CHAPTER 1

Introduction

1.1 Background and Statement of Problem

When the world economic recession took place during 1980-1983, some developing countries encountered deterioration of their gross national product growth. Many of them, including Mexico, Serbia, Venezuela, Peru, the Philippines, etc., could no longer afford to pay their external debts. Amid the worldwide economic turmoil, Thailand's external debt burden increased rapidly and continuously in both public and private sectors.

To address the above problems, the Thai government pursued strict monetary and fiscal policies, export-led growth, and extensive promotion of tourism and services. These policies became effective by the late 1980s. The Thai economy experienced high rates of growth, with low inflation and decrease in unemployment from 5.8% in 1987 to 1.5% in1993. The World Bank placed Thailand as The East Asia Miracles in 1993, the year which the Black Monday broke out in New York's stock market, making the severe fall of yields in both America and West Europe stock markets and then decrease in interest rates. Such events pushed magnitudes of cash flows moving toward East Asia, especially Thailand. The Bank of Thailand responded by proposing two financial plans including the first plan (1983-1992) and the second (1993-1995), via deregulating financial rules by establishing the Bangkok International

Banking Facilities (BIBF) in 1993. Such performances made a surge of capital inflow into both public and private sector about 7,000 billion baht during 1990 to 1995.

Evidently, throughout the process of national development, Thailand has to rely greatly on financing and technology resources from aboard. Developing countries can not only depend on revenues from taxation and government's organizations as these are not enough to meet the economic expansion and equity in standard of living of people. Hence, foreign exchange earnings are considered essential part for growth and prosperity among most developing countries. They need foreign currencies to buy capital goods for export-oriented industrial production. In this regard, export of goods and services are two main sectors to generate foreign exchange earnings. So far, these earnings are not sufficient to cover all facets of development among these developing states.

Previously, Thailand was able to seek sufficient foreign exchange earnings so that it could achieve balanced budget. Years later, it lacked enough earnings for the annual expenditure and debt financing, so it has to once again, turn to external financial resources.

From figure 1.1, the change of exchange rate system from the US-dollar pegged basket system to managed floating system has brought about fluctuations of baht values compared to other currencies. Such fluctuations mainly stemmed from weak economic structure and the speculations in money markets thus increasing external debts burdens. The government always has to adapt for new methods of debt management to analyze variation of exchange rates, movement of yield curves, duration of the payments, and risk of the

payments for decreasing stock of debts. Appropriate measures are, such as, to keep foreign acceptance of country's reliability continuously, to adjust cash flow of debt suitable to government budget and to adopt the structure of external debt appropriate to International Reserve management. Also the government has to reduce annual payment and to solve suitably bunching of debt in few currencies with analysis of market risk due to fluctuation in exchange rates.
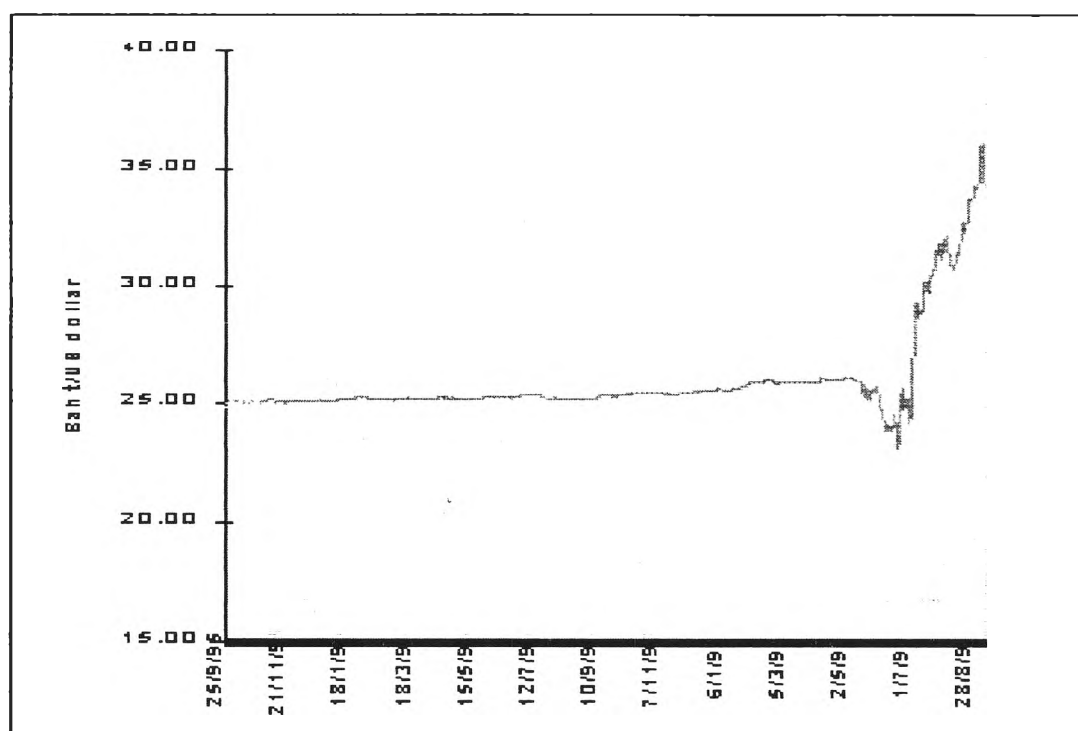

