CHAPTER 3: RESEARCH METHODOLOGY

3.1) Basic Data Description

One of the major reasons bond market return volatility in Malaysia has not been examined is due to the lack of a well-specified index for the bond market with an adequate history. There was no a comprehensive bond market index that provided price and rate of return data until the RAM-Quantshop MGS index for the government bonds and the RAM Listed Bond Index for the Private Debt Securities or Corporate bonds in 1994 and 1995 respectively. On the other hands, KLSE Composite Index (KLSE) CI was established in 1986 to provide the price and return data for the stock market. In this study, KLSE CI is used to represent the stock market, the RAM-Quantshop MGS index, which includes the All-Series (MGS-AS), Short-Term (MGS-ST), Medium-Term (MGS-MT) and Long-Term (MGS-LT) MGS indices are used to represent the performance of the MGS and the RAM-Listed Bond index is used for measuring the performance of the PDS in Malaysia.

The market weighted KLSE CI consists of 100 blue chips stocks. It is computed by calculating the total market value of the top 100 firms by market capitalisation in the index and the total market value of those firms on the previous day of trading. The percentage increase in the total market value from one day to the next represents the increase in the index. The rate of return of the index equals the rate of return that would be earned by an investor holding a portfolio of all 100 firms in the index in proportion to their market values, except that the index does not reflect cash dividends paid by those firms. The KLSE CI record for the period of January 1994 to October 2002 is used in the study. This period covers the economic boom of 1995 – 1996 and the Asian financial crisis that occurred in 1997.

Due to lack of awareness on the bond index, it's worth to introduce the MGS and PDS index. RAM – Quantshop MGS Bond Index measures the changing value of MGS by taking into account the capital appreciation, accrued interest and reinvestment of coupon payments. The index provides information on the

risk, return and inter-relationship of different MGS maturity terms besides serving as a standard for portfolio managers to compare their performance with the market performance. The MGS index covers MGS that are worth more than RM 100 million on issue, with the minimum maturity tenure of a year. It focuses on government bonds due to their highest value and liquidity. There are 4 series of MGS index that are used to measure the performance of the MGS of different maturity terms that allow the investors to target their portfolio requirements with the benchmark. The MGS index consist of the following series:

- All Series (maturity longer than 1 year)
- Short-Term (maturity of 1 year and less than 3 years)
- Medium-Term (maturity of 3 years and less than 7 years)
- Long-Term (maturity of 7 years and longer)

MGS index is market-weighted. The weight of a security in the index is the market value of the security on issue divided by the total value of all securities on issue. MGS index is an accumulation index that incorporates the capital and income components. The capital is based on gross yields provided on a monthly basis by Bank Negara Malaysia (BNM) while income is based on the coupon. Coupon is reinvested in the securities on the coupon payment date in proportion to the market value of the securities. New bond issues and re-issues of bonds are added to the index on the last day of the month in which those bonds were issued. Matured bonds are deleted from the valuation on the last day of the month when the bonds matured. The index automatically re-balances when any of the variables stated above changes and the return calculations are based on changes in the value of a portfolio. The MGS index is influenced by the following factors:

- **Accrued interest**

  The index increases steadily due to the interest earned over time that sees the MGS index to move in the increasing trend.

- **Changing yields**

  This is the major source of movements in the index. A rise in yields implies a fall in prices and the index. A fall in current yields implies a rise in the index.

- **Reducing maturity**

  The impact of difference between yields and coupon is smaller when the bond approaches its maturity date. Bonds priced at a discount (premium) will slowly increase (decrease) in value over time.

MGS index for the period of January 1994 to October 2002 is used in the study.

