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# FACTORS INFLUENCING YIELD SPREADS OF THE MALAYSIAN BONDS

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## ABSTRACT

*Malaysian bond market is developing rapidly but not much is understood in terms of macroeconomic factors that could influence the yield spread of the Ringgit Malaysian denominated bonds. Based on a multifactor model, this paper examines the impact of four macroeconomic factors namely: Kuala Lumpur Composite Index (KLCI), Industry Production Index (IPI), Consumer Price Index (CPI) and interest rates (IR) on bond yield spread of the Malaysian Government Securities (MGS) and Corporate Bonds (CBs) for a period from January 2001 to December 2008. The findings support the expected hypotheses that CPI and IR are the major drivers that influence the changes in MGS yield spreads. However IPI and KLCI have weak and no influence on MGS yield spreads respectively Whilst IR, CPI and IPI have significant influence on the yield spreads of CB1, CB2 and CB3, KLCI has significant influence only on the CB1 yield spread but not on CB2 and CB3 yield spreads.*

**Keywords**: bonds yield spreads, corporate bonds, Malaysian government securities

## INTRODUCTION

Bond market plays an important role as an alternative source of financing in the growing world economy today. Following the Asian financial crisis in 1997, the government has initiated active utilisation of bonds as a main source for long-term financing in strengthening the financial system of the country and to reduce the vulnerabilities in financial crisis in the future (Fabella & Madhur, 2003). Today bonds are becoming increasingly popular as an alternative source of funding. Bond market is flexible and provides wider alternative sources of funding to corporations as compared to the traditional source of financing such as bank loans. According to Hale (2003), bond market is able to provide fund to corporations at a lower cost compared to bank loans. At the same time, cost of monitoring is not required for bonds whilst banks imposed additional cost for

reserve and capital requirement, operating, and monitoring costs that are normally charged by banks to their borrowers.

As a result of 1997 Asian financial crisis, Malaysia suffered lack of well-balanced financial system as Malaysia was then over dependence on banks financing (Zainuddin, 2001). Learning from the experience of the financial crisis, the government of Malaysia has realised the importance of having an efficient capital market for rapid economic growth and enhance the robust development of the bond market so as to provide a competitive source of long-term financing to the economy. Since then the government of Malaysia has taken some effort to amend the Securities Commission Act 1983. In July, 2000, the Securities Commission Malaysia (SC) became a single regulator for all fund raising activities such as the registration and approval for the issuance of corporate bonds in Malaysia. Following the amendments of the Securities Commission Act 1983, the Companies Act 1965, the Banking and Financial Institutions Act 1989, the Futures Industry Act 1993 and the Securities Industry (Central Depositories) Act 1991, the SC responsibles as the approving and registering authority for the issuance of all securities in Malaysia (BNM, 2009).

Nonetheless, although Malaysian bond market is developing rapidly (see the detail discussion in the next section), yet not much is understood in terms of the causes of bond yield spreads changes. The term "bond spreads" or "spreads" refers to the interest rate differential between two bonds. Mathematically, a bond spread is the simple subtraction of one bond yield from another. Traders use yield spreads as their benchmark for valuing bonds. Most traders have computer trading systems, such as Bloomberg and PC Bond which allow them to quickly calculate historical and actual spreads between many different bonds. Min (1998) also argued that lack of research in this area is not a salient feature pertaining to Malaysian bond market only, but also in other emerging markets in the world. Ameer (2007) supported this argument after observing that there were an extremely limited number of empirical evidences concerning relationship between macroeconomic variables and bond markets in Asian economies.

The movement of the bond yield spreads in Figures 1 and 2 has inspired us to investigate the contributing factors. As shown, we noticed that the yield spreads of the bonds move about in a similar pattern throughout the period of 2001 to 2008. It can also be observed that all the series reached their peak point and lowest point at almost similar period. Another important observation is the downward trend of yield spreads across the various types of bonds. The yield spreads experienced a sharp increase in 2003 but followed by a sharp decline in 2004 onwards. This implies reduced investment return to the investors. In the nutshell, the trends have spurred us to investigate the causes of the volatile as well as generally declining patterns of bond yield spreads. With a special

attention given on the role of selected macroeconomic variables, this study poses a question of what would be the determinant(s) of bond yield spreads in Malaysian market.

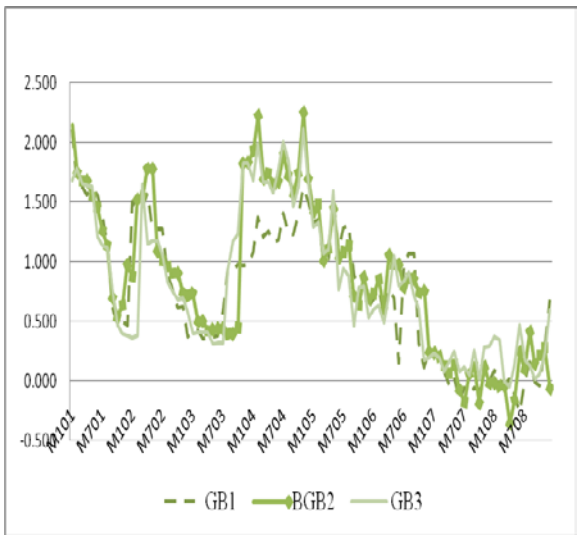


*Figure 1.* Selected government bonds

*Source:* Bond Pricing Agency Malaysia (2009)

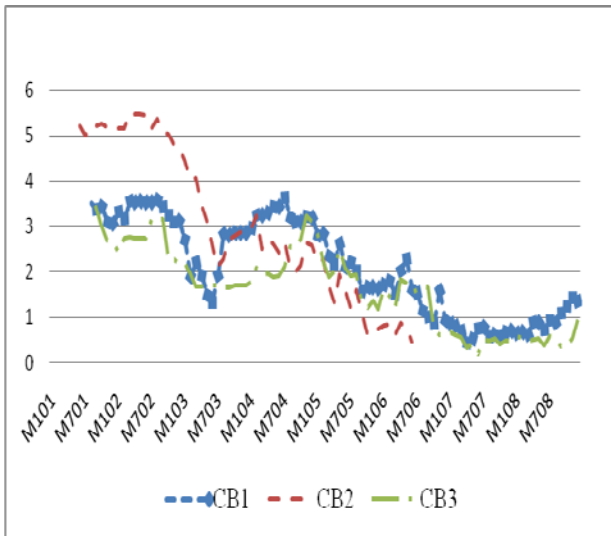


*Figure 2.* Selected corporate bonds

*Source:* Bond Pricing Agency Malaysia (2009)

The article is structured as follows. Section two provides a brief historical development of Malaysian bond market. A brief review of previous studies is available in section three, followed by discussion on empirical model and data collection in section four. Section five presents the results of the analysis and possible implications. Section six concludes the paper.