Figure 1.1 Exchange rates of Baht against US dollar

In 1995, decrease in Thai export caused higher current account deficit and slower economic expansion. Inflation jumped in connection with

the flood in the same year. Furthermore, there was rumor of baht devaluation spreading by speculator in Hongkong, Singapore markets who used this occasion to speculate the baht values forcing sharp fluctuations of exchange rates.

Accordingly, government should be more interested in market risk. It should significantly focus on measuring more precisely the level of market risk incurred to its debt. The significant developments of such methodologies which have undergone for a long time, along with technological breakthroughs in data proceeding, have gone hand in hand with changes in management practices-a movement away from management based on accrual accounting toward risk management based on marking market positions. Increased liquidity and pricing availability along with a new focus on trading led to the implementation of frequent revaluation the position. The mark-to-market concept-significant has been developed to improve methodologies and system to measure financial performance.

Indices for foreign exchange, fixed income securities have been used extensively to monitor return across asset classes for searching common standard to measure market risks and to estimate better the risk/return profile of individual asset or asset classes. Financial engineers are now effective designing and implementing market risk monitoring systems that can provide management and timely information on potentiality of each position. Financial engineers have developed these concepts for measuring market risks and converged-toward the idea of defining risks in term of potential future losses

as a consequence of random market movements that follow assumed statistical properties, known as the Value-at-Risk (VaR) methodology.

The conventional asset/liability management can estimate future income statements under assumed market scenarios which are clear, but untimely to report actual situation of market. Advantages of the Value-at-Risk approach is tracking trading positions in view of marked-to-market to simulate short and /or intermediate term changes in market value as a result of characteristic of future market scenarios explained by a certain quality of present market scenarios.

The use of statistical techniques to measure market risk is not new. For years, modern fixed-income portfolio management have well known on analytical concepts such as duration, convexity and basis point value to measure their exposure to market risk. However they have primarily focused on analytical tools of each standard product that have never been used for risk management at a corporate level. As one of the key concepts of modern risk management, VaR is a tool to measure quantity, with in a specified confidence interval, and the maximum potential loss for a given trading position.

Hence, the new developments of VAR approach have been used as an effective tool to show value-at-risk of the government's external debts and proper currency denomination of a new loan. Of this study, cash flow mapping for government bonds and loans will be applied in order to measure their market risks. However, this study will not touch other financial burden in government sector, as some could not be made public, such as currency swap

and any transactions in forward markets (mostly conducted that by the Bank of Thailand). Findings of this study would by somehow considered useful for relevant parties in terms of risk minimization

1.2 Objective

1. To estimate Value-at-Risk for present values of maximum current payments for Thai government's bonds and loans on a daily, monthly and yearly basis given level of confidence.

2. To analyze result of diversification of issuing government's direct external debt denominated in foreign currencies.

3. To analyze VaR improvement to issue a new bond and loan

1.3 Scope of Work

By using the Value-at-Risk model, this study aims to find maximum present value of government's direct external debt, bonds and amortized loans at 95% confidence level. Such a model is compliant with the current financial operations, as information can be transferred with higher speed, more convenience, and lower cost via modern technology.

The Value-at-Risk model is used in this study to calculate the burden of external debt as of September 31, 1996, covering principals and interests from 1995 to 2032 as the maximum present value. Then, the author will find DelVaR to answer what currencies for issue of bonds and loans with minimized incremental risks.

The author will study interest rate risk and exchange rate risk for mapping cash flows of bonds and loans into 21 risk vertices including 1-year to 10-year zero coupon rate and THB/AS, THB/C$, THB/SFr, THB/DM, THB/DKr, THB/BFr, THB/pound, THB/yen, THB/SR and THB/US$. The Value-at-Risk will be measured on a daily, monthly and yearly basis with 95% level of confidence. Such data[1] have been observed from swap interest rates and exchange rates with 15 government's bonds[2] denominated in Yen (Samurai bonds) and US dollar (Yankee bonds) and annual fixed payments of amortized loans[3] during 1995 - 2031 by analyzing the result of risk expectation. In addition , the DelVaR methodology is used to improve VaR for issuing a new bond or loan. Primary assumptions are, as follows:

1) Interest rate risk of foreigner's investment in Thai government's bonds and Loans can measured by variance of fix rates of THB interest rate swap that is decomposed into cash equivalent positions of year (i). The year(i) zero coupon rate can be calculated via the following formula :

$$1 = \sum_{I=1}^{t-1} c_i * e^{-Ri*I} \quad + \quad (c_t + 1) * e^{-Rt*T} \quad \text{or}$$

$$R_t = \frac{1}{t} * \log \left(\frac{1 + c_t}{1 - \sum c_i * e^{-Ri*I}} \right)$$

$c_{i,t}$: fix rate or price of THB interest rate swaps on year (i,t).

