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Using Causal Loop Diagram in Understanding Financial Activities of Malaysia Pension Fund

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ABSTRACT

Objective – The aim of the article is to present the development of a simulation framework which identifies Malaysia Pension Fund main sources as well as the financial activities.

Methodology/Technique - Numerous factors influencing the financial condition pension fund is summarized. Based on the set of system factors in literature summarization, causal loop diagram is used to analyse the inter-relationships among these factors.

Findings – Causal loop diagram shows a relationship between these factors, which can be used in analysing financial condition of a pension fund. In the developed causal loop diagram, it shows the main sources of Malaysia pension fund, the asset allocation, and the future benefit payment.

Novelty – The causal loop diagram will then, be used as a dynamic hypothesis of this study and serves as a basis for quantitative models.

Type of Paper: Conceptual

Keywords: Pension Fund, Financial Activities, Simulation, Causal Loop Diagram.

1. Introduction

Today, the burden on the pension fund is getting heavy. Around the world, people are expected to live up until 74 years in the year 2045-2050 while in developed countries, life expectancy will rise to 82 years (United Nation, 2003). In a developing country like Malaysia, the population of people aged 60 years and above was estimated to be around at 1 million in 1999, and is expected to increase to 4 million by the year 2025 (Karim, 1997) while the life expectancy for an aging population has increased to 71.9 years for males and 76.4 years for females in the year of 2007 (Caraher, 2000; Department of Statistics, 2008). These demographic trends are believed to impose some pressure on the public pension system and it could also have a major impact on the government's economic position (Roseveare, 1996). For these reasons, pension has become one of the most important issues for policymakers where in

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most countries, pension spending is projected to grow substantially as populations' age and the number of retirees increases. An aging population also creates concern about the sustainability of public pension systems (Boldrin et al. (1999) and Bongaarts (2004)). As workers reach their retirement age and their longevity happens to be high, they will be entitled to draw pension for a much longer time. This paper is organized as follows. Section 2 discusses a review of the related pension literature. This is followed by section 3, where research methodology is described by explaining the definition of the causal loop diagram. In section 4, an explanation on the causal loop diagram in understanding financial activities of Malaysia pension fund is given. The last section provides a summary of this paper.

2. Pension Literature

Among the many issues in the literature, there are two main focuses; the rising of pension spending and the increasing number of pensioners. These phenomena are believed to be caused by the increasing life expectancy in the world's population (Banks and Emmerson, 2000). As a result, it will affect the pension's plan sponsors who have to bear the cost of providing pension benefit (Banks and Emmerson, 2000). For example, in developed countries like the United States, at which the number of people over 65 years old will double by 2040, their social security trust fund balance will be exhausted in 2014 and 2037 as projected by Lee and Tuljapurkar (Lee and Skinner, 1999). The United States retirement system is also projected to be in greater negative balance (from negative 6 trillion to negative 60 trillion) by 2070 (Lee and Skinner, 1999). Seven pension funds in Israel are also confronting a severe problem where their pension funds will face liquidity crisis and they will be unable to meet their obligations in the future (Silver, 2006). The United Kingdom government is also having problems of increasing pension spending where they spent over 100 billion pounds (about thirty percent of total public spending) in 1998-1999 in their pension system (Banks and Emmerson, 2000). Also, the final salary pension scheme in the United Kingdom is having a crisis with sixty eight percent of schemes closed to new entrants and ten percent closed to the accrual of new pensions (Silver, 2006). This problem is mainly caused by the cost of pension plan that is dramatically increasing and volatile. Consequently, most countries are reforming their pension system with the intention that the pension system will continuously exist to provide the pension benefit for the retired workers. Malaysia is also confronting the same phenomena when the public pension plan (for government workers) has to bear the cost of more than RM7,040 million throughout 2007 and this figure is estimated to increase in the future. Therefore, it is not surprising that the Malaysia's government is also very much intent on reforming the pension system for public workers (Bernama, 2007).

