 2001).

However, the current status of national population as well as its future prospects play a greater or a lesser role in our context. The age and gender distribution of a population is considered as one of the most significant elements that determine the future of many pension schemes around the globe. The interaction between some of the demographic elements and labour market parameters affect in several dimensions the social security schemes characteristics to which in their term they impress the future financial viability of these schemes.

Theoretically and not so far empirically, population projections can be obtained by various techniques and methodologies. However, most of the long term oriented projections have employed what is called a Cohort Component Method (CCM). This method was formerly developed by the English economist Edwin Cannan (1895) and was first employed by Notestein (1945) to perform a global population projection.[62] After him, the majority of population projection literatures have hinged essentially on this method, the thing which has made it the dominant framework to specifically project the periodical transition of the global population in the 20th century. The projection method according to this approach

[62] The initial work of those authors was not reviewd by the author but cited from the Socioeconomic Data and Applications Center. of Columbia university. For detailed information about their work, see references.

proceeds by updating the population of each sex and age specific brackets according to the periodical assumptions about the components of the population change. The sources of population growth components regardless of their algebraic sign can be listed under two major groups. The first incorporates the natural changes of population size and structure as some people along different time intervals die and some infants are born.(While the second group of transitional components deals with the future possible geographical movement steps between the targeted population and the external ones as some inhabitants might decide to permanently go out to other countries and others might choose to immigrate into the targeted population (Schopflocher and Jin, 1998).[63]

Excluding the impact of new births, the natural periodical transition would always have a negative impact on the size of any population unless the number of net migrants from the outside sources is enough to offset the number of death cases at the same time interval. However, when the number of new births is considered, the net impact of population transitional movement over any period depends mainly on the force effects of all growth components.

Based upon this approach, the components of population periodical movements (Fertility, Mortality, in-out migration) are applied separately on each age- sex brackets. Along the annual time increments of the simulation process, population cohorts are periodically transferred to the next cohort group after the net natural increases is added or subtracted. The number of deaths among all cohorts can be obtained by multiplying the cohort sex groups by their parallel survival rates. Mathematically speaking,

$$\mathrm{Nd}_{i,s}^{t} = \mathrm{Nl}_{i}^{t} \cdot \left(1 - \mathrm{Sr}_{i,s}^{t}\right) \tag{5.1}$$

Where $Nd_{i,s}^{t}$ denotes the number of deaths of age (i) in period t.

Nl_{i}^{t} : Total population of age (i) at time (t).

Sr_{i}^{t} : Age-Time specific survival rate.

s : The gender status- s$\in$ $(male, female)$.

[63] See also Transport and Population Data Centre (2004).

On the other hand, the number of new births is generated by applying the cohort specific fertility rates on the female population at childbearing ages. The representative age rang for childbearing females as often used by corresponding literatures starts at the age of 15 and ends up at the age of 49. The following formula depicts how new births are calculated in our model according to (CCM):

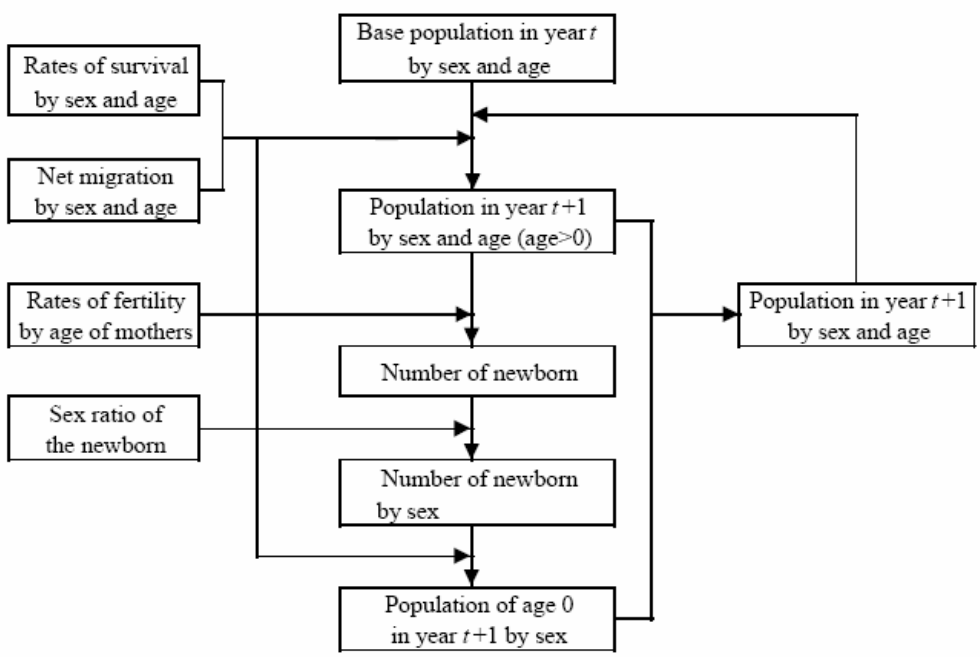
$$B^t = \sum_{i=15}^{49} N_{i,f}^t \cdot Fr_i^t \tag{5.2}$$

Where B^t : New births in year t.

$N_{i,f}^t$: Female population at age (i) at time (t).

Fr_i^t : Age-Time specific fertility rate.

The net count for children aged below one can be obtained via applying extra ordinary steps. First, new births are distributed among both genders by the presumed sex allocation factor of new birth. Secondly, after sexual distribution of new birth being obtained, the resulted figures are adjusted by applying the corresponding survival and net migration rate. (Takahashi et al., 2002). Figure 5.1 shows in a simple manner the general methodological process for estimating the future population according to the (CCM):



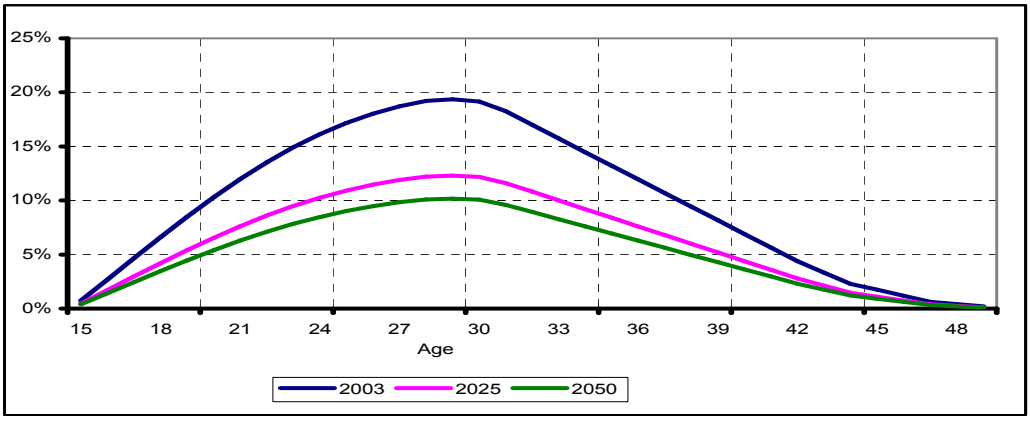
Source: The international Financial and Actuarial Services (2002).

Figure 5.1: The general framework of CCM

5.2.2 Data and Assumptions

As a first attempt to implement this approach to projecting the Jordanian population over the entire simulation period, the required data is being obtained from their different national and international sources. The initial one-year-age and gender increments of the Jordanian population in 2003 were acquired from the Department of Statistics (DOS) of Jordan. The mortality rates used in the model are essentially based on the World Bank prospects about the future age- gender specific survival rates of the Jordanian population. Future assumptions regarding fertility and net migration rates are based to large extent on the United Nation (UN) population division country specific estimations (UN, 2004). The model relies basically on the "main variant" forecasts concerning fertility, mortality and migration rates, since they are based on the most likely evolution of each of them in the light of the trends observed in recent years(Ministry of treasury, Italy).

These sources as Figure 5.2 depicts, estimate that Total Fertility Rate (TFR) will decline from currently 367% to 290% by the end of this decade. Afterward, TFR continues to decline until it reaches the level of 180% by the year 2050. Consequently, the average number of babies born to a Jordanian woman would almost half over the first five decades of this century.[64] The following figure shows the estimated age specific fertility rates over the simulation period.



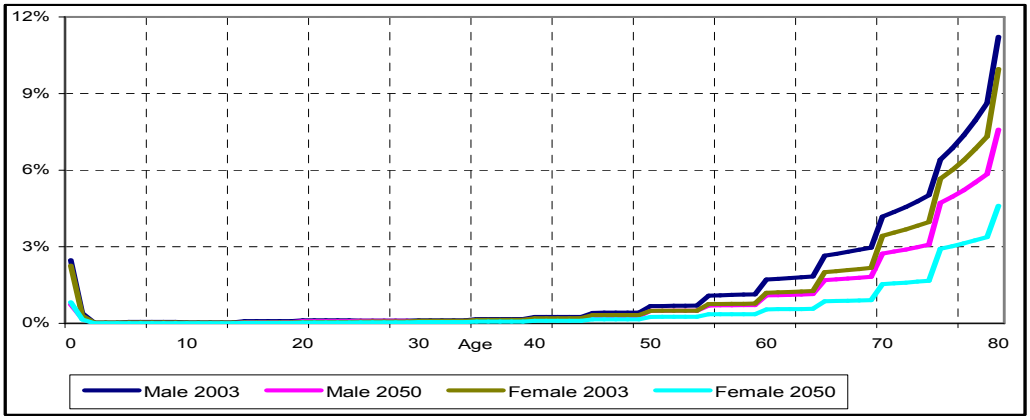
Source: Author's own representation with accordance to United Nations population division, 2003.

Figure 5.2: Age specific fertility rate for 2003- 2050

As one of the consequences of improving life and health standards, the World Bank vision of the future development in mortality rates seems quit optimistic. The average mortality

[64] The average babies born for each woman at the same period has reached 380% in Arab states, developing countries 290% and 180% in OECD countries. For more detailed figures see UN (2004).

rate for females as the bank staffs expect would continue its declination until it reaches half of its current level by 2050. The average mortality rate for males is assumed to decrease as well but in a lower extent when compared with their counterpart females, since that is assumed to place on 5.2% by 2050 which is more than half its level in 2003 (7.8%). Figure 3.3 shows how the proportion of those who deceased at a peculiar age and year would fall over the period of simulation.



Source: Author's own representation in accordance with World Bank, 2003.

Figure 5.3: Age- Sex based mortality rates (2003, 2050)

No less important, life expectancies for both genders at each one-year age increments are crucially needed in our context as one of the inputs the model utilizes to canvass the implications of reform scenarios, since they pertain directly to the estimated life expectancies. Once survival and hence mortality rates being assumed or projected, the corresponding age-sex specific life expectancies can be computed accordingly. Since mortality rates at each age bracket are higher for males when compared with their counterpart females, the age specific remaining life expectancy for women always exceeds that of men. Aside from the sexual divergence of life expectancies, the male life expectancy at birth, as our projection model finds, would increase from 70.5 in 2003 up to 76 years in 2050. The female life expectancy at birth, on the other hand, most likely would jump up to 81.1 by the year 2050, which is roughly 8 years above its level in 2003. By looking at Table 5.1 one can recognize that in both terms the actual and relative ones, the life expectancies over the entire prediction period would improve for both genders but relatively larger for those of women. This can be clearly attributed to the future prospects regarding the probability of dying for both genders, at which it is expected to decrease at each age after birth more proportionally for females than males. Concerning the remaining

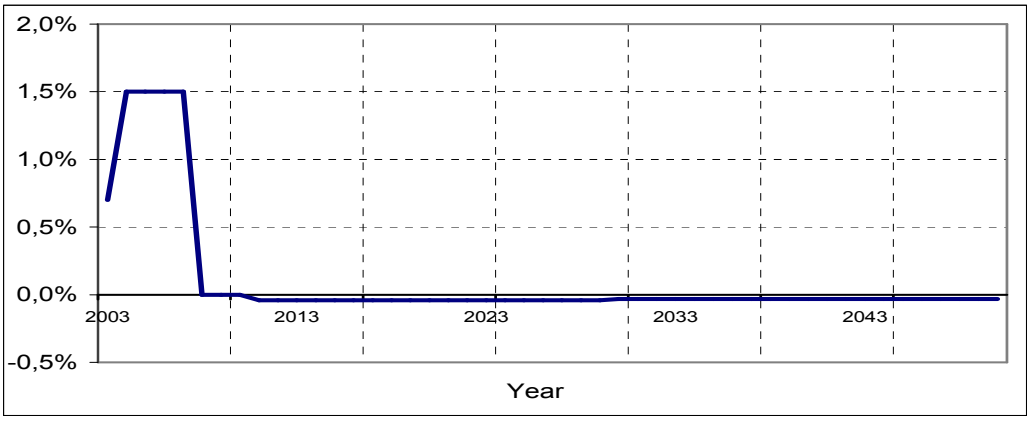
life expectancy at the normal age of retirement, the men who reached the age of 60 at year 2003 are expected to live for another 17.2 years until their death, while at the same year a women who has reached this age may live for another 18.6 years. Along our simulation, at the age of 60, both men and women are most likely to survive longer as time passes up. Again, the increase in the remaining life expectancies for females would surpass their male counterpart in absolute and proportional terms.

Table 5.1: Gender life expectancy at birth and normal retirement age

Year	2003	2010	2020	2030	2040	2050
At Birth						
Male	70,5	72,1	73,6	74,4	75,2	76,0
Female	73,2	74,8	76,8	78,1	79,5	81,1
Gender Average	71,9	73,5	75,2	76,2	77,4	78,5
At Normal Retirement Age, 60 for male and 55 for female.						
Male	17,2	18,0	18,8	19,2	19,7	20,1
Female	18,6	19,6	19,9	21,6	22,6	23,8
Gender Average	17,9	18,8	19,4	20,4	21,1	22,0

Source: Author's Calculations.
Note: For a detailed explanation on the methodology used to calculate the figures of the above table see Anderson (2001).

Concerning the net national migration rates over the simulation period, the population division of the UN expects Jordan to have a slight excess of immigrants over emigrants during the first half of this decade and a negative trend thereafter. However, the author has adjusted these figures to reflect the recent development in the global political situation in general and the growing tensions in the Middle East. Jordan has already started to face an unexpected wave of immigrants from Iraq and western countries following the war on Iraq and of the social and legislative stresses on the eastern immigrants in U.S among other western countries. Thus, the author expects that net migration rate to Jordan will to reach double its level in 2003 over the coming four years. After 2007, the considered migration rates will remain similar to the expectation of the UN.



Source: 2003- 2007 assumed by the author and the rest correspond to the UN prospects.

Figure 5.4: The assumed net migration rate over the simulation period (2003- 2050)

5.2.3 Specific Model Methodology

The general approach of (CCM) as defined in advance, is being superseded by an adjusted technical methodology. This methodology is well thought out to contemplate the characteristic manner of the data that has been obtained from their different sources.

The model uses a one- year cohort based matrices or both genders, in an attempt to have the needed sort of future population outcomes. The population for each gender during the simulation time interval is modelled according to a one- year step by step transition mechanism. The model transmits the cohorts that have already been born in year (t) to the following estimated year by applying the corresponding survival and migration rates.

$$N_{i+1,s}^{t+1} = \underbrace{N_{i,s}^{t} \cdot S_{i,s}^{t}}_{\text{Natural Decline}} + \underbrace{IM_{i+1}^{t+1} - EM_{i+1}^{t+1}}_{\text{Out-Sourced growth factors}} \tag{5.3}$$

Where (t) ranges from 2003 to 2049.

The survival probabilities S are recomputed by incorporating mortality rates in year t in such a manner that it reflects the transition of half- year intervals by one-year increments. This can be done according to equation (4-4) by considering the mortality rate of the observed gender and age bracket:

$$S_{i,s}^{t} = (1 - m_{i,s}^{t}) \div (1 - \tfrac{1}{2} m_{i,s}^{t}) \cdot (1 - \tfrac{1}{2} m_{i+1,s}^{t}) \tag{5.4}$$

Regarding the flow of new births, the model estimates them by incorporating the age specific fertility rates to the appropriate female population that is observed at the middle of year t and t+1.[65]

$$B_{t} = \sum_{i=15}^{49} f_{i}^{t} \cdot \tfrac{1}{2} \left\{ N_{i,f}^{t} + N_{i,f}^{t+1} \right\} \tag{5.5}$$

Thereafter, the outcome of equation (4.5) is conveyed forth into equation (4.6) to forecast the population aged below one at the middle of year t +1:

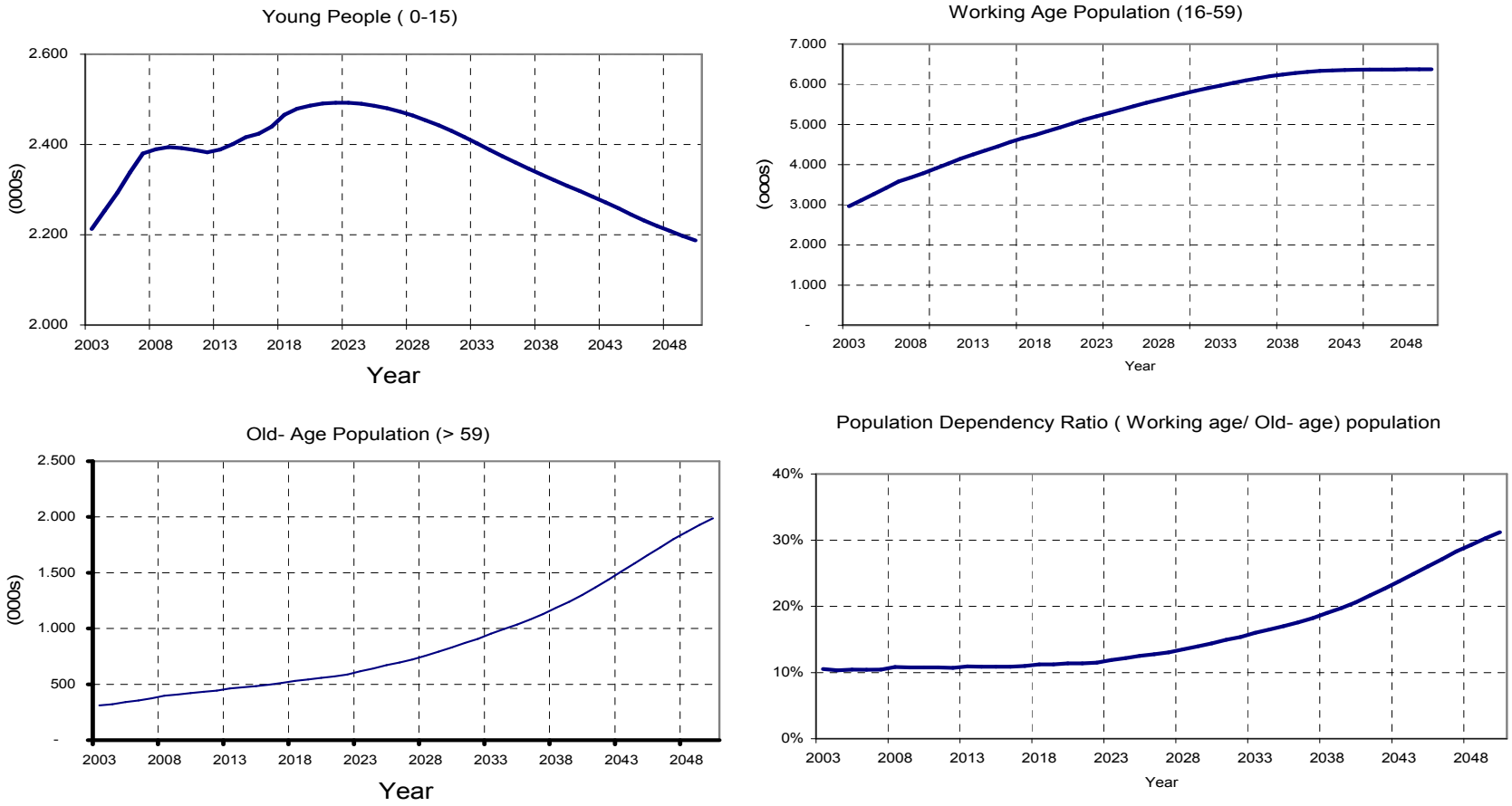
$$N_{0,s}^{t+1} = Gf_{s}^{t} \cdot B^{t} \cdot (1 - \tfrac{1}{2} m_{0}^{t}) + IM_{0,s}^{t+1} - EM_{0,s}^{t+1} \tag{5.6}$$

Gf_{s}^{t} : refers to the distribution factor of new births among genders at time t, this is assumed to remain as its level in 2003. To the best of our knowledge, no external factors could have an influence on this factor; it's no more than Gods' will.

After simulating the above corresponding equations with the data defined in section 5.2.2, the projection of the Jordanian population has shown some interesting outcomes that might afford us with some preliminary implications for the SSC. However, discussing such implications should not be considered unless the overall model sections are entirely outperformed. Figure5.5 displays a general overview of the foreseeable development of the Jordanian population structure all along the simulation period. The population of young people continues to increase rapidly during the coming next four years and afterward starts to grow steadily with a few fold of decline during the early years of the first half of the second decade. After 2023, the aggregate population for those who are aged 15 years and below commences to decline over the rest of the simulation period. However, the working age population as estimated by this model gives us some primarily optimistic hints requested for our context as it grows over the entire period of simulation. Such an optimistic view should not continue as it is initially seen as the simulations also depict an

[65] Applying age specific fertility rate is a common request of actuarial methodologies, see for instance Office of Chief Actuary (2000).

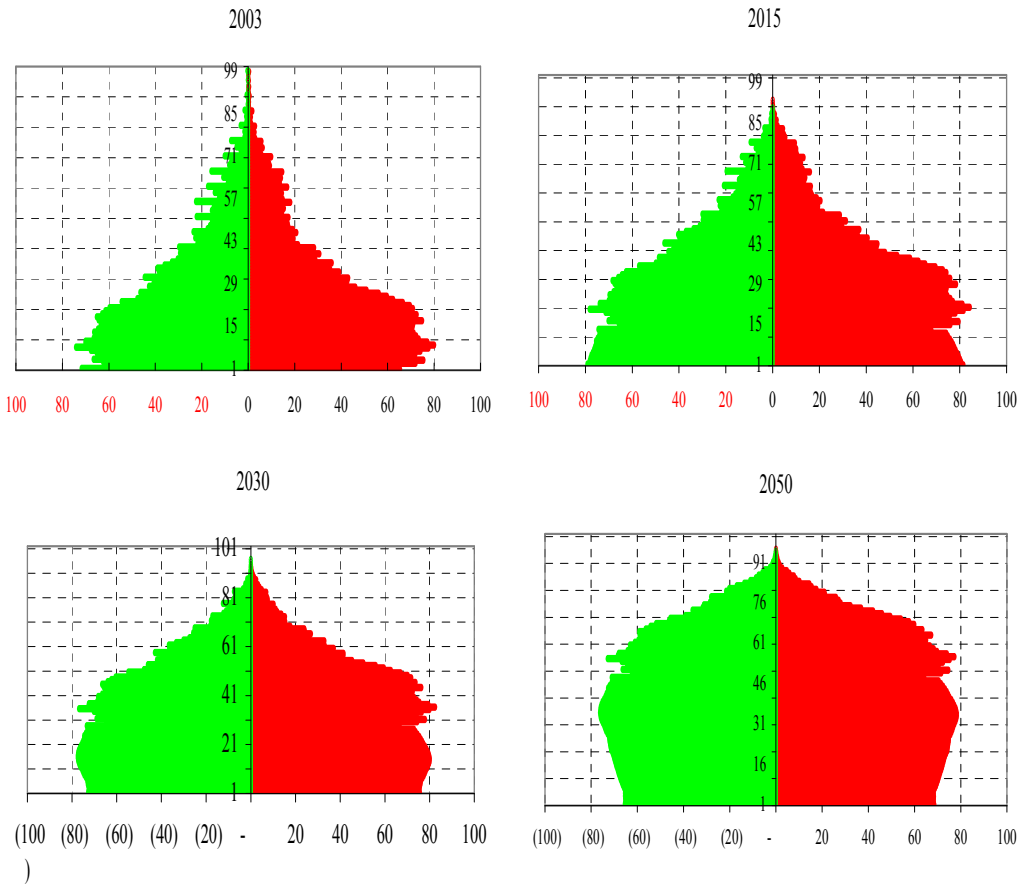
increasing trend of the old age population along the same interval of the increase in working age population. The net offset of both trends on the population dependency ratio is shown clearly in Figure5.5. The total impact of the transition process of the Jordanian population has resulted in the tripling of the ratio of old age people to the working one by the end of the simulation period. This rationalized apparently in the same figure, the concavity and convexity of the working age population and old aged population time trends, respectively, indicates that the former is most likely to grow in decreasing rates while the growth of the latter would be in increasing rates.



Source: Author's Estimation.

Figure5.5: The estimated development in population size and parameters

The development of age and sex distribution of the whole Jordanian population as shown by the population pyramids in Figure 5.6 indicates a gentle transition from a classical pyramid shape that reflects a young population to wide-top pyramid which indicates a relatively older one. This of course comes to the space as the consequences of the anticipated mix of low births coinciding with continued improvements in life expectancies start to appear on the population structure.



Source: Author's Estimation, Hazmomics Actuarial Model, Demographic Section.

Figure 5.6: The development of the Jordanian population pyramids

5.3 Employment Data, Assumptions and Projections

Data and assumptions regarding the labour market parameters and conditions are considered by many actuaries and financial experts as among the most important inputs requested for evaluating and modelling the long term financial characteristics of pension schemes. The structure and count of pension schemes members (Participants, employers, and pensioner) depends basically on the employment market parameters. Without clear

figures and prospects concerning these parameters, no one can guess how the future of pension schemes would look.

Quantitative measures of employment markets link to a great extent to the demographic parameters, particularly, the population structure. For instance, the interaction between that structure and the labour participation rate would result in appropriate figures regarding the size of an active labour force.

The initial data about the Jordan Labour Force Participation Rate (LFPR) distributed according to the age and sex increments is obtained from the DOS most recent labour market survey (2003). The data shows as commonly observed in many countries, especially in developing ones, that the average labour force participation rate for Jordanian females among all age increments is lower than of their counterpart males. In 2003, roughly 67% of males whose age is considered for regular employment were active, while only 11.2% of the female population at these ages were available for work. This can be vindicated by the cultural and traditional responsibilities of women in which they have to look after their homes, children and dependent elderly. However, this realism as the historical trend says will not continue, the relative stability of males LFPR and the continuing growth of female LFPR would most likely remove the gender disparity of the participation in economic activities. Saying that in figures, if LFPR continues to grow at the same drift of the last ten years (3.5% annually), 61% of the female working age population are inferred to share the active labour force by the end of the simulation period. The latter estimated level of participation appears similar to the average level observed currently in the OECD countries (OECD, 2004). Among the interpretations of such a development of female participation in market based producing activities that the assumed decline in fertility rates causes the child caring responsibilities to diminish accordingly. Several literatures have confirmed that the number of children affects the ability of women to participate in the labour market (Heckman and Willis, 1977). However, some economists argue that the increase in female participation in the labour market reduces their ability to get pregnant and also their capability to follow-up motherhood responsibilities (Harvey, 1996).

