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INTEREST RATE UNCERTAINTY, SPREAD AND ECONOMIC ACTIVITY: EMPIRICAL EVIDENCE IN MALAYSIA

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Abstract

The determination of the term structure of interest rate is of great interest to both policy makers and researchers in finance and economics. Not surprisingly, a large body of literature (among others, Fisher (1907), Cox, Ingersoll and Ross (1985), and Longstaff (2000). The uncertainty of interest rates is another variable that has been widely investigated, since it measures uncertainty of a macroeconomic nature. It is important both for its effect on the macroeconomic variables (interest rates, investments, etc.) and its effect on individual or firm investment decisions (see, for example, Siegfred (2000)). Therefore, this study will focus on the interest rate spread resulting from default risk and attempts to explain how and why the risk spread leads business cycles. This study also contribute to the existing literature by looking at the interest rate uncertainty that plays a critical role in explaining the interest rate spread and economic activity. Furthermore, the finding shows that interest rate uncertainty embodies useful information in term of predicting the growth rate of industrial production.

Key words: *interest rate uncertainly, interest rate spread, economic activity*

INTRODUCTION

At the micro-level, firms acquire funds through internal and external financings. Firms with no endowment or less tangible asset are dependent to the bank debt as the external financing and vice versa. The selection of the sources of financing is important element to the capital structure decision of the firms. When firms borrow fund from banks and issue bonds, and pay interest, hence firms' balance sheet are exposed to interest rate uncertainty. The size of debt market in Malaysia is certainly large enough to warrant a thorough examination of this issue. As shown in Table 1, the low interest rate after the financial crisis in 1997 encourages firms to acquire loans and issues bonds. In 1990, the total amount of debts was RM116.7 billion and increased to RM478.8 billion in 2002. During the same period, the total equity issued increased from RM29.5 billion to RM117.0 billion. Further, the percentage share of bonds from the total debts increased from 2.2% in 1990 to 7.6% in 2002. And the percentage share of bonds from the total asset also increased from 0.8% in 1990 to 2.6% in 2002.

Table 1: Internal and External Financings by Types

Types of financing	RM million			
	1990[1]	1995[1]	2000[2]	2002[2]
Loans	114 061	251 860	447 400	442 600
Debt Securities	2 603	11 898	30 953	36 195[p]
Total Debt	116 664	263 758	478 353	478 795
Equity	29 522	178 859	244 054	116 951
Total Asset	320 400	733 000	1 250 800	1 395 000

Note: [1] excluding housing loans sold to Cagamas Berhad
[2] includes loans sold to Cagamas and Dana Harta
[p] preliminary
Source: Bank Negara Malaysia, *Annual Report (various issues)*

These figures imply that: first, the substitutability of commercial paper and corporate bonds, and corporate bonds and equity; second, the interest rate spread might think to reflect a risk premium for risky loans and risky bond yields. Even, if bond-holders are risk neutral, as long as some bonds are expected to be in default at the maturity date, the risky bond yields should higher than the risk-free treasury bills in order to compensate for bond default. Thus, the spread reflects expectations of the performance of risky bonds. Certainly, the size of interest rate spread may not be explained solely by default risk. Kwark (2002) suggest the tax differentials and financial intermediation costs may also determine the size of the spread. However, fluctuations of the interest rate spread are generally considered to be related to movements in default risk over the business cycle.

Therefore, this study will focus on the interest rate spread resulting from default risk and attempts to explain how and why the risk spread leads business cycles. These studies also contribute to the existing literature by looking at the interest rate uncertainty that plays a critical role in explaining the interest rate spread and economic activity.

The rest of the paper is organized in the following way: the next section explains the theoretical background; the model used, data sources and estimation procedure are outlined in the third section; empirical results are examined in the fourth section; and the fifth section summarizes the conclusions.

THE INTEREST RATE UNCERTAINTY LITERATURE

The determination of the term structure of interest rate is of great interest to both policymakers and researchers in finance and economics. Not surprisingly, a large body of literature (among others, Fisher (1907), Cox, Ingersoll and Ross (1985), and Longstaff (2000). The uncertainty of interest rates is another variable that has been widely investigated, since it measures uncertainty of a macroeconomic nature. It is important both for its effect on the macroeconomic variables (interest rates, investments, etc.) and its effect on individual or firm investment decisions (see, for example, Siegfred (2000)).