As a result of the phenomenon mentioned, financial condition of a pension fund should be assessed in order to measure its capability in financing pension liability. Developing an asset allocation model can be part of investigating financial condition of a pension fund (Fombellida and Zapatero, 2010). The amount of a financial institution's total portfolio placed in each class is determined by an asset allocation model. Asset allocation is defined as the practice of dividing resources among different categories. Examples of categories of resources are stocks, bonds, real estate and etc. Many researchers have developed an asset allocation model as mentioned in Fombellida and Zapatero, 2010; Menoncin and Scaillet, 2006 and Xiao, 2001, but none of them, are using causal loop approach. The advantages of the causal loop diagram approach as described by Chaim and Streit, 2008 and Kiani et al. 2009 are:

- more dynamic information is provided,
- cause and effect relationship can be determined,
- able to visualize a mental model of a system.

Due to the increasing burden of retirement benefits payable to public sector employees, the Malaysian government established the Pension Trust Fund (PTF) in 1991. The Pension Trust Fund was assigned by the Federal Government to finance its pension liability. The pension trust fund was granted RM500 million launching grant by the Federal Government. Later in

March 2007, Pensions Trust Fund was replaced by Kumpulan Wang Persaraan (KWAP) or Retirement Fund. Since then, all powers, assets and liabilities, functions as well as activities of the Pensions Trust Fund were taken over by KWAP. The main objective of KWAP is to manage established fund towards achieving optimum returns on its investments. Ideally, the fund shall be applied towards assisting the Federal Government in funding its pension liability. However, in order to achieve KWAP main objective, the ability of KWAP to finance pension expenditure should be measured. Therefore, this study will develop a simulation framework to analyze financial condition of KWAP.

3. Methodology

From the literature in Fombellida and Zapatero, (2010), Menoncin and Scaillet, (2006), and Xiao (2001), numerous factors influencing the financial condition pension fund is summarized. Based on the set of system factors in literature summarization, causal loop diagram is used to analyze the inter-relationships among these factors. A causal loop is referred to as influence diagram or mathematically known as directed graphs. A causal loop enlightens a dynamic process of a system in which the chain effects of a cause are traced through a set of related variables back to the original cause. A causal loop is formed when a set of variables has been linked together in a connected path. Causal loop shows a relationship between variables and serves as a basis for quantitative models, when backed by formulae that quantify variables. A causal loop is also referred to as feedback. Feedback is a situation where A affects B and then, B in turn affects A through a chain of causes and effects. The relationship between A and B in different direction will predict how the system under study behaves. A feedback structure then will be mapped in causal loop diagrams. Figure 1 shows an example of causal loop diagram. This diagram uses an arrow to explain causal influences between variables. It also uses positive or negative signs to show the type of relation that each factor has with the others. A positive sign “+” means the two variables change in the same direction (increase or decrease) and the negative sign “- “ means the two variables change in opposite direction. For example, if the increase (decrease) in A causes an increase (decrease) in B, it is a positive relationship. If the increase (decrease) in A causes a decrease (increase) in B, this is known as a negative relationship. In the next section, we will show the pension fund financial activities by using causal loop diagram.

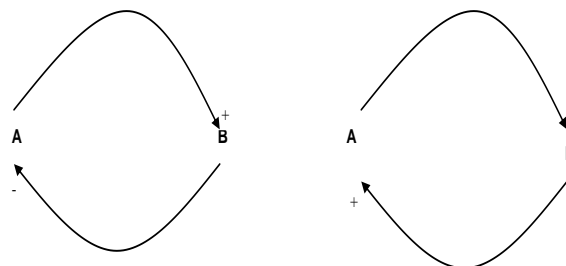


Figure 1: Causal Loop Diagram

3.2 Causal Loop Framework

All In this section, causal loop diagram is used to provide a better understanding of financial activities in Malaysia pension fund. The drawn causal loop diagram explains the financial activities and shows the interaction of each variable in the model. In this study, the activities of Malaysia pension fund (also known as Kumpulan Wang Amanah Pencen) are studied (the information was gathered through literature review and KWAP website) to evaluate the financial condition of the pension fund as shown in Figure 2. For the time being, pension