The second step of our estimation proceeds by interacting the age specific LFPR for both genders with their analogous projected population to which the size and structure of active workers is then derived for the entire simulation period. The overwhelming increase in the

number of females available for work as Figure5.7 shows is attributed to the gradual and lasting augmentation in their participation rates and to the continuously growing population. The size of active males available for jobs is also projected to increase but to a lesser extent than females. In mathematical terms, the size of the female active labour force is estimated to grow by more than four percentage points annually, while the growth rate of the corresponding male population is not expected to outmatch one percentage point. The following formula shows illustratively how the size and structure of actively available persons from both genders is being estimated along the simulation period.

$$ALF_s^t = \sum_{i=16}^{70} ALF_{i,s}^t = \sum_{i=16}^{70} N_{i,s}^t \cdot LFPR_{i,s}^t \tag{5.7}$$

ALF_t : Active labour force at year t. $N_{i,s}^t$: Population of gender s, age i and year t.

$LFPR_{i,s}^t$: Labour force participation rate of gender s at age i and year t.

Regarding employment, the model relies essentially on the official data published by the DOS, since they are the most convincing data for employment market in Jordan and the only data which performs the rates of employment on Gender- Age basis. The last employment survey has shown hat level of unemployment stands at approximately 14% among the Jordanians who are actively looking for work which is quit higher than the average observed rate of 12.2% in North Africa and Middle East region. More than one fifth of Jordanian women who were seeking jobs were not employed at the time of survey, compared with only 13% for men. Concerning future forecasts of employment according to their age and sex distribution the model employs several procedures in order to make them more certain. Some economists utilize the assumed ongoing differences between real economic and productivity growth rates as an approximate measure for estimating the future proportional increase in employment. Such a methodological approach assumes implicitly that the (capital/ labour) ratio remains constant along the course of simulation, but this as we think is a logical assumption that one can use to analyze the development in labour market conditions over a relatively shorter time interval. However, there are many reasons in which such a premise is not recommended for half century projections. For instance, the technological innovations and changes play an indispensable role in determining the intensity level of labour and capital in any economic activity. Also

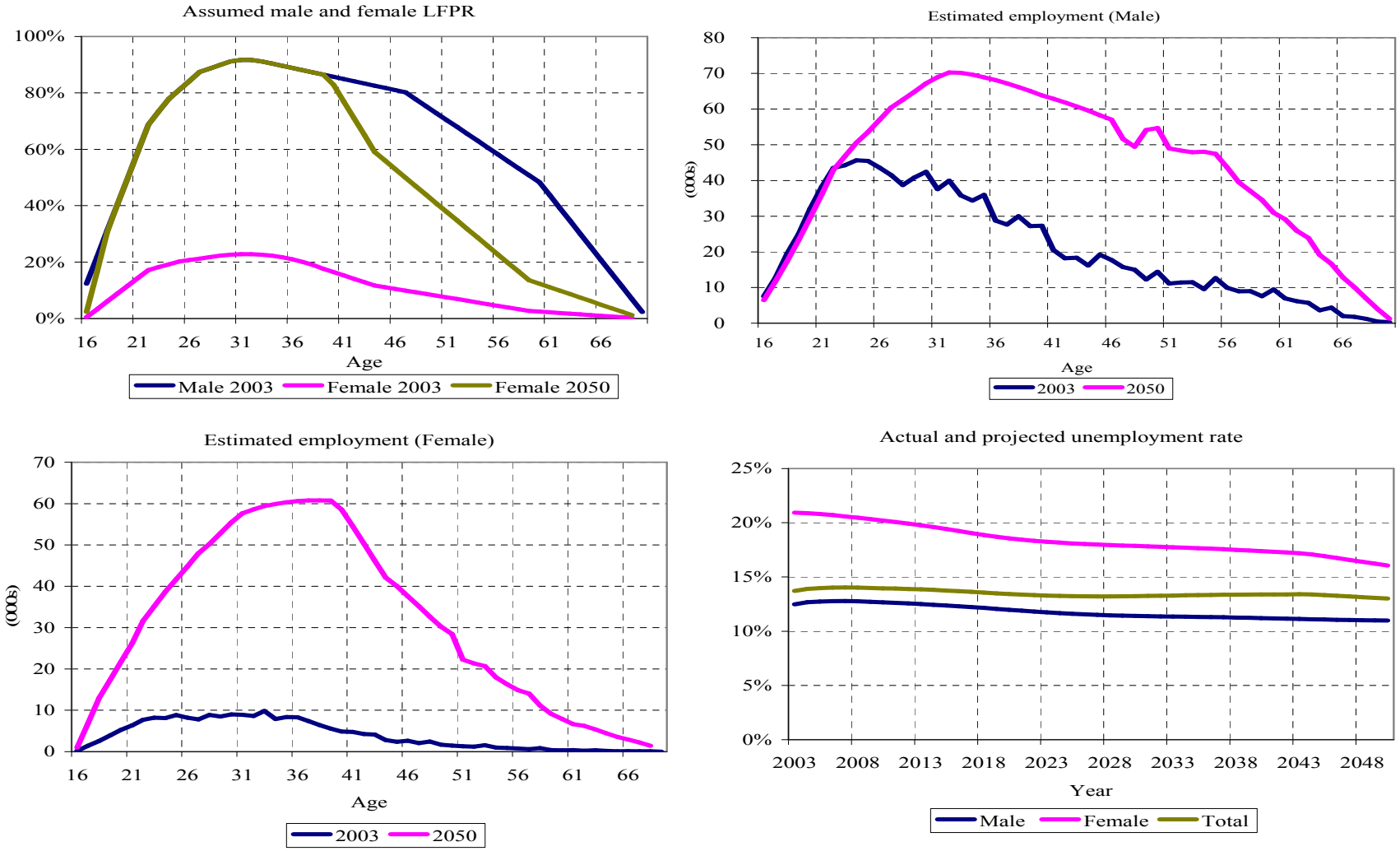
administrative procedures especially efficiency based reform could have a significant influence on the combination between human capital and other types of capital, e.g. technology. Therefore, due to the high degree of uncertainty in which unemployment rates can move either way, the hypothesis of no change regarding the age-sex specific employment rate compared to their initial level seemed to be the most unbiased choice. (Ministry of Treasury, 1998). From that on, the size and the structure of employed persons can be obtained by applying the assumed age and gender specific employment rates on the corresponding estimated figures of the age and gender specific aggregate job-seeking population (Active labour force).

$$EN_s^t = \sum_{i=16}^{70} \left(Er_{i,s}^t . ALF_{i,s}^t \right) \tag{5.8}$$

EN_t : Employed population at year t. $Er_{i,s_{f,m}}^t$: Employment rate of genders at age i and year t.

Applying the above equation on the assumed labour market future conditions has lead to an moderately decreasing unemployment rate from currently 13.3 % to 13% by the end of the simulation period.

Figure5.7 graphically displays the projected outcomes of the age and gender based size of employment and the corresponding unemployment rates assorted by their procedural steps. It is worthy mentioning here that these figures were adjusted to preclude none Jordanian citizenships which have been excluded from the early mentioned labour force measures. The size of imported labour force has stabilized on an absolute level of 25 thousands over the last four years. This might be one of the recent and future expected developments in the Jordanian employment market characteristics in which some of work opportunities that have been historically occupied by foreign employees are being and will be substituted by Jordanian citizenships. Such a fact may be among the sequences of dropping down a wide range of cultural and social barriers as well as the government policy toward restricting the imports of foreign workers to allow for more chances for Jordanian job seekers.



Source: Author's own calculations.

Figure5.7: The future predicted in the labor force figures and parameters

5.4 Economic and Financial Assumptions

Assumptions as to future economic and financial conditions are considered among the most important inputs required for the actuarial and financial projections. These types of data are substantial to estimate the growth rates in insured wages of covered participants, pension indexation and returns on fund assets, in addition to several others. The key economic and financial assumptions considered in our future simulations are:

1. Inflation Rates.
2. GDP growth rates.
3. Real return on funds assets.
4. Other financial and economic assumptions that are endogenously derived by the usage of above base assumptions.

5.4.1 Inflation Rate

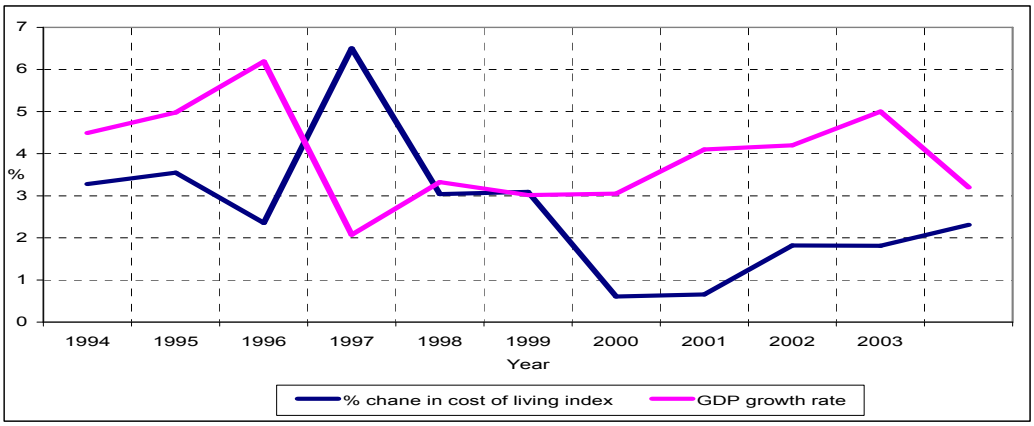
In formatting any financial and economic projections regardless their form and aim, the future image of the proportional variations in the price levels are always needed for adding nominal premiums over real terms. However, in our model inflation rate is used for various purposes. It incorporates future estimates of real return on funds assets to finally compute the nominal changes in the scheme reserves that are induced by investment. They are also being utilized for predicting the annual growth rates of contributors corresponding wages and salaries as well as for indexing future pensions once they are presumed.

By looking at the historical trend of inflation rates over the last ten years measured by the proportional changes in the cost of living index (Figure 5.8), one can indicate that the rate has fluctuated moderately between an upper range of 6.5% to a lower base of 0.6 % with a periodical average of 2.5%. However, the world economic outlook which presents economic forecasts for two years visualizes that inflation rate in Jordan will jump to 3% and fall back to 1.8% in 2004 and 2005, respectively (IMF, 2004). But since these forecasts comprise only short term perspectives, the reliance on those seems not comfortably consistent with the rational long-term modelling methodologies. From there on and as sort of simplification we assume that inflation remains on its average level over the simulation period. The dynamic expected fluctuations below and above this average

seem likely to split each other, especially if their direction continues to have the same observed historical trend.

5.4.2 Economic Growth Rate

Figure 5.8 displays the extent in which the Jordanian economy has experienced capricious output growth rates. The maximum registered growth rate over the last ten years was almost as far as the minimum registered rate from the whole period average. Among the logical explications for this sort of trend is the capacity of the economy to over-average the historical growth rates and also its capability to absorb the expected and unexpected negative shocks. This of course discerns some implicit limits on formulating the future forecasts regarding this factor. The IMF (2004) predicts Jordan economy to recover in 2004 and 2005 by real income growth of 5% and 5.5%, respectively. After considering these facts, the model employs ultimate changeable margins above and below the historical average starting up by the recovery level and ending down with the minimum registered growth level. Saying that in numbers, the assumed GDP growth is set to start by 5.5 % in 2005 and gradually fall down to 2% by the end of the simulation period.



Source: Author's own representation based on Central Bank of Jordan, published statistics and IMF world economic outlook, April 2004.

Figure 5.8: Real GDP growth rate and inflation rate during (1993- 2003)

5.4.3 Real Return on Investment

As we have shown early in this thesis, the SSC fund had performed badly during the first fifteen years after it was established. The performance over the second half of last decade and the beginning of this century, however, has substantially improved. The

average real ROR during the former period was almost below zero while in the remaining years has reached roughly five percentage points above zero. By considering the historical performance figures and the most recently observed ones, it would be logic to assume that the real average profitability on the scheme accumulated reserves would average on 3.5 percentage points over the entire prediction period. In the sensitivity analyses part of this chapter, below and above that rate scenarios are also being simulated.

5.5 Scheme- Specific Inputs and Assumptions

Since the main fold of our model is to evaluate the sustainability conditions of SSC financial characteristics and to assess the proposed reform strategies on behalf of other theoretical approaches, a wide range of the scheme specific data is needed in order to do so. Required data is aligned according to the scheme member groups; contributors, beneficiaries and SSC administrators. Financial rights and obligations accrued to these groups are also crucially required for our projection procedures.

At first glance, it is desirable to indicate some of the general assumptions that are considered in our simulations. Before presenting our model inputs, it's worthy mentioning here that detailed and disaggregated data concerning scheme agents are a common request for most of the actuarial model performed by worldwide literatures. These inputs as will be presented in the coming sections collaborates other variables to perform the future forecasts regarding some of the scheme indicators that are not exogenously expressed by the author.

In regards to the first sort inputs, initial data on the scheme main members were obtained directly from the SSC internal database. The actual distribution of beneficiaries and contributors among one-year age and gender specific increments are presented in Figure 5.9. Beneficiaries in their term are split up to into three major groups: i) old age beneficiaries ii) disability due to natural causes iii) other forms of beneficiaries which comprise the aggregate survivors of either naturally died beneficiaries or competent contributors. It also implicates the total number of disabled beneficiaries and their survivors whom disability was initially caused by work injuries or occupational disease. The branches of the latter groups are rationally linked to the number of OA beneficiaries on an annual basis considering the relation which had been observed over the last three years prior to start year of estimation. The number of OA beneficiaries as Figure 5.9

apparently shows is more of males than those of females among all age increments. Such a fact can be logically imagined by the same figure as the sexual status gap applies also for the stock of contributors. The interaction between both sorts of members is generally explained in the following paragraph. Nevertheless, the only leftover group of agents which is defined as the number of personnel who are responsible to run out the corporation is proportionally fixed to the number of contributors as initially observed in 2003.

The future prospects vis-à-vis the first type of members is expressed by utilizing transition probability factors for each state of beneficiaries. These probabilities are set according to the scheme past experiences as well as their future outlook. The fractional values of these probabilities are always below or equal to one since they interpret the probability of getting retired in the current period for a stochastic contributor who was alive until the end of the previous period. These probabilities are expressed with respect to a one year age lagged contributors. Putting that in front, the estimated number of new retirees in each year is modelled by fractionizing the scale of contributors who were aged one year less a year before the current simulated year. For instance, the number of pensioners whose age is currently 45 years is among the contributors who have finished their forty-four years of age at year t-1. Consequently, the gender and age probability of retirement typifies random walk behavioural factors of contributors on behalf of the scheme eligibility conditions and constraints. Figure 5.9 depicts the initial probabilities for each gender classified by their ages as being employed by the model for both groups of beneficiaries, old age and disability.

The initial gender-age based coverage ratios are also required for estimating the size and structure of contributors. The coverage ratios are defined by the proportion of the employed population that contributes to the SSC scheme and pays contributions from their career based compensations. These ratios are at first computed through interacting the age-gender specific distribution of the stock of contributors as exactly obtained from the SSC database with the counterpart employed population at the same year. The outcomes of implementing this methodology on Jordan seem a bit different than how they look in other countries. Such dissimilarity between Jordan and other countries appears as the coverage ratios for women in Jordan among all age increments were higher than those observed of men. However, this can be logically attributed to the traditional and cultural fingerprints on labour market characteristics and also due to some of the SSC law articles. Making this

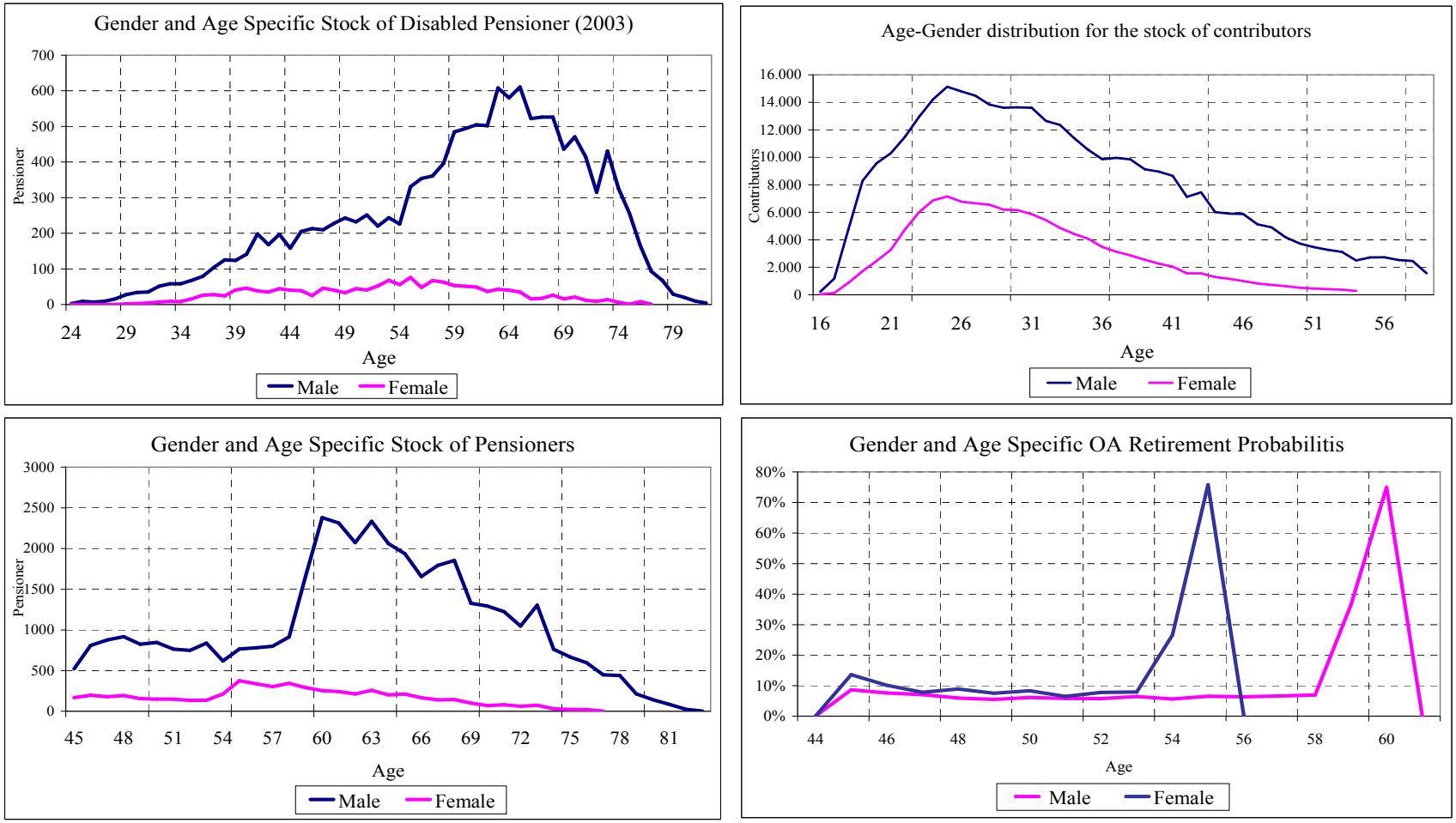


Figure 5.9: Gender and age specific agents stock and transition probabilities

simpler, the SSC law states that the participation of paid employment is mandatory for firms hiring more than five employees. Coinciding with this fact, women prefer working with more labour intensive private firms over other activities that employ less than the SSC minimum mandatory floor. This happens due to the fact that employment opportunities in firms that are hiring more workers at the same job site are socially more competent for women. Therefore, the ratio of men who are working in voluntary participating firms (hires less than five employees) is much higher when compared with the corresponding ratio for women (DOS, 2003). Furthermore in this context, while the age distribution remains constant throughout the simulation period, the coverage ratio for males is expected to increase from the current level of 30% in the year 2003 male employed persons up to 61% by 2050. This prospect follows principally two main logical senses. First, the historical trend has shown that coverage ratio for males has grown periodically. Second, the proportion of employees who belong to the old- public pension system will diminish over time as one of the major consequences of suspending new civil servants and the new military personnel who hired after 1995 and 2003, respectively into the public pension system. However, the development in coverage ratios for each one year age brackets are being restricted in our model to the maximum level observed today in some OECD countries. Simulating the number of contributors in brief can be viewed in the following formula:

$$NC^{t}_{i,s} = Cr^{t}_{i,s} \cdot EN^{t}_{i,s} \tag{5.9}$$

Where $NC^{t}_{i,s}$ stands for the number of contributors. $NC^{t}_{i,s}$: The age-gender specific coverage ratio. $EN^{t}_{i,s}$: The age-gender specific employed population.

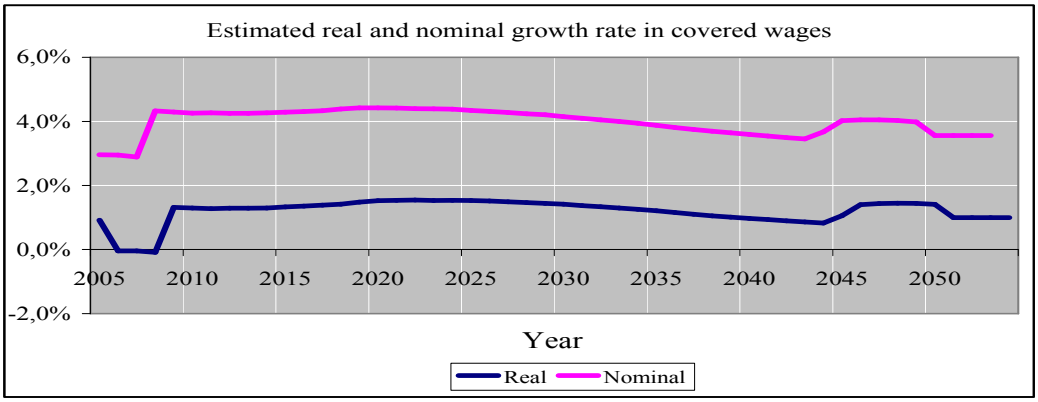
Applying that on Jordan as Figure 5.9 illustratively shows, has resulted in an increasing number of contributors of both genders among all ages. This, as shall be shown latter in this chapter induces the capability of the scheme to raise operational funds and hence stimulates the accumulation of pension fund reserves. Staying align with our context, the aggregate number of contributors as the model estimates, would increase from a bit less than half a million participants in 2003 to almost 5 times that number by 2050. Considering genders separately, the number of males who have contributed to SSC during 2003 matches only one-fifth their estimated number by the end of the first half of this century. The sight looks more impressive for females, since both the increase in their

labour force participation rate and the increase in their population size leads mainly to the massive increase in their SSC participation estimates. In 2050, the projected number of women who are covered by the SSC law comprised almost six multiples of their number at the start year of estimation. Consequently, the females' proportion out of total SSC contributors is likely to increase at the expense of their counterpart male.

In order to stylize the inputs and assumptions required for estimating the claims on the scheme and the financial rights owed for him through out the simulation period, set of procedures are considered step by step. Foremost, the initial distribution of the insured wages is obtained from the SSC's internal database according to the age and gender of their earners. Such a distribution is crucially employed to outperform the financial projections of our model by incorporating them with the periodically adjusted structure of contributors and hence count-down the contributions collected from each cohort. In addition to that, the age specific wage distribution is among the most important inputs used to project the pension benefits accrued under the outperformed scenarios. The estimates of their future growth rates, however, derived endogenously by the model through combining the assumed GDP growth rates, deflator index and the projected employment growth rates in such a way that restores the wage bill share of GDP throughout the simulation to its initial level in 2003. The assumption of a constant share of aggregate wages to the level of national output has been widely considered by many literatures. The outcomes of this mythological approach for the baseline scenario as Figure 5.10 presents, indicate how labour productivity and nominal wages growth rates would fluctuate over the coming four and half decades. The following equation displays how annual wage growth rates are calculated throughout the actuarial model:

$$Wg_{i,s}^{t} = Rgdp_{t} + \pi d_{t} - ENg_{t} \tag{5.10}$$

$Wg_{i,s}^{t}$: Annual wage growth rate. $Rgdp_t$: Real GDP growth rate at time t. πd_t : Inflation rate measured by the national product deflator. ENg_t : The proportional change in the number of total employment.



Source: Author's own estimation. Hazmomics Actuarial Model.

Figure 5.10 The estimated trend in nominal and real growth rates of covered wages

Another sort of inputs that are fundamentally required comprises the service credits considered for the calculations of participant pensions upon retirement. The approach which has been considered for this task weighs the age of the contributor at the time of retirement and also conceives the presumed average age at which the participant initially joins the scheme. The latter is being approximated by the weighted average age of new enrolled SSC participants in 2003. These credits, however, are constrained by the maximum possible difference between the years of estimation, the year in which the system has been established and the age upon pension is computed. For instance, if we want to explore the service credit for a pensioner whose age is 60 at retirement according to this methodology with an assumed age of participation of 25, the total difference of 35 years of service credits, logically interpreting, such a length of service credit cannot be considered for that pensioner, given the fact that system age is only 23 years. To rationalize such a case, the assumed length of service credit is returned back to no more than the minimum of both measures which is 23 years. Nevertheless, as the simulation moves up simultaneously, the service credits adjust periodically to reflect scheme age, participant's age at retirement as well as the assumed age at which the participant joins the scheme.[66]

Lastly, as regards the financing system of the SSC scheme, particularly in the absence of external funds, it is desirable to make the proportional levels of paid contribution, despite their orientations, unchanged during the simulation period unless either the aggregate revenues of the scheme or its reserves are not enough to cover all the financial

[66] See appendix to figure out how the assumed years of contribution for participants of both genders would develop across the simulation period.

obligations. If an overall deficit takes place in any of the simulated years, in the presence of inadequate reserves, the ongoing unfunded liabilities is set to be financed endogenously through proportionally raising the level of contributions on all insured participants.

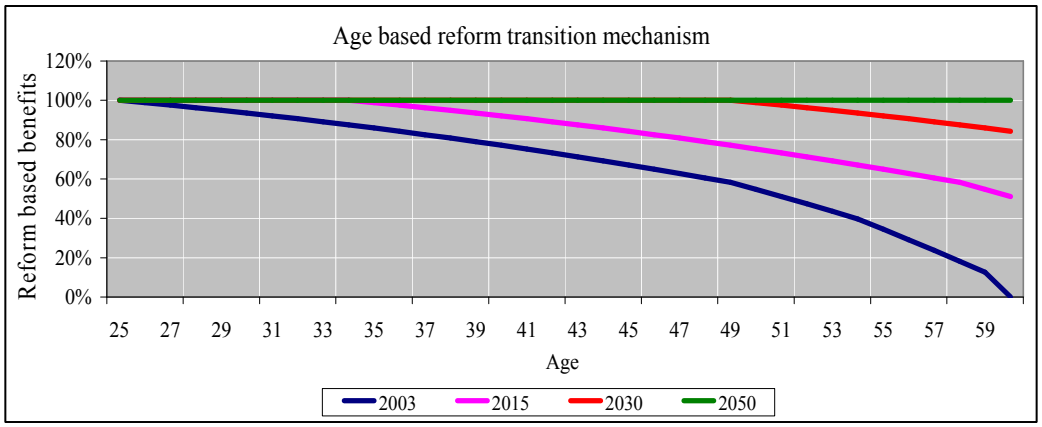
5.6 Reform Specific Assumptions

Before turning to the adjustment in some of the assumed parameters as a request of assessing reform strategies, an overall outlook to the unchanged assumptions is superior. To restore the social objectives of the SSC scheme in providing disability pension and survivors income guaranties, the way in which these benefits are calculated remains abiding under both reform scenarios. The contribution fees paid by the employers on behalf of their employees are also set constant across the simulation period. The additional contribution rate collected for health insurance intentions continues to be charged and listed under other income category. As in the base line scenario, if an overall deficit accrues in any year without any sufficient reserves to cover it, the unfunded deficit is modelled as to be endogenously and entirely financed through a reduction in OA benefits.