Nevertheless, spread between risky loans and free risk loans also become a huge study related to interest rate. However, the only paper that incorporates interest rate uncertainty directly into a model of spread was the aforementioned paper by Ferderer et al. (1998). According to their fixed parameter results, the coefficient on interest rate uncertainty is positive and significant.

They refer to this finding as novel with the implication that the spread includes 'liquidity' premium that rises with interest rate uncertainty.

Then Chuderewicz (2002) become a second paper found interest rate uncertainty also can predict the commercial paper-bill spread rather than Federal policy or default risk. He founds that the Federal's surprise cut in mid-October was especially effective in reversing the rapid rise in uncertainty and therefore the paper-bill spread. The result indicate that interest rate uncertainty does embody useful (predictive) information over and above that contained in the index of leading economic indicators, the National Association of Purchasers Manager Index (NAPM), a measure of default risk, as well as other financial variables.

Thereto, Chuderewicz (2002) said holding liquid asset allows investors the flexibility to readjust their portfolios quickly and at low cost when new information arrives. In an uncertain environment, investors tend to increase their appetite for liquidity given the higher probability of new information arriving. If bills are more liquid than paper, then paper should embody a liquidity premium that rises with uncertainty. The spread will be influenced by uncertainty in the following way. A higher uncertainty, given a more liquid bill market, causes investors to substitute away from paper towards bills, raising the price of bills and lowering the price of paper, resulting in a higher spread.

Thereby, analyzing interest rate spreads has always been popular among economists. While some academicians use spreads as an indicator of future economic performances (see, Bernanke (1990), Stock and Watson (1989), Friedman and Kuttner (1992, 1993 and 1998), others try to explain the behavior of spreads themselves (see, Chapter 11 of Campbell et al. (1997) and the references cited therein) often by testing the expectations hypothesis of the term structure of interest rates.

Although there are some empirical findings that are agreed upon, some studies find conflicting results about the dynamics of the term structure of interest rates (see, Campbell et al. (1997) and Christiano et al. (1999)). Fuhrer (1996) and Chen (2001) argue that the reason behind these mixed results stems from the fact that short-term interest rates are not volatile enough to explain long-term interest rates. Moreover, Balduzzi et al. (1997) argue that longer-term rates are more heavily influenced by the persistent expectation for future target changes in short-term interest rates, possibly due to expected changes in monetary policy.

Thus, the nature of the spreads or their predictive powers for the future economic performance might be influenced by different factors, which concern monetary policy makers. McCallum (1994) and Walsh (1998) discuss the effect of an exogenous rise in the risk premium on the interest rates, and Evans (1998) and Chen (2001) report that there is a time-varying inflation risk premium throughout the term structure of interest rates. Thus, uncertainty stemming from inflation is a well-recognized variable in the literature to explain the behavior of interest rates.

Some of the studies mentioned above suggest that inflation uncertainty is an indicator of interest rate spreads. One common factor in these studies is that they stop short of (1) identifying different sources of inflation uncertainty, and (2) observing the effects of these inflation uncertainties on interest rate spreads. Evans (1991) and Berument et al. (2002) elaborate three types of inflation uncertainty: structural uncertainty, which arises from the instability of the relationship between current and lag values of inflation; impulse uncertainty, which arises from temporary shocks that hit the economy; and steady-state inflation uncertainty, which arises from the uncertainty on the level of long-run inflation. They show that the effects of these inflation uncertainties on inflation and interest rates can be different.

The other researcher like Stock and Watson (1989), Friedman and Kuttner (1992) and Bernanke(1983), also said that interest rate spread has been emphasized to have high predictive power for future business conditions. Where as, Friedman and Kuttner (1993) and Gertler et al. (1991) suggest default risk as a reason for the leading behavior of the interest rate spread. Certainly, the average size of interest rate spread may not explained solely by default risk. Tax differentials and financial intermediation costs may also determine the size of the spread. However, the fluctuations of the interest rate spread are generally considered to be related to movement in default risk over the business cycle. If investors expect future economic conditions to be favorable and the bankruptcy risk on risky investments to decrease accordingly, then they might require a relatively small risk premium over the risk free interest rate, which then reduces the interest rate spread.