## THE DEVELOPMENT OF MALAYSIAN BOND MARKET

After 1997 financial crisis, the Malaysian bond market grew at a very fast rate with total outstanding bonds increased from RM271 billion in 2000 to RM585.48 billion in 2008 or an increase of 115%. Trading volume in secondary market increased to RM387.5 billion in 2007 from RM151.2 billion in 1999 (BNM, 2007). The increasing trend in the trading volume reflects the liquidity conditions in the Malaysian bond market. Chart 1 shows the increasing trend of the Malaysian bond market.

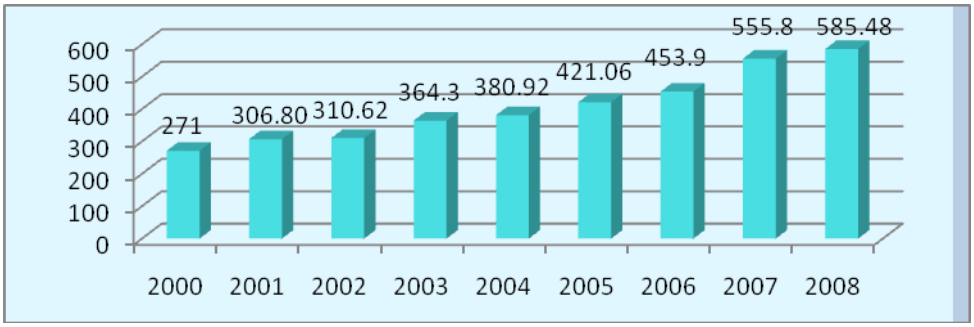


*Chart 1*. Outstanding debt securities 2000–2008 (RM bonds)

*Source:* Securities Commission Malaysia (2003)

A well developed bond market is critical for the economic growth of the country. As a results the government has taken one step ahead by enforcing some efforts to promote bond market in Malaysia and to make an alternative source of debt financing in order to meet the corporate sector borrowing requirements (Ibrahim & Wong, 2006). In June, 2006, the Asian Development Bank (ADB) ranked Malaysian debt securities market as the second largest in Asia after Japan (BNM, 2007). The amount of approval for corporate bonds issuance increased tremendously by 246.8% to RM158.8 billion in 2007 from merely RM40.7 billion in 2001 as shown in Chart 2. The size of private debt securities as a percentage of total bank loans and financing to private corporation increased from 36% in 1999 to 56.2% in December 2007. This is an indication of the reduction of corporations' reliance on bank loans (BNM, 2007).

The establishment of Rating Agency of Malaysia (RAM) and Malaysian Rating Corporation (MARC) has further encouraged rapid development of Malaysian bond market. The expansion of bond market is also encouraged by the existence of a benchmark where Malaysian Government Securities (MGS) are selected as a benchmark yield curve Malaysian bond market due to its risk free characteristic (Rhee, 2000). Benchmarking is an important element in the development of any bond market in the world (Harun, 2002). The establishment of a benchmark yield curve is important to achieve the objectives in providing conducive environment for an active and liquid bond market.

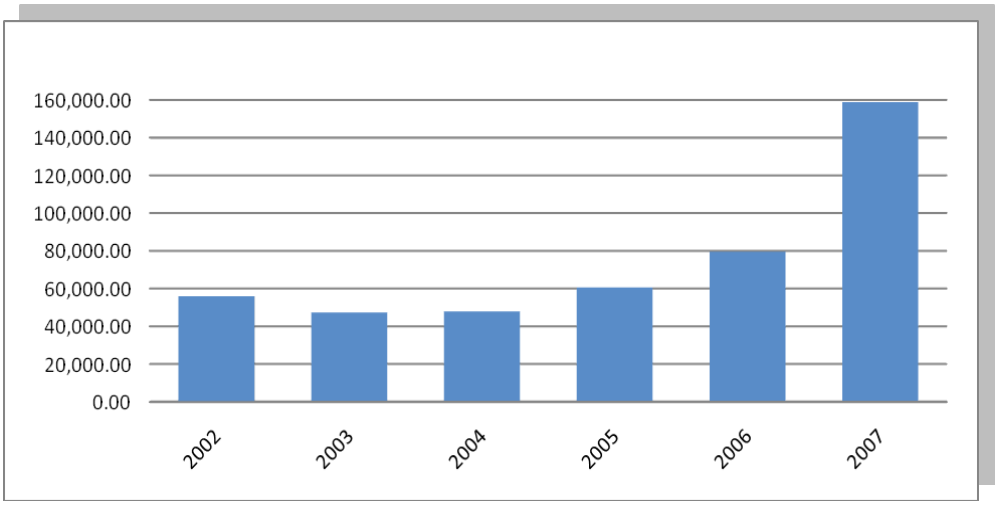


*Chart 2.* The size of issues approved by SC

*Source:* Securities Commission Malaysia (2003)

Whilst Dalla (1995) found that Malaysian bond market faced liquidity and inactive problem in their secondary market, based on the recent study by Chan, Ahmad and Wooldridge (2007), the changes in microstructure of the Malaysian corporate bond market has led to significant improvement in liquidity. In 2007, the turnover of domestic bond market in Malaysia has increased by 45.8% to RM777 billion and total outstanding expanded by 22.8% and accounted for 86.8% of nominal Gross Domestic Products (GDP) (BNM, 2007).