Both reform scenarios have to be treated by their own specialty in order to accurately perform their assessments on the main aspects considered in our analyses. Concerning the financial and economic assumptions, the model treats them exactly as being assumed in the base line scenario since the changes in the scheme financing strategy would mainly affect the scheme itself rather than the whole economy. However, enforcing either reform strategies may have a great influence on some of the scheme assumptions.

Both reform strategies are performed on the basis of gradual age-based transition mechanism. Retirement benefits as the model simulates, have relatively more elements of the reformed scheme for younger participants than for older ones. Such an approach is well thought out to adhere to the time left for participants to adjust their retirement behaviour which fundamentally follows the level of pensions and it also might be politically more acceptable. Putting the former argument in clear view, if either reform strategies intends to lower the pension level, and they actually will, then a participant whose age reaches the normal retirement age would be less able to postpone his retirement, increase his contribution credits or raise his personal savings to stabilize the

promised level of benefits, and vice versa. Therefore, age specific allocation factors are carefully considered for benefit calculation once retirement is due. Moreover, as the reform age proceeds with time, the age specific allocation factors adjust annually by a one- year less age increments. These factors are clearly displayed in the following figure.



Source: Author's estimation, Hazmomics actuarial model.

Figure 5.11 The simulated age-based transition mechanism to implement reform scenarios (Allocation Factor)

As regards the Quasi- Actuarial approach, benefits are calculated by distributing out the nationalized contribution accounts over the remaining life expectancy estimated for each beneficiary at the time retirement. At the first year of effectuation, the actual contributions of each retiree are inflated by the average nominal rate of return raised by the pension fund during the whole period prior to reform. Beside these settings, the model considers the deviation of individual longevity that brings the actual length of life below the estimated one at retirement at the expense of pensioner, while extra lengths over the estimated are the responsibility of the scheme itself. In a general mathematical view, pure Quasi- Benefits are calculated according to the following equation:

$$Bp_{i,s}^{t} = \left\{ \begin{array}{l} \sum_{t=by-sc}^{by} Cr_t \cdot Y_t \cdot (1+r_n)^{by-t} + \\ \sum_{t=by}^{ry} Cr_t \cdot Y_t \cdot \left[(1+r_t)\cdot(1+\pi_t)\right]^{ry-by} \end{array} \right\} / 12 \cdot (L_{e,by} - bY) \qquad (5.11)$$

Where Bt: is the monthly pension benefit computed purely according to the Quasi-Actuarial formula. by: The starting year of reform. sc: Number of contributory years.

Cr_t : Contribution rate at year t. Y_t : Annual contributory income. r_n : Notional rate of return. r_t : Actual rate of return on buffer fund reserves. π_t : Inflation rate measured by the cost of living index. $L_{e,by}$: Life expectancy at retirement.

To make the approach more reasonable with respect to proportional changes in the general price level, the model indexes the accumulated contributions at the time of retirement with the future expected rates of inflation. Without doing such an adjustment, the real value of assets could dramatically fall against the higher levels of inflation.

However, the above equation shows only how benefits are calculated when the reform strategy is fully implemented at the time of transition. To make benefit determination consistent with our gradual transition mechanism, the allocation factor which has been defined in advance should be considered in this equation to attain the final level of age based benefits exactly as the model figures:

$$Bg_{i,s}^{t} = AF_i^t \cdot Bp_{i,s}^{t} + (1 - AF_i^t) \cdot Bof_{i,s}^{t} \qquad (5.12)$$

According to this generalized formula, the final pension $Bg_{i,s}^{t}$ due at participant retirement constitutes basically of the pros-reform benefit $Bp_{i,s}^{t}$ assigned be the allocation factor AF_i^t and the remaining residual from the old benefit formula $Bof_{i,s}^{t}$. For example, if the allocation factor equals zero at a given retirement age and projection year, benefits in such a case are fully determined by the old pension formula. The higher the allocation factor is, the more link between pensioners own contributions and benefits would exist.

Regarding the fully funded scenario, the present value of benefits payable throughout the participant retirement life are thought to match exactly the discounted value of his accumulated contributions along his working life. The main difference between this approach and the latter on is that the investment returns on the accumulated contributions stop accruing at the time of retirement, while in the latter one it continues accruing on the rest of the accumulated contributions after retirement. Illustrating this mathematically, benefits according to the fully funded scenario are calculated by the following formula:

$$B^{r}_{i,s} = \frac{(1-z)\cdot\left(\sum_{t=by-sc}^{by} Cr_t \cdot Y_t \cdot (1+r_n)^{by-t} + \sum_{t=by}^{ry} Cr_t \cdot Y_t \cdot \left[(1+r_t)\cdot(1+\pi_t)\right]^{ry-by}\right)}{12\cdot z\cdot\left(1-z^{n}\right)} \tag{5.13}$$

Where $z = 1/(1+r_{r\to e})$, $r_{r\to e}$: denotes the average expected rate of return on the pension buffer fund from the time of retirement until the year at which the pensioner is expected to die. The model performs such a rate as the historical average of the rate of return on pension reserve along the simulation period.[67]

As among the expected outcomes of implementing either reform strategies is a reduction in the age specific replacement rates and strengthening the relation between pension benefits and contributions, the orientation toward retirement at early age is well thought to fall gradually throughout the implementation period. By reaching forward the end of estimation period, the retirement rate for the minimum eligible age of retirement is estimated to fall by 50% from its initial level at the start of the simulation. The presumed level of reduction in the probability of retirement for a participant whose age is 46, for example, would be 50% lower than its level in the base line scenario. For reasons of comparability, although the incentives might differ between both assessed scenarios, the probabilities of retirement among all age increments are set indistinguishable.

5.7 The Financial Model Methodology

The main purpose of the Financial Model (FM) is to assess the financial viability of the Jordanian pension scheme under a status quo conditions and the proposed reform approaches. The description of this model proceeds by tracking-in the development of the balance sheet components in which the net flows and stock balances are clearly defined. Therefore, the definitional process of our model constitutes three dependently structured sections:

– Scheme Expenditures.
– Scheme Revenues.
– Net Reserve Balance.

[67] For more detailed view about the calculation of annuity see for instance Muksian (2003), Bodie and Merton (2000).

5.7.1 Scheme 's Expenditures

As it has been defined earlier this chapter, the pension expenditures comprise the cash outflows toward the insured population and the cost of running down the SSC activities likewise financing the insurable operational activities or the cost of managing the scheme reserves.

$$\mathrm{Exp}_t = \mathrm{Ix}_t + \mathrm{Ax}_t \tag{5.14}$$

Where Exp_t represents the scheme total expenditures. Ix_t : Insurable current liabilities. Ax_t : Administrative expenses.

The schemes total liabilities typify the annual financial rights accrued to the scheme beneficiaries from different branches: Old-Age (OA), disability due to natural causes, disability due to work injuries and diseases, and survivors of all branches. Cost of OA beneficiaries are projected on an annual basis by incorporating the gender-age adjusted average wages and the corresponding number of OA beneficiaries. Performing this mathematically:

$$\mathrm{C}_{t,s,OA} = \sum_{i=45}^{99} \mathrm{N}^{t}_{i,s,OA} \cdot \bullet \mathrm{AS}^{t}_{i,s,OA} \tag{5.15}$$

C_t : Cost of Old-Age benefits in year t. $N^t_{i,OA}$: Stock of Old Age pensioner (OA) of age i at year t. $AS^t_{i,OA}$: Adjusted average salary for Old-Age beneficiaries of age i and time t.

Precisely speaking, the age and gender adjusted salaries are educed by proportionally recomposing the previous salaries with the average salaries of the new pensioner in each of simulated year. Such a methodology takes into account the thoughtfulness of weighted composition of the stock and the flow of pensioner. In addition to that, if pension indexation is implemented by the scheme rules then average pensions are inflated periodically by the appropriate assumed index.

$$AS^{t}_{i,s,OA} = \frac{\left[Np^{t-1}_{i-1,s,OA} \cdot \left(1 - m^{i}_{t,s}\right) \cdot \left(1 + \theta^{t}\right) \cdot AS^{t-1}_{i-1,s,OA}\right] + \left[Nfp^{t}_{i,s} \cdot S^{t}_{i,s,OA}\right]}{Np^{t}_{i,s,OA}} \tag{5.16}$$

Worthy of mentioning here is that the average pension of flow pensioner comprises the age based estimated service credits, the pensioner reference salary at the time of retirement and number of dependents in the pension formula exactly as stated by the SSC current law.

Here N^{t-1}_{i-1} corresponds for the stock of pensioners in the previous year at age i-1. m^{i}_{t}: Age specific mortality rate. θ^{t}: Pension indexation factor. Nfp^{t}_{i}: The flow of new pensioner. S^{t}_{i}: Age specific computed salary.

In order to ease the understanding of transition mechanism, its worthy to mention here that the age specific stock of Old-Age beneficiaries as well as disabled pensioner due to natural causes are updated on an annual basis via incorporating the proper survival rates on the stock of prior year pensioners and the probabilities of moving out from the stock of contributors toward the stock of pensioners.[68] Mathematically, the transition formula is given by:

$$Np^{t}_{i,s,b} = Np^{t-1}_{i-1,s,b} \cdot \left(1 - m^{t}_{i,s}\right) + Pr^{t}_{i,s,b} \cdot Nc^{i-1}_{t-1} \cdot \left(\left[\left(1 - (m^{t}_{i,s}/12)\right)^{12} - 1\right] / m^{t}_{i,s}\right) \tag{5.17}$$

b denotes the pension branch: Old age or Disability. s the gender status. Pr: Age and gender specific probability of transition from active contributors to branch- specific pensioners.

The product of branch based transition probabilities and the corresponding active contributors is sub-aggregated into equal monthly flows to consider the survival of new pensioners as the time they flow. Simplifying that more, not all pensioners who retire during the predicted year will stay alive until the end of that year, unless the rounded result of multiplying the age corresponding mortality rate with the number of new retirees is less than to be mathematically considered.

[68] These probabilities have already been defined in section (5-2).

To estimate the annual cost of the naturally caused disability, the model tracks the development of average disability pensions for each age and sex increments, which is annually updated to reflect the adjustment in the accrued benefits of new disabled pensioners. The next step proceeds via multiplying the updated average pension of each age bracket (one year increments) by the corresponding number of disability pensioners. From there on, disability pensions are adjusted annually to reflect both, the development of the size and structure of disabled pensioners and the periodical adjustments of their average pensions. The following formula shows in quantitative terms how the annual cost of natural disabilities has been estimated within the model:

$$C_{t,s,ND} = \sum_{i=45}^{99} N^{t}_{i,s,ND} \cdot \bullet AS^{t}_{i,s,ND} \tag{5.18}$$

Where $C_{t,s,ND}$ stands for the periodical cost of natural disability d of gender s. $N^{t}_{i,s,ND}$: Stock of naturally disabled pensioners. $AS^{t}_{i,s,OA}$: The adjusted average pension of naturally disabled pensioners. The latter is computed exactly as done for the OA pension.

Concerning the cost of other insurable expenditures, the model estimates them depending on two segments: the aggregate number of beneficiaries modelled as a fixed proportion of the covered population, and a combined fraction of OA and DA average benefit per pensioner. This is simply identified in this formula:

$$CS^{t}_{sr} = \prod_{s=m}^{s=f} \left\{ \begin{array}{c} \cdot \alpha^{sr}_{s} \left(\underbrace{\sum_{i=16}^{99} \left(N^{t}_{i,OA,s} + N^{t}_{i,ND,s} \right)}_{\text{Total OA\&ND beneficiaries}} \right) \cdot \\ \mu^{sr}_{s} \underbrace{\left(\left(N^{t}_{s,OA} \cdot AS^{t}_{s,OA} + N^{t}_{s,ND} \cdot AS^{t}_{s,ND} \right) / \left(N^{t}_{s,OA} + N^{t}_{s,ND} \right) \right)}_{\text{Weighted average OA\&ND pension}} \end{array} \right\} \tag{5.19}$$

CS^{t}_{sr}: Cost of survivors. α^{sr}_{s}: A factor which indicates the ratio of survivors' beneficiaries to the combined stock of OA and ND pensioners. μ^{sr}_{s}: The rationing factor for average survivor benefits to the weighted combined average wage of OA and ND. Annual expenditures on disabled pensioner due to occupational causes can be calculated

by implementing the same methodology except that parameters should then reflect occupational disability pensions and pensioners.

Non insurable expenditures that make up the scheme total expenditures reflect explicitly the cost required to run out the scheme different activities. The commonly used approach to estimate these expenditures is by proportionally linking their floor with the level of annual total contributions. Hence, administrative expenditures all along the simulation time interval are assumed to be a fixed proportion η_t of total contributions TC collected periodically.

$$AE_t = \eta_t \cdot TC_t \tag{5.20}$$

5.7.2 Scheme's Revenues

The SSC has two main sources of finance, the receipts of participants' contributions and the rewards on investing the scheme accumulated funds. Regarding the former type of revenues, the SSC collects on a monthly basis a fixed proportion of the participants gross income as insurance fees against Old-Age, disability and death. However, the proportional fees paid for the insurance against work injuries and occupational diseases (WI) are modelled as other insurable revenues. The distribution of insurance fees among employers and employees is framed separately in order to stimulate some the cost implications on hiring firms.

$$IR_t = \underbrace{\left[\left(\nu^t_{OA,e} + \nu^t_{WE,e}\right) + \left(\nu^t_{OA,c} + \nu^t_{WI}\right)\right]}_{\substack{\text{Total contribution rate paid jointly by} \\ \text{employers and workers against} \\ \text{old age, dissability and work injuries}}} \cdot \overbrace{\sum_{i=16}^{70} Nc^t_{i,s} \cdot I^t_{i,s}}^{\text{Total insured wage bill}} \tag{5.21}$$

Where IR denotes the insurance revenues; $\nu^t_{OA,e}$ refers to the contribution rate paid by the employer to insure his employee against OA, DA and D, while $\nu^t_{WE,e}$ denotes the contribution rate needed for the insurance against work injuries. The same applies for $\nu^t_{OA,c}, \nu^t_{WI}$, but they represent the contribution rates that have to be paid by the insured participants rather than by their employers.

As regards non-insurable receipts (Investment rewards), the model estimate them endogenously on a periodical basis taking into account the timing of contribution flows and the way they are utilized due at time of payment. Generally, the model treats investment returns according to the source they where generated by: (i) The return on the previous period accumulated reserves and (ii) the interest rate on the monthly contribution flows out-weighted annually, since contribution flows are not transferred directly to the SSC investment fund but deposited in bank accounts. Representing this mathematically:

$$NI_t = ROR_{t-1} \cdot Rv_{t-1} + \frac{IR_t}{12 \cdot r_d^t} \cdot \left[\left(1 + r_d^t\right)^{12} - 1 \right] \tag{5.22}$$

Where ROR_{t-1}: is the previous year annual rate of return on the SSC reserve investment. Rv_{t-1}: One year lagged-accumulated reserves. r_d^t: Monthly interest rate on short- term deposits. Here, for the sake of simplification the model assumes an equal distribution of insurable revenues among the months of the year. Anyhow, fluctuations over the average are quite possible to offset each others.

Combining the last two equations together implies that the scheme total revenues are associated directly with the level of contribution rates, total wage bill, short term interest rate, the scheme accumulated reserves and the rate of return on them.

$$Rev_t = ROR_{t-1} \cdot Rv_{t-1} + \frac{IR_t}{12 \cdot r_d^t} \cdot \left[\left(1 + r_d^t\right)^{12} - 1 \right] \tag{5.23}$$

Once the system starts to face a negative operational balance, the last part of the last equation would vanish, and the only generator of investment reward would be the accumulated fund reserves.

5.7.3 Buffer Fund Net Worth

At the end of each financial year, gross scheme surpluses or deficits are added or leaked out from the pension total accumulated reserves. Accordingly, the fund reserves

adjust periodically to the added investment rewards and net operational balance. The latter can be defined as the net cash flows originated by the scheme insurable activities in which it reflects the periodical insurance income but excluding the scheme total expenditures. Worth mentioning here is that any volatility in the value of fund assets are internally encountered in the value of investment returns.

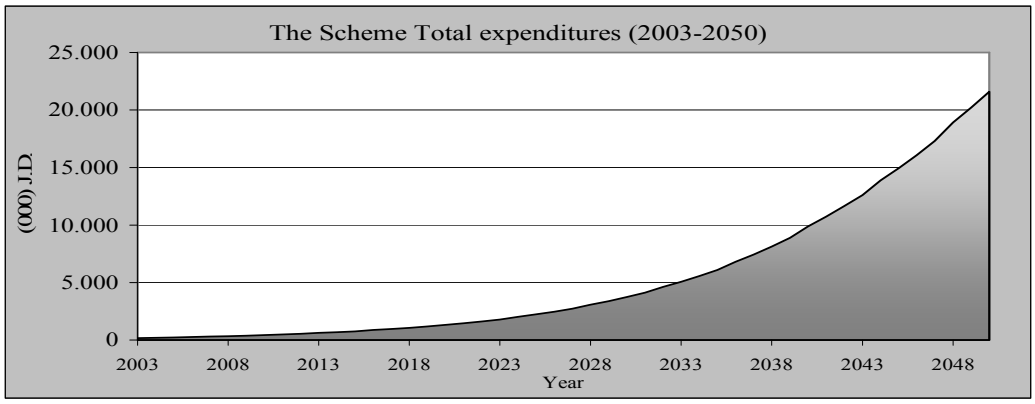
$$Rv_t = Rv_{t-1}(1 + ROR_{t-1}) + \frac{IR_t}{12 \cdot r_d^t} \cdot \left[\left(1 + r_d^t\right)^{12} - 1 \right] - Exp_t \tag{5.24}$$

As far as the scheme total revenues surpass the aggregate expenditures, the fund reserves would keep accumulating. However, if the total annual expenditure exceeds the scheme total receipts then the deficit would accordingly be financed internally through the reduction in the pension fund accumulated assets.

5.8 Model's Outcomes

5.8.1 Scheme's Expenditure.

After utilizing the corresponding parameters and assumptions, the actuarial model shows some unwished facts heeding the growth in scheme liabilities along the estimation period. The total expenditures that comprise insurable benefits and the cost needed to oversee the scheme activities, as indicated in Figure 5.12, would increase form 165 million (m) JD to more than 23 billions (b) in 2050. The convexity of the expenditures curve which reflects the development of expenditures along the estimation period indicates that the marginal change of the scheme expenditures is increasing for each additional year of estimation.



Source: Author's own estimation, Hazmomics Actuarial Model.

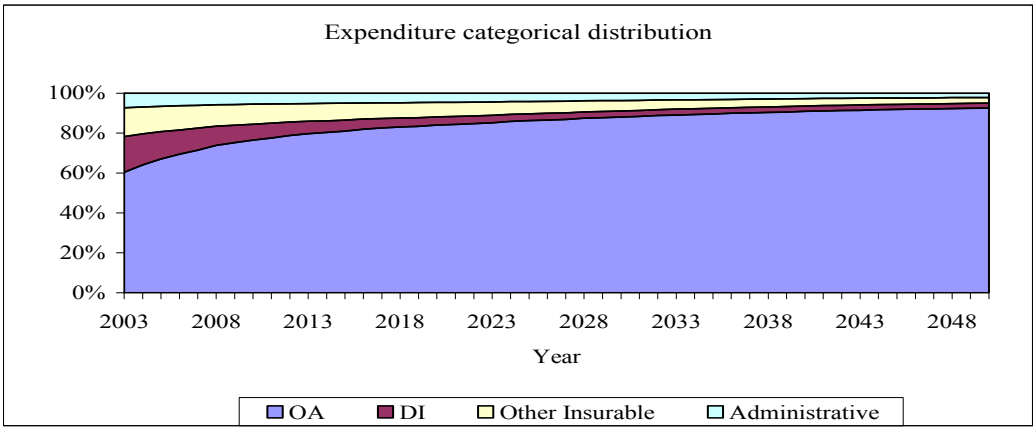
Figure 5.12: The projected development in the scheme total expenditures

The insurable expenditures in which the old age benefits constitute the greatest portion of them would step-up increasingly from a base level of 148 million (m) JD in 2003 to roughly 23 billion (b) JD in 2050. This can be attributed to many factors of which the increase in the number of beneficiaries and the jump-up in the contributory credits considered for benefits calculations at the time of retirement, is among the most important stimulants. The increase of the service credits considered for benefits calculation would be more than those observed in the benchmark year of our simulation. Today no one can retire with more than 25 years of contributory period, since just yet the system age has reached a quarter century. The only way a pensioner can have further service credits, is by Buying-in previous contributory years.[69] The cost of natural and work caused disability pensions is also expected to increase along the simulation period but in a lesser extent than OA benefits. In the bench year of our estimation, the cost of this provision was less than 30 m JD which is about 6% of its estimated level in 45 years. As regards other insurable expenditures that are awarded in many fashions in which survivors and lump sum benefits comprise the major part, the simulation depicts that they will grow rapidly during the coming four and half decades with an average annual growth rate of 7%. The rate, however, is relatively less than the estimated growth rate of

[69] This, however, is constrained with a qualifying conditions: the additional period that is subject to opposition must be a real active working period, the insured participant cannot be compelled to the SSC law during this period, the insurer have to verify that this period has never been considered for the government pension and lastly, considering the working credits outside Jordan is only available for the insured participants who have a Jordanian citizenship.

administrative expenditures that will step-up from 17 m JD in 2003 to almost about half billion in 2050.[70]

Proportionally speaking, the relative grandness of OA benefits as the model estimates would increase gradually over the estimation period at the expense of other categories. Within less than fifty years, as apparently depicted in Figure 5.13, the ratio of OA expenditures to total scheme expenditures would rise from about 60% in 2003 to more than 90% in 2050. This of course denominates why any reform strategy should give more attention to this branch of insurable coverage over others. Such a prospect, however, is discussed in the coming sections in more details.



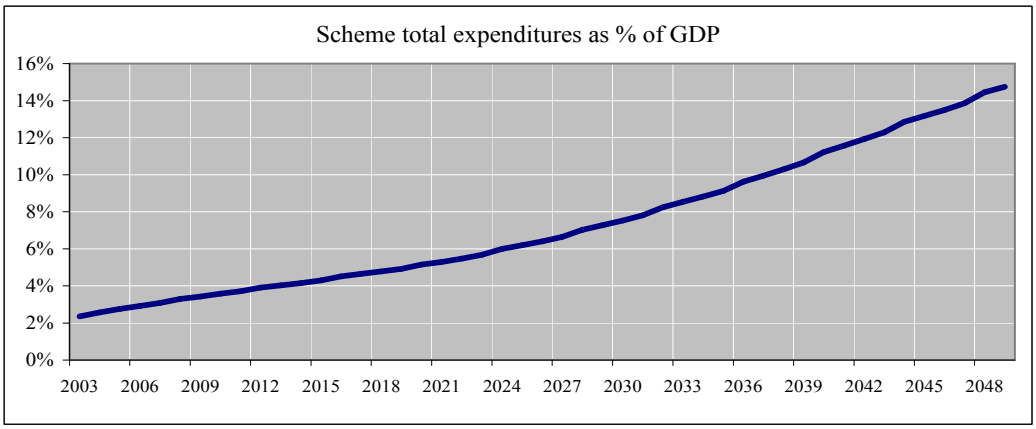
Source: Author's own estimations, Hazmomics actuarial model.

Figure 5.13: The estimated development in the beneficiaries' structure

Referring the scheme total expenditures to the size of the economy demonstrates the extent at which SSC would contribute to the future aggregate demand in Jordan. In 2003, the total scheme financial outflows have comprised for less than 2.5 % of GDP. Although the expectations regarding the future growth rates of Jordan economy seems quite optimistic, this ratio is expected to jump-up gradually until the end of our simulation. The model assumes that GDP will increase nominally by an average growth rate of 7.5% during the first three decades of this centaury. Combining that rate with our estimates of the average growth rate of scheme total expenditure (12%) during the same time interval, suggest that the portion of scheme expenditures to the level of GDP would reach 7.3% by 2030. As for the last two decades of our estimations, this ratio would increase relatively more than the observed trend in the following twenty five years. This comes in fact since

[70] These expenditures comprise also the allowances reported in the SSC balance sheet.

our future prospect regarding the GDP annual growth rate suggest that it would slow down smoothly over the concerned period when it is compared with the corresponding rate during the first twenty-five years of our simulations. In addition to that, although the growth rate of scheme total expenditures would either slow down during the same period, the extent of drop in the GDP offsets the decline in the former rate.[71] As a result, the total expenditure is expected to attain 15% of GDP by the year 2050. This corresponds about the estimated levels for OECD countries at the same year (Visco, 2001).



Source: Author's estimation, Hazmomics actuarial model.

Figure 5.14 The estimated development in the scheme expenditures relative to GDP

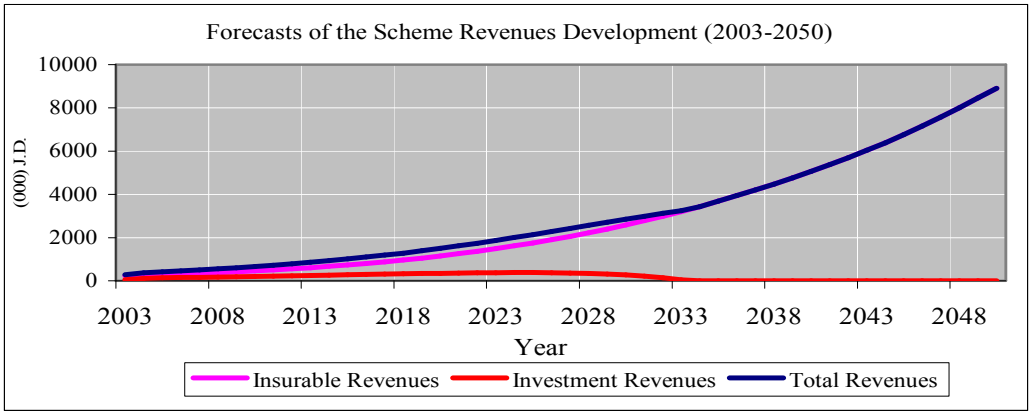
5.8.2 Scheme's Revenues

As mentioned earlier in this chapter, the SSC has two main sources of funds which are used in a way or another to finance the scheme's ongoing financial obligations, and to accumulate and invest the remainder in order to face a part of its future expected unfunded liabilities. Starting the analysis with the most concerned part of our simulations, the model estimates that the insurable revenues that are periodically and proportionally charged from the base of participants insured salaries on behalf of the portion paid by their employers, either as an OA insurance fees or health coverage one, would continue growing all along the estimation period. The main engine of growth as the model utilizes can be generalized by the potential increase in the number of contributors. Such an increase would be fundamentally motivated by the growth in the working age population which is endogenously incorporated with the expected increase in the female labour force

[71] The assumed average growth rate of GDP during the 4th and 5th decade of this century is 5.4%, while the estimated annual growth rate in the scheme total expenditures stands at roughly 9.6%.

participation rate and also with the potential increase in the male's coverage ratio. Additionally, the nominal growth of the insured wages and salaries would move up the collected contributions by the same proportion.