After that, Kwark (2002) has founds that the interest rate spread between risky loan rates and risk-free rates has a high predictive power for subsequent fluctuations in real output. It's shown that the lower level of risky loans increases the profit of the financial firms or intermediaries, which in turn decreases the interest rate to restore the zero profit condition for the financial intermediaries. Consequently, the decrease in default risk reduces the interest rate spread. Therefore, inflexibility of investment can generate the leading behavior of the interest rate spread over the business cycle.

METHODOLOGY

Using the same explanation and definition of interest rate uncertainty and spread in Chuderewicz, this paper is trying to implement to the Malaysian financial market. We are trying to predict the spread, which is defined as the difference between all grade corporate bonds with the rate on 3-month Treasury bills. The spread divide to two grades a low-grade and high-grade spread. And we also are trying to examine an effect on investment (leading economic indicator) and interest rate uncertainty to real output.

Interest Rate Uncertainty

Interest rate uncertainty measured by two conditional variances which CVMEAN and CVARIMA from the GARCH (1,1) model for treasury bills (TB). The CVMEAN specification can be characterized as follow:

$$TB_t = c + u_t \quad (1)$$

$$u_t = \varepsilon_t, \quad \varepsilon_t | I_{t-1} \sim N(0, \sigma^2_t) \quad (2)$$

$$\sigma^2_t = \omega_0 + \omega_1 \varepsilon^2_{t-1} + \omega_2 \sigma^2_{t-1} \quad (3)$$

The resulting conditional variance from equation 3 is labeled CVMEAN with the mean equation estimated with a constant and no regressors. The specification for CVARIMA is characterized as follow:

$$TB_t = c + u_t \quad (4)$$

$$(1 - \rho_1)\, u_t = (1 + \theta_1)\varepsilon_t, \ \varepsilon_t | I_{t-1} \sim N(0, \sigma^2_t) \quad (5)$$

$$\sigma^2_t = \omega_0 + \omega_1 \varepsilon^2_{t-1} + \omega_2 \sigma^2_{t-1} \quad (6)$$

The resulting conditional variance from equation 6 is labeled CVMEAN estimated using ARIMA (1, 1).

Then, both measured of interest rate uncertainty (CVMEAN, CVARIMA) are using with the spread to shows the relationship. The relationship between spread and both of interest rate uncertainty can be defined as follows:

$$SPREAD = \alpha_0 + \alpha_1 CVMEAN_{t-1} + \alpha_2 DDEFAULT_{t-1} + \alpha_3 POLICY_{t-1} \quad (7)$$

$$SPREAD = \alpha_0 + \alpha_1 CVARIMA_{t-1} + \alpha_2 DDEFAULT_{t-1} + \alpha_3 POLICY_{t-1} \quad (8)$$

Table 2: Variables and the Definition

Variables	Definition
Low-grade spread	The difference between corporate bonds rated BBB for all maturity with the rate on 3-month T-bills
High-grade spread	The difference between corporate bonds rated AAA for all maturity with the rate on 3-month T-bills
CVMEAN	The conditional variance of the 3-month T-bills. Mean equation with no regressors
CVARIMA	The conditional variance of the 3-month T-bills. T-bill modeled as an ARIMA (1, 1) in the mean equation
DDEFAULT	The first difference of the spread between AAA and BBB for all maturity
POLICY	The spread between 3-month interbank rate and the rate on 3-month T-bills

Equation 7 is to shows the relationship between spread with interest rate uncertainty using CVMEAN approach and also liquidity and monetary policy. The equations 8 are follow the same using CVARIMA. The definition for all variables is defined and shows in the Table 2.

Real Economic Activity and Interest Rate Uncertainty

Even there has a weak effect between interest rate uncertainty and spread but real economic activity can also affected by interest rate uncertainty. Previous work in this area focuses on the role of interest rate uncertainty on investment expenditures (Bernanke, 1983; Federer, 1993; Ingersoll and Ross, 1992; Leahy and Whited, 1996). The theoretical implications in this line of research are ambiguous. Leahy and Whited (1996), point out that there are two opposing forces operating that result in the ambiguity. On one hand, an increasingly uncertain environment increases the value of waiting since new information is arguably more valuable in an uncertain environment, particularly if investment is irreversible.