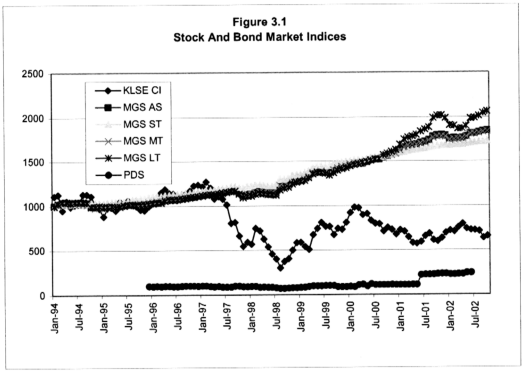
In Malaysia, PDS can be issued through a public offering (i.e. listing on the KLSE) or issued over-the-counter. If the method of issuing a PDS is through a public offering, the corporation concerned must issue a prospectus. Meanwhile, for issuing through OTC, a prospectus is not required, but these PDS can only be offered to the prescribed corporations, insurance companies, statutory bodies, approved funds, unit trusts, corporations with net assets of more than RM 10 million, licensed fund managers and persons declared as exempt purchasers. The secondary market for bonds includes the OTC market where most of the bonds are traded and the KLSE where listed bonds (also known as loan stocks) are being traded. Unlike the stock exchange, the OTC market consists of bond dealers and brokers spread throughout the country that use the communication network to transact their business. The majority of bonds (MGS, Khazanah, Cagamas and unlisted corporate bonds) are traded OTC. There is no index measuring the performance of the OTC-traded bonds. Listed bonds are known as loan stocks on the KLSE. There are three types of loan stocks, namely the Redeemable Convertible Loan Stocks, Irredeemable Convertible Loan Stocks and Redeemable Non-Convertible Loan Stocks. RAM listed bond index (established in December 1995, abolished in July 2002) measures the overall performance of the listed corporate bond market in Malaysia. It includes all bonds and loan stocks listed on the KLSE with a maturity term greater than one year. The index is calculated daily using the closing prices of the bonds on the KLSE. It is market weighted and the weight for the bond is proportional to its outstanding volume in the market. New bond is included in the index on the day after listing. Maturing bond is excluded one year before its maturity. RAM listed bond index over the period of December 1995 to June 2002 is

used in the study to reflect the performance of the PDS. As most of the PDS are OTC traded, the RAM-Listed bond index may not accurately represent the PDS market.

3.2) Historical Data

Table 3.1 (appendix) shows the historical records for the stock and bond market indices for the period of January 1994 to October 2002. Its graphical form is shown in figure 3.1.

Figure 3.1: Stock And Bond Market Indices



It is observed that the RAM-Quantshop MGS AS, ST, MT and LT indices are growing steadily and upwardly since their establishment in 1994, which might be caused by the positive impact of accrued interest on the bonds. The MGS AS, MT and LT bonds moved in the same direction and same pace. The graph for these indices is overlapping each other. However, starting from December 2000, the MGS LT deviated from and outperformed the MGS AS and MT bonds. The MGS ST index is always higher than other MGS classes until about September 2000 when MGS ST became the lowest MGS bond

market index. The bond market grew steadily compared to the stock market even during the 1997 Asian financial crisis. There is also less fluctuation shown by the bond indices. The bond market seem to be not affected by the crisis, which might indicate its potential as a third pillar of a well developed capital market and a good capital market instrument for the portfolio manager to include in their investment portfolio for market risk hedging. Bond seems to offer investors a safer investment alternative compared to stocks in the volatile market due to its steady growth and lower fluctuation.

3.3) Description Of Bond And Stock Returns

The stock and bond market indices returns are computed using the monthly closing index, meaning the index of the last trading day of the month. The following formula is applied for calculating the stock and bond market monthly returns.

$$\text{Return (\%)} = \frac{\text{Current month closing index} - \text{Previous month closing index}}{\text{Previous month closing index}} \times 100\%$$

The historical record for the returns of stocks and bonds is stated in Table 3.2 (appendix). Its graphical form is shown in figure 3.2. Likewise, figure 3.3 shows the historical returns only for the MGS bonds, which provides a useful indication for the MGS bonds performance according to different maturity term classes.

Figure 3.2: Returns For Stock And Bond Market

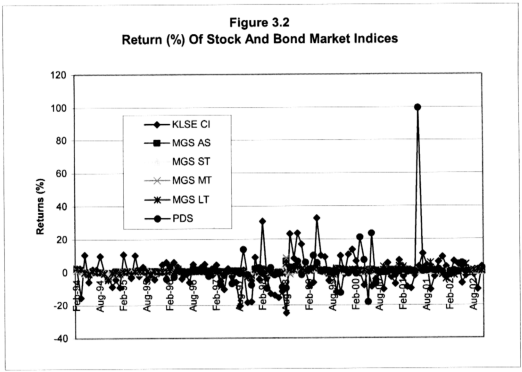
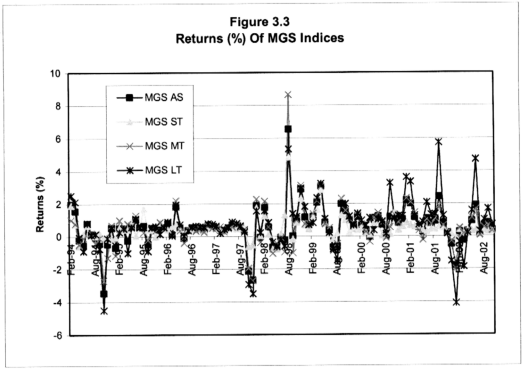