## LITERATURE REVIEW

### Theoretical Review

According to Megginson, Smart and Gitman, (2007) and Bodie, Kane and Marcus (2008), investing in bond is related to investment in the form of debt instrument, which promises to pay a fixed amount of income stream and the bond's principal amount or its par value at maturity date. Another type of bond investors is the one that looking at benefits from the rise in the bond prices. Therefore, bond prices and yield are closely related and their movement provide an important indicator for the investment performance of the bondholders. According to Thau (2001), there are three types of yields related to investing in bonds:

(i) Coupon yield referred to interest paid to the bondholder as a percentage of bond par values, namely coupon rate of the bond;

(ii) Current yield being measured by the annual coupon income divided by bond's market price; and

(iii) Yield to maturity (YTM) that provides more comprehensive measure of bond returns by estimating the total amount of income for the entire period of bond holdings.

Due to more meaningful measures given by the bond yield as compared to the prices, this study is focusing on YTM as a measured of bond performance.

In bond market investigation, the excess return is related to the yield spreads which is important for bond investment performance analysis. Most of the researchers have frequently used yield spreads as one of the important variables in determining investment performance. For instance, Elton, Gruber, Agrawal and Mann (1999) defined yield spreads as the difference in yield to maturity on corporate bonds and the government bonds of equivalent maturity period.

### Empirical Review

The model behind this study has its origin in a number of important empirical studies of bond as well as equity market in which the common measures are found. Chen, Roll and Rose (1986) used multifactor model to explain the security returns as a function of macroeconomics variables. The multifactor model is an extension of asset pricing model that allow researchers to improve the analysis by not limiting the number of variables to be used in their empirical model. Fah (2008) studied the impact of several macroeconomic factors to the yield spreads between two Malaysian Government Securities (MGS) and 10-year MGS. The

study found that GDP growth rates, industry production and money supply ratio are positively related to MGS yield spreads. Other variables such as foreign exchange rates, interest rates, current account, reserves and asset return were not affecting the MGS yield spreads. In contrast, Batten, Fetherston and Hoontrakul, (2006) revealed that the interest rates were found to have negative impact on the yield spread of USD denominated Malaysian bonds. Faerber (2000) supported this finding by stating that the inverse relationship between market rates of interest rate and bond prices in which the increase in interest rate will cause in the decrease of bond prices. Intuitively, the decrease in bond prices will translate into the widening of the yield spread and vice versa.

In other related studies, Tang and Yan (2005) revealed that macroeconomic conditions have significant impact on credit spreads. Credit spreads changes with the economic growth rate, where the widening spreads are associated with the weak conditions and narrows during economic expansion. Further, credit spreads increase dramatically with volatility of the economic growth rate. Booth, Georgopoulus and Hejazi (2007) offer another support to Tang and Yan (2005) study by demonstrating that the existence of strong link between provincial yield spreads and provincial fiscal position (i.e. debt and deficit level). The provincial yield spreads are directly related to the fiscal policy of the provinces. In the recent year, Tang and Yan (2008) investigate the impact of macroeconomic factors on corporate bond yield spreads that subject to default risk. The finding of Tang and Yan (2008), which is consistent with Min (1998), provides additional support to the intuition that average spreads are lower during economic expansion and vice versa.

## EMPIRICAL MODEL AND DATA COLLECTION

### Empirical Model

Equation (1) below explains the relationship between macroeconomic variables such as Consumer Price Index (*CPI*), interest rates (*IR*), Industry Production Index (*IPI*) and Kuala Lumpur Composite Index (*KLCI*) and bond yield spreads of MGS and corporate bonds.

Batten et al. (2006) found that the country's growth rate, inflation rate, interest rates and stock market are the most explainable variable to the changes of bond yield spreads. The study motivated us to investigate the impact of these variables on the yield spreads of the Malaysian Government Securities (MGS) and corporate bonds (CBs). Based on the multifactor model, we propose the following empirical model for the purpose of our investigations.

$$Yield\ spread_{i,t} = \beta_0 + \beta_1 CPI_{i,t} + \beta_2 IR_{i,t} + \beta_3 KLCI_{i,t} + \beta_5 IPI_{i,t} + \varepsilon_{i,t} \quad (1)$$

where

*Yield spreads*$_{it}$ represents the difference between YTM of MGS, and conventional corporate bonds against 3-month treasury bills rates.
$CPI_{i,t}$ is the monthly Consumer Price Index as a proxy for country's inflation.
$IR_{i,t}$ is the monthly interest rates (3 month Treasury-bil).
$KLCI_{i,t}$ is the month end closing of KLCI index.
$IPI_{i,t}$ is the monthly Industry Production Index.
$\varepsilon_{i,t}$ is the stochastic error term

Multifactor model captures for events such as recessions or macroeconomic factors that drive investor's non-investment sources of income. The Asset Pricing Theory (APT) recognised that only few important factors that are commonly used like *IPI, IR, CPI, KLCI* might affect the long-term average returns of financial assets such as stocks and bonds (Ross, 1976). All the above variables enter in the logarithmic form.

**Data Collection**

The data on YTM are collected from Bond Pricing Agency Malaysia's (BPAM, formerly known as Bondweb Malaysia Sdn. Bhd.) database. BPAM was established as Malaysia's first bond pricing agency on 18 April 2006 and has been recognised as one of the official sources for Ringgit denominated bonds prices evaluation in Malaysian bond market. The establishment of BPAM is to fulfill one of SC initiative to enhance the transparency and consistency. The data is based on the monthly last traded prices. The data consist of monthly observation of YTM for MGS and conventional corporate bonds for the 8 years period from January 2001 to December 2008. A total of 149 Malaysian Government Securities (MGS) data and 238 Corporate Bond (CB) data are collected. The data on macroeconomic variables are collected from Economics Report and the Bank Negara Report via its website (http://www.bnm.gov.my). The data on stock exchange is gathered from KLSE monthly closing index for the period under investigation.

## RESULTS AND DISCUSSIONS

### Descriptive statistics

Descriptive statistics of the yield spreads of MGS and CBs are presented in Table 1. The bonds are broken down into 1, 2 and 3 category according to 1, 3 and 5 year maturity period respectively.