This effect, referred to as the option value of waiting, implies that interest rate uncertainty and investment are negatively related. The opposing effect relies on the expected value of the firm being a convex function with respect to interest rates. Higher (mean preserving) interest rate volatility increases the likelihood there will be extremely low and extremely high interest rate in the future. Given a convex function, the benefits of lower rates exceed the costs of higher rates with the result that increased interest rate uncertainty tends to increase investment.

Empirically, the results are mixed as well. Even (1983) finds a negative relationship between interest rate uncertainty and aggregate output. Federer (1993) uses the risk premium on long-term bonds as his measure of uncertainty and finds a significant relationship between uncertainty and investment. Many other papers offer mixed results. As Leahy and Whited (1996) summarize: “the empirical evidence on the issue is far too scanty to assert with confidence that we can sign the investment-uncertainty relationship (p. 67)”.

In what follows, we try to investigate whether or not uncertainty embodies useful information in terms of predicting the growth rate of industrial production that is not included in a variety of other financial and non-financial economic variables. We are using index industrial production as a dependent variable and proxy to aggregate output.

Baseline model shows the relationship between change in industrial production and index of leading economics indicators.

Where economics indicators defined as spread between corporate bond and treasury bills with the banks lending rate. This spread using as measures for investment. The investment is for a long-term and short-term. Then we add CVMEAN and CVARIMA to the baseline model to see the effect of uncertainty interest rate. All the equation for baseline model and interest rate uncertainty is detailed as follows:

Baseline Model:
Long-term

$$\Delta IPP_t = \alpha + \beta\Delta IPP_{t-1} + \delta DLEADm_{,t-1} + \varepsilon_t \quad (9)$$

Short-term

$$\Delta IPP_t = \alpha + \beta\Delta IPP_{t-1} + \delta LEADm_{,t-1} + \varepsilon_t \quad (10)$$

Baseline + CVMEAN Model:
Long-term

$$\Delta IPP_t = \alpha + \beta\Delta IPP_{t-1} + \delta DLEADm_{,t-1} + \Sigma CVMEAN_{m,t-1} + \varepsilon_t \quad (11)$$

Short-term

$$\Delta IPP_t = \alpha + \beta\Delta IPP_{t-1} + \delta LEADm_{,t-1} + \Sigma CVMEAN_{m,t-1} + \varepsilon_t \quad (12)$$

Baseline + CVARIMA Model:
Long-term

$$\Delta IPP_t = \alpha + \beta\Delta IPP_{t-1} + \delta DLEADm_{,t-1} + \Sigma CVARIMA_{m,t-1} + \varepsilon_t \quad (13)$$

Short-term

$$\Delta IPP_t = \alpha + \beta\Delta IPP_{t-1} + \delta LEADm_{,t-1} + \Sigma CVARIMA_{m,t-1} + \varepsilon_t \quad (14)$$

Where:

- ΔIPP = change in index of industrial production
- DLEAD = the first difference of spread between corporate bonds for all maturity with base lending rate (BLR) commercial bank (non-stationary at level)
- LEAD = the spread between treasury bills for all maturity with base lending rate (BLR) (stationary at level)
- CVMEAN = The conditional variance from a GARCH (1, 1) of the 3-month T-bills. Mean equation with no regressors
- CVARIMA = The conditional variance from GARCH (1, 1) specification of the 3-month T-bills. T-bill modeled as an ARIMA (1, 1) in the mean equation.

Data

We are using five years monthly data from January 1998 to December 2002. The data is from RAM Bonds Newsletter and Monthly Statistical Bulletin Bank Negara Malaysia.

EMPIRICAL RESULT

Spread and Interest Rate Uncertainty

The result for spread and interest rate uncertainty using CVMEAN shows in the table 3. The result shows an insignificant for all low-grade spread (except for 3 and 5 years maturity). And all high-grade spread shows that increased in liquidity in the corporate bond weaken relationship between the spread and interest rate uncertainty. Insignificant in coefficient on DDEFAULT in all regression are consistent with the result in Chuderewicz (2002), Bernanke (1990) and Ferderer et al (1998). POLICY coefficient is significant in all regression low-grade and high-grade (except for 10 years maturity). This result implying that both spread rise with tighter monetary policy, consistent with Bernanke (1990) and Federer et al (1998).