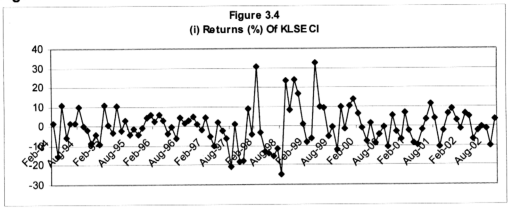
Figure 3.2 shows that the fluctuation of the monthly returns for stocks and PDS is pretty much higher than the MGS returns. The normal monthly returns range for the stocks, MGS AS, MGS ST, MGS MT, MGS LT and PDS is recorded as $\pm$10%, $\pm$2%, $\pm$1%, $\pm$2%, $\pm$4% and $\pm$10% respectively. MGS bonds recorded the greatest monthly gain (loss) on August 1998 (October 1994). For the stocks, the greatest monthly gain (loss) occurred on April 1999 (August 1998). The overall returns for the MGS bonds ranges from –5% to +9%. The range of returns fluctuated from –18% to approximately 100%, for PDS compared to the range of –25% to 33% for the stocks. There is a big jump for the PDS index on June 2001, which saw the index skyrocketing from 111.38 on May 2001 to 222.34 on June 2001, due to high demand for the PDS. Stocks have the highest returns among these financial assets. However, the returns of corporate bonds exceeded the returns of stocks for the period of March to June 2000. Figure 3.2 also shows that there are more peaks and troughs for the stocks compared to bonds.

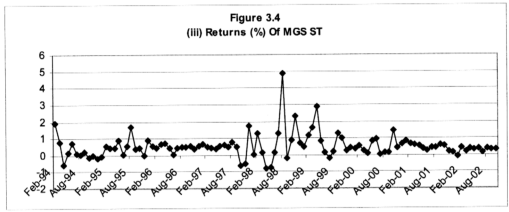
Figure 3.3: Returns Of MGS Indices

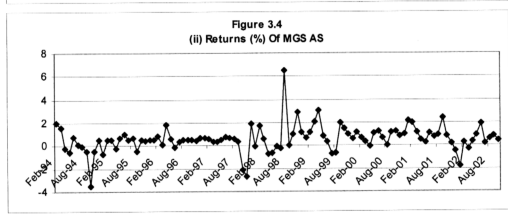


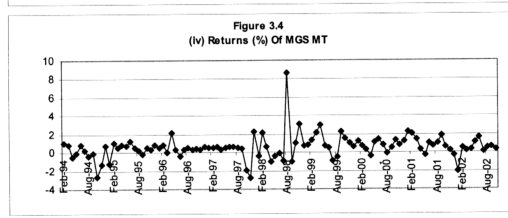
By superimposing the returns for the MGS AS, ST, MT and LT on figure 3.3; it is observed that the returns fluctuation (volatility) is higher for long-term bonds. All the MGS have the same historical returns profile, which indicates that the MGS returns move in the same trend but differ only in the magnitude. This indicates the existence of contagion effect within the MGS bonds. MGS AS and MT returns moved coincidentally, which shows that these two assets move in the similar direction and degree. Figure 3.4 shows the returns for each of the financial asset individually.

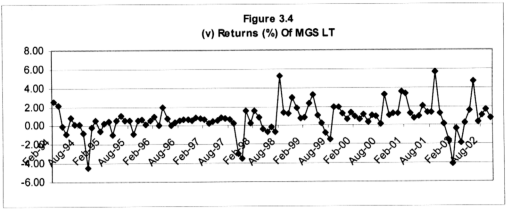
Figure 3.4: Returns Of Stocks And Bonds

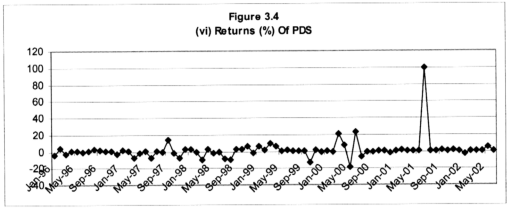












The summary for each of the financial asset returns as plotted on figure 3.4 is shown in table 3.3 as below. The monthly average (last column) is calculated by using the simple arithmetic average return.