Aside from the changes of system member structure, the model estimates that general receipts from participants will continue growing all along the estimation period. By 2050, the insurable revenues are expected to surpass the level of 9 b JD which is 33 times its level in 2003. If these revenues were to increase annually by the same proportion, the required average growth rate in total contributions would be some thing around 8%. With regard to the investment revenues of the SSC buffer fund that are estimated through the integration of the assumed real rate of returns on investment, inflation rates and the level of accumulated reserves, they would keep growing but in a decreasing rate until the year 2031. As in that year the reserves would be completely depleted and nothing will remain in the fund for investment. Afterward, the scheme revenue will consist entirely of the contribution proceeds collected from the schemes participants as will as from their employers on their behalf. The almost linearly and flatly sloping revenue trend curve, as depicted in Figure 5.15 specifies clearly how these revenues grow smoothly over the simulation period. In the first three decades of this century the extra revenues generated by the gradually up-moving female participation rate and male coverage ratio is slightly absorbed by the slow down in the growth rate of investment revenues. As for the rest of our simulation period, although the scheme loses one of its revenue source, the marginal revenue generated from the scheme participant commences increasing as an affect of integrating market conditions e.g. system coverage and participation rate, labour market parameters, with the scheme specific parameters.



Source: Author's estimation, Hazmomics actuarial model.

Figure 5.15: The development of scheme revenues (2003-2050)

5.8.3 Financial Viability

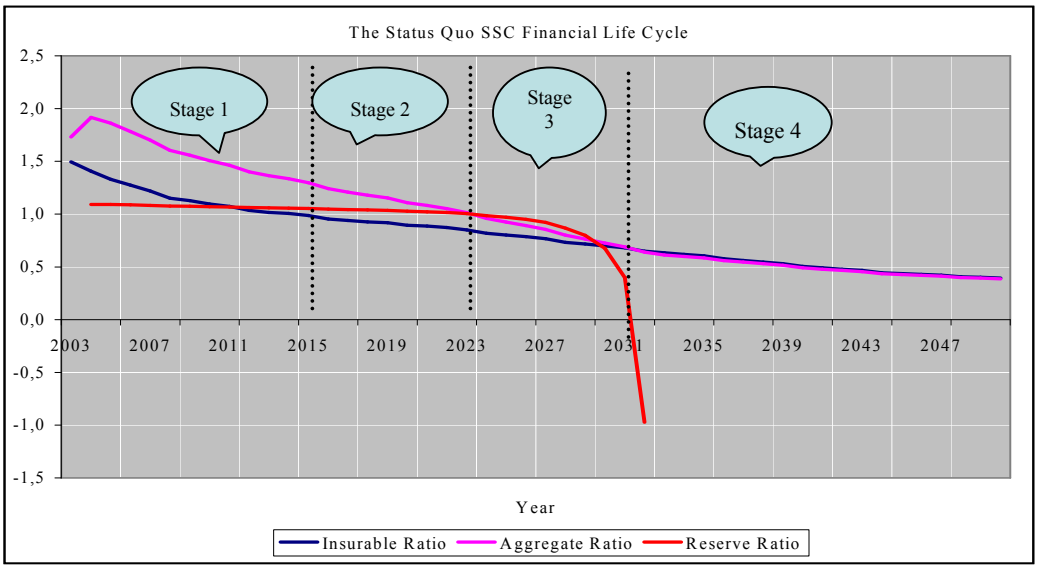
Before going through the detailed analysis of our estimations for the scheme financial balances during the simulation period, three definitions that are widely used in pension literatures should initially be performed. The insurable balances as the first to define here allude the excess (shortage) of the periodical contributions collected from the scheme insured participants over the corresponding expenditures that are oriented towards financing the benefits of covered beneficiaries.

The second type of pension scheme financial balances deals with the issue of to what extent the scheme insurable revenues can cover both the scheme periodical pension benefits and the cost needed to run the system activities. This is often referred to as the operating balance. Logically, deficit in insurable balance never comes before the existence of the operating one. The third and the most significant measure of schemes financial affordability is the total balance. The only difference between this measure and the operating one is that the former accounts for, in addition to insurable revenues that are collected from contributors, the investment revenues that are yielded by the accumulated reserves during periods that experience an existence of accumulated reserves.

In regards to the forecasts of SSC future balances, the actuarial model demonstrates unhappy financial sounds although they are initially expected. During the first seven years of our estimation, or more precisely until the 2011 financial year, the scheme will continue attaining operational surpluses as the annual revenues paid by all participants surpass the combined value of pension benefits provided under the SSC provisions and the administrative cost needed to finance the scheme utilities. After the end of 2011 financial year, the system starts to experience an operating deficit but continues to have insurable surpluses. Extra liabilities that are above the accrued insurable revenues imbibe a part of the buffer fund investment yields, or the accumulated reserves if the latter yields are non-positive. Afterwards, the operating gap continues in expansion until the system reaches a point where contribution proceeds will not only be insufficient to cover the total expenditures but also the insurable expenditures as well. Upon reaching this point, one can namely characterize the schemes financial conditions under insurable imbalances. This as our model finds start to appear and take place in 2016.

What is worth mention here, although we have clarified that theoretically in the previous chapter, reserves during the above categorized financial stage keep on accumulating or

the system otherwise would run on aggregate imbalance basis. This is more likely to happen for the SSC by 2023 and from that date after when the total revenues that annually flow to the system as from contributions and investment returns fail to cover the scheme aggregate expenditures. Accordingly, the deficit would automatically be financed via the accumulated reserves in the SSC buffer fund. The most significant feature of this stage (stage 3) is that reserves keep decumulating all through the subsequent years until reserves are fully depleted by the year 2031. In stage four which is more likely to begin after 2031, neither any reserves are available nor are the contribution proceeds capable to finance the scheme total expenditures. The following Figure 5.16 indicates how the financial life cycle stages that have been theoretically defined in chapter four of this thesis would look like under the SSC status quo conditions. The insurable ratio in that figure denotes the ratio of insurable revenues at the cost of providing pension benefits. The aggregate ratio represents the ratio of pension total revenue to its total expenditures. Lastly, the reserve ratio indicates the level of accumulated reserve in the corresponding year to the level of reserves one year before.

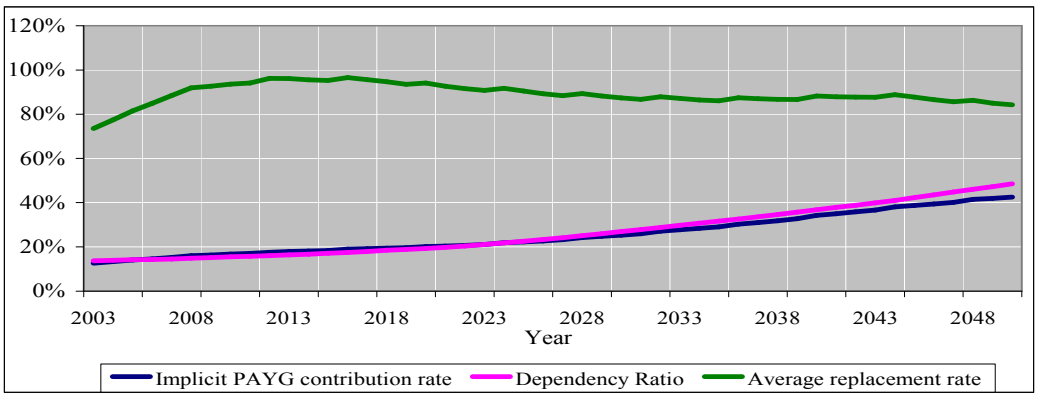


Source: Author' calculations, Hazmomics actuarial model.

Figure 5.16: SSC status quo financial life cycle (2003- 2005)

The unwanted sight of the development of the scheme financial balances can mainly be attributed by the gradual increase in system's dependency ratio. The increase in this ratio, as Figure 5.17 depicts, is associated with a step-up in the implicit contribution rate needed to be charged if the scheme is financing all its ongoing expenditures fully and directly from the contributions paid by participants. All along the estimation period, the

scheme experiences an up going movement in system's dependency ratio as the number of accumulated pensioners increase more significantly than the quantity of covered workers does. The slope of the implicit contribution rate, however, is relatively lower than the corresponding slope of dependency from the beginning of the third decade of this century. Such a feature follows the fact that system OA average replaced income starts to fall smoothly during this period. Among the explanations of this characteristic, is that the impact of extra contributory years considered for benefits calculation is weakened via the maximum replacement rate imposed by the SSC law. Another factor which can attribute that feature originates mainly by the gradual fall of marginal benefits provided through the minimum floor of COLA allowances.[72]



Source: Author's estimation, Hazmomics actuarial model.

Figure 5.17: The development in some of the scheme parameters

As can be gathered from the above analysis, SSC on a status quo basis is running on unhappy financial prospects. The present value of unfunded liabilities during our simulation period is forecast to match almost 170% of the current GDP.[73] Without any external financial supports, one can say that SSC is only 29 years from financial collapse.

5.9 Reform Assessments

In the following sections of this chapter we investigate how both reform approaches affect the future financial and distributional characteristics of the SSC. Although the

[72] To clarify more, the minimum COLA floor of 30 JD is kept constant all along our estimation period. thus, as the nominal level of reference salaries considered for pension calculation starts to grow, the 10% of that base would exceed the absolute level of 30 JD.

[73] The real rate of interest used to discount the future assets and liabilities is 2.5%. If we raise this rate to 4%, for instance, the ratio of unfunded liabilities would fall to 88% of today's GDP.

basic assumptions regarding the design and structure of these approaches have already been defined in this chapter, it is worthwhile to call back some of the financial and solidarity criteria considered. Starting with solidarity features, both reform strategies keep on the provisions that provide eligible participants with a similarly calculated disability pensions regardless their initial causes. These reforms involve also a survivor insurable coverage in which benefits provided by such a provision relate to the salaries and pensions of original beneficiaries, exactly as with no reform manner. More generally speaking, the new rules that each of the proposed strategies would imply, implement only for the OA provision and have nothing to do with other entailments.

As regards the main financial features of these strategies, benefits in the fully funded approach as for first are determined via gradually substituting the fully funded benefits for part of the benefits that are determined according to the old benefit formula.[74] Contributions collected prior to the year of reform are credit with a notional ROR that reflects the average ROR achieved on the SSC's buffer fund all along the entire period of scheme establishment. The same mechanism applies also when the Quasi Actuarial (QA) strategy is alternatively implemented except that benefits that are computed according to the old age formula are gradually replaced by QA based benefits instead of the fully funded ones. The strategy as well as the model, does not adjust for any benefits that have already accrued prior to the starting year of reform implementation. Only the flow of new beneficiaries is considered in the reform adjustments.

5.9.1 Financial Sustainability

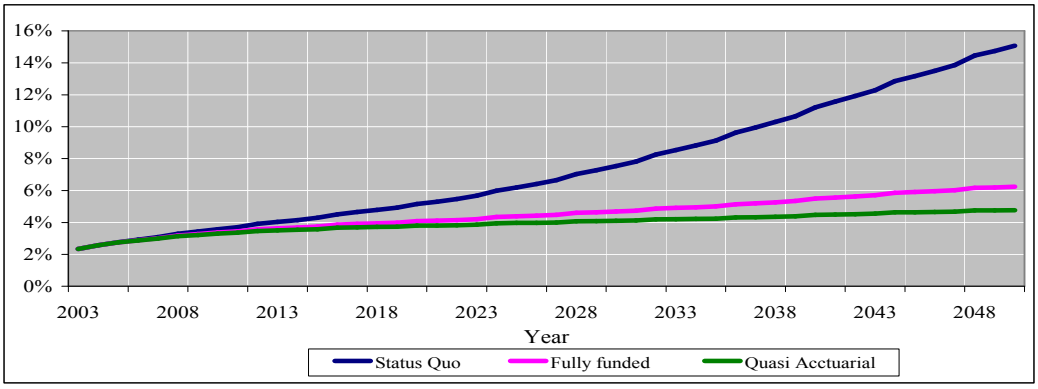
In the status quo scenario the model has shown that within less than fifty years, the SSC would experience all the financial life cycle stages of defined benefits schemes. Without any substantial reforms, the scheme would not be able to provide beneficiaries of the foreseen future with the same level of benefits that are promised under the current law, unless future participants take the responsibility and the effort to pay them these benefits.

The above briefly listed possible implications, however, seem not really to happen when either strategies are simulated. As logically implied, both strategies have a prospected

[74] The gradual mechanism has been defined in section 5.2.3.

influence on the level of scheme expenditures but nothing concerning its revenues. This comes to bear as these strategies involve a potential reduction of benefits level among all ages of retirement.[75] Figure 5.18 shows the estimated extent of the scheme outlays that are proportionally represented with respect to the level of nominal national output across the simulated years. During the first 7 years after reform, expenditures associated with each reform strategy remain relatively on their level as when no reform takes place at all. The logical explanation of such an outcome relates mainly to the gradual mechanism in which these reforms are implemented. Over a longer term perspective, the potentials of these reforms incept brightening up as the gap between the scheme expenditures originated by the implementation of both strategies and the status quo estimated outlays continue increasing over the rest of our simulation period.

By the end of the simulation period, the scheme financial outlays are expected to comprise 7% of GDP which is 2% points higher than if the quasi actuarial strategy is alternatively implemented. The considerable gap between the status quo expenditures and those that arise under the implementation of either strategy can be attributed to two main drivers. The first reflects the potential fall in the level of benefits that would increasingly take place as the gradual mechanism phases out. The second reason of such outcomes is ascribed mainly to the assumable fall in the retirement probabilities among ages that are below the normal age of retirement. The only reason why the estimated expenditures under the quasi actuarial strategy appear lower than those generated by the fully funded one, is that the latter strategy implies a higher extent of benefits level.



Source: Author's own estimation, Hazmomics actuarial model.

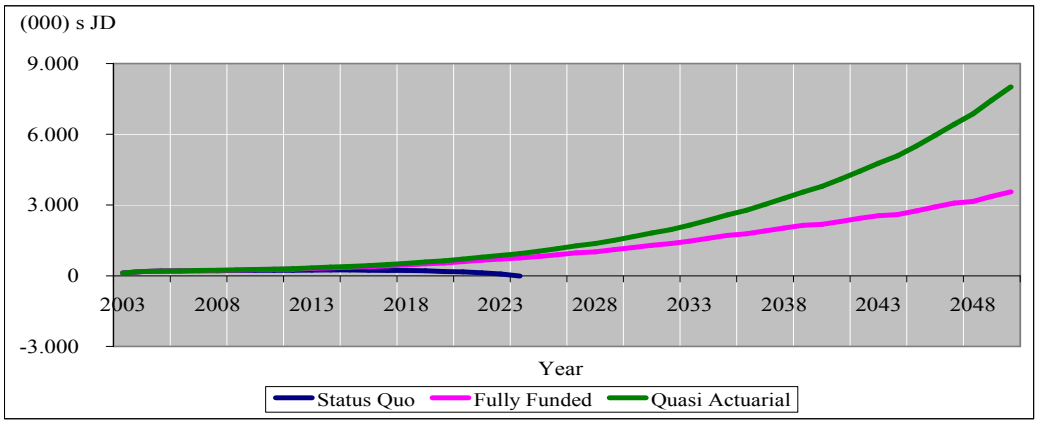
Figure 5.18: The estimated development of the scheme expenditures under the status quo and reform scenarios, relative to GDP

[75] This clearly appears within the analysis in chapter 3 as we have implied that SSC current law provides most of the participants with an implicit rate of return on their contributions which is higher than that expected when either strategy is implemented.

Incorporating these results with the estimates of total revenues all along the simulation period exhibits felicitous facts regarding the financial viability of the scheme and indicates also for some useful prospected hints for the subsequent periods after simulation.

As for the quasi actuarial strategy, financial balances appear with no deficit across the simulated years. Even thinking pessimistically about the second half of this century, financial balances are susceptible to continue without a negative trend. This can logically be inferred from Figure 5.19 since the plotted curves of these balances never appear slopping downward or stabilizing even at the end points of our simulation.

In the fully funded scenario, however, the scheme is more likely to keep achieving surpluses over the simulation period but would not continue for a much more extended period. As Figure 5.19 shows, the plotted curve of the model estimates for the future surpluses veers less steeply by the end of our simulation period. As expected, the aggregate financial surpluses reproduced by this strategy are less than those observed in the former strategy. This of course is due to the relatively more adequate level of pension benefits implied by this strategy than it is with the former one.

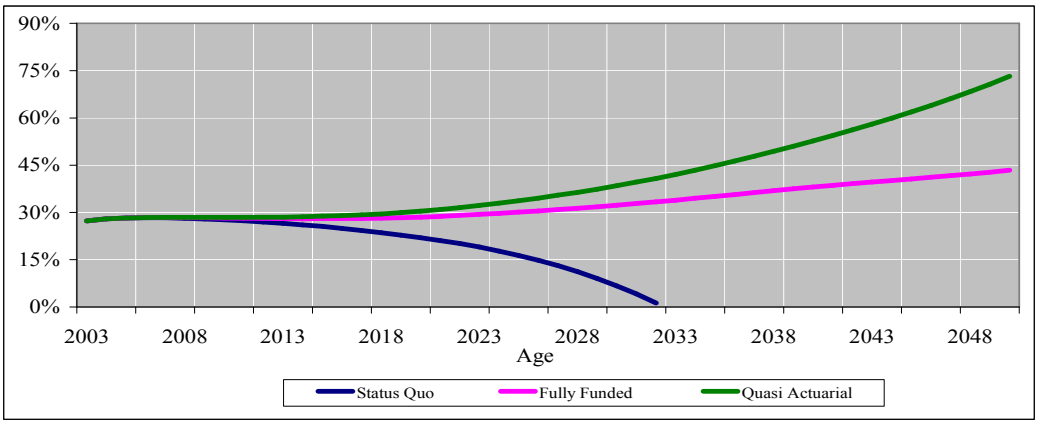


Source: Author's estimation, Hazmomics actuarial model.

Figure 5.19: Estimates of the scheme financial balance under status quo and reform scenarios

Proportionally to GDP, the quasi actuarial reform option in more likely to generate huge reserves in the scheme buffer fund, expanding its viability for a longer term perspective. The initially observed level of SSC's reserves that constituted a 27% of GDP in 2003, increases gradually across the simulation period until it reaches almost as much as three-quarters level of national output by year 2050. The reserves rendered by the other reform

option, on the other hand, continue accumulating but in a lesser extent than we have seen in the case above. The maximum level of reserves that are induced by the fully funded reform strategy reach their maximum potential of 41 % points out of GDP by 2038, to gradually end by a lower level of 36% in 2050. This proportion will certainly keep diminishing as the scheme starts to bear aggregate financial imbalances. Such an outlook has been early guessed in the chapter before, since the transition to a fully funded scheme, in the absence of external support, would never imply an ever lasting sustainability. The transition cost has to be paid at some point.



Source: Author's calculation, Hazmomics actuarial model.

Figure 5.20: Estimates of the scheme reserves relative to GDP under status quo and reform scenarios

5.9.2 Participant's Intergenerational Adequacy

Having discussed the sustainability and viability implications of both reform strategies, a fair overview must be presented here to spot on their consequences with respect to adequacy measure. The level of career income that is replaced with the pension benefits produced by these reforms depends mainly on the participant's earnings over his entire career life, length of employment, the life span after retirement, and the investment yield on the scheme buffer fund. The gradual diminishing reliance on the old system benefits rules makes the influences of these variables appear gradually as the age of reform goes further by time.

Since the fully funded approach implies a greater extent of pension benefits than those guaranteed by the other approach, the level of adequacy seems more favorable from a pure participants perspective when they have to choose between either one of these approaches. Figure 5.21 reports apparently the estimated replacement rate and its

development over the simulation period if the system continues working under the current rules or has implemented one of the investigated reform approaches. Under the status quo conditions, participants who retire at the normal age of retirement during the coming seven years would receive proportionally higher pension benefits than what a pensioner gets today. This of course as we have mentioned before, is due to the fact that such a pensioner would have more service credits to be considered in benefits calculations. After 2011, however, the replacement rate stabilizes all along the estimation period since the rule of maximum replacement rate starts to influence pensions effectively.[76]

Concerning the fully funded approach, the level of replacement rate during the coming seven years springs up but in a lesser extent than in the status quo case, since funded elements commence influencing the retirement benefits gradually. As the length of implementation extends subsequently, the replacement rate declines smoothly until it reaches few points above 40%. The case might be harsher for future pensioners when a quasi actuarial approach is alternatively implemented. Such a decline in the level of pension benefits when compared with the level of earning before retirement observed in the last two mentioned cases can mainly be attributed to vanishing generous components and increasing life expectancies for both genders.[77]

What is worth mentioning here is that females would probably be more affected by either proposed strategies. This appears clearly in Figure 5.21 as when the fully funded approach is implemented males would end up with a bit more than 40% replacement while females receive few percentage points lower than that level. The same extent of divergence between both genders in replacement rates appears when the quasi actuarial system is alternatively implemented.

Although the relative measure of adequacy shows never wanted facts about the consequences of both strategies, we still hold hopes that the SSC's buffer fund future performance would close the gap, and participants would substitute part of the expected

[76] It has to be wondered, however, whether the benefits level remains constant at the time when SSC reserves are fully depleted. The important question to raise here, how policy makers would response to future deficits? In our analyses, nevertheless, we solve the problem hypothetically through the implementation of pure PAYG contribution financing strategy from the time the SSC defaults the accrued benefits provided by the law.

[77] The extent of decline of replacement rates in the proposed approaches is sensitive to the SSC buffer fund performance. in the above analyses the considered real rate of return is 3.5%. In the coming sections, however, further scenarios are performed regarding this rate.

losses in the level of adequacy through enhancing their own savings. This seems much favourable than the status quo as they might save nothing and should expect anything.

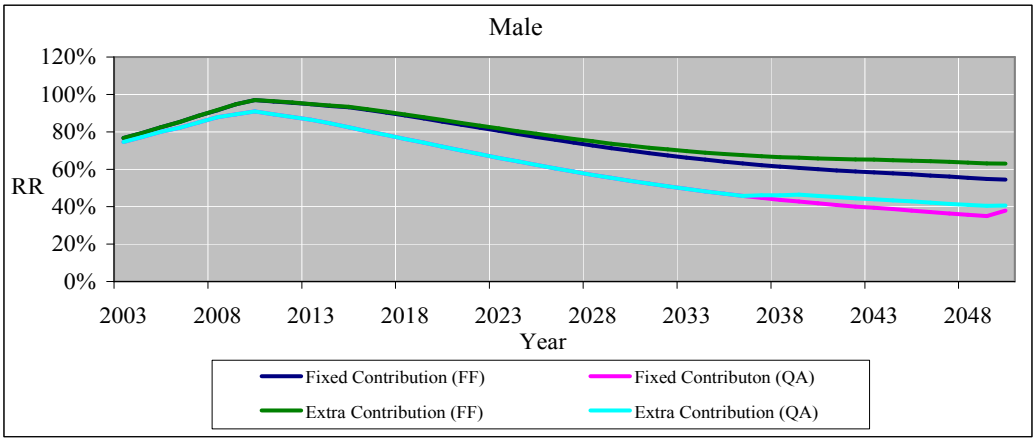
Source: Author's own estimation, Hazmomics actuarial model.

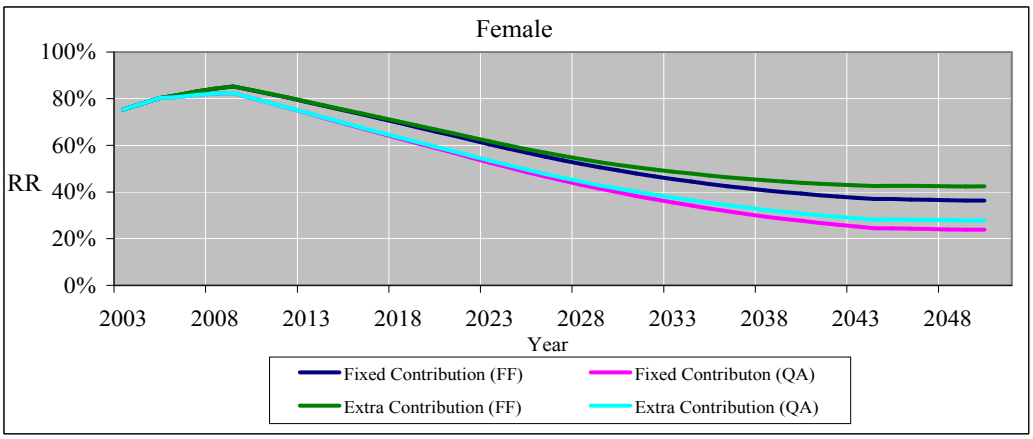
Figure 5.21: The development of replacement rates under status quo and reform scenarios

Alternatively to building guesses on the possibility that private saving would increase to substitute part of the losses in their future expected adequacy, we assumed that the scheme starts to charge additional contribution rates along the simulated period. During the first ten years after implementation and the next fifteen years afterward, we assume that the scheme starts to charge extra 1% and 2% as contribution rate, respectively. In 2031, we modeled and additional 1% contribution over the remaining period of simulation. Before interpreting the expected outcomes of such a proposal, it is worthwhile to mention some of its advantages over the reliance on voluntary savings by participants. the first regards to the fact that participants might fail or underestimate the need of these savings. Second, if they really save enough for their future shortfalls in adequacy level, their voluntary savings could be always subject to withdrawal risks. Thirdly, as participants would most likely utilize their voluntary savings in deposits

accounts, the returns on these accounts might prove lower than those can be achieved within the SSC's buffer Fund.

As shown in Figure 3.1, the proposed mechanism to increase aims at increasing the level of adequacy has proved some optimistic implications with respect to future generation. In the fully funded approach the proposed increase in contribution rate can increase the level of replacement of those who retire at the end of our simulation period to a bit more than sixty percent for male and forty percent for female. The view seems to be less affirmative in the case of quasi actuarial approach as the replacement rate for male retiring in 2050 reaches almost forty two percentage points and twenty eight percentage points for female. However, as we have already stated above, females can gain a substantial increase in their adequacy level if they postpone retirement to reasonable ages. It is important to state in this context that the proposed change in contribution would can result in increasing the financial viability of the scheme and thus allow for higher degrees of funding. From there on, the level of adequacy can arrive on closer levels of the fully funded approach.