Table 3: Interest Rate Uncertainty Using CVMEAN

$$SPREAD_{m,t} = \alpha_0 + \alpha_1 CVMEAN_{t-1} + \alpha_2 DDEFAULT_{m,t-1} + \alpha_3 POLICY_{t-1}$$

SPREAD	Constant	CVMEAN	DDEFAULT	POLICY	Adjusted R^2
LOWGRADE3	6.2478* (66.6908)	0.0487* (3.4458)	0.1261 (0.7534)	0.5724* (5.9312)	0.6798
LOWGRADE5	7.0851* (72.6195)	0.0376** (2.5571)	0.1169 (0.7116)	0.5333* (5.3337)	0.5992
LOWGRADE7	7.9416* (66.6850)	0.0197 (1.1045)	0.1149 (0.8356)	0.4691* (3.9306)	0.3692
LOWGRADDE10	8.7504* (60.1657)	0.0214 (0.9639)	-0.0240 (-0.1280)	0.5051* (3.3156)	0.3212
HIGHGRADE3	2.0004* (11.2331)	0.0132 (0.4903)	0.3938 (1.2378)	0.5111* (2.7860)	0.1878
HIGHGRADE5	2.5500* (14.9494)	0.0009 (0.0368)	0.3775 (1.3140)	0.4447** (2.5439)	0.1235
HIGHGRADE7	3.1434* (19.6280)	-0.0077 (-0.3179)	0.2058 (1.1105)	0.3515* (2.1841)	0.0623
HIGHGRADE10	3.7533* (26.4993)	-0.0167 (-0.7711)	0.1083 (0.5936)	0.2312 (1.5583)	-0.0084

* Significant at 1% level

** Significant at 5% level

Table 4: Interest Rate Uncertainty Using CVARIMA

$$SPREAD_{m,t} = \alpha_0 + \alpha_1 CVARIMA_{t-1} + \alpha_2 DDEFAULT_{m,t-1} + \alpha_3 POLICY_{t-1}$$

SPREAD	Constant	CVARIMA	DDEFAULT	POLICY	Adjusted R^2
LOWGRADE3	6.2470* (61.3621)	0.0842 (1.3566)	0.2239 (1.2523)	0.7136* (7.4537)	0.6222
LOWGRADE5	7.0848* (69.1715)	0.0621 (0.9944)	0.1852 (1.0893)	0.6436* (6.6999)	0.5587
LOWGRADE7	7.9317* (68.3700)	-0.1422 (0.1178)	0.1982 (1.4802)	0.6671* (6.1791)	0.3989
LOWGRADE10	8.7454* (59.5784)	0.0107 (0.1178)	0.0322 (0.1731)	0.6087* (4.3321)	0.3097
HIGHGRADE3	2.0035* (11.2710)	0.0764 (0.7049)	0.3970 (1.2718)	0.5056* (3.0246)	0.1917
HIGHGRADE5	2.5529* (14.9900)	0.0500 (0.4813)	0.3598 (1.2731)	0.4082** (2.5558)	0.1272
HIGHGRADE7	3.1456* (19.6265)	0.0291 (0.2949)	0.1830 (0.9893)	0.2958 (1.9834)	0.0621
HIGHGRADE10	3.7585* (26.3867)	0.0238 (0.2712)	0.0574 (0.3178)	0.1372 (1.0067)	-0.0181

* Significant at 1% level

** Significant at 5% level

As the result achieved from interest rate uncertainty using CVMEAN, CVARIMA follow the same effect. The result inconsistent with Chuderewicz where CVARIMA have a insignificant effect to the spread. The result also found POLICY is significant with spread for low grade and high grade bonds (except for 7 years and 10 years maturity). The result details shows in Table 4.