liability is beared by the federal government. Kumpulan Wang Amanah Pencen (KWAP) is only responsible in managing pension contributions from contributing employers and conducting investment activities. As shown in Figure 2, the contributing employers are divided into two types of employers, federal contribution and state contribution. Both of the employers are contributing to the pension contributions for employees who are granted pensionable status by the Public Service Department. In addition, employers are required to pay pension contribution for its pensionable employees at the rate of 17.5% of the basic salaries of the employees. Therefore, 17.5% from total salary of state and federal employees will be contributed into the pension fund. Hence, the increment of salary for state and federal employees causes a rise in total salary which also causes a rise in total contribution. Thus, all the contribution will be invested in pension asset. The amount of pension asset placed into each class is determined by an asset allocation model. Asset allocation is defined as the practice of dividing resources among different categories. As reported in KWAP annual report, the categories of resources are equity, fixed deposits, government securities, and alternative investments. Each of the investment return in each of these categories will be returned to the pension asset. Therefore, pension asset increases due to the total contribution from federal and state government, and also from total return on investment. Also, asset allocation percentage (in the investment) is changed due to the increment/changes in the amount of pension asset. In the future, pension asset will be used to finance pension liability such as annuities, gratuity, and cash in lieu of leave. Therefore, pension asset will decrease/changes due to payment of pension benefit.

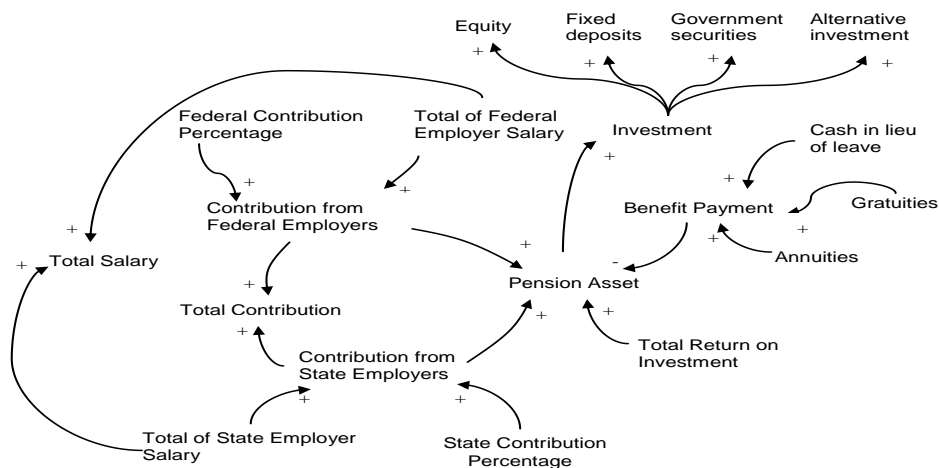


Figure 2: Causal Loop Diagram of Pension Fund Activities

Basic mathematical equations are as follows;

- Pension asset(t) = pension asset(t - dt) + (federal contribution + state contribution + total return on investment + share return – benefit payment) * dt (1)
- Federal contribution = total federal employer salary*federal contribution percentage (2)
- State contribution = total state employer salary*state contribution percentage (3)
- Total contribution=federal contribution + state contribution (4)
- Total return on investment = return on investment (Equity+Fixed Deposits +Government Securities+Alternative Investment) (5)
- Benefit payment = annuities+cash in lieu of leave+gratuity (6)

Conclusion

This paper discusses the contribution of causal loop framework to illustrate the financial activities of Malaysia pension fund. The framework enables the decision maker of Malaysia pension fund to quickly access the linkages that exist in the financial activities of the pension fund. Then, causal loop diagram will be used as the dynamic hypothesis of this study and serves as a basis for developing a simulation model.

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