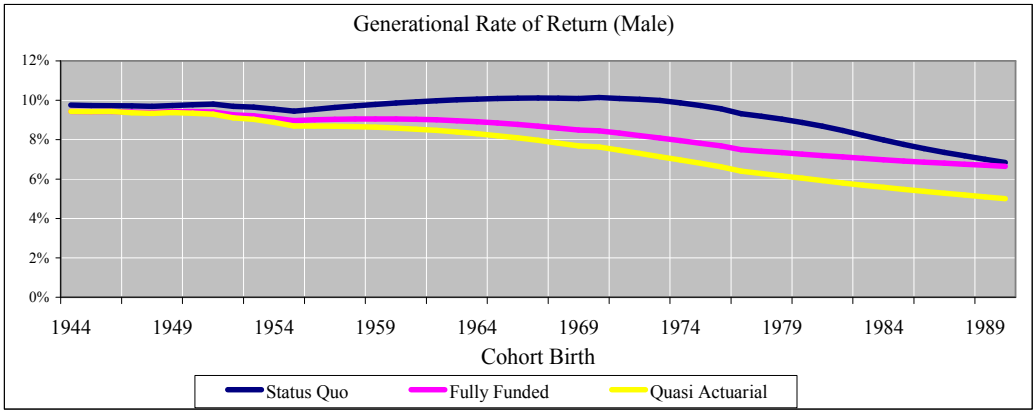
Source: Author's estimation, Hazmomics actuarial model.

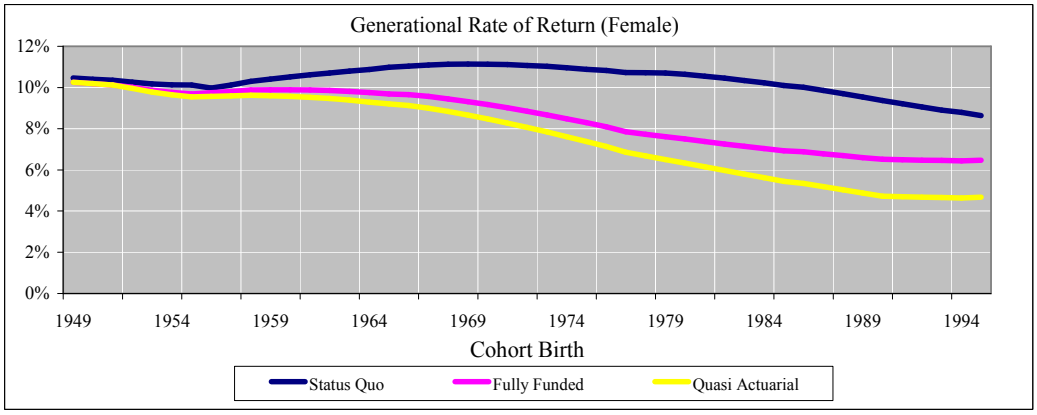
Figure 5.22: The impact of charging extra rates of contribution on intergenerational adequacy

5.9.3 Intergenerational Fairness

The issue of intergenerational fairness has taken considerable attention in pension literatures since it represents one of the most important dimensions considered for the judgment of the viability of pension schemes with respect to reform strategies. One can think about the issue of intergenerational adequacy which has been clarified in the previous section as a dimension of social generosity and this upcoming measure as a dimension of equity and financial generosity among subsequent generations.

Before turning to analyze how status quo and reform scenarios conditions might influence the distribution of real wealth and net benefits between different SSC cohort participants, few facts are worth putting forward. Since our simulations have indicated that SSC scheme under the current law and future expected conditions would have no capital assets anymore to finance its ongoing obligations after the financial default in year 2031, from there on, we have assumed that SSC solves this annually be charging the human capital (Contributors in our case) an additional rate of contribution to finance the deficit. For instance, if we want to compute the contributions paid by a participant who retires at the normal age of retirement at the beginning of 2033, given the fact that he has paid an additional contribution rate of 15% in 2033 as the SSC apposes on him to pay that portion to finance the aggregate deficit in that year, then the model computes his rate of return considering the current contribution rate for contributory years prior to 2031, and that of 2032 to compute contributions in that year. Second, we utilize the contribution paid by participants and the benefits they would get according to the three scenarios from the normal age of retirement until they reach the average life expectancy at that age to calculate the internal rate of return which they would probably get.





Source: Author's own estimation, Hazmomics actuarial model.

Figure 5.23: The estimated implicit ROR on the contributions of different cohorts under the status quo and reform scenarios

Figure 5.23 above shows how different cohorts who have already participated in the SSC or will participate in the future would earn a various rate of return on their contributions. Under status quo conditions the earlier and middle cohorts from both genders earn an eminent yield as for their participation in the system until the normal age of retirement stated in the current SSC law. Cohorts who had been born before 1972 for males and 1976 for females are expected to experience such a huge returns on their own contributions if the current rules of the SSC are kept unchanged until the beginning of the third decade of this century. Middle cohorts, more particularly, males who were born between 1960 and 1972 and females who were born during 1957 and 23 years latter, get higher returns on their contributions since they would experience an increase in margins of life expectancies. Younger cohorts born after these years start to loose some of the preferential advantages given to their parents, since they might have to start paying extra contributions that are needed to finance the annual liabilities accrued to future pensioners when the reserves of the buffer fund are fully exhausted. The start of drop in the ROR

given implicitly on the generational contributions appears earlier for male cohorts than female ones. This can be attributed mainly to the fact that participants of same cohort but of different genders would heterogeneously face the burden of financial shortfalls. This comes to bear due to the fact that the females' normal age of retirement is five years less than of male and hence they actually face fewer years of high contribution rates than males would face. For instance, female participants born in 1977 can retire on the normal basis by year 2031 without having paid any additional rate of contribution; given the fact that contribution rate would start increasing by 2032. Males with the same birth year, however, would be able to retire on the normal basis of retirement by 2035 and consequently they would have to pay additional proportion of their pre-retirement income during the last three years before retirement. From there on, gender heterogeneity among participants of the same cohort is likely to appear in this context.

As for identical cohorts in the status quo scenario, females keep getting higher returns on their contributions than males get. However, aside from gender distributional facts, the financial viability prospect for the periods that follow our estimated period assure us that the case would even be worse for the upcoming generations.[78]Although such a case is not affordable, the contributions requested for balancing in the pension outlays continue increasing or the benefits, alternatively, would need to be cut.[79]

As can be cogitated from the same figure, rates of return that are implicitly awarded to pension contributions during the reform transition period and explicitly afterwards, tend to decrease gradually across the simulation period. The logical explanation for such an expected movement style reflects mainly the increasing of market based elements that come at the expense of the generous current law components. But since the fully funded approach has no transition and solidarity cost elements, the rate of return appears higher than those generated within the quasi actuarial approach.[80] This however, most probably

[78] It is worthwhile to remind that our analysis assumes no external financial support for the system.

[79] These are only two ways in which future deficit can be recovered. However, there are many ways and combinations in which such a problem can find a solution. But we should recognize here these options are parametric rather than systematic. Particularly, these options have been discussed in the previous chapter.

[80] Since the fully funded approach aims at awarding the participants with an exact and actual yield on their own contributions, no proportional deductions are assumed to cover the unfunded liabilities of their parents.

would not last forever, although it might continue long enough, as the unfunded liability and the cost of solidarity has to be funded sometime.[81]

Over a longer view, if the quasi actuarial approach is implemented then subsequent cohorts would continue to earn a stabilized rate of return on their contributions as long as the profitability of the SSC buffer fund remains stable rather than deteriorating. Such a perspective applies also for the fully funded approach but should never be viewed as for never-ending space. However, it should be noticed that increasing life expectancies as figures and prospectors estimate, would break a part of the stabilization of generational returns that might occur under either reform strategies. If we attempt to throw the ball in the court of future generations, a straight forward way to which they can overcome their expected losses is through delaying retirement proportionally and actuarially with the increase in life expectancies. However, the selection between these two approaches in the spectrum of intergenerational fairness depends mainly on the time interval considered by policy makers and on the extent in which a very much longer expected financial default would be exchanged with relatively small losses in the subsequent generation's rate of return.

The most important point which has to be raised here is that continuing with the current scheme would surely land up with parents bequeathing a huge transferred debt to their children. Alternatively, both approaches considered here for reform, seem to offer more stabilized intergenerational equity and better financial viability than would occur if we continue on the basis of current law.

5.10 Sensitivity Analyses

Having performed the financial projections, quantitative and qualitative measures of reform strategies according to the baseline assumptions, it is worth doing and performing the possible consequences that correspond to the change in some of the model main suppositions. Since our simulations spread over a long term time interval, some of the assumptions if not all might deviate from their baseline level. Nevertheless, this is common in all financial and economic models that aim at performing medium term and

[81] This is more imaginable when we look at the analyses of the case when the profitability of the buffer fund is double the base line scenario.

long term estimations, and our model is no exception to this context. To make the implications of sensitivity simulations more intelligible and general, we will simulate only the major variables to which their influences on the dimensions considered above are thought to be enough to stimulate thoughtful engagement and discussions.

5.10.1 Rate of Return

It is agreed by many finance experts and economists that rates of return involve a large space of discretions in which it is useless to anticipate that their assumed levels would remain unchanged along five decades of simulation horizon. Therefore, the model performs the outcomes of utilizing another two scenarios regarding this factor. The first scenario, assumes that the SSC buffer fund would generate half the baseline scenario real rate of return, while the other one assumes double that level.

Before exhibiting the outcomes of these scenarios, it would be useful to determine the possible extent and consequences of them rather than presenting the whole terminations. In the status quo scenario, the returns on the accumulated reserves affect directly the annual financial balance of the scheme, since these returns comprise one of the scheme two sources of ongoing revenues stream. On the other hand, it affects implicitly the level and time when additional contributions will be charged to the scheme participants, from the time to which SSC reserves are fully spent. The latter sort of influence serves basically the issue of scheme fairness among the participants of various generations.

In the context of both reform strategies, rate of return on the SSC buffer fund affects not only the revenue streams of the system, but it also affects the streams of expenditures and hence the scheme financial balances. In addition to that, proportional returns on the scheme reserves influence explicitly both the level of replaced income as well as the returns awarded on the contributions of different cohorts.

Starting our analyses with the aggregate financial implications of status quo conditions, the model explores how rates of return could substantially alter the length of SSC financial life cycle stages. The utilization of half baseline rate of return exhibits some uninvited consequences regarding the time occurrence of financial shortfalls and hence the depletion of the buffer fund reserves. By the year 2021, the scheme total outlays would not sufficiently be covered by its own ongoing revenues and from there on, the

scheme reserves start to exhaust gradually to finance the accrued deficits until they end by no balance by the year 2030. The difference between this case in the baseline case is apparent in Table 5.2 as the aggregate deficit and reserves depletion in the latter case happen 3 years after their appearance in the former one. The consequences of double baseline rate of return, on the other hand, seems as among the ever wanted scenarios since it helps the postponement of aggregate deficit and reserves depletion by 10 and 9 years, respectively.[82]

Concerning the reform strategies, it is clear enough that changing the value of assumed ROR would have a wider range of influence on the scheme future financial conditions. In addition to the dimensions considered in the status quo scenario, modifying the ROR presumption involves some adjustments of the future prospects about the scheme financial outlays.

From a logical point of view, as the final level of contributions that are used to calculate the pension benefits of each participant upon retirement depends mainly on the profitability of the buffer fund, one should recognize why the scheme outlays respond directly to that rate. The main difference between both reform approach in respect to this aspect, however, is that the elasticity of insurable expenditures to the profitability of buffer fund occurs under the implementation of fully funded is greater than the corresponding elasticity when the quasi actuarial would have been alternatively implemented.

Moreover, the responsiveness of scheme investment revenues to the ROR on the buffer fund would also differ between the two approaches of reform. The magnitude of this fact again can initially be explained by the expenditures side. Since the elasticity of expenditures to the buffer fund profitability is higher under the fully funded approach the annual operational balance in such a case would be smaller. Consequently, the add-on (withdraw) to the scheme accumulated reserves would be smaller (greater) than in the case to which the quasi actuarial strategy is alternatively enforced. From there on, the scheme investment revenues in the subsequent year that depend initially on the previous year reserves and the same year balances come lower under the fully funded approach than in the quasi actuarial one.

[82] At the end of this paragraph, it should be noticed that the change in the assumed rate of return affects the scheme aggregate revenues only via influencing the investment revenues and has nothing to do with the insurable ones.

Table 5.2: Response of financial viability to rate of return

	Financial Balance (Million JD)			Reserves as % of GDP		
Year	Baseline	Half Baseline	Double Baseline	Baseline	Half Baseline	Double Baseline
2003	121	121	121	27	27	27
2004	178	143	247	28	28	29
2005	195	155	278	27	28	30
2006	203	158	302	27	28	31
2007	210	159	326	27	28	32
2008	211	153	346	26	28	33
2009	220	157	377	25	28	34
2010	227	156	407	25	28	35
2011	234	157	441	24	27	35
2012	233	147	469	23	27	36
2013	237	143	505	22	27	37
2014	245	142	548	22	26	37
2015	245	134	588	21	26	38
2016	230	109	616	20	25	38
2017	226	95	658	19	24	39
2018	219	78	703	18	24	39
2019	213	62	754	17	23	40
2020	179	17	781	16	22	40
2021	161	(-)	829	15	21	40
2022	131	(-)	871	14	20	41
2023	78	(-)	897	12	19	41
2024	(-)	(-)	885	11	18	41
2025	(-)	(-)	896	9	16	41
2026	(-)	(-)	900	8	15	40
2027	(-)	(-)	881	6	13	40
2028	(-)	(-)	783	4	11	39
2029	(-)	(-)	721	2	9	39
2030	(-)	(-)	630	-	7	37
2031	(-)	(-)	503	-	4	36
2032	(-)	(-)	260	-	1	35
2033	(-)	(-)	45	-	-	33
2034	(-)	(-)	(-)	-	-	30
2035	(-)	(-)	(-)	-	-	28
2036	(-)	(-)	(-)	-	-	25
2037	(-)	(-)	(-)	-	-	22
2038	(-)	(-)	(-)	-	-	18
2039	(-)	(-)	(-)	-	-	14
2040	(-)	(-)	(-)	-	-	9
2041	(-)	(-)	(-)	-	-	3
2042	(-)	(-)	(-)	-	-	-
2043	(-)	(-)	(-)	-	-	-
2044	(-)	(-)	(-)	-	-	-
2045	(-)	(-)	(-)	-	-	-
2046	(-)	(-)	(-)	-	-	-
2047	(-)	(-)	(-)	-	-	-
2048	(-)	(-)	(-)	-	-	-
2049	(-)	(-)	(-)	-	-	-
2050	(-)	(-)	(-)	-	-	-

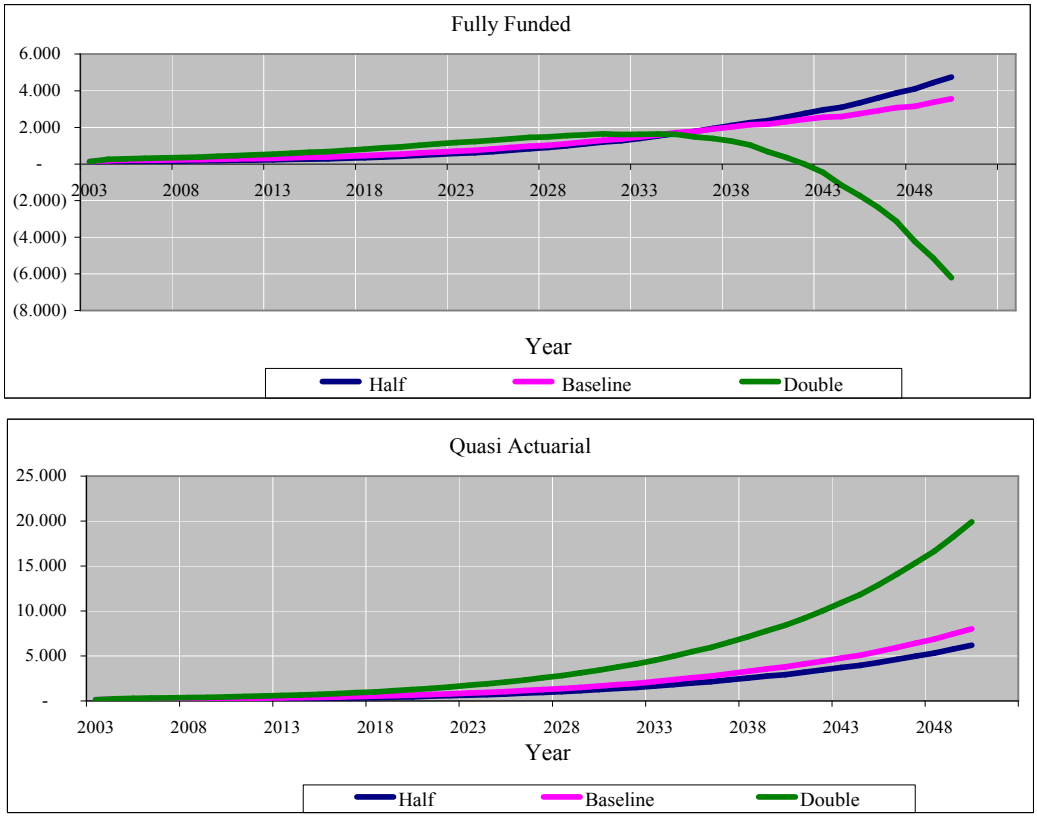
Source: Author's own estimation, Hazmomics actuarial model.

Let us now start interpreting some of the expected consequences of changing the ROR assumption on the financial viability of both proposed reform strategies. The fully funded approach surprisingly indicates that the increase in the reserve investment profitability could result in decreasing the course length of financial surpluses to which the scheme afterwards, turns to be a case of deficit. With a comparison to the baseline assumption, duplicating the assumed value of ROR helps the system to generate higher levels of financial balances over the medium term horizon, but turns down to lower levels over a longer term one. This can be attributed mainly to the fact that pension insurable outlays would increase proportionally more than the proportional gain in investment yields. In other words, pensioners get a higher rate of return on their contributions that the increase

due to their retirement benefits, which cannot be offset by the correlative increase in the scheme non insurable revenues. Such a scenario quickly discerns what the end of a fully funded strategy would look like. It should be recognized, however, that all the financial shortages that come after the depletion of SSC reserves represent mainly the unfunded liabilities of those who would have retired entirely or partially on the basis of the old unreformed system. On the contrary, if they system investment policy performs inefficiently and yields as much as half of the baseline assumed ROR, then one can depict from Figure 5.24 that this might improve the financial sustainability of the system with respect to time, but will not last infinitely.[83]

To the contrast of the implications that might appear due to changing the assumed ROR in the fully funded approach, the financial viability of the scheme when the quasi actuarial strategy is alternatively implemented seems to improve with respect to a higher level of returns and to deteriorate whenever the returns go down. Mathematically as well as logically, this can be ascribed by the fact that when the buffer fund investment profitability falls down, the non-insurable revenues fall proportionally more than the declination of insurable expenditure, and vice versa.

[83] This applies only for the aggregate scheme financial balances. We will see latter in this section how this would worsen the intergenerational fairness of the scheme participants.



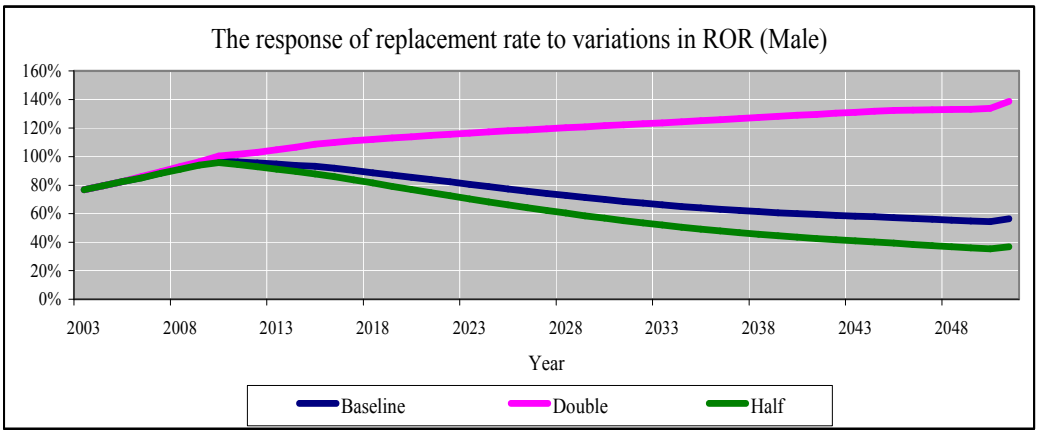
Source: Author's own estimation, Hazmomics actuarial model.

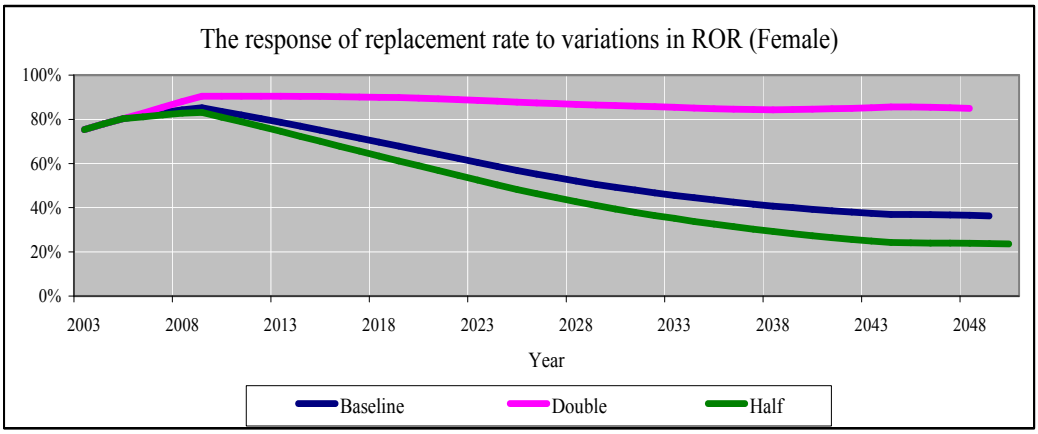
Figure 5.24: The impact of buffer fund profitability on the scheme's financial balances

Another important dimension need to be considered in this context is how the principle of intergenerational adequacy and equity responses to changing in the ROR assumption. With regard to the intergenerational adequacy, the variations in buffer fund profitability play a crucial role in determining the level of participant's replacement rate upon retirement under both investigated reform strategies, since such profitability comprises one of the most important components of benefits formula. In the status quo scenario, benefits remain independent of ROR as long as the model assumes that unfunded ongoing liabilities are financed via enhancing the contributions of insured workers.

Exploring the adequacy consequences of changing the assumable ROR in the fully funded scenario, as Figure 5.25 clearly depicts, discerns explicitly the extent to which pensioners replacement rates are sensitive to this factor. A good performing investment strategy of buffer fund that yields a double baseline assumed ROR substantially increases the level of pensioner adequacy measured by gross replacement rate. Instead of ending-up by almost three-fifth the last earned salary before retirement for males who retire in

2050 at the normal age of retirement when the ROR is on its baseline scenario, counterpart participants could get more than double this level if the investment strategy would have performed twice the baseline performance. If on the other hand, the investment strategy fails to achieve the assumed baseline ROR and performs only as much as half that level, participants adequacy could fall to few percentage points above one-fifth the baseline level by the year 2050. What calls for attention in both cases is that the former case is less affordable in the very long run since we have seen that financial balances tend to go in deficit during the simulation period.[84] The latter case, propositionally speaking, would also be far than favorable from a pure participant's point of view since it would land them up by an extremely low level of adequacy, although it is financially welcomed by the scheme sponsors.



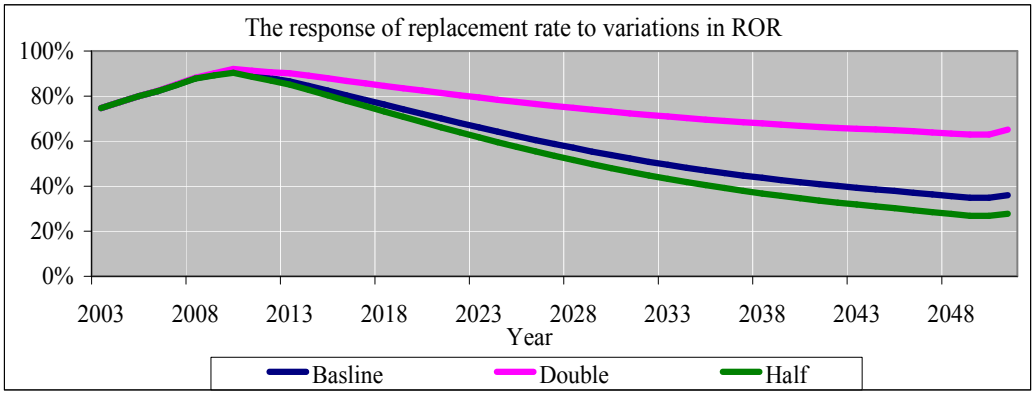


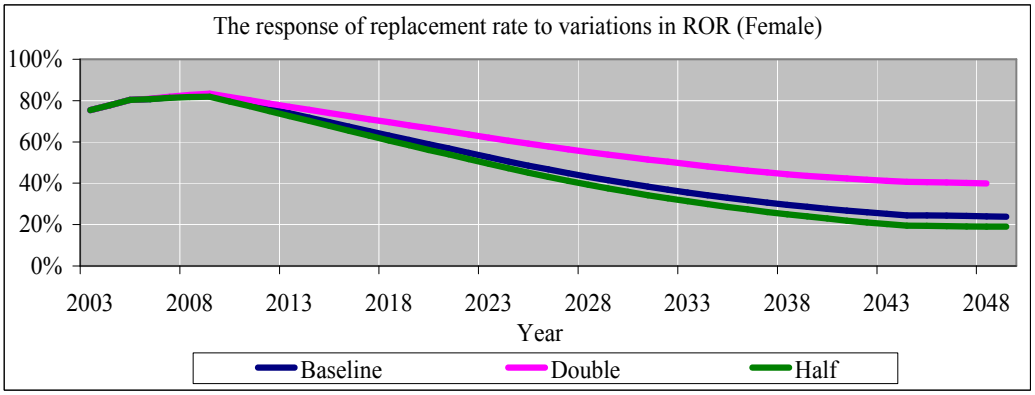
Source: Author's estimation, Hazmomics actuarial model.

Figure 5.25: The response of participant's replacement rate to variations in buffer fund's profitability (Fully Funded)

[84] As these balances continue further in deficit, they would gradually deplete the scheme financial reserves in the foreseen future.

The case might even be worse for pensioners if the quasi actuarial strategy is alternatively implemented and the reserves of the scheme fail to generate more than half of the baseline presumed ROR, since by the end of our simulation period normally retiring males and females could not substitute more than 28% and 19% of their pre-retirement insured salaries, respectively. The contrary case in terms of ROR, on the other hand, elevates the hope of participants regarding the implementation of such strategy as it will provide them with relatively ad-equitable pensions when compared with those of their parents. This conclusion, however, seems more acceptable of male rather than for female participants. Since the latter participants do not tend to earn as much as half their pre-retirement salary even under a very optimistic scenario concerning the ROR. The best way to which they can reach at least that level is through postponing their retirement age at the expense of their own leisure.