Real Economics Activity and Interest Rate Uncertainty

Table 5 to table 7 explained the result for baseline model which is relationship between change in IPP and long-tem and short term investment with all grading and maturity. The result shows insignificant effect DLEAD and LEAD to a change in IPP excluding investment in grade A bond with 7 years and 10 years maturity and this imply that the long-term and short-term investment cannot predict the economic activity.

Table 5: Long-term Investment Grade Bond for All Maturity

$\Delta IPP_t = \alpha + \beta\Delta IPP_{t-1} + \delta DLEADm_{,t-1} + \varepsilon_t$

Maturity	α	β	δ	Adjusted R^2
AAA3	0.9983 (1.8981)	-0.4546* (4.0587)	1.1041 (0.8675)	0.2147
AAA5	10.7355 (2.0745)	-0.0581*** (1.9410)	0.6810 (0.4746)	0.0370
AAA7	0.9754 (1.8614)	-0.4530* (4.0374)	1.1015 (0.8372)	0.2140
AAA10	0.9692 (1.8675)	-0.4495* (4.0394)	1.4564 (1.2770)	0.2269
AA3	0.9389 (1.7835)	-0.4613* (4.0938)	-0.2111 (0.3610)	0.2059
AA5	1.0045 (1.9060)	-0.4609* (4.1172)	1.1741 (0.8528)	0.2144
AA7	0.9891 (1.8888)	-0.4508* (4.0227)	1.3206 (0.9636)	0.2172
AA10	0.9822 (1.8825)	-0.4536* (4.0643)	1.3391 (1.0826)	0.2206
A3	1.0016 (1.9263)	-0.4542* (4.0909)	1.6224 (1.3065)	0.2280
A5	1.0243 (1.9495)	-0.4711* (4.2060)	1.3277 (1.0897)	0.2208
A7	1.0238 (1.9788)	-0.4816* (4.3313)	1.7641 (1.5575)	0.2376
A10	0.9580 (1.8902)	-0.4560* (4.2032)	2.3925** (2.0807)	0.2621

* Significant at 1% level
** Significant at 5% level
*** Significant at 10% level

Table 6: Long-term Non-investment Grade Bond for All Maturity

$\Delta IPP_t = \alpha + \beta\Delta IPP_{t-1} + \delta DLEADm_{,t-1} + \varepsilon_t$

Maturity	α	β	δ	Adjusted R^2
BBB3	0.9501 (1.8058)	-0.4613* (4.0840)	0.2554 (0.2429)	0.2049
BBB5	0.9508 (1.8200)	-0.4770* (4.2026)	0.9546 (0.9151)	0.2160
BBB7	0.9598 (1.8275)	-0.4545* (4.0355)	-0.5225 (0.5728)	0.2087
BBB10	0.9137 (1.7637)	-0.4797* (4.2929)	1.1280 (1.3843)	0.2308
BB3	0.9945 (1.8553)	-0.4582* (4.0738)	0.5299 (0.4344)	0.2067
BB5	1.0099 (1.8749)	-0.4555* (4.0446)	0.5171 (0.5119)	0.2078
BB7	0.8458 (1.5668)	-0.4439* (3.5835)	0.5967 (0.5022)	0.1797
BB10	0.9991 (1.8907)	-0.4521* (4.0171)	0.7035 (0.7298)	0.2116

* Significant at 1% level

Table 7: Short-term Investment

$\Delta IPP_t = \alpha + \beta\Delta IPP_{t-1} + \delta LEADm_{,t-1} + \varepsilon_t$

Maturity	α	β	δ	Adjusted R^2
TB3	1.7605 (0.5776)	-0.4584* (4.0707)	0.2150 (0.2705)	0.2051
TB6	0.6358 (0.1901)	-0.4595* (4.0768)	-0.0843 (0.0843)	0.2041
TB12	1.8113 (0.5778)	-0.4584* (4.0702)	0.2405 (0.2792)	0.2051

* Significant at 1% level

Then we add interest rate uncertainty to the baseline model and the results for change in baseline model plus interest rate uncertainty using CVMEAN and CVARIMA is shows in Table 8 to Table 11. We can conclude that have a negative relationship between interest rate uncertainty and aggregate output even the relationship are weak. This finding is consistent with Evans (1983). So, interest rate uncertainty embodies useful information in terms of predicting the growth rate of industrial production.