Table 1
*Descriptive statistics of the bond yield spreads*

| | Government bonds | | | Corporate bonds | | |
|---|---|---|---|---|---|---|
| | GB1 | GB2 | GB3 | CB1 | CB2 | CB3 |
| Mean | **0.75** | 0.86 | 1.02 | **2.10** | 2.07 | 1.92 |
| Median | 0.78 | 0.81 | 0.95 | 2.00 | 2.05 | 1.90 |
| Std. Dev. | 0.57 | 0.66 | 0.73 | **1.05** | **1.07** | **1.01** |
| Skewness | 0.01 | 0.22 | 0.27 | –0.05 | –0.01 | –0.03 |
| Kurtosis | 1.85 | 2.03 | 2.01 | 1.48 | 1.42 | 1.58 |
| Max | 2.09 | 2.25 | 2.36 | 3.60 | 3.70 | 3.70 |
| Min | –0.26 | –0.35 | –0.15 | 0.50 | 0.50 | 0.40 |
| No. of observations | 34 | 51 | 64 | 50 | 39 | 149 |

Table 1 above shows that all the sample have positive mean with the highest mean of 2.10 given by CB1 and the lowest mean of 0.75 is given by GB1. The results are in line with the trade off notion of risk and return, in which the higher yield given by corporate bonds as a means to compensate for the instrument's risk exposure. The measures of standard deviation generally used to measure the volatility and the riskiness of the instrument also shows higher standard deviation of corporate bonds.

Table 2
*Descriptive statistics for macroeconomics variables*

| | KLCI | IPI | CPI | IR |
|---|---|---|---|---|
| Mean | **905.20** | **4.13** | **104.44** | **2.91** |
| Median | 874.05 | 4.80 | 104.15 | 2.80 |
| Std. Dev. | **234.41** | 6.02 | 3.47 | 0.41 |
| Skewness | 0.76 | –0.66 | 1.18 | –0.05 |
| Kurtosis | 2.59 | 3.72 | 4.86 | 2.39 |
| Max | **1445.03** | 18.40 | 114.90 | 3.56 |
| Min | **572.88** | –15.60 | 98.60 | 1.84 |

Table 2 shows the average KLCI for the last 8 years stood at 905.20 point with the maximum of 1445.03 points and the minimum of 572.88 points. The higher value of KLCI's standard deviation reveals the bigger fluctuation in KLCI. The

high standard deviation also implies higher risk if an investment is made in KLCI during this period. The average growth for the last 8 years as given by IPI is 4.13%. The average CPI (as a measure of country's inflation) is 104.44. The average three months Treasury bills (IP) for the past 8 years stand at 2.91.

**Unit Root Test**

Table 3 shows the result of Augmented Dickey-Fuller (ADF) test for unit roots of the variables and first differences of the natural log values. The results indicate that the null hypothesis of the presence of unit root cannot be rejected. However, at first difference the null hypothesis can be rejected in all cases with the *t*-statistics statistically significant at 1% level. This indicates that at first difference all series are stationary when tested with trend or without trend. Therefore the series can be said to be integrated of order 1, *I* (1). We also applied Phillip-Perron (PP) unit root test as an alternative way to examine stationarity of the variables. PP test is to determine the presence of unit roots in the sample of various types of bonds. The results of PP's test at level are found to be almost consistent with ADF test. Similar to the ADF test, at first difference, all the PP values are statistically significant at 1 percent level, with or without time trend. Hence, the null hypothesis of unit root can be rejected and the results suggest that the series are integrated of order 1, *I* (1). The results are available upon request.

Table 3
*Unit root tests for the monthly bond yield spreads*

| Variables | Level | | First differentiation | |
|---|---|---|---|---|
| | Constant | Constant with trend | Constant | Constant with trend |
| lnGB1 | –2.797 | –2.955** | –10.174*** | –10.166*** |
| lnGB2 | –1.841 | –2.399 | –5.235*** | –5.199*** |
| lnGB3 | –1.499 | –2.628 | –7.266*** | –7.351*** |
| lnCB1 | –1.482 | –2.235 | –9.801*** | –9.759*** |
| lnCB2 | –1.414 | –2.517 | –8.673*** | –8.645*** |
| lnCB3 | –1.829 | –2.148 | –9.664*** | –9.686*** |
| lnCPI | –0.878 | –1.618 | –8.602*** | –8.595*** |
| lnIR | –0.936 | –1.536 | –5.890*** | –5.832*** |
| lnKLCI | –1.275 | –2.001 | –7.853*** | –7.872*** |
| lnIPI | –1.292 | –1.112 | –4.286*** | –4.571*** |

*Notes:* *, ** and *** indicates the rejection of the null hypothesis at level of confidence 10%, 5% and 1%, respectively.

**Cointegration Analysis**

Tables 4 and 5 show the trace statistics and maximum eigenvalue statistics from the Johansen and Juselius (1990) (JJ) for the Malaysian Government Securities

and Corporate Bonds. After correcting the statistical values, both trace and max-eigenvalue statistics reject the null hypothesis of zero cointegrating equation. As shown in Table 4 below, the null hypothesis of zero cointegration ($r = 0$) is rejected by the Trace statistics and Maximum Eigenvalue statistics at 5% significant level. Both tests indicate the presence of a single cointegrating vector in the model, confirming the existence of a long-run stable linear equilibrium relationship among the variables in MGS.