Source: Author's estimation, Hazmomics actuarial model.

Figure 5.26: The response of participant's replacement rate to variations in buffer fund's profitability (Quasi Actuarial)

Before turning to the issue of intergenerational equity, let us exploit the financial aggregate advantages that originate from achieving a high ROR on the SSC buffer fund to increase the degree of equity in the quasi actuarial approach. As we have already

indicated in the above analyses, a substantial increase in the profitability of the SSC buffer fund improves the financial viability of the scheme and it might make the scheme even more than funded. If this argument is true, then one can ask why we shouldn't increase the level of equity in a way that brings back the scheme to the line of fully funding and at the same time raises the adequacy of participants.

A possible way to increase the degree of equity and at the same time keeping on the incentive implications of the quasi actuarial approach,[85] is to annuitize the accumulated contributions of each participant at the time of retirement to the remaining life span with an annuity rate that comprise half the ROR estimated to occur on SSC the buffer fund.[86]

Utilizing such a methodological presumption in our model discerns some hopes for participants who could fear from the great influence of implementing this reform approach on their retirement adequacy. Figure 5.27 shows how the adequacy of participants who retire at the normal age of retirement under a gradually implemented quasi actuarial reform develops over the simulation period and responses to variances in ROR. Instead of acquiring a pension that comprises almost three-fifth the pre-retirement salary of males who retire in 2050 under the case where a buffer performance stands on twice as much as the baseline assumed ROR and the equity principle is applied in the same manner of the baseline methodology, they could earn almost few percentage points less than their pre-retirement salary if the degree of equity belongs to the adjusted approach. This of course rams us on a general ratiocination that the optimal combination between equity and adequacy in reformed partially funded schemes depends mainly on the performance of the buffer fund.

The females adequacy would also be increased if the ROR where high enough to increase the degree of equity in a quasi actuarial but in a lesser extent than males, since as we have already indicated, their normal retirement age is 5 years lower than of males and they also live longer than they. Accordingly, relatively lower levels of accumulated contributions would be distributed for a longer period of life span after retirement. In spite of these facts, females get almost 60% of their pre-retirement salary if the degree if equity would have increased in a quasi actuarial reform strategy.

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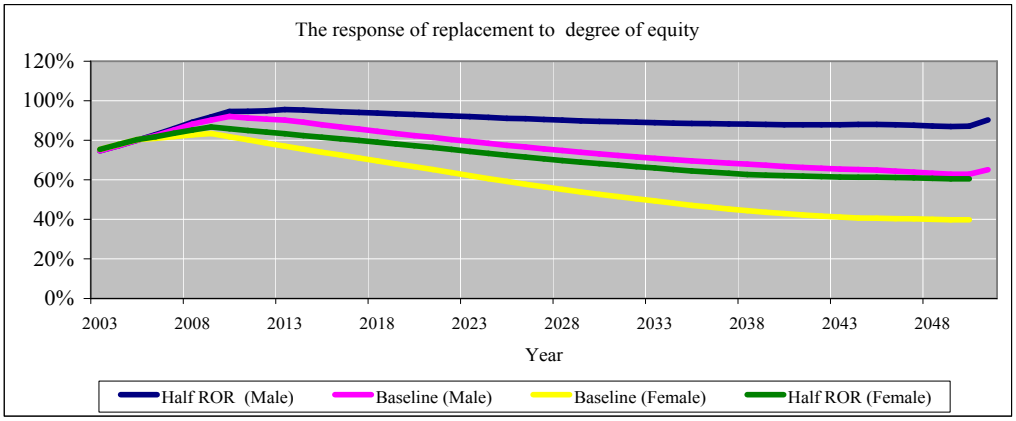
[85] We have explained in the previous how a quasi actuarial approach involves a greater motivation for late retirement when compared with those associate within the fully funded approach.

[86] This is only an assumption; it might prove that the needed fraction should be lower or higher than half of that rate.



Source: Author's estimation, Hazmomics actuarial model

Figure 5.27: The response of pensioner's replacement rate to various degrees of equity

The exploration of the responsiveness of ROR given on the contributions of participants form different cohorts to the variances in buffer fund ROR calls for some comebacks. In a status quo scenario, changing the assumed future ROR on SSC buffer fund influences the participants own profitability through affecting the time of reserve depletion and thus the need to step-up the contribution rate. As we have already shown, increasing the assumed ROR delays the need of rising contributions since it helps the scheme to raise more revenues and hence slows down the reserves depletion, and vice versa.

In both reform strategies, the implications of changing the rate of buffer fund profitability on the distribution of ROR among different cohorts appear more explicitly than it is implicitly recognized in the status quo scenario. The disparity between early born cohorts and latter ones, with respect to implicit ROR given on their contributions, vanishes whenever the profitability of utilizing the scheme reserves increases, and widen with its declination.

The hope about both reform scenarios, aside from their future sustainability, is that they involve a smoothly falling ROR across subsequent cohorts as long as the investment of the scheme reserves performing virtuously. This desired feature can be portrayed in figure as the curves that represent the implicit ROR given on the contributions of subsequent cohort slopes gradually under both simulated reform scenarios where the profitability of the scheme investment comprises double the baseline assumptions. On the other hand, later cohorts in the status quo scenario seem as the pure looser in terms of the ROR they get implicitly on their contributions, even though the scheme generates a

proportionally high return on its revenues. For instance, a male participant who was born in 1974 gets 2 percentage points more than a counterpart male who was born 15 years latter. Under the status quo scenario, such a spread gradually propagates among cohorts with more than 30 years of age gap. The fact looks even better when the fully funded scenario is alternatively considered, since the generational ROR curves slope more flatly than those of the quasi actuarial approach.

The most prominent fear of both reform approaches, however, originates whenever the scheme performs badly in terms of the level of profitability it generates on its accumulated reserves. One dimensional aspect of anxiety is that future pensioners would experience a steeply falling ROR on their own pension contributions. These unwanted consequences can be obviated by introducing some guaranty tools such as providing participants with a minimum ROR on their contributions. What should always be recognized for such a solution, however, is that any sort of guaranty would come at the expense of scheme future financial viability.[87]

At the end of this spectrum, although reform strategies that involve a direct link between pensions and contributions tend to provide vulnerable sorts of intergenerational equity, they would in the worst cases entail a more stabilized intergenerational equity trends if the perspective expands for a longer term horizon.

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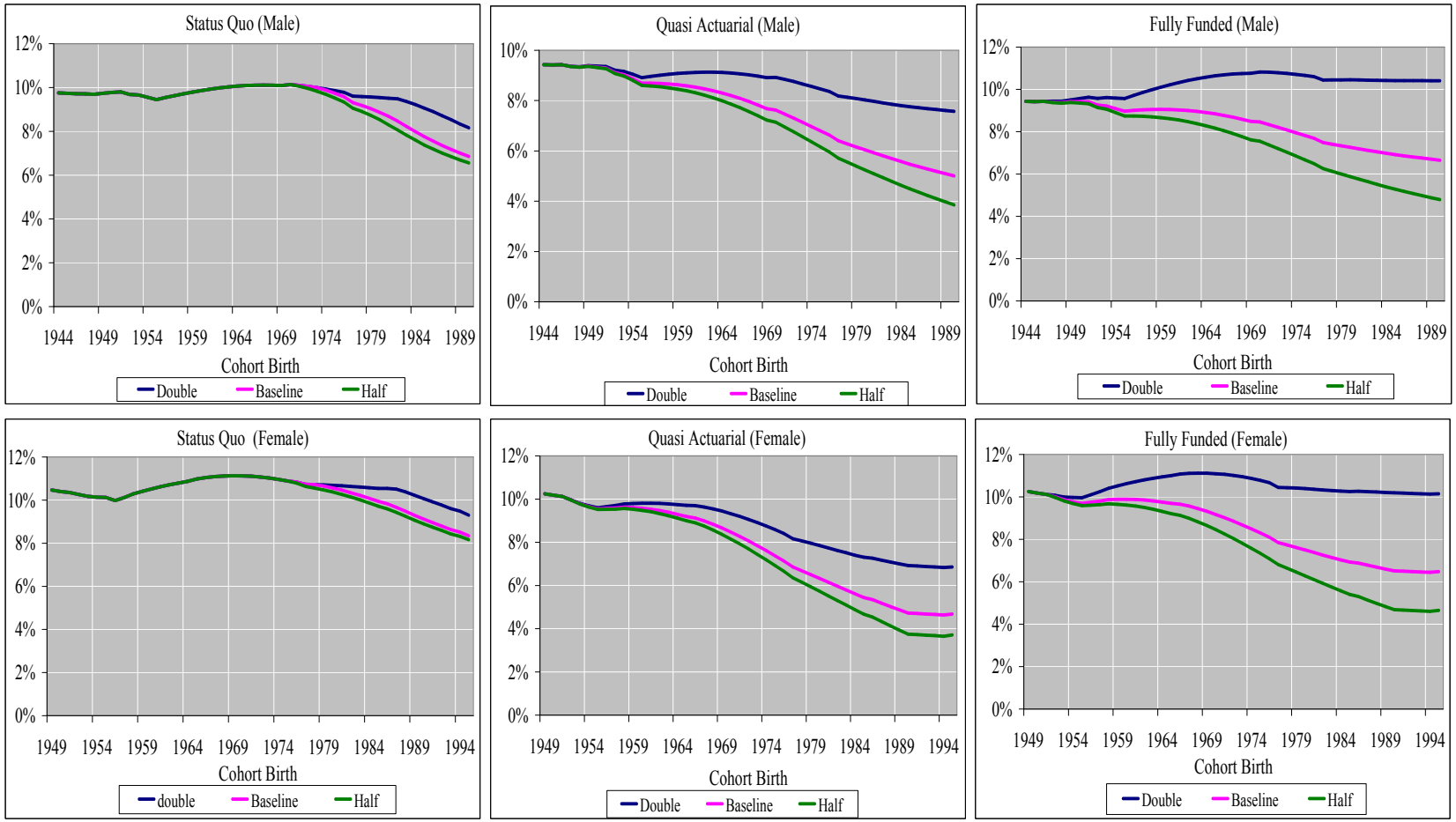
[87] Risks that involve shortages in the future financial resources to cover the corresponding outlets are often defined as default risks. See for instance,



Source: Author's estimation, Hazmomics actuarial model.

Figure 5.28: The response of generational ROR to the profitability of SSC buffer fund

5.10.2 Coverage Ratio

As indicated at earlier sections of this chapter, age and gender specific coverage ratios are extremely needed in the process of projecting future financial conditions for pension provisions. They integrate the corresponding counts of actively employed inhabitants to generate detailed figures concerning the participants who are covered under the umbrella of pension insurance.

Before performing the quantitative outcomes of changing the main hypotheses regarding the fraction of employed persons covered by the SSC, it is worthwhile to explain why this sort of alteration is needed in this context. First, it should be recognized to what extent pension crises could come earlier or later than we have already estimated in the baseline-status quo scenario as a result of changing the future prospects about the scheme agents' structure, namely the dependency ratio. The second significant reason for requesting such an analysis is to judge the stability of the consequences and reform implications that have already emerged in our baseline scenario with respect to variations in the pension coverage ratio.

To explore the possible consequences of adjusting the coverage ratio all along the simulation period, we presumably modify the annual growth rate of male coverage ratio to half of its baseline rate. Applying this adjustable rate to our simulation model has resulted in an increase in the average coverage ratio of all one-year age brackets from 30% in 2003 to almost 43% by 2050, instead from 30% to 60% in the baseline scenario assumption, respectively.

Logically speaking before quantitatively evaluating, such an adjustment would involve a potential impact on two main dimensional aspects for the future of SSC. The first appears through decreasing the prospected figures concerning the development in the number of insured workers and hence the insurable revenues of the scheme. Consequently, the second influence takes place on the number of new pensioners since they are generated via applying the age specific retirement rate on the corresponding number of insured participants. This of course, brings down the insurable outlays toward future pensioners when compared with their estimated levels according to the baseline scenario assumptions. The net impact of these consequences on the scheme financial viability depends mainly on the elasticity of the scheme revenues and expenditures in each status scenario to the change in the number of participants.

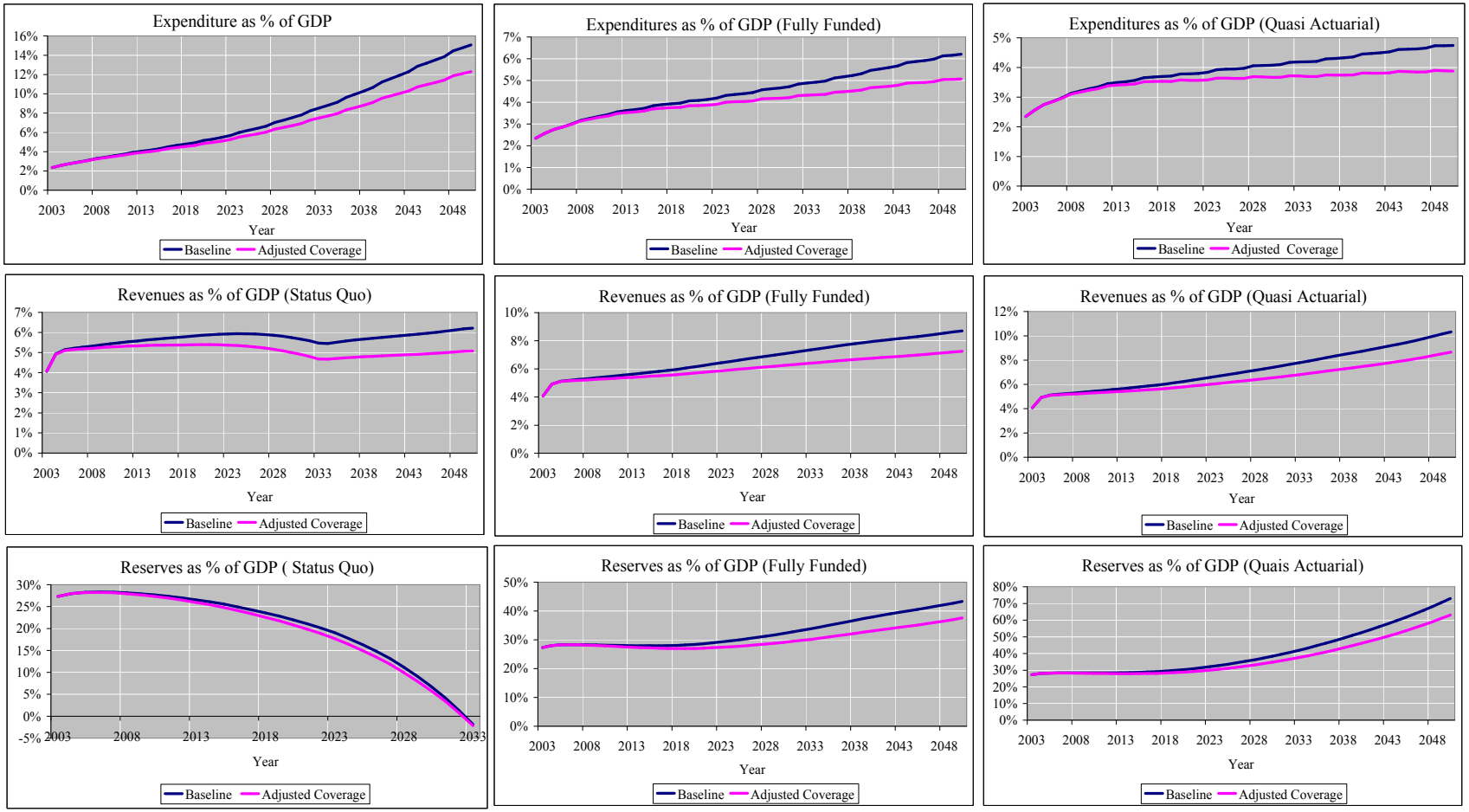
Switching to the quantitative outcomes of changing our concerned assumption, Figure 5.29 shows how the schemes future viability of the scheme under the status quo and reform scenarios conditions would be influenced by reducing the future figures about the males coverage ratio.

Interestingly, the sensitivity analysis of the status quo conditions belittles the aggregate influence of falling coverage ratio on the scheme buffer reserves. This can apparently be seen in the below figures regardless of system experiences. The simulation of the same future trend in the baseline scenario of males' coverage ratio or the reduced one, shows that the scheme's reserves would be fully depleted by 2033. Aside from the issue of reserves depletion, the observed gap between the total scheme outlays that accrue under the basically assumed coverage ratios and those accrued after reducing these ratios gradually increases until it reaches almost 2% of GDP in 2050. The revenues on the other hand, would also gradually fall across the simulated period as a result of reducing the estimates of the future development in male coverage ratios. This however would be in a lesser extent than it might appear in expenditures side since the model has indicated that the influence of the latter adjustment on revenues reaches its maximal drop of almost one percentage point of GDP by 2050. [88]

The greatest influence of changing such prospects appears more significantly in the case where either reform strategies are implemented. This can mainly be attributed by the fact that the elasticity of scheme revenues under both reform scenarios is greater than of expenditures. For instance, by 2050 the revenues under the status quo reform scenario decreases by almost two percentage points of GDP if the future male's coverage ratios would have stabilized on the reduced baseline levels. While the influence of such an adjustment in coverage ratios on the scheme total expenditures could not surpass one percentage year by the same year of comparison. Consequently, the reserves of the scheme as result of being relatively pessimistic about the future development in male's coverage ratio drop gradually and increasingly along the simulated period. However, the scale of drop seems greater in the case of funded reform scenario than the observed level in the quasi actuarial one as the proportional drop of the expenditures in the former case is lower and that of revenues is higher.

[88] This applies only among our simulated years. It is more likely that the extent of drop increases after 2050.

Generally interpreting, the coverage ratio plays an imperative role in determining the possible degree of equity that can be implemented in any reform strategy aims at increasing the link between pension contributions and benefits. More particularly for the SSC, the ever wanted increase in the level of coverage should not be considered as one of the substantial solutions to postpone the financial collapse of the scheme while keeping it on the rules of the current law.



Source: Author's estimation, Hazmomics actuarial model.

Figure 5.29: The development of the scheme financial conditions when reducing the coverage ratio prospects

6. Conclusions

The study evidently depicts that the JSSC suffers from severe weaknesses and structural problems. The current SSC law, from a pure adequacy perspective, provides extremely generous compensations for almost all participants receiving benefits from the majority provisions provided by the SSC. As in other countries, but in a greater extent, the current law favors females over males and low income over higher income earners. The elasticity of replacement rate with respect to the age of retirement, gives no strong reason why participants shouldn't retire earlier than the normal age of retirement. Regardless of the level of income and the gender status, most of the participants who fulfill the minimum vesting period for early retirement, can replace half of their pre retirement income with a lifelong retirement income if they decided to retire at the age of forty-five. In terms of international standard, this is extremely generous. As regards disability, it seems that the current law provides acceptable levels of disability income for participants who become disabled during their participation in the scheme after having fulfilled the minimum vesting period for such a provision. The implication of this feature, however, shouldn't serve a big attention as in the case of old age provision, for several reasons. Among them is that receiving such a kind of benefits is neither the control of participants but rather the control of the scheme sponsors, and more particularly of an independent medical committee. the second reason for no big policy attention refer to low number of those who receive disability pension when compared with the number of beneficiaries from old age provision as well as other provisions.

Concerning the financial measures of generosity, the distributional model has reported never wanted implications of the current law. Foremost, the Old-Age provision pays an extremely high implicit rate of return (ROR) on pension contributions that by far exceeds either the rate of return generated on the SSC buffer fund or of stock traded in Amman Stock Exchange market. There are also clear signs of ROR heterogeneity with respect to several factors, among which are the participants earning level, gender status, vesting period and age of retirement. The extent of preferable treatment of low income earners over higher ones with regard to money's worth measures, however, does not imply any further challenges. To the contrary of thereof, the view might change if the perception that high

income earners do really live longer than those who earn much less, does really apply in Jordan. In addition to that, the Net Present Value measure verifies that ROR wouldn't be the best measure of generosity in this respect as the net present value of those who are earning more is much greater than others, even though the implicit ROR on their pension contributions is lower. The greatest attention, however, should directly be oriented towards the most worrying outcomes of generosity measure. The negative elasticity of implicit ROR on contributions with respect to the age of retirement and the vesting period not only motivates early retirement, but it also encourages participants to game the scheme by contributing for relatively shorter vesting periods.

On the static basis, proposed reform strategies, the fully funded and the quasi actuarial system, have proved some optimistic outcomes in terms of the two concepts of generosity. The only advantage of quasi actuarial over the funded reform approach is that the former provide a greater extent of motivation for postponing the age of retirement and it allows also for internally financing the transition cost of the scheme as well as providing some risk pooling (solidarity element) among the scheme participants.

The analysis of the scheme overall future financial conditions shows that the scheme is not anymore at the beginning of a long financial march but rather at the mid of a shorter one. If the rules of the current law kept unchanged along the foreseeable future, the scheme would most likely suffer subsequent financial challenges. After 2011, the system would start to experience a continuous deficit in its operating balance in which scheme aggregate expenditures couldn't entirely be covered by its insurable revenues. Five years later, not only the insurable revenues would not be able to finance the operating expenses but they would also fail to cover the insurable outlays accrued to different types of beneficiaries. However, the deficit in the annual insurable balance could still be financed via the investment revenues generated on the scheme accumulated reserves until the end of the 2022 financial year. After that, the increase in aggregate deficit could still be financed through the gradual exhaustion of the scheme reserves until they are fully depleted by 2031.

If the scheme sponsors decide to finance the continuing deficit in the scheme total outlays via imposing extra rates of contribution on the scheme working participants (on PAYG basis), then the total contributions rate is likely to increase gradually from fewer percentage points above one-fifth their monthly salary in 2032 to more than forty percentage points by 2050.

The simulation of an age-based gradual transition mechanism to either fully funded scheme with a fair degree of equity and a quasi actuarial with a lower one shows that the system financial viability would substantially improve. But the lower levels of benefit implied within the quasi actuarial approach when compared with those implied according to the funded approach would maintain the scheme viability for a longer term horizon infinitely. While in the fully funded approach, the possibility for the scheme to remain infinitely solvent is logically unrealistic, for two reasons. The first concerns the transition cost that has to be paid sometime and the second relates directly to the solidarity principle of the scheme in which adequate benefits have to be provided for all participants who fulfill certain requirements and some security based provisions such as disability that should remain unclosed.

The most debatable consequences are those which relate to the adequacy and intergenerational equity measures. In the status quo scenario, retirement benefits are assumed to remain unchangeable as future deficits are modeled to be internally financed through charging extra contributions from the working participants. Thus, the level of adequacy appears constant from the beginning of the coming decade and so forth. The adequacy implied in both reform scenarios, however, would likely to decrease all along the simulated period and stabilize afterward. The level of adequacy connoted in the fully funded approach is higher than those appear in the other proposed strategy. But as has been mentioned above, once the scheme is likely to become insolvent in sometime in the future, the level of adequacy might fall again. Frankly interpreting, subsequent retirees would experience a chronological decline in their retirement adequacy levels than those would imply if the current SSC law remains unchanged, though this presumption is less possible to subsist. But it is theoretically possible that when participants recognize such a declining trend early in their career life would save more to substitute the expected losses in their future adequacy (Flavin, 1981; Hubbard, 1986). However, it might be proved that mandating participants to contribute more to the scheme is a better substitute than leaving them save voluntary. Such a conclusion can be attributed to several reasons, among them, is that mandatory savings to prevent participants from to myopic behavior and also they might generate a higher rate of return when compared with rates that are given on regular deposit account.

As regards the intergenerational fairness under the status quo and reform scenarios conditions, the simulations have clearly shown that the equity of males who are born after 1974 and females after 1979 would dramatically drop if the scheme continues working under the rules of current law. Although the decrease in participants equity appears for earlier cohorts when either reform strategy is alternatively implemented, the marginal decrement in participant equity among future subsequent cohorts are lower. Again, the higher equity degrees implied in the fully funded scenario when they are compared with the quasi actuarial are less likely to remain stable in a longer term perspective. The sensitivity analysis is also used to estimate how the above measures respond to changes in the baseline assumptions. The possibility to spread the transition cost among more subsequent generations and hence more equity degree inherent in the reform strategy, mainly depends on the volume of accumulated reserves, the scheme unfunded liability, investment profitability, retirement probabilities and the increase future participation, among others. For instance, the increase in the rate of return generated on the scheme reserves would likely improve the assets and liability position of the scheme and thus allow a space for the transition cost to be distributed more gradually.

The conclusion that Feldstein and Samwick (1996) have reached regarding the possibility to switch the American unfunded pension scheme to funded pension with a minor increase in contribution rate and stable level of benefits cannot be considered as a general theory for reforming unfunded schemes but rather a scheme specific-option and possibility. The potential rates of return on pension reserves, the assets and liability position, as well as other important variables considered in their study do not similarly exist in other country schemes. Direct evidence on the scheme specific conditions of reform, is the main elements that helped Chile to successfully proceed with its reform experience. Acuña and Iglesias (2001) report that the increase of income from copper surpluses, the large growth of income tax receipts and the revenues from privatizing public entities have helped Chile to pay-off its pension unfunded liability.

Appendix

Appendix 1: The development of the SSC financial conditions

Scheme's Financial Measures (Million JD)										
	Scheme's Revenues				Expenditures			Financial Indicators		
	Insurance Revenues		Other							
Year	Pension Contributions	Other Contributions	Investment Revenues	Total Revenues	Insurance	Administrative	Total	Insurable Balance	Operational Balance	Overall Balance
1980	4,1	0,6	0,1	4,8	0	0,3	0,3	4,7	4,4	4,5
1981	10,2	1,4	0,6	12,2	0,4	0,5	0,9	11,2	10,7	11,3
1982	21,3	2,6	1,5	25,4	1,2	0,7	1,9	22,7	22	23,5
1983	24,2	2,9	2,9	30,0	2,6	0,9	3,5	24,5	23,6	26,5
1984	32,2	3,9	4	40,1	3,6	0,9	4,5	32,5	31,6	35,6
1985	34,1	4,3	5,4	43,8	5,3	1,5	6,8	33,1	31,6	37
1986	40	5	8,1	53,1	7,4	1,3	8,7	37,6	36,3	44,4
1987	38,8	4,7	11,3	54,8	9,1	1,5	10,6	34,4	32,9	44,2
1988	40,5	4,9	14,2	59,6	11	1,8	12,8	34,4	32,6	46,8
1989	42,2	5,2	20,1	67,5	14,6	2	16,6	32,8	30,8	50,9
1990	44,6	5,5	25,5	75,6	17,7	2,5	20,2	32,4	29,9	55,4
1991	47	5,6	31,3	83,9	18,2	2,6	20,8	34,4	31,8	63,1
1992	54,1	6,5	29,7	90,3	20,2	3,2	23,4	40,4	37,2	66,9
1993	63,4	7,6	35,7	106,7	23,4	4,2	27,6	47,6	43,4	79,1
1994	70,6	8,6	39,9	119,1	28,4	5,2	33,6	50,8	45,6	85,5
1995	79,6	9,8	49,7	139,1	32,9	5	37,9	56,5	51,5	101,2
1996	91,6	11,2	62,8	165,6	41,5	5,5	47	61,3	55,8	118,6
1997	104,3	12,9	76,7	193,9	50,2	6	56,2	67	61	137,7
1998	110,7	13,7	76,4	200,8	57,5	6,4	63,9	66,9	60,5	136,9
1999	124,6	15,4	103,2	243,2	66,6	7,3	73,9	73,4	66,1	169,3
2000	132,4	16,3	85,5	234,2	79,5	7	86,5	69,2	62,2	147,7
2001	154,2	17,9	72,6	244,7	104,3	7,7	112	67,8	60,1	132,7
2002	181,6	20,1	37,7	239,4	132,1	11,2	143,3	69,6	58,4	96,1
2003	190	21	68,6	279,6	153,7	12,1	165,8	57,3	45,2	113,8

Source: Author's own representation based on SSC's annual reports, different issues.