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[1] Source: Peregrine Fixed Income, Reuters and Datastream
[2] From list of external debt as of September 30,1996 ,Loan Policy Department Ministry of Finance
[3] From a table of external debt service payments by currency, print on Feb. 1997,Loan Policy Department ,Ministry of Finance

R_i : known year (i) zero coupon rate.

R_t : year(t) zero coupon rate.

2) Market Risk of disbursement of government's bonds and loans would be defined as interest rate risk indicated by the fluctuations of 1-year zero coupon rate risk vertices, 2-year zero coupon rate risk vertices,..., 10-year zero coupon rate risk vertices. Exchange rate risk is indicated by the fluctuations of THB/AS, THB/C$, THB/SFr, THB/DM, THB/DKr, THB/BFr, THB/pound, THB/yen, THB/SR and THB/US$ exchange rate risk vertices.

3) Expected values of exchange rates on date 31/12/1997, 31/12/1998,...., 31/12/2030 would be the same as the exchange rate via the last up-date-data, 8/9/1997, because we need similar criteria to transform the present values of external debt dominated in foreign currencies to that in THB currency for comparing concentration of currencies each year.

4)[4] For the study of Improvement of VaR by using Del VaR method, the author assumes that after issuing debt following such method, change in variances of price returns would be insignificant (we can use F-test to prove the acceptance of change in variance) or in other word, the results of such method are correct, when an addition of external debt is small. However if we need to increase a lot of external debt, we should analyze incremental risks by using DelVaR method whenever the change in the variances is significantly accepted.

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[4] Please see Mark Carman, " Improving on VaR" , Risk magazine, May 1996.

1.4 Research Methodology

Given the objectives, this study is aimed to find value at risk and analyze diversification of the external debt. The author hence considers the payment since 1995 until 2032 that was the final year of the last payment of the external debt as of September, 30 1996. The expected present value on date 29/12/1995, 31/12/1996, 1/7/1997 was calculated by using their historical scenario and the maximum present value of external debt on such date. On date 8/9/1997, 31/12/1997, 31/12/1998,..., 31/12/2032, the author used 2 scenarios, unstable exchange rate (2/7/1997-8/9/1997) and stable exchange rate (25/9/1995-31/12/1996), by a mean of bootstrapping to get the same numbers of any scenarios and to be equal 30,000 data for one day holding period or 1,200 data for one month holding period or 100 data for one year holding period. For both scenarios, the author used the exchange rates on date 08/09/1997 being the same criteria to compare present values of the external debt, denominated in bath currency, with decrease in principals of such debts each year.

In this study, the author calculated variances of price returns by risk vertices of any scenarios. Later, properties of covariance and correlation were used to analyze the direction and magnitude of baht currency against other foreign currencies. After that, the author studied bunching of the foreign currencies' debt in any scenario that implied the cause of higher risk not only came from bunching but also from dispersing the external debt into other foreign currencies. This means that we should not disperse the external debt into baht against a foreign currency where its covariance of price return had positive sign and big magnitude, although a percent share of the debt in such currency is small. However, we recommended when, and which currency we should issue as the external debt by using Del Var. We know this by looking at

which currency is making a negative sign of Del Var indicating that we could diversify the debt into that currency to decrease the risk.

1.5 Organization of the study

This thesis can be divided into the following chapters:

Chapter One shows statement of problems, objectives, scope of work and research methodologies. Also included would be importance of the study on Value-at-Risk for government bonds and loans, the description of process of calculation and limit, as well as basis assumptions for models and scenarios considered.

The Value-at-Risk methodologies will be mentioned in Chapter Two. Firstly we reviews literatures about the government debt management and the use of VaR methodologies. We also explain these concepts proper for mapping bonds, including Analytical methods and Monte Carlo Simulation.

In Chapter Three, there show four major financial sources, namely multilateral sources, bilateral sources, capital markets, and commercial sources. The study would also lending channels, limitations and significance of each source. Also to be considered would be distribution of principal issued at different time interval, and estimation of the maximum present value of debts by analyzing the bunching and diversification of the present external debts in order to show the actual maximum burden of government debts.

Chapter Four would show policy implications as concerned with external borrowing, loan projects, limitation, control and necessary processes. Then, application of the DelVar model will be discussed in order to show and optimal choice

for issuing a new bond under two different scenarios, as well as benefits to derive from the stable exchange system.

Conclusion will come in chapter 5