Table 8: Baseline and Interest Rate Uncertainty Using CVMEAN for Long-term Investment

$\Delta IPP_t = \alpha + \beta\Delta IPP_{t-1} + \delta DLEADm_{,t-1} + \Sigma CVMEAN_{m,t-1} + \varepsilon_t$

Maturity	α	β	δ	Σ	Adjusted R^2
AAA3	1.1583 (2.0054)	-0.4566* (4.0556)	1.1454 (0.8947)	-0.0520 (0.6865)	0.2071
AAA5	20.0888 (3.0777)	-0.1085* (2.9559)	0.5677 (0.4094)	0.2277** (2.2280)	0.1017

AAA7	1.1295 (1.9638)	-0.4595* (4.0331)	1.1247 (0.8502)	-0.0505 (0.6669)	0.2060
AAA10	1.1182 (1.9634)	-0.4516* (4.0349)	1.4578 (1.2715)	-0.0490 (0.6523)	0.2188
AA3	1.0855 1.8778)	-0.4632* (4.0866)	-0.2005 (0.3409)	-0.0480 (0.6312)	0.1971
AA5	1.1661 (2.0144)	-0.4631* (4.1159)	1.2249 (0.8842)	-0.0523 (0.6910)	0.2069
AA7	1.1457 (1.9931)	-0.4527* (4.0188)	1.3506 (0.9801)	-0.0512 (0.6772)	0.2094
AA10	1.301 (1.9741)	-0.4556* (4.0593)	1.3374 (1.0755)	-0.0486 (0.6450)	0.2122
A3	1.1847 (2.0731)	-0.4563* (4.0949)	1.7208 (1.3740)	-0.0591 (0.7856)	0.2226
A5	1.2026 (2.0803)	-0.4742* (4.2146)	1.4148 (1.1515)	-0.0570 (0.7538)	0.2147
A7	1.2190 (2.1432)	-0.4856* (4.3514)	1.8724 (1.6380)	-0.0626 (0.8372)	0.2335
A10	1.1345 (2.0425)	-0.4583* (4.2089)	2.4465** (2.1167)	-0.0580 (0.7904)	0.2570
BBB3	1.1020 (1.9079)	-0.4637* (4.0817)	0.2917 (0.2756)	-0.0499 (0.6545)	0.1965
BBB5	1.1078 (1.9326)	-0.4797* (4.2031)	0.9827 (0.9368)	-0.0516 (0.6820)	0.2082
BBB7	1.1078 (1.9223)	-0.4565* (4.0303)	-0.5211 (0.5682)	-0.0487 (0.6411)	0.2002
BBB10	1.0581 (1.8606)	-0.4815* (4.2844)	1.1209 (1.3680)	-0.0474 (0.6328)	0.2223
BB3	1.1282 (1.9347)	-0.4603* (4.0663)	0.4570 (0.3706)	-0.0460 (0.6017)	0.1974
BB5	1.1313 (1.9408)	-0.4580* (4.0385)	0.4219 (0.4094)	-0.0436 (0.5660)	0.1979
BB7	0.9982 (1.7088)	-0.4484* (3.5976)	0.4579 (0.3784)	-0.0546 (0.7026)	0.1718
BB10	1.1147 (1.9340)	-0.4604* (4.0671)	0.6113 (0.6197)	-0.0402 (0.5211)	0.2011

* Significant at 1% level
** Significant at 5% level

Table 9: Baseline and Interest Rate Uncertainty Using CVMEAN for Short-term Investment
$\Delta IPP_t = \alpha + \beta \Delta IPP_{t-1} + \delta LEADm_{,t-1} + \Sigma CVMEAN_{m,t-1} + \varepsilon_t$

Maturity	α	β	δ	Σ	Adjusted R^2
TB3	2.2352 (0.7120)	-0.4604* (4.0671)	0.2979 (0.3689)	-0.0530 (0.6891)	0.1974
TB6	1.0700 (0.3117)	-0.4612* (4.0687)	-0.0072 (0.0080)	-0.0487 (0.6336)	0.1954
TB12	2.4313 (0.7442)	-0.4603* (4.0676)	0.3665 (0.4149)	-0.0552 (0.7116)	0.1979