Appendix 2: The ROR on market and SSC sectoral portfolios

Year	Industrial		Banking		Service		Insurance		Portfolio	
	SSC	Market	SSC	Market	SSC	Market	SSC	Market	SSC	Market
1986	3	3,3	1,3	4,2	2	3,5	3,9	6,8	2,4	3,8
1987	2,5	4,2	0,8	4,5	1,7	3	6	8,1	1,9	4,3
1988	1,8	4,6	0,9	4	1,4	2,7	4,9	7,2	1,5	4,3
1989	3,9	5,3	1,1	3,5	1,4	4,4	2,5	8,6	3,1	4,6
1990	4,7	7,3	2,1	2,9	1,4	4,5	2,7	7,9	3,8	5,3
1991	4,8	6,8	2,5	3,5	3,2	5	2,7	9,2	4,2	5,4
1992	5	6,7	4,9	3,9	3,3	5,2	10,8	9,5	4,5	5,5
1993	2	6,2	3,7	3,9	9,3	6	5,4	10	2,8	5,3
1994	1,7	4,6	3,9	3,4	7,4	5	7,6	7,4	2,7	4,2
1995	2	4,1	3,3	3	7,5	3,9	6,5	6,8	2,8	3,7
1996	3,2	4,3	2,8	2,9	5,6	2,1	3,6	4,2	3,4	3,4
1997	1,9	3,7	2,3	2,5	4,7	0,9	10,5	3,3	2,4	2,5
1998	3,1	4,1	2,3	3,1	4,6	1,2	4,2	2,8	2,4	2,9
Average	3	5	2	3	4	4	5	7	3	4

Source: Author's own calculations and representation based on Zaghloul (2003).

Appendix 3: Pension insurance indicators in selected countries

Pension Insurance Indicators in Selected Countries

Country	Contribution Rate		Life Expectancy at Birth		Normal Retirement Age		Earliest Retirement Age	
	Insured Participant	Employer	Male	Female	Male	Female	Male	Female
Algeria	5,5	8	68,7	71,8	60	55	50	45
Bahrain	5	7	72,1	76,3	60	65	c	c
Egypt	13	17	66,7	69,9	60	60	c	c
Jordan	5,5	9	69,7	72,5	60	55	45	45
Kuwait	10	20	74,9	79	50	50	45	45
Lebanon	0	8,5	71,9	75,1	64	64	60	60
Libya	3,75	10,5	69,2	73,3	65	60	c	c
Morroco	3,96	7,93	66,8	70,5	60	60	c	c
Oman	5	8	70,2	73,2	60	55	c	c
Saudi Arabia	9	9	71,1	73,7	60	55	c	c
Sudan	8	17	55,6	58,4	60	55	45	45
Syria	7	14	70,6	73,1	60	55	55	50
Tunisia	3,68	7,37	69,6	72,7	60	60	50	50
Yemen	6	9	60,7	62,9	60	55	50	45
Average Arab	6,1	10,9	68,4	71,6	59,9	57,4	50	48
Austria	10,25	12,55	75	81,5	65	60	c	c
Belgium	7,5	8,86	75,7	81,9	65	63	60	60
Cyprus	6,3	6,3	76	80,5	65	65	63	63
France	6,65	9,8	75,2	82,8	60	60	c	c
Germany	9,75	9,75	75	81,1	65	65	60	60
Greece	6,67	13,33	75,9	81,2	65	60	60	55
Italy	8,89	23,81	75,5	81,9	65	60	c	c
Norway	7,8	14,1	76	81,9	67	67	c	c
Sweden	7	11,91	77,6	82,6	65	65	61	61
Switzerland	11,9	11,9	75,9	82,3	65	63	c	c
Turkey	9	11	68	73,2	55	50	c	c
UK	11	12,8	75,7	80,7	65	60	c	c
Average Europe	8,6	12,2	75,1	81,0	63,9	61,5	54	52

Source: Author's own representation based on: ISSA (2004) for the selected European countries; ISSA (2003a) for the selected Arab-African countries; ISSA (2002) for the selected Arab-Asian Countries.

c: The country has no early pensionable age, has one only for specific groups, or information is not available.

Appendix 4: The development in the scheme's revenues under status quo conditions

Status Quo's Revenues													
Scheme's Total Revenues (Million JD)													
						Insurance Revenues							
	Annual Insured Salary (JD)		OA Contributions by Employer			Contributions by Employee							
Year	Male	Female	Male	Female	Total	Male	Female	Total	Total OA Contributions	Other Insurance Revenues	Total Insurance Revenues	Investment Revenues	Total Revenues
2004	3054	2477	102	28	130	62	17	80	210	44	254	117	372
2005	3141	2557	112	32	144	68	20	88	232	49	280	139	419
2006	3238	2639	123	36	159	75	22	97	256	54	309	152	461
2007	3338	2721	135	40	175	83	24	107	282	59	341	165	506
2008	3489	2846	148	44	192	90	27	118	310	65	375	178	553
2009	3660	2978	163	50	213	100	30	130	343	72	415	192	607
2010	3833	3115	179	55	234	109	34	143	377	79	457	206	663
2011	4019	3256	197	62	258	120	38	158	416	87	503	221	724
2012	4217	3403	216	68	284	132	42	174	458	96	554	236	789
2013	4415	3556	236	76	311	144	46	190	502	105	607	250	857
2014	4635	3719	259	84	343	158	51	209	552	116	668	265	933
2015	4863	3893	283	93	376	173	57	230	605	127	732	281	1013
2016	5106	4079	308	103	411	188	63	251	663	139	801	296	1098
2017	5367	4275	337	113	450	206	69	275	725	152	877	311	1188
2018	5637	4484	367	125	492	224	76	301	793	166	959	325	1284
2019	5935	4704	401	138	539	245	84	330	869	182	1051	338	1389
2020	6252	4931	438	152	590	268	93	361	950	199	1150	351	1501
2021	6585	5169	477	167	644	292	102	394	1038	218	1255	362	1618
2022	6933	5416	519	184	703	317	112	429	1132	237	1370	372	1742
2023	7291	5670	563	201	764	344	123	467	1231	258	1489	380	1869
2024	7668	5936	610	221	830	373	135	507	1338	281	1619	384	2003
2025	8060	6212	659	242	901	403	148	551	1452	305	1757	383	2139
2026	8468	6495	712	265	976	435	162	597	1573	330	1903	376	2278
2027	8889	6791	766	290	1056	468	177	645	1702	357	2058	363	2422
2028	9318	7093	824	316	1140	503	193	697	1837	385	2222	343	2566
2029	9764	7407	884	346	1230	540	211	752	1981	416	2397	310	2708
2030	10221	7730	947	377	1325	579	231	810	2134	448	2582	267	2849
2031	10682	8060	1013	412	1425	619	252	871	2296	482	2778	210	2989
2032	11157	8405	1082	450	1532	661	275	936	2469	518	2987	139	3125
2033	11642	8754	1153	490	1643	705	299	1004	2648	556	3203	45	3248
2034	12141	9109	1229	533	1762	751	326	1077	2839	596	3435	0	3435
2035	12652	9475	1309	580	1889	800	354	1154	3043	639	3681	0	3681
2036	13166	9851	1391	629	2021	850	384	1235	3255	683	3939	0	3939
2037	13685	10232	1475	682	2157	901	417	1318	3476	730	4205	0	4205
2038	14209	10620	1560	739	2299	953	451	1405	3703	777	4481	0	4481
2039	14744	11018	1645	798	2444	1006	488	1493	3937	826	4764	0	4764
2040	15282	11428	1734	863	2597	1060	527	1587	4183	878	5062	0	5062
2041	15832	11853	1826	932	2758	1116	569	1685	4443	933	5376	0	5376
2042	16382	12289	1919	1005	2924	1172	614	1787	4711	989	5700	0	5700
2043	16948	12734	2014	1083	3097	1231	662	1893	4989	1047	6037	0	6037
2044	17569	13243	2118	1161	3279	1294	710	2004	5282	1109	6391	0	6391
2045	18266	13852	2231	1238	3470	1364	757	2120	5590	1174	6764	0	6764
2046	19002	14492	2354	1318	3672	1439	806	2244	5916	1242	7159	0	7159
2047	19773	15162	2484	1402	3886	1518	857	2375	6260	1314	7575	0	7575
2048	20574	15866	2620	1489	4109	1601	910	2511	6620	1390	8010	0	8010
2049	21400	16592	2762	1580	4342	1688	965	2653	6995	1469	8464	0	8464
2050	22175	17278	2900	1667	4568	1772	1019	2791	7359	1545	8904	0	8904

Source: Author's estimation

Appendix 5: Scheme's estimated expenditures under the Status Quo conditions

Scheme's Expenditures (Million JD)											
	Insurance Expenditures										
	Old Age			Natural Disability			Other Insurance Expenditures	Total Insurance Expenditures	Adminstrative Expenditures and Allowances	Total Expenditures	Total Expenditures as % of GDP
Year	Male	Female	Total	Male	Female	Total					
2004	113	11	124	25	2	27	29	180	19	199	2,6
2005	136	15	151	25	2	27	32	210	21	231	2,8
2006	160	19	179	25	2	28	35	242	23	265	2,9
2007	188	23	212	26	3	29	38	278	25	303	3,1
2008	225	28	253	27	3	29	41	323	28	351	3,3
2009	257	34	290	27	3	30	44	364	31	395	3,4
2010	293	41	334	27	3	30	48	412	33	445	3,6
2011	331	48	379	28	3	32	52	463	37	499	3,7
2012	381	57	438	29	4	33	56	527	40	567	3,9
2013	428	66	494	30	4	34	60	588	43	631	4,0
2014	477	76	553	30	4	35	65	653	47	701	4,2
2015	532	89	622	32	5	37	70	729	51	780	4,3
2016	607	105	711	33	5	38	76	826	56	881	4,5
2017	675	120	795	34	6	40	82	916	61	977	4,6
2018	748	136	885	36	6	42	88	1014	65	1080	4,8
2019	826	155	981	38	7	45	95	1121	71	1192	4,9
2020	932	179	1111	40	8	48	102	1261	77	1338	5,2
2021	1027	203	1230	42	8	51	110	1391	83	1473	5,3
2022	1137	230	1367	45	9	54	119	1539	89	1629	5,5
2023	1265	261	1526	49	10	59	127	1712	96	1808	5,7
2024	1437	298	1735	52	11	64	137	1935	103	2038	6,0
2025	1590	337	1927	56	12	68	147	2142	110	2252	6,2
2026	1755	378	2133	60	14	74	157	2364	118	2482	6,4
2027	1942	427	2369	66	16	82	168	2619	125	2744	6,6
2028	2202	488	2690	71	17	88	180	2958	133	3091	7,0
2029	2428	546	2974	77	19	96	192	3262	141	3402	7,3
2030	2678	611	3289	83	21	104	205	3598	148	3747	7,5
2031	2953	685	3637	92	23	116	218	3972	156	4128	7,8
2032	3323	777	4100	100	26	126	233	4459	164	4623	8,2
2033	3650	868	4519	108	29	137	248	4903	171	5074	8,5
2034	3998	967	4965	117	32	148	264	5377	181	5558	8,8
2035	4370	1085	5454	129	35	165	281	5900	194	6094	9,1
2036	4889	1227	6116	140	39	179	298	6593	207	6800	9,6
2037	5343	1361	6703	151	43	194	317	7214	221	7435	9,9
2038	5839	1508	7347	163	47	210	336	7892	236	8128	10,3
2039	6375	1676	8051	180	52	232	355	8637	251	8888	10,7
2040	7110	1872	8982	193	57	250	375	9607	266	9873	11,2
2041	7730	2052	9783	207	62	269	396	10448	283	10731	11,6
2042	8388	2248	10636	222	67	289	418	11343	300	11643	11,9
2043	9073	2474	11547	242	75	317	441	12305	318	12622	12,3
2044	10009	2736	12745	258	81	339	465	13549	336	13885	12,9
2045	10758	2983	13740	274	88	362	489	14592	356	14948	13,2
2046	11541	3256	14797	292	96	387	515	15699	377	16076	13,5
2047	12366	3580	15946	317	106	422	542	16910	399	17309	13,9
2048	13510	3966	17476	336	114	450	570	18495	422	18917	14,5
2049	14374	4307	18681	356	123	479	599	19759	445	20205	14,7
2050	15271	4708	19978	385	136	521	628	21127	469	21596	15,1

Source: Author's own estimation.

Appendix 6: Scheme's estimated financial indicators under the Status Quo conditions

Status Quo's Financial Indicators (Million JD)						
Year	Operational Balance	Insurable Balance	Total Balance	Surpluss or Deficit as % of GDP	Reserves	Reserves as % of GDP
2004	61	80	178	2,4	2107	28,0
2005	55	76	195	2,4	2302	28,3
2006	51	75	203	2,3	2505	28,3
2007	45	70	210	2,2	2715	28,3
2008	32	60	211	2,0	2926	28,1
2009	28	59	220	2,0	3146	27,9
2010	21	54	227	1,9	3372	27,7
2011	14	50	234	1,8	3607	27,4
2012	-2	38	233	1,6	3840	27,0
2013	-13	30	237	1,5	4077	26,5
2014	-21	27	245	1,5	4322	26,1
2015	-35	16	245	1,4	4567	25,6
2016	-66	-10	230	1,2	4797	24,9
2017	-85	-25	226	1,1	5023	24,3
2018	-106	-40	219	1,0	5242	23,6
2019	-125	-54	213	0,9	5455	22,8
2020	-172	-95	179	0,7	5634	22,0
2021	-201	-118	161	0,6	5796	21,1
2022	-242	-152	131	0,4	5926	20,1
2023	-302	-206	78	0,2	6004	19,0
2024	-402	-299	-17	-0,1	5987	17,8
2025	-478	-367	-95	-0,3	5892	16,3
2026	-562	-444	-186	-0,5	5706	14,8
2027	-669	-543	-306	-0,7	5401	13,2
2028	-852	-719	-509	-1,2	4892	11,2
2029	-991	-850	-680	-1,5	4211	9,0
2030	-1152	-1003	-885	-1,8	3326	6,7
2031	-1340	-1183	-1129	-2,1	2197	4,2
2032	-1630	-1466	-1491	-2,7	706	1,3
2033	-1869	-1698	-1824	-3,1	-	-
2034	-2123	-1942	-2123	-3,4	-	-
2035	-2413	-2219	-2413	-3,6	-	-
2036	-2862	-2654	-2862	-4,0	-	-
2037	-3230	-3008	-3230	-4,3	-	-
2038	-3648	-3412	-3648	-4,6	-	-
2039	-4124	-3873	-4124	-4,9	-	-
2040	-4812	-4545	-4812	-5,5	-	-
2041	-5354	-5072	-5354	-5,8	-	-
2042	-5943	-5643	-5943	-6,1	-	-
2043	-6585	-6268	-6585	-6,4	-	-
2044	-7494	-7157	-7494	-6,9	-	-
2045	-8184	-7828	-8184	-7,2	-	-
2046	-8917	-8540	-8917	-7,5	-	-
2047	-9734	-9335	-9734	-7,8	-	-
2048	-10907	-10485	-10907	-8,3	-	-
2049	-11740	-11295	-11740	-8,6	-	-
2050	-12691	-12223	-12691	-8,9	-	-

Source: Author's own estimation.

Appendix 7: Scheme's member structure under the Status Quo conditions.

	Contributors			Beneficiaries						
				Old Age			Natural Disability			Other Provisions
Year	Male	Female	Total	Male	Female	Total	Male	Female	Total	
2004	371053	127701	498754	45313	6478	51791	13.805	1575	15380	11618
2005	395614	138679	534293	50128	7566	57694	13.828	1631	15459	12445
2006	422168	150329	572497	54970	8645	63615	13.859	1693	15552	13335
2007	449374	162932	612306	60184	9825	70009	13.896	1759	15655	14263
2008	470763	173646	644409	65743	11101	76844	13.923	1832	15755	15010
2009	494888	185432	680320	71131	12498	83629	13.964	1912	15876	15847
2010	518651	197581	716232	76963	14087	91050	14.009	1994	16003	16683
2011	543225	210161	753386	82801	15732	98533	14.066	2086	16152	17549
2012	568395	223453	791848	88929	17591	106520	14.141	2188	16329	18445
2013	593015	236784	829799	95601	19533	115134	14.230	2301	16531	19329
2014	619946	250878	870824	102383	21641	124024	14.346	2423	16769	20284
2015	645464	265524	910988	109766	24091	133857	14.483	2550	17033	21220
2016	671198	279959	951157	117624	26625	144249	14.646	2691	17337	22156
2017	696975	294776	991751	125989	29294	155283	14.844	2840	17684	23101
2018	723274	309955	1033229	134738	32126	166864	15.073	2996	18069	24067
2019	751481	325712	1077193	143603	35148	178751	15.346	3165	18511	25091
2020	778922	341806	1120728	153009	38462	191471	15.661	3344	19005	26105
2021	805431	358479	1163910	162993	41996	204989	16.028	3539	19567	27111
2022	832138	376513	1208651	174136	45808	219944	16.453	3752	20205	28153
2023	857373	394483	1251856	186584	49920	236504	16.923	3976	20899	29160
2024	883387	413317	1296704	199792	54273	254065	17.448	4217	21665	30205
2025	908653	433057	1341710	213779	59205	272984	18.023	4475	22498	31253
2026	933697	452612	1386309	228362	64348	292710	18.666	4749	23415	32292
2027	958011	473982	1431993	244258	69925	314183	19.371	5041	24412	33356
2028	982316	495782	1478098	261488	75968	337456	20.138	5342	25480	34430
2029	1006064	518586	1524650	279201	82377	361578	20.952	5675	26627	35514
2030	1029885	542611	1572496	297979	89208	387187	21.824	6028	27852	36629
2031	1053729	568341	1622070	317571	96316	413887	22.750	6405	29155	37783
2032	1077559	595153	1672712	338018	104050	442068	23.735	6809	30544	38963
2033	1100792	621812	1722604	359426	112459	471885	24.769	7236	32005	40125
2034	1125141	650114	1775255	381121	121220	502341	25.858	7689	33547	41352
2035	1149618	679626	1829244	403233	130637	533870	27.003	8163	35166	42609
2036	1174198	709597	1883795	426561	140676	567237	28.203	8659	36862	43880
2037	1197670	740900	1938570	451166	151268	602434	29.439	9168	38607	45156
2038	1219669	772941	1992610	476835	162562	639397	30.701	9704	40405	46414
2039	1239986	805209	2045195	503456	174162	677618	31.987	10267	42254	47639
2040	1260586	838875	2099461	531073	185949	717022	33.295	10855	44150	48903
2041	1281581	873495	2155076	559579	198243	757822	34.623	11465	46088	50199
2042	1301274	908964	2210238	588508	211062	799570	35.954	12112	48066	51484
2043	1320332	944878	2265210	617245	224284	841529	37.282	12799	50081	52764
2044	1339197	974250	2313447	645773	237598	883371	38.605	13516	52121	53888
2045	1357340	993456	2350796	674435	252009	926444	39.927	14266	54193	54758
2046	1376504	1010668	2387172	702859	267341	970200	41.255	15036	56291	55605
2047	1395794	1027246	2423040	730982	283359	1014341	42.578	15830	58408	56441
2048	1414968	1042766	2457734	757986	300287	1058273	43.903	16643	60546	57249
2049	1434102	1057962	2492064	784461	317393	1101854	45.226	17491	62717	58048
2050	1453314	1072217	2525531	810631	335087	1145718	46.550	18363	64913	58828

Source: Author's own estimation.

Appendix 8: Scheme's estimated revenues under Quasi Actuarial approach

	Average-Annual Insured Salary (JD)		Insurance Revenues (Million JD)										
			OA Contributons by Employer			OA Contributions by Employee							
Year	Male	Female	Male	Female	Total	Male	Female	Total	Total OA Contributions	Other Insurance Revenues	Total Insurance Revenues	Investment Revenues	Total Revenues
2004	3054	2477	101	28	130	62	17	79	209	44	253	117	370
2005	3161	2573	112	31	143	68	19	87	230	48	278	139	417
2006	3258	2655	123	35	158	75	21	96	254	53	307	152	459
2007	3360	2739	135	39	174	82	24	106	280	59	338	165	503
2008	3512	2865	148	43	191	90	26	117	308	64	372	179	551
2009	3685	2998	163	48	211	100	30	129	340	71	412	194	605
2010	3859	3136	179	54	233	109	33	142	375	79	453	209	663
2011	4048	3279	196	60	256	120	37	157	413	87	500	226	726
2012	4247	3428	216	67	282	132	41	172	455	95	550	244	794
2013	4448	3582	236	74	309	144	45	189	498	104	603	264	867
2014	4670	3748	259	82	340	158	50	208	548	115	663	285	948
2015	4901	3923	283	91	373	173	55	228	601	126	727	308	1035
2016	5146	4111	309	100	409	189	61	250	658	138	796	333	1129
2017	5410	4310	337	110	447	206	68	273	721	151	872	360	1232
2018	5684	4521	367	122	489	224	74	299	788	165	953	390	1343
2019	5985	4743	402	134	536	246	82	328	864	181	1045	423	1468
2020	6305	4973	439	148	587	268	90	358	945	198	1143	460	1603
2021	6643	5214	478	163	641	292	99	391	1032	216	1248	499	1748
2022	6995	5465	520	179	699	318	109	427	1126	236	1362	544	1906
2023	7357	5722	564	196	760	344	120	464	1224	257	1481	594	2074
2024	7739	5991	611	215	826	373	132	505	1331	279	1610	648	2258
2025	8137	6271	661	236	897	404	144	548	1445	303	1748	707	2454
2026	8551	6558	713	258	971	436	158	594	1565	328	1893	771	2664
2027	8977	6858	768	283	1051	470	173	642	1693	355	2048	843	2891
2028	9412	7165	826	309	1135	505	189	694	1828	384	2212	922	3134
2029	9866	7484	887	337	1224	542	206	748	1972	414	2386	1006	3392
2030	10329	7812	950	369	1319	581	225	806	2125	446	2571	1099	3670
2031	10798	8148	1016	403	1419	621	246	867	2286	480	2766	1202	3968
2032	11280	8498	1086	440	1526	664	269	932	2458	516	2974	1314	4288
2033	11774	8852	1158	479	1636	708	293	1000	2637	553	3190	1435	4625
2034	12281	9214	1234	521	1755	754	318	1073	2828	594	3422	1567	4988
2035	12800	9587	1315	567	1881	803	346	1150	3031	636	3667	1712	5378
2036	13325	9969	1398	615	2013	854	376	1230	3243	681	3924	1870	5793
2037	13853	10358	1482	667	2150	906	408	1314	3463	727	4190	2040	6230
2038	14387	10753	1568	723	2290	958	442	1400	3690	775	4465	2224	6689
2039	14933	11159	1654	781	2435	1011	477	1488	3924	824	4747	2425	7172
2040	15481	11577	1743	845	2588	1065	516	1582	4169	875	5045	2641	7686
2041	16043	12011	1837	912	2749	1122	558	1680	4429	930	5359	2871	8229
2042	16605	12456	1931	985	2915	1180	602	1782	4697	986	5683	3119	8802
2043	17184	12910	2027	1061	3088	1239	648	1887	4975	1044	6020	3387	9407
2044	17771	13377	2127	1143	3269	1300	698	1998	5267	1106	6373	3675	10048
2045	18409	13913	2233	1226	3459	1365	749	2114	5573	1170	6743	3982	10725
2046	19141	14545	2355	1305	3660	1439	798	2237	5897	1238	7135	4313	11448
2047	19910	15209	2484	1389	3873	1518	849	2367	6240	1310	7550	4670	12220
2048	20712	15910	2620	1476	4096	1601	902	2503	6599	1385	7984	5056	13040
2049	21543	16636	2762	1566	4328	1688	957	2645	6973	1464	8437	5467	13903
2050	22323	17326	2900	1654	4554	1772	1011	2783	7337	1540	8878	5911	14789

Source: Author's own estimation

Appendix 9: Scheme's estimated expenditures under Quasi Actuarial approach

	Insurance Expenditures (Million JD)										
	Old Age			Natural Disability							
Year	Male	Female	Total	Male	Female	Total	Other Insurance Expenditures	Total Insurance Expenditures	Adminstrative Expenditures and Allowances	Total Expenditures	Total Expenditures as % of GDP
2004	112	11	124	25	2	27	29	180	19	199	2,6
2005	135	15	150	25	2	27	31	209	21	230	2,7
2006	157	18	175	25	2	28	34	237	23	260	2,9
2007	180	21	202	26	3	29	37	268	25	293	3,0
2008	211	26	237	27	3	29	40	306	28	334	3,1
2009	236	30	266	27	3	30	44	339	30	370	3,2
2010	264	35	299	27	3	30	47	376	33	410	3,3
2011	292	40	332	28	3	32	51	415	37	451	3,3
2012	329	46	375	29	4	33	55	463	40	503	3,5
2013	360	52	412	30	4	34	60	505	44	549	3,5
2014	392	58	450	30	4	35	65	549	48	597	3,5
2015	426	66	492	32	5	37	70	598	52	651	3,6
2016	473	75	548	33	5	38	75	661	57	718	3,7
2017	512	83	595	34	6	40	81	716	63	778	3,7
2018	553	91	644	36	6	42	87	773	68	841	3,7
2019	592	101	693	38	7	45	94	832	75	906	3,7
2020	648	113	761	40	7	47	102	910	81	991	3,8
2021	692	124	815	42	8	50	109	975	89	1064	3,8
2022	741	135	877	45	9	54	118	1048	97	1145	3,8
2023	798	148	947	49	10	59	126	1132	106	1238	3,8
2024	877	163	1040	52	11	63	136	1239	115	1354	3,9
2025	938	178	1116	56	12	68	145	1329	125	1454	3,9
2026	999	192	1191	60	13	73	156	1420	136	1556	3,9
2027	1065	209	1274	66	15	81	167	1522	147	1669	4,0
2028	1164	229	1393	71	17	88	178	1659	160	1819	4,1
2029	1237	246	1483	77	18	95	190	1769	173	1942	4,1
2030	1314	264	1578	83	20	104	203	1885	187	2072	4,1
2031	1396	285	1681	92	23	115	217	2013	202	2216	4,1
2032	1514	310	1824	100	25	125	231	2180	219	2399	4,2
2033	1604	333	1937	108	28	136	246	2319	236	2555	4,2
2034	1695	356	2051	117	31	148	262	2461	254	2715	4,2
2035	1788	385	2173	130	35	164	279	2616	274	2890	4,2
2036	1933	417	2350	140	38	178	297	2825	296	3120	4,3
2037	2043	445	2489	151	42	193	315	2996	318	3314	4,3
2038	2163	475	2638	163	45	209	333	3181	341	3522	4,3
2039	2290	511	2801	180	51	231	353	3385	366	3751	4,4
2040	2481	548	3029	193	55	249	373	3651	392	4043	4,5
2041	2623	581	3204	207	60	268	394	3865	420	4285	4,5
2042	2771	615	3386	222	66	288	416	4089	449	4539	4,5
2043	2921	658	3579	243	73	316	439	4333	480	4813	4,5
2044	3143	703	3845	259	79	338	462	4645	513	5158	4,6
2045	3296	742	4038	275	86	361	487	4887	547	5434	4,6
2046	3449	786	4235	292	93	386	513	5134	585	5718	4,6
2047	3610	843	4453	318	103	421	539	5413	624	6037	4,7
2048	3853	905	4759	336	112	448	568	5774	666	6440	4,7
2049	4006	957	4964	356	121	477	597	6037	710	6748	4,7
2050	4161	1024	5185	386	133	518	625	6329	756	7084	4,7

Source: Author's own estimation

Appendix 10: Scheme's financial indicators under the Quasi Actuarial approach (Million JD)

Quasi Actuarial Financial Indicators						
Year	Operational Balance	Insurable Balance	Total Balance	Surpluss or Deficit as %	Reserves	Reserves as % of GDP
2004	60	79	177	2,3	2106	28,0
2005	55	76	194	2,4	2300	28,2
2006	54	77	206	2,3	2506	28,3
2007	53	78	218	2,3	2724	28,4
2008	46	74	225	2,2	2949	28,4
2009	51	81	244	2,2	3193	28,3
2010	53	87	262	2,2	3456	28,3
2011	59	95	285	2,2	3740	28,4
2012	58	99	303	2,1	4043	28,4
2013	66	110	329	2,1	4372	28,4
2014	79	127	364	2,2	4736	28,6
2015	91	143	398	2,2	5135	28,7
2016	93	151	426	2,2	5561	28,9
2017	110	172	470	2,3	6031	29,1
2018	130	199	520	2,3	6551	29,4
2019	158	233	581	2,4	7132	29,8
2020	173	255	633	2,5	7765	30,3
2021	208	296	707	2,6	8472	30,8
2022	242	339	786	2,7	9259	31,4
2023	271	377	865	2,7	10123	32,1
2024	286	401	934	2,8	11058	32,8
2025	327	452	1033	2,9	12091	33,6
2026	374	509	1145	3,0	13236	34,4
2027	419	566	1262	3,1	14497	35,3
2028	436	596	1358	3,1	15856	36,2
2029	492	665	1498	3,2	17354	37,2
2030	550	737	1650	3,3	19003	38,3
2031	607	809	1809	3,4	20812	39,5
2032	637	856	1951	3,5	22763	40,7
2033	703	939	2138	3,6	24901	41,9
2034	781	1035	2347	3,7	27248	43,3
2035	858	1133	2570	3,8	29818	44,7
2036	893	1188	2762	3,9	32580	46,1
2037	973	1291	3013	4,0	35593	47,6
2038	1049	1390	3273	4,1	38867	49,2
2039	1113	1479	3538	4,2	42404	50,8
2040	1128	1521	3769	4,3	46173	52,5
2041	1211	1631	4082	4,4	50255	54,2
2042	1294	1743	4413	4,5	54668	56,0
2043	1370	1850	4757	4,6	59425	57,8
2044	1392	1905	5067	4,7	64492	59,7
2045	1502	2049	5483	4,8	69975	61,7
2046	1626	2210	5939	5,0	75914	63,7
2047	1739	2364	6410	5,1	82324	65,9
2048	1790	2456	6846	5,2	89169	68,1
2049	1956	2666	7422	5,4	96591	70,5
2050	2082	2838	7993	5,6	104585	73,0

Source: Author's own estimation.