Table 4
*Cointegration test – Malaysian Government Securities*

| $H_0$ | Trace | Adj. Trace | 5 % CV | Max. Eigen. | Adj. Max | 5 % CV |
|---|---|---|---|---|---|---|
| **Panel I: MGS 1 (GB1)** | | | | | | |
| r = 0 | 133.430** | 77.38** | 69.818 | 59.063** | 34.26** | 33.876 |
| r ≤ 1 | 74.366** | 43.13 | 47.856 | 43.637** | 25.31 | 27.584 |
| r ≤ 2 | 30.729** | 17.82 | 29.797 | 19.887 | 11.53 | 21.131 |
| r ≤ 3 | 10.842 | 6.29 | 15.494 | 10.309 | 5.98 | 14.264 |
| r ≤ 4 | 0.532 | 0.31 | 3.841 | 0.532 | 0.31 | 3.841 |
| **Panel II: MGS 2 (GB2)** | | | | | | |
| r = 0 | 128.626** | 74.60** | 69.818 | 58.467** | 33.91** | 33.876 |
| r ≤ 1 | 61.358** | 35.59 | 47.856 | 29.456** | 17.08 | 27.584 |
| r ≤ 2 | 31.902** | 18.50 | 29.797 | 18.904 | 10.96 | 21.131 |
| r ≤ 3 | 12.998 | 7.54 | 15.494 | 12.842 | 7.45 | 14.264 |
| r ≤ 4 | 0.156 | 0.09 | 3.841 | 0.156 | 0.09 | 3.841 |
| **Panel III: MGS 3 (GB3)** | | | | | | |
| r = 0 | 165.219** | 95.83** | 69.818 | 82.287** | 47.73** | 33.876 |
| r ≤ 1 | 82.931** | 48.09 | 47.856 | 37.450** | 21.72 | 27.584 |
| r ≤ 2 | 45.480** | 26.38 | 29.797 | 33.449** | 19.40 | 21.131 |
| r ≤ 3 | 12.031 | 6.98 | 15.494 | 10.776 | 6.25 | 14.264 |
| r ≤ 4 | 1.255 | 0.73 | 3.841 | 1.255 | 0.73 | 3.841 |

*Notes:* CV stands for critical value.
** denotes significant at 5%t according to MacKinnon-Haug-Michelis (1999) MHM. The Adjustment of trace and Maximum Eigenvalue Statistics has been adjusted for small sample size correction using Reinsel and Ahn's (1992) formula: *T-nk /T*.

Table 5 shows that the existence of three cointegrating vector based on the rejection of null hypothesis at 5% level for *CB2* and *CB3*. Meanwhile, the result for *CB1* shows the existence of four cointegrating vector based on the rejection of null hypothesis at 5% level. The adjustment needs to be done to avoid biasness pertaining to the problem of small sample size. We are dealing with small sample size and after correcting the statistical values, both trace and max-eigenvalue statistics reject the null hypothesis of zero cointegrating equation at 5% significant level. Results of the adjustment tests again indicate the presence of a single cointegrating vector in the model and there is a long-run stable linear equilibrium relationship among the variables in CB.

Table 5
*Cointegration test – Corporate bonds*

| $H_0$ | Trace | Adj. Trace | 5 % CV | Max. Eigen. | Adj. Max | 5 % CV |
|---|---|---|---|---|---|---|
| **Panel I: Corporate Bond 1 (CB1)** | | | | | | |
| r = 0 | 178.561** | 104.18** | 69.818 | 100.438** | 58.25** | 33.876 |
| r ≤ 1 | 78.123** | 45.31 | 47.856 | 40.539** | 23.51 | 27.584 |
| r ≤ 2 | 37.583** | 21.79 | 29.797 | 21.334** | 12.37 | 21.131 |
| r ≤ 3 | 16.249** | 9.42 | 15.494 | 16.134** | 9.36 | 14.264 |
| r ≤ 4 | 0.114 | 0.07 | 3.841 | 0.114 | 0.07 | 3.841 |
| **Panel II: Corporate Bond 2 (CB2)** | | | | | | |
| r = 0 | 164.715** | 95.53** | 69.818 | 86.385** | 50.10** | 33.876 |
| r ≤ 1 | 78.329** | 45.43 | 47.856 | 39.131** | 22.70 | 27.584 |
| r ≤ 2 | 39.197** | 22.73 | 29.797 | 24.214** | 14.04 | 21.131 |
| r ≤ 3 | 14.983 | 8.69 | 15.494 | 12.937 | 7.50 | 14.264 |
| r ≤ 4 | 2.045 | 1.19 | 3.841 | 2.045 | 1.19 | 3.841 |
| **Panel III: Corporate Bond 3 (CB3)** | | | | | | |
| r = 0 | 160.233** | 92.92** | 69.818 | 83.825** | 48.62** | 33.876 |
| r ≤ 1 | 76.407** | 44.31 | 47.856 | 42.546** | 24.68 | 27.584 |
| r ≤ 2 | 33.860** | 19.64 | 29.797 | 21.208** | 12.30 | 21.131 |
| r ≤ 3 | 12.651 | 7.34 | 15.494 | 12.199 | 7.08 | 14.264 |
| r ≤ 4 | 0.452 | 0.26 | 3.841 | 0.452 | 0.26 | 3.841 |

*Notes:* CV stands for critical value.
** denotes significant at 5%t according to MacKinnon-Haug-Michelis (1999) MHM. The Adjustment of trace and Maximum Eigenvalue Statistics has been adjusted for small sample size correction using Reinsel and Ahn's (1992) formula: *T-nk /T.*

## Long-Run Equation

The long-run cointegrating equation for the relationship between yield spread and macroeconomic variables are given in Tables 6 and 7. These equations were obtained from the error correction models. We will start with the discussion on MGS. The equation given in Table 6 suggests a consistent sign for all the variables except for positive intercept for *GB1* and negative intercept for *GB2* and *GB3*. However the results show that the significance of the variables varies between *GB1*, *GB2* and *GB3*. There is a negative relationship between MGS yield spread and *KLCI, IPI* and *IR* and positive relationship between MGS yield spread and *CPI*.

The long-run equation in Table 6 reveals that *CPI* is positively related to yield spreads in all the cases. *CPI* is significant with the positive coefficient of 0.3494, 0.7367 and 2.333 and a t-statistics of 3.9674, 4.8433 and 7.623 for *GB1, GB2* and *GB3* respectively. This shows that an increase in *CPI* will cause the spread to widen. The results are consistent with the anticipated hypothesis. Higher *CPI* implies difficult economic condition and caused yield spread to increase because investors will require higher risk premium for their investment. In addition higher

*CPI* will reduce the purchasing power of consumers, causing less cash flowing in the country. The positive relationship as suggested by the equation is consistent with earlier prediction and previous empirical finding by Fama and French (1989).