Table 3.3: Summary For The Stock And Bond Market Indices

	Greatest Gain		Greatest Loss		Range Of Fluctuation (%)	Normal Fluctuation (%)	Monthly Average (%)
	%	Month	%	Month			
KLSE	32.65	Apr 1999	-24.97	Aug 1998	57.00	±10	-0.05
MGS AS	6.55	Aug 1998	-3.47	Oct 1994	10.00	±2	0.59
MGS ST	4.85	Aug 1998	-0.78	May 1998	5.60	±1	0.53
MGS MT	8.63	Aug 1998	-2.71 -2.69	Nov 1997 Oct 1994	11.34	±2	0.59
MGS LT	5.71 5.32	Sept 2001 Aug 2001	-4.50 -4.09	Oct 1994 Jan 2002	10.21	±4	0.70
PDS	99.62	June 2001	-18.11	May 2000	117.73	±10	1.26

3.4) Description Of Returns Volatility

In the empirical investigation, we examine the trend of returns volatility, the relationship and correlation of returns volatility between the stocks and bonds. Volatility is a measure of changeability or randomness of asset prices. In theory, volatility should be measured in percentage changes in price, or rates of return. The standard deviation (SD) of returns is used as a measure of volatility in this paper. SD measures the dispersion of returns, which summarises the probability of seeing extreme values of return. Large SD indicates that the chance of a large positive or negative return is large. Stocks and bonds returns are used to calculate the 12-month moving average standard deviation (12MMA SD) of returns. 12MMA SD provides a dynamic view of the changing volatility environment over the 9-year period under study and demonstrates the large and rapid changes in bond market volatility. To examine whether the level of volatility for stock and bond return have changed over time, F-tests are carried out to test the ratio of variances for 1-year non-overlapping periods, 6-month non-overlapping periods and 1-year, 6-month overlapping periods for significant differences.

To examine the relative volatility of bonds compared to the volatility of the stocks, two specific measures of relative volatility are used to examine the level of bond market volatility compared to the stock market volatility besides providing the trend of the bond market volatility. Two specific measures of relative volatility used in the study are:

a) A 12-month moving average standard deviation ratio (12MMA SDR) for bonds versus a comparable moving 12-month standard deviation for stocks. F-test is carried out for the 12-month non-overlapping and 12-month moving average-6month-overlapping periods to determine the significant changes in the ratio of volatility over time.
b) A moving measures of systematic risk (beta) for bond returns relative to stock returns.

Beta is an indicative parameter for investors to evaluate the risk of their portfolio. Beta explains the systematic risk relationship between bond and

stock market. A beta value of 1 means the financial instrument moves in the same direction and magnitude as the stock market. A beta value of –1 means the financial instrument moves in the same magnitude as the stock market movement but in an opposite direction. For risk hedging in the volatile market, portfolio managers choose to invest in stocks or other capital market instruments that have low or negative beta, i.e. in securities that do not move as much as stocks and in the opposite way of stocks. The beta of the bond market is studied to examine the relationship of the bond and its suitability as a market risk-hedging instrument for investment portfolios. In this study, a moving measure of systematic risk (beta), the 12-month moving average (monthly overlapping) regression model is used to determine the beta of the bond markets. 12MMA beta is obtained from the regression of 12-month-monthly rates of return for bonds against the comparative stock returns. By plotting the bond market returns against the stocks market returns, the beta coefficient is equivalent to the slope of the regression. The regression coefficient or beta is calculated by using the "SLOPE" function of Microsoft Excel.

The last section of the investigation involves the study of the correlation between stocks and bonds returns, which is the factor explaining the historical beta profile for the financial assets and relationships of the stocks and bonds performance. The equation for beta is shown as below:

$$\beta = Cov_{B,S} / \sigma_M^2$$

Where Cov = covariance

σ= Standard Deviation (risk)

B = Bond

S = Stock

M = Market.

However,

$$Cov\,(B,S) = \rho\,(B,S)\,\sigma_B\sigma_S$$

Thus, $\beta = \rho\,(B,S)\,\sigma_B\sigma_S / \sigma_M^2$

Where ρ = correlation

The main factor impacting the covariance and beta is the correlation between stocks and bonds. Based on the above equation, the 12-month moving

average correlation graphs for the bond markets are expected to have the same profile as the beta graph for the bond market. The correlation between the stocks and bonds is obtained by applying the "CORREL" function in Microsoft Excel.

3.5) Research Hypotheses

The research hypotheses employed in this study adopted the statistical test to compare and identify whether there exist any significant changes in the volatility of bond and stock market returns, and the relative volatility (Standard Deviation Ratio, SDR) of the bond market compared to the stock market overtime.

The null hypotheses formulated:

a) There are no significant changes in the returns of stocks and bonds overtime.
b) There are no significant changes in SDR for bond market overtime

The alternate hypotheses:

a) There are significant changes in the returns of stocks and bonds overtime.
b) There are significant changes in SDR for bond market overtime