Appendix 11: Scheme's members structure under the Quasi Actuarial approach

	Contributors			Beneficiaries						
				Old Age			Natural Disability			Other
Year	Male	Female	Total	Male	Female	Total	Male	Female	Total	Provisions
2004	368312	127701	496013	45263	6471	51734	13.803	1575	15378	11554
2005	392693	133987	526680	49933	7540	57473	13.823	1627	15450	12268
2006	419048	145245	564293	54575	8551	63126	13.849	1688	15537	13144
2007	446054	157421	603475	59515	9643	69158	13.881	1749	15630	14057
2008	467285	167772	635057	64738	10815	75553	13.906	1818	15724	14793
2009	491231	179163	670394	69708	12085	81793	13.946	1897	15843	15616
2010	514820	190898	705718	75027	13523	88550	13.987	1977	15964	16439
2011	539208	203054	742262	80279	14989	95268	14.041	2066	16107	17290
2012	564196	215900	780096	85708	16631	102339	14.110	2165	16275	18171
2013	588635	228778	817413	91573	18321	109894	14.193	2271	16464	19040
2014	615364	242395	857759	97419	20141	117560	14.302	2388	16690	19980
2015	640697	256545	897242	103724	22245	125969	14.437	2511	16948	20900
2016	666244	270489	936733	110345	24395	134740	14.596	2646	17242	21820
2017	691827	284805	976632	117316	26639	143955	14.788	2791	17579	22749
2018	717934	299474	1017408	124515	28986	153501	15.010	2943	17953	23699
2019	745931	314695	1060626	131639	31473	163112	15.277	3105	18382	24705
2020	773170	330247	1103417	139118	34169	173287	15.588	3276	18864	25702
2021	799483	346362	1145845	146928	37023	183951	15.952	3462	19414	26691
2022	825994	363783	1189777	155562	40078	195640	16.371	3668	20039	27714
2023	851038	381148	1232186	165214	43332	208546	16.835	3881	20716	28702
2024	876866	399338	1276204	175282	46713	221995	17.351	4112	21463	29727
2025	901947	418413	1320360	185836	50545	236381	17.921	4358	22279	30756
2026	926796	437307	1364103	196585	54448	251033	18.559	4620	23179	31774
2027	950932	457956	1408888	208132	58632	266764	19.256	4899	24155	32818
2028	975059	479011	1454070	220634	63120	283754	20.010	5188	25198	33870
2029	998637	501045	1499682	233201	67808	301009	20.818	5507	26325	34933
2030	1022275	524259	1546534	246318	72779	319097	21.680	5847	27527	36024
2031	1045950	549123	1595073	259892	77838	337730	22.596	6208	28804	37155
2032	1069599	575026	1644625	273721	83314	357035	23.569	6596	30165	38309
2033	1092658	600783	1693441	288133	89253	377386	24.594	7007	31601	39446
2034	1116827	628130	1744957	302430	95357	397787	25.672	7445	33117	40646
2035	1141118	656651	1797769	316661	101893	418554	26.806	7904	34710	41876
2036	1165526	685601	1851127	331554	108779	440333	27.994	8385	36379	43119
2037	1188821	715843	1904664	347144	115954	463098	29.219	8878	38097	44366
2038	1210656	746806	1957462	363285	123527	486812	30.473	9398	39871	45596
2039	1230821	777977	2008798	379819	131189	511008	31.747	9941	41688	46792
2040	1251271	810515	2061786	396723	138818	535541	33.046	10511	43557	48026
2041	1272114	843949	2116063	413989	146696	560685	34.364	11101	45465	49290
2042	1291885	878225	2170110	431275	154817	586092	35.685	11724	47409	50549
2043	1310881	912918	2223799	448123	163120	611243	36.998	12383	49381	51800
2044	1329610	949033	2278643	464374	171292	635666	38.308	13080	51388	53077
2045	1347943	978869	2326812	480455	180056	660511	39.623	13809	53432	54199
2046	1366971	997284	2364255	495809	189326	685135	40.943	14553	55496	55071
2047	1386349	1014623	2400972	510913	198859	709772	42.256	15323	57579	55927
2048	1405524	1030608	2436132	524740	208898	733638	43.573	16117	59690	56746
2049	1424530	1045856	2470386	537850	218688	756538	44.884	16944	61828	57543
2050	1443609	1060616	2504225	550496	228713	779209	46.199	17796	63995	58332

Source: Author's own estimation.

Appendix 12: Scheme's estimated revenues under the Fully Funded approach

			Insurance Revenues (Million JD)										
	Annual Insured S		OA Contributons by Employer			OA Contributions by Employees							
Year	Male	Female	Male	Female	Total	Male	Female	Total	Total OA Contributions	Other Insurance Revenues	Total Insurance Revenues	Investment Revenues	Total Revenues
2004	3054	2477	101	28	130	62	17	79	209	44	253	117	370
2005	3161	2573	112	31	143	68	19	87	230	48	278	139	417
2006	3258	2655	123	35	158	75	21	96	254	53	307	152	459
2007	3360	2739	135	39	174	82	24	106	280	59	338	165	503
2008	3512	2865	148	43	191	90	26	117	308	64	372	179	551
2009	3685	2998	163	48	211	100	30	129	340	71	412	193	605
2010	3859	3136	179	54	233	109	33	142	375	79	453	208	662
2011	4048	3279	196	60	256	120	37	157	413	87	500	224	724
2012	4247	3428	216	67	282	132	41	172	455	95	550	242	792
2013	4448	3582	236	74	309	144	45	189	498	104	603	260	863
2014	4670	3748	259	82	340	158	50	208	548	115	663	280	943
2015	4901	3923	283	91	373	173	55	228	601	126	727	301	1028
2016	5146	4111	309	100	409	189	61	250	658	138	796	324	1120
2017	5410	4310	337	110	447	206	68	273	721	151	872	348	1220
2018	5684	4521	367	122	489	224	74	299	788	165	953	374	1328
2019	5985	4743	402	134	536	246	82	328	864	181	1045	403	1448
2020	6305	4973	439	148	587	268	90	358	945	198	1143	435	1578
2021	6643	5214	478	163	641	292	99	391	1032	216	1248	468	1717
2022	6995	5465	520	179	699	318	109	427	1126	236	1362	506	1868
2023	7357	5722	564	196	760	344	120	464	1224	257	1481	547	2028
2024	7739	5991	611	215	826	373	132	505	1331	279	1610	591	2201
2025	8137	6271	661	236	897	404	144	548	1445	303	1748	638	2385
2026	8551	6558	713	258	971	436	158	594	1565	328	1893	688	2582
2027	8977	6858	768	283	1051	470	173	642	1693	355	2048	744	2793
2028	9412	7165	826	309	1135	505	189	694	1828	384	2212	804	3016
2029	9866	7484	887	337	1224	542	206	748	1972	414	2386	867	3254
2030	10329	7812	950	369	1319	581	225	806	2125	446	2571	936	3507
2031	10798	8148	1016	403	1419	621	246	867	2286	480	2766	1010	3776
2032	11280	8498	1086	440	1526	664	269	932	2458	516	2974	1090	4064
2033	11774	8852	1158	479	1636	708	293	1000	2637	553	3190	1174	4363
2034	12281	9214	1234	521	1755	754	318	1073	2828	594	3422	1264	4685
2035	12800	9587	1315	567	1881	803	346	1150	3031	636	3667	1361	5028
2036	13325	9969	1398	615	2013	854	376	1230	3243	681	3924	1465	5389
2037	13853	10358	1482	667	2150	906	408	1314	3463	727	4190	1574	5764
2038	14387	10753	1568	723	2290	958	442	1400	3690	775	4465	1690	6155
2039	14933	11159	1654	781	2435	1011	477	1488	3924	824	4747	1813	6561
2040	15481	11577	1743	845	2588	1065	516	1582	4169	875	5045	1943	6988
2041	16043	12011	1837	912	2749	1122	558	1680	4429	930	5359	2075	7434
2042	16605	12456	1931	985	2915	1180	602	1782	4697	986	5683	2214	7897
2043	17184	12910	2027	1061	3088	1239	648	1887	4975	1044	6020	2361	8381
2044	17771	13377	2127	1143	3269	1300	698	1998	5267	1106	6373	2515	8887
2045	18409	13913	2233	1226	3459	1365	749	2114	5573	1170	6743	2671	9414
2046	19141	14545	2355	1305	3660	1439	798	2237	5897	1238	7135	2835	9971
2047	19910	15209	2484	1389	3873	1518	849	2367	6240	1310	7550	3010	10560
2048	20712	15910	2620	1476	4096	1601	902	2503	6599	1385	7984	3194	11178
2049	21543	16636	2762	1566	4328	1688	957	2645	6973	1464	8437	3382	11819
2050	22323	17326	2900	1654	4554	1772	1011	2783	7337	1540	8878	3583	12460

Source: Author's own estimation.

Appendix 13: Scheme's estimated expenditures under the Fully Funded approach

Scheme's Expenditures (Million JD)											
	Insurance Expenditures										
	Old Age			Natural Disability			Other Insurance Expenditures	Total Insurance Revenues	Adminstrative Expenditures and Allowances	Total Expenditures	Total Expenditures as % of GDP
Year	Male	Female	Total	Male	Female	Total					
2004	112	11	124	25	2	27	29	180	19	199	2,6
2005	135	15	150	25	2	27	31	209	21	230	2,7
2006	157	18	176	25	2	28	34	238	23	261	2,9
2007	182	22	204	26	3	29	37	270	25	296	3,0
2008	214	26	241	27	3	29	40	310	28	338	3,2
2009	241	31	272	27	3	30	44	345	30	376	3,3
2010	271	36	307	27	3	30	47	385	33	418	3,4
2011	302	41	343	28	3	32	51	426	37	462	3,4
2012	341	48	390	29	4	33	55	477	40	518	3,6
2013	377	54	431	30	4	34	60	524	44	568	3,6
2014	412	61	473	30	4	35	65	572	48	620	3,7
2015	451	70	521	32	5	37	70	627	52	680	3,7
2016	504	80	584	33	5	38	75	697	57	754	3,8
2017	550	89	638	34	6	40	81	759	62	821	3,9
2018	597	99	695	36	6	42	87	824	67	891	3,9
2019	643	110	753	38	7	45	94	892	74	965	4,0
2020	709	123	833	40	7	47	102	982	80	1062	4,1
2021	762	136	898	42	8	50	109	1058	87	1145	4,1
2022	823	150	973	45	9	54	118	1144	95	1239	4,1
2023	893	165	1058	49	10	59	126	1243	103	1347	4,2
2024	988	183	1171	52	11	63	136	1370	112	1482	4,3
2025	1065	201	1266	56	12	68	145	1479	122	1601	4,4
2026	1143	219	1361	60	13	73	156	1591	132	1723	4,4
2027	1228	240	1468	66	15	81	167	1716	143	1859	4,4
2028	1354	265	1619	71	17	88	178	1885	154	2040	4,6
2029	1451	287	1738	77	18	95	190	2024	166	2190	4,6
2030	1555	311	1866	83	20	104	203	2173	179	2353	4,7
2031	1667	339	2006	92	23	115	217	2338	193	2531	4,7
2032	1823	372	2195	100	25	125	231	2551	208	2760	4,8
2033	1949	403	2352	108	28	136	246	2734	224	2958	4,9
2034	2078	435	2513	117	31	148	262	2923	240	3163	4,9
2035	2211	475	2686	130	35	164	279	3130	258	3387	5,0
2036	2412	521	2933	140	38	178	297	3407	276	3684	5,1
2037	2573	562	3135	151	42	193	315	3642	296	3938	5,2
2038	2748	606	3354	163	45	209	333	3897	316	4212	5,2
2039	2936	658	3594	180	51	231	353	4177	337	4514	5,3
2040	3208	715	3923	193	55	249	373	4544	359	4903	5,5
2041	3421	766	4186	207	60	268	394	4848	382	5230	5,5
2042	3645	819	4464	222	66	288	416	5168	406	5573	5,6
2043	3874	885	4759	243	73	316	439	5513	431	5944	5,7
2044	4202	955	5157	259	79	338	462	5957	457	6414	5,8
2045	4442	1020	5462	275	86	361	487	6310	484	6794	5,9
2046	4684	1091	5775	292	93	386	513	6673	513	7186	5,9
2047	4940	1179	6119	318	103	421	539	7079	543	7623	6,0
2048	5311	1279	6590	336	112	448	568	7605	576	8181	6,1
2049	5560	1364	6924	356	121	477	597	7997	609	8606	6,2
2050	5814	1468	7283	386	133	518	625	8426	642	9068	6,2

Source: Author's own estimation.

Appendix 14: Scheme's financial indicators under the Fully Funded approach

Fully Funded Financial Indicators						
Year	Operational Balance	Insurable Balance	Total Balance	Surpluss or Deficit as % of GDP	Reserves	Reserves as % of GDP
2004	60	79	177	2,3%	2106	28,0%
2005	55	76	194	2,4%	2300	28,2%
2006	53	76	205	2,3%	2505	28,3%
2007	50	76	215	2,2%	2720	28,3%
2008	42	70	221	2,1%	2941	28,3%
2009	45	75	238	2,1%	3179	28,2%
2010	45	78	253	2,1%	3432	28,1%
2011	47	84	272	2,1%	3704	28,1%
2012	44	84	285	2,0%	3989	28,0%
2013	47	91	307	2,0%	4296	27,9%
2014	56	104	336	2,0%	4632	27,9%
2015	62	114	363	2,0%	4995	27,9%
2016	57	114	381	2,0%	5376	27,9%
2017	67	129	415	2,0%	5791	28,0%
2018	79	147	453	2,0%	6244	28,1%
2019	98	172	501	2,1%	6745	28,2%
2020	102	182	536	2,1%	7281	28,4%
2021	125	212	593	2,2%	7875	28,6%
2022	147	242	652	2,2%	8527	28,9%
2023	160	263	706	2,2%	9233	29,3%
2024	156	268	746	2,2%	9980	29,6%
2025	176	298	814	2,3%	10794	30,0%
2026	203	335	891	2,3%	11685	30,4%
2027	225	367	969	2,4%	12654	30,8%
2028	210	364	1015	2,3%	13668	31,2%
2029	236	403	1104	2,4%	14772	31,7%
2030	262	442	1198	2,4%	15970	32,2%
2031	283	476	1293	2,5%	17263	32,8%
2032	266	474	1356	2,4%	18619	33,3%
2033	288	511	1461	2,5%	20080	33,8%
2034	318	558	1582	2,5%	21662	34,4%
2035	344	602	1705	2,6%	23367	35,0%
2036	310	586	1775	2,5%	25142	35,6%
2037	327	623	1901	2,5%	27043	36,2%
2038	333	649	2023	2,6%	29066	36,8%
2039	320	657	2134	2,6%	31200	37,4%
2040	235	594	2178	2,5%	33378	37,9%
2041	229	611	2304	2,5%	35682	38,5%
2042	216	622	2431	2,5%	38112	39,0%
2043	190	620	2551	2,5%	40663	39,6%
2044	80	537	2595	2,4%	43258	40,0%
2045	78	562	2749	2,4%	46007	40,5%
2046	86	599	2922	2,5%	48928	41,1%
2047	73	617	3084	2,5%	52012	41,6%
2048	-41	534	3153	2,4%	55165	42,2%
2049	-5	604	3377	2,5%	58543	42,7%
2050	-16	626	3567	2,5%	62109	43,3%

Source: Author's own estimation.

Appendix 15: Scheme's members structure under the Fully Funded approach

	Contributors			Beneficiaries						
				Old Age			Natural Disability			
Year	Male	Female	Total	Male	Female	Total	Male	Female	Total	Other Provisions
2004	368312	127701	496013	45263	6471	51734	13.803	1575	15378	11554
2005	392693	133987	526680	49933	7540	57473	13.823	1627	15450	12268
2006	419048	145245	564293	54575	8551	63126	13.849	1688	15537	13144
2007	446054	157421	603475	59515	9643	69158	13.881	1749	15630	14057
2008	467285	167772	635057	64738	10815	75553	13.906	1818	15724	14793
2009	491231	179163	670394	69708	12085	81793	13.946	1897	15843	15616
2010	514820	190898	705718	75027	13523	88550	13.987	1977	15964	16439
2011	539208	203054	742262	80279	14989	95268	14.041	2066	16107	17290
2012	564196	215900	780096	85708	16631	102339	14.110	2165	16275	18171
2013	588635	228778	817413	91573	18321	109894	14.193	2271	16464	19040
2014	615364	242395	857759	97419	20141	117560	14.302	2388	16690	19980
2015	640697	256545	897242	103724	22245	125969	14.437	2511	16948	20900
2016	666244	270489	936733	110345	24395	134740	14.596	2646	17242	21820
2017	691827	284805	976632	117316	26639	143955	14.788	2791	17579	22749
2018	717934	299474	1017408	124515	28986	153501	15.010	2943	17953	23699
2019	745931	314695	1060626	131639	31473	163112	15.277	3105	18382	24705
2020	773170	330247	1103417	139118	34169	173287	15.588	3276	18864	25702
2021	799483	346362	1145845	146928	37023	183951	15.952	3462	19414	26691
2022	825994	363783	1189777	155562	40078	195640	16.371	3668	20039	27714
2023	851038	381148	1232186	165214	43332	208546	16.835	3881	20716	28702
2024	876866	399338	1276204	175282	46713	221995	17.351	4112	21463	29727
2025	901947	418413	1320360	185836	50545	236381	17.921	4358	22279	30756
2026	926796	437307	1364103	196585	54448	251033	18.559	4620	23179	31774
2027	950932	457956	1408888	208132	58632	266764	19.256	4899	24155	32818
2028	975059	479011	1454070	220634	63120	283754	20.010	5188	25198	33870
2029	998637	501045	1499682	233201	67808	301009	20.818	5507	26325	34933
2030	1022275	524259	1546534	246318	72779	319097	21.680	5847	27527	36024
2031	1045950	549123	1595073	259892	77838	337730	22.596	6208	28804	37155
2032	1069599	575026	1644625	273721	83314	357035	23.569	6596	30165	38309
2033	1092658	600783	1693441	288133	89253	377386	24.594	7007	31601	39446
2034	1116827	628130	1744957	302430	95357	397787	25.672	7445	33117	40646
2035	1141118	656651	1797769	316661	101893	418554	26.806	7904	34710	41876
2036	1165526	685601	1851127	331554	108779	440333	27.994	8385	36379	43119
2037	1188821	715843	1904664	347144	115954	463098	29.219	8878	38097	44366
2038	1210656	746806	1957462	363285	123527	486812	30.473	9398	39871	45596
2039	1230821	777977	2008798	379819	131189	511008	31.747	9941	41688	46792
2040	1251271	810515	2061786	396723	138818	535541	33.046	10511	43557	48026
2041	1272114	843949	2116063	413989	146696	560685	34.364	11101	45465	49290
2042	1291885	878225	2170110	431275	154817	586092	35.685	11724	47409	50549
2043	1310881	912918	2223799	448123	163120	611243	36.998	12383	49381	51800
2044	1329610	949033	2278643	464374	171292	635666	38.308	13080	51388	53077
2045	1347943	978869	2326812	480455	180056	660511	39.623	13809	53432	54199
2046	1366971	997284	2364255	495809	189326	685135	40.943	14553	55496	55071
2047	1386349	1014623	2400972	510913	198859	709772	42.256	15323	57579	55927
2048	1405524	1030608	2436132	524740	208898	733638	43.573	16117	59690	56746
2049	1424530	1045856	2470386	537850	218688	756538	44.884	16944	61828	57543
2050	1443609	1060616	2504225	550496	228713	779209	46.199	17796	63995	58332

Source: Author's own calculation.

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Marital Status: Single

EDUCATION

	TU-Darmstadt, Germany	**Darmstadt**
2003- 2005	Ph.D. student under the supervision of Prof. Dr.Dr.h.c Bert Rürup: Thesis Title "The Financial Implications of Sustainable Pension Reform: Theory and Scheme-Specific Options for the Jordanian Social Security Corporation,"	
1998-2000	**Yarmouk University, Jordan**	**Irbid**
	M.Sc. in Economics, January	
1993-1997	**Mosul University, Iraq**	**Mosul**
	B.Sc. in Economics with a ranking of second among class	
1993	General Secondary Education Certificate Examination.	**Amman**

PROFESSIONAL

2000 - 2003 **Ministry of Finance (MOF), Jordan** **Amman**

Economist& Financial Analyst at the Studies and Research Directorate

I was responsible for (a) preparing a studies on different national and global economic and fiscal issues (b) making recommendations on the regulations and acts of the fiscal policy in Jordan for the Minister and secretary general of finance (c) making recommendations to the Jordanian government on the Public pension scheme reforms (d) developing expenditure forecasting tools for the Jordanian Ministry of Finance (on behalf of the International Monetary Fund)

2002-2003 **Philidilphia University, Jordan** **Amman**

Lecturer

Part-time lecturer for courses in Macroeconomics and social Insurance for BA students

1999-2000 **Al-Manhal International Schools, Jordan** **Amman**

Lecturer

Instructor of Business studies and Economics for the IGSCE students (O-Level)

1998-1999 **Yarmouk University** **Irbid**

Teaching Assistants

Missions

2001-2003 **Government of Jordan** **Amman**

Member of the Government Pension Reform Committee

Consulting and recommending the government of Jordan, Minister of finance, and Secretary General of the ministry of finance on pension reform policies. Conduct research and proposals regarding these issues on behalf of international organizations.

2002-2003 **Ministry of Energy** **Amman**

Member of the Electricity Sector Privatization Committee

Helping the government of Jordan on privatization issues and preparing financial assessments of the different approaches recommended by the international consultants.

2003 **Ministry of Petroleum & Ministry of trade and Industry, Iraq** **Baghdad**

A representative of the MOF in the Jordanian Ministerial delegation to Iraq:. Negotiating bilateral trade and oil agreement

2002-2003 **National Petroleum Refinery Company (NPRC), Jordan** **Amman**

Analyze and follow up the financial agreement between the MOF and NPRC.

Selected Training Courses

2003 Macro Time series Modeling, International Monetary Fund (IMF), Washington D.C., January

2001 Tax Analysis & Revenues forecasting held by Harvard University with the Coordination of GTZ, Amman**.** January.

Conferences

2001 Evaluation of the Privatization Policies in Arab Countries, Arab Monetary Fund (AMF), Abu Dhabi, UAE. December.

2002 External Debt Statistics, International Monetary Fund (IMF), held in Manama, Bahrain, Feb.

Selected PAPERS

Bizer, K., Rahahleh, H. and W. Sesselmeier (2004): "Innovating the Stability and Growth Pact of the European Union by Introducing Tradable Deficit Permits," Conference: Institutions and Policies for the New Europe, Portoroz-Koper, Slovenia, June17-19, 2004.

Al-Aotum R and H. Rahahleh (2002): "Predicting Economic Crises: the Case of Jordan," the Higher Council of Science and Technology, Amman.

Khasawneh, H. and H. Rahahleh (2002): "Electronic Commerce and its Impact on Tax Revenues," IT Conference, Philadelphia University, April 2002.

Khasawneh, H. and H. Rahahleh (2001): "User's Manual for the "Civil & Military Scheme Pension Forecasting Model," Actuarial Study, Approved by the (IMF), unpublished.

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