Table 6
*Long-run equation (Malaysian Government Securities)*

**Panel I: Malaysian Government Securities 1 (GB1)**

lnGB = 36.6046 – 0.0002lnKLCI – 0.2346lnIPI + 0.3494lnCPI** – 0.2346lnIR
[–0.5849] [–0.6378] [3.9674] [–0.6378]

**Panel II: Malaysian Government Securities 2 (GB2)**

lnGB = –63.4825 – 0.0011lnKLCI – 0.2228lnIPI*** + 0.7367lnCPI*** – 3.4486lnIR***
[–1.6957] [–6.4677] [4.8433] [–5.4956]

**Panel III: Malaysian Government Securities 3 (GB3)**

lnGB = –213.3623 – 0.0004lnKLCI – 0.0443lnIPI + 2.3333lnCPI*** – 9.5583lnIR***
[–0.2972] [–0.6251] [7.6233] [–7.6335]

*Note:* *, ** and *** denote significant at 10%, 5% and 1%, respectively.

With regard to *GB1*, macroeconomic variables (*IPI, KLCI* and *IR*) in the regression equation are not significant and contradict to the earlier predictions. Results reveal that the relationship between *KLCI* and yield spread are not significant in all of the equation in Table 6. There are negative coefficient of -0.0002, -0.0011 and -0.0004 and a t-statistics of -0.5849, -1.6957 and -0.2972 for *GB1, GB2* and *GB3* respectively. *KLCI* is used in the study to represent the firm's asset value. The increase in stock market implies an increase in asset value that will reduce the probability of default, hence decrease the yield spread (Batten et al., 2006). Batten et al. (2006) also indicated that asset factors proxied by stock market indices of different countries varies and are inconsistent. One possible reason for the inconsistent finding is due to the rebalancing of portfolio between bonds and stocks held by international portfolio manager. Another possible reason is that MGS investment is less risky since it is guaranteed by the government.

The empirical finding pertaining to *IR* is found to be consistent with our predictions except for *GB1*. For *GB1, IR* is found to be insignificant with the coefficient of -0.236 and a t-statistics of -0.6378 and is not consistent with the findings of Batten et al. (2006). In their findings *IR* is negatively related and significant in all the emerging countries under investigations. Batten et al. (2006) has investigated nine sovereign bonds from four emerging countries namely

Malaysia, China, Korea and Philippine. One possible reason for the different findings is the bond's shorter maturity period. Bonds with shorter maturity period are less sensitive to fluctuations (Bodie et al., 2008). *GB1* has the shortest maturity period as compared to *GB2* and *GB3*. However, the empirical finding reveals that *IR* is significant in both equation for *GB2* and *GB3* with negative coefficient of –3.4486 and –9.5583 and a t-statistics of –5.4956 and –7.6335 respectively. Therefore, we can conclude that the relationship between *IR* and MGS yield spread is inversely related. The result is consistent with Bodie et al. (2008) where bond prices and yields are inversely related. Bond prices and yields are important elements in fixed income securities. The changes in bonds prices are directly related to bonds yield through the inverse relationship between bond prices and yield.

Table 6 shows the coefficient of economic growth as measured by *IPI* is –0.2228 with the t-statistics of –6.4677. *IPI* is negatively related to *GB2* and it is significant at 1% level and supported our hypothesis. However *IPI* is not significant to *GB1* and *GB3*. An increase in *IPI* can be seen as an indicator for healthy economic growth for the country. This could probably because *IPI* is not an accurate measure of economic growth as compared to *GDP* a commonly used indicator for economic growth. Fah (2008) found that *GDP* could cause significant impact to the changes in MGS yield spread.

Results of the long-run equation corporate bonds, as shown in Table 7, indicate that all the macroeconomic variables have the expected sign that support our hypotheses. All variables are significantly related to *CB*. However, the results show that the statistical significance levels vary. The empirical finding shows that *KLCI* is negatively related to *CB1, CB2* and *CB3* respectively. *IPI* is also significant and negatively related to *CB1, CB2* and *CB3*.

Inflation represented by *CPI is* found to be positively related to yield spread of *CB1, CB2* and *CB3* respectively. *CPI* is closely related to consumer spending in which an increase in *CPI* will decrease consumer's spending and causing less cash flow in the country. This could contribute to slowdown in the economic condition of the country and thus increase yield spread. *IR* is negatively related to *CB1, CB2* and *CB3*. The empirical findings indicate the significant relationship between *IR* and *CB* yield spreads. The result supports the finding of Batten et al. (2006).

Table 7
*Long-run equation (Corporate Bond)*

**Panel I: Corporate Bond 1 (CB1)**

lnCB = 86.6190 – 0.0025lnKLCI** – 0.1707lnIPI*** + 1.0208lnCPI*** – 4.8588lnIR***
[–4.3341] [–6.4205] [9.8278] [–11.3949]

**Panel II: Corporate Bond 2 (CB2)**

lnCB = 131.5000 – 0.0018lnKLCI* – 0.2041lnIPI** + 1.5003lnCPI*** – 6.7425lnIR***
[–2.2159] [–4.1065] [8.6294] [–9.5309]

**Panel III: Corporate Bond 3 (CB3)**

lnCB = 150.6970 – 0.0023lnKLCI* – 0.2254lnIPI** + 1.7100lnCPI*** – 7.4665lnIR***
[–2.1895] [–3.8119] [8.3903] [–9.2599]

*Note:* *, ** and *** denote significant at 10%, 5% and 1%, respectively.

## Granger Causality Test

From Table 8, the existence of cointegration is further justified by the significance of at least Granger Causality Test although the adjustment process from short-run disequilibrium to long run disequilibrium does not necessarily through the same channel. The presences of bidirectional causal linkages between variables are observed between *GB1* and *IPI* and between *IR* and *CPI*. This indicates that changes in *CPI* and *IR* Granger cause *GB1*'s yield spread. *IPI* and *GB1* Granger cause each other.

However, there are mixed results for *GB2* and *GB3*. *GB2* has unidirectional causal effects running from *IR* to *IPI*, from *CPI* to *IR* and from *CPI* and *GB2* to *IPI* for *GB2*. While *GB3* has bidirectional relationship that can be observed between *CPI* and *IR*, the unidirectional causal effect also can be observed for *GB3* running from *KLCI* to *IR* and from *IPI* to *IR*. The Granger causality test reveals the existence of bidirectional relationship between *IR* and *CPI* for all cases except for *GB2*. The consistency in bidirectional relationship between *IR* and *CPI* is also supported by Atmadja (2005). He found inflation rate granger caused changes in domestic interest rates in Malaysia as well as other Asian countries under investigation. This may indicate that MGS's investors take into consideration the changes in *CPI*, *IR* and *IPI* of the country when making their bond yield projections.

Table 8
*Granger causality test for Malaysian Government Securities*

| | ΔlnGB [F-stat] | ΔlnKLCI [F-stat] | ΔlnIPI [F-stat] | ΔlnCPI [F-stat] | ΔlnIR [F-stat] | ECT (t-stat) |
|---|---|---|---|---|---|---|
| **Panel I: MGS 1 (GB1)** | | | | | | |
| ΔlnGB | _ | 15.6786** | 14.3788** | 18.4805** | 46.0946*** | 0.0632** |
| | | [0.0282] | [0.0448] | [0.0100] | [0.0000] | (3.5155) |
| ΔlnKLCI | 8.7082 | _ | 8.5018 | 2.9047 | 8.8811 | 3.5173 |
| | [0.2743] | | [0.2904] | [0.8937] | [0.2613] | (0.9728) |
| ΔlnIPI | 17.4288** | 3.5986 | _ | 9.9220 | 6.3830 | -0.1811 |
| | [0.0148] | [0.8247] | | [0.1930] | [0.4958] | (-0.7463) |
| ΔlnCPI | 6.0183 | 3.4799 | 2.1021 | _ | 17.0240** | 0.1808* |
| | [0.5376] | [0.8373] | [0.9540] | | [0.0172] | (1.8878) |
| ΔlnIR | 14.9468 | 12.2514* | 9.9100 | 41.5894*** | _ | -0.0493*** |
| | [0.0367] | [0.0926] | [0.1937] | [0.0000] | | (-4.4229) |
| **Panel II: MGS 2 (GB2)** | | | | | | |
| ΔlnGB | _ | 2.7291 | 2.0763 | 3.4977 | 5.0979 | -0.0906 |
| | | [0.9502] | [0.9786] | [0.8994] | [0.7471] | (-1.0895) |
| ΔlnKLCI | 12.7083 | _ | 9.3033 | 3.6719 | 4.1278 | -8.5424 |
| | [0.1223] | | [0.3174] | [0.8854] | [0.8454] | (-0.8834) |
| ΔlnIPI | 0.3924*** | 5.2286 | _ | 17.3231** | 16.5271** | -2.2950** |
| | [0.0089] | [0.7329] | | [0.0269] | [0.0354] | (-3.6169) |
| ΔlnCPI | 8.1459 | 1.7194 | 0.4096 | _ | 7.3369 | 0.3697 |
| | [0.4193] | [0.9884] | [0.9999] | | [0.5007] | (1.3283) |
| ΔlnIR | 10.2053 | 2.9401 | 3.4416 | 18.2306** | _ | -0.0674* |
| | [ 0.2509] | [0.9381] | [0.9037] | [0.0196] | | (-1.9234) |
| **Panel III: MGS 3 (GB3)** | | | | | | |
| ΔlnGB | _ | 3.5261 | 3.3228 | 12.5246 | 6.0533 | -0.0717* |
| | | [0.8971] | [0.9125] | [0.1293] | [0.6413] | (-1.9353) |
| ΔlnKLCI | 8.4264 | _ | 5.3582 | 2.7895 | 3.7318 | -4.0541 |
| | [0.3930] | | [0.7187] | [0.9469] | [0.8805] | (-0.7347) |
| ΔlnIPI | 3.6553 | 2.3708 | _ | 7.6453 | 3.1526 | 0.0779 |
| | [0.8868] | [0.9675] | | [0.4689] | [0.9244] | (0.1937) |
| ΔlnCPI | 10.686 | 5.7025 | 4.0640 | _ | 19.3622** | 0.2439 |
| | [0.2201] | [0.6805] | [0.8513] | | [0.0130] | (1.6421) |
| ΔlnIR | 6.9761 | 27.2272*** | 23.6432*** | 47.6584*** | _ | 0.0797*** |
| | [0.5392] | [0.0006] | [0.0026] | [0.0000] | | (5.4017) |

*Note:* Figure in [ ] represents p-value, while figure in ( ) stands for t-value. Asterisks *, ** and *** denote significant at 10%, 5% and 1%, respectively.

Table 9 reports the results on Vector Error Correction Model and short-run Granger causality test for corporate bonds (*CB*s). The results show the existence of unidirectional causality effect running from *KLCI* to *IR*, from *CPI* to *IR*, from *IPI* to *IR* and from *IPI* to *CB1*. There is no bidirectional causality observed between the variables. The result reveals that *KLCI*, *CPI* and *IPI* play a vital role in leading the changes in IR. The relationships suggest that the movement of *KLCI, CPI* and *IPI* can be used as a useful and reliable indicator to predict the *IR*. The presence of unidirectional causality effect from *IPI* to *CB1* implies that the economic growth as measured by *IPI* Granger cause yield spread. The relationship suggests that the movement in *IPI* can be used to predict future yield spread.

Table 9
*Granger causality test for corporate bonds*

| | ΔlnGB [F-stat] | ΔlnKLCI [F-stat] | ΔlnIPI [F-stat] | ΔlnCPI [F-stat] | ΔlnIR [F-stat] | ECT (t-stat) |
|---|---|---|---|---|---|---|
| **Panel I: Corporate Bond 1 (CB1)** | | | | | | |
| ΔlnGB | – | 10.8254 | 14.5473* | 10.1935 | 9.5095 | -0.2393* |
| | | [0.2118] | [0.0686] | [0.2517] | [0.3011] | [-2.5941] |
| ΔlnKLCI | 3.5585 | – | 5.8434 | 2.4634 | 2.5600 | -9.6228 |
| | [0.8946] | | [0.6648] | [0.9634] | [0.9589] | [-0.7906] |
| ΔlnIPI | 2.7630 | 4.0187 | – | 9.6697 | 4.4475 | -1.0373 |
| | [0.9483] | [0.8554] | | [0.2890] | [0.8147] | [-1.2171] |
| ΔlnCPI | 2.7995 | 2.8846 | 1.3139 | – | 12.3640 | 0.4930 |
| | [0.9463] | [0.9414] | [0.9954] | | [0.1357] | [ 1.4238] |
| ΔlnIR | 13.2154 | 19.8633** | 23.6537*** | 44.0656*** | – | 0.1639*** |
| | [0.1046] | [0.0109] | [0.0026] | [0.0000] | | [ 4.7514] |
| **Panel II: Corporate Bond 2 (CB2)** | | | | | | |
| ΔlnGB | – | 10.9687 | 10.7942 | 9.0537 | 5.3512 | -0.1288* |
| | | [0.2035] | [0.2136] | [0.3378] | [0.7195] | (-2.1636) |
| ΔlnKLCI | 7.5251 | – | 9.4359 | 1.2477 | 3.9527 | -2.5588 |
| | [0.4812] | | [0.3069] | [0.9961] | [0.8614] | (-0.2964) |
| ΔlnIPI | 9.1183 | 2.9448 | – | 6.1891 | 7.2474 | -0.3657 |
| | [0.3324] | [0.9378] | | [0.6261] | [0.5102] | (-0.6527) |
| ΔlnCPI | 8.8239 | 6.4507 | 3.5095 | – | 15.8435** | 0.2064 |
| | [0.3574] | [0.5969] | [0.8984] | | [0.0447] | (0.9077) |
| ΔlnIR | 14.7028* | 22.1202*** | 27.1670*** | 47.2442*** | – | 0.1140*** |
| | [0.0652] | [0.0047] | [0.0007] | [0.0000] | | (4.8064) |
| **Panel III: Corporate Bond 3 (CB3)** | | | | | | |
| ΔlnGB | – | 7.8714 | 9.7014 | 15.4199* | 14.3812* | -0.1484* |
| | | [0.4461] | [0.2866] | [0.0515] | [0.0724] | (-2.4447) |
| ΔlnKLCI | 3.8414 | – | 6.6985 | 2.6367 | 2.5663 | -5.5775 |
| | [0.8711] | | [0.5695] | [0.9550] | [0.9586] | (-0.7061) |
| ΔlnIPI | 4.8343 | 2.9424 | – | 8.7861 | 2.7500 | -0.1656 |
| | [0.7751] | [0.9379] | | [0.3607] | [0.9491] | (-0.3046) |
| ΔlnCPI | 4.8598 | 2.3206 | 2.3152 | – | 6.5083 | 0.4076* |
| | [0.7725] | [0.9696] | [0.9698] | | [0.5905] | (1.9062) |
| ΔlnIR | 9.5396 | 23.4144*** | 23.0796*** | 45.3110*** | – | 0.0930** |
| | [0.2988] | [0.0029] | [0.0033] | [0.0000] | | (4.2324) |

*Note:* Figure in [ ] represents p-value, while figure in ( ) stands for t-value. Asterisks *, ** and *** denote significant at 10%, 5% and 1%, respectively.

The result of Granger Causality test indicates the existence of unidirectional causality effect running from *IPI* to *IR*, from *KLCI* to *IR* and from *CPI* to *IR*. This causality indirectly affects *CB3*, through the input of other variables on *IR*. Thus, the information on *IPI, KLCI* and *CPI* can be used as important tools to predict the direction of *IR*. Later the IR can be used to predict yield spread. The inverse relationship between IR and yield spread is supported by many empirical researches. The unidirectional causal effect also can be observed for *CB3* that running from *CPI* to *CB3*. In short, the result of Granger causality test reveals that *CB3* is Granger-caused by *CPI*. Hence the changes in country's inflation as measured by *CPI* can be used to predict yield spread. Hence, *IR* and *CPI* play a vital role in predicting the movement of *CB* yield spread in Malaysian market.

## CONCLUSIONS

This study attempts to investigate the implication of macroeconomic variables on the bond yield spread. By utilising Johansen and Juselius (1990) approach of cointegration and error correction model, for the time period spanning from January 2001 to December 2008, we found that several macroeconomics factors help in explaining the behavior of bonds yield spread.

Our research findings provide an insight understanding of the determinants of yield spread that could benefit the investors and issuers in making wise investment and financing decisions. The findings could add new knowledge to the investors as well as portfolio managers in making informed investment decision. By understanding how macroeconomic factors work and affect differently on each types of bonds, portfolio managers, investment managers and investors would be able to construct better investment portfolio plan that could provide them with higher return. Investors with higher risk tolerance may consider increasing their investments in this instrument during economic uncertainty such as indicated by increasing CPI and decrease in IPI. During economic turmoil an investor may benefit from higher yield spread due to the increase of risk premium. The findings show that interest rate is one of the major determinants of bond yield spread. Therefore, investors may restructure their portfolio in tandem with the movement of interest rates. Falling of interest rates do not impacts long-term investors due to the benefit of cash flows from the coupon payment but trading investors will benefit from the capital appreciation when the bond prices increase. The knowledge and information on macroeconomic factors could also assist bond issuers to make better prediction in particular in the pricing their bonds. By understanding the direction of interest rates, bond issuers are able to determine the financing costs. Cost of funds is lower when interest rates is low and vice versa. Therefore, bond issuers should consider buying back their bonds against the cost of new financing when interest rate is low. Our findings also show that macroeconomic factors are important in determining the bond yield spread.

Policy maker must exercise care when drawing up monetary policy involving interest rates and other economic policy because these policies may affect *CPI*, *KLCI* and *IPI* and in turn affect yield spread. The understanding of how the bonds works plus the awareness of the bond market could further help to develop bond market in Malaysia as lauded in the Malaysian Capital Master Plan.

Nonetheless, this study is not without limitations which are mainly due to the nature of the data themselves. First limitation would be the fact that the market is thinly traded and most of the bonds are held till maturity. The second limitation is

the differences in maturity or issuing period which may confound some analysis though the impact is thought to be minimal.

Further future study on bond market should incorporate the Islamic and conventional types of bonds as well as government and corporate bonds to understand the behavior of different types of bond. In addition future research should also consider other factors that could affect bond yield spread such as foreign exchange rate and money supply. Extending this study to other market and incorporate other macroeconomic variables is worth pursuing for additional literature.

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