* Significant at 1% level

Table 10: Baseline and Interest Rate Uncertainty Using CVARIMA for Long-term Investment

$\Delta IPP_t = \alpha + \beta\Delta IPP_{t-1} + \delta DLEADm_{,t-1} + \Sigma CVARIMA_{m,t-1} + \varepsilon_t$

Maturity	α	β	δ	Σ	Adjusted R^2
AAA3	1.2538 (2.2549)	-0.4759* (4.2387)	1.1460 (0.9070)	-0.4521 (1.3556)	0.2265
AAA5	15.4214 (2.6825)	-0.0831** (2.5415)	0.6687 (0.4746)	-0.0714 (1.7430)	0.0714
AAA7	1.2324 (2.2285)	-0.4742* (4.2186)	1.1659 (0.8925)	-0.4555 (1.3649)	0.2262
AAA10	1.2243 (2.2366)	-0.4708* (4.2231)	1.4895 (1.3162)	-0.4540 (1.3726)	0.2792
AA3	1.1883 (2.1387)	-0.4824* (4.2675)	-0.2129 (0.3665)	-0.4450 (1.3262)	0.2167
AA5	1.2581 (2.2629)	-0.4822* (4.2963)	1.2049 (0.8815)	-0.4496 (1.3478)	0.2259
AA7	1.2481 (2.2586)	-0.4720* (4.2057)	1.3926 (1.0236)	-0.4578 (1.3749)	0.2297
AA10	1.2397 (2.2522)	-0.4750* (4.2487)	1.3929 (1.1346)	-0.4567 (1.3749)	0.2330
A3	1.2410 (2.2619)	-0.4747* (4.2590)	1.5670 (1.2690)	-0.4302 (1.2987)	0.2375
A5	1.2769 (2.3047)	-0.4925* (4.3856)	1.3451 (1.3507)	-0.4486 (1.3507)	0.2323
A7	1.2791 (2.3450)	-0.5034* (4.5184)	1.7897 (1.5928)	-0.4533 (1.3805)	0.2500
A10	1.2002 (2.2439)	-0.4765* (4.3793)	2.3640** (2.0702)	-0.4322 (1.3363)	0.2725
BBB3	1.2048 (2.1690)	-0.4836* (4.2669)	0.3587 (0.3427)	-0.4531 (1.3468)	0.2164
BBB5	1.2179 (2.2123)	-0.5020* (4.4106)	1.0856 (1.0462)	-0.4756 (1.4246)	0.2303
BBB7	1.2107 (2.1840)	-0.4755* (4.2106)	-0.5362 (0.5919)	-0.4469 (1.3347)	0.2198
BBB10	1.1682 (2.1399)	0.5017* (4.4805)	1.1530 (1.4263)	-0.4552 (1.3801)	0.2433
BB3	1.2416 (2.2001)	-0.4793* (4.2466)	0.5127 (0.4231)	-0.4432 (1.3213)	0.2173
BB5	1.2509 (2.2013)	-0.4766* (4.2160)	0.4720 (0.4699)	-0.4393 (1.3096)	0.2179
BB7	1.0858 (1.9215)	-0.4644* (3.7476)	0.4528 (0.3824)	-0.4524 (1.3378)	0.1917
BB10	1.2175 (2.1912)	-0.4737* (4.1763)	0.5039 (0.5177)	-0.4151 (1.2213)	0.2186

* Significant at 1% level, ** Significant at 5% level

Table 11: Baseline and Interest Rate Uncertainty Using CVARIMA for Short-term Investment

$\Delta IPP_t = \alpha + \beta\Delta IPP_{t-1} + \delta LEADm,_{t-1} + \Sigma CVARIMA_{m,t-1} + \varepsilon_t$

Maturity	α	β	δ	Σ	Adjusted R^2
TB3	0.9863 (0.3194)	-0.4807* (4.2452)	-0.0569 (0.0697)	-0.4509 (1.2974)	0.2148
TB6	-0.2166 (0.0642)	-0.4833* (4.2743)	-0.3866 (0.4251)	-0.4798 (1.3892)	0.2174
TB12	1.0539 (0.3324)	-0.4805* (4.2437)	-0.0408 (0.0461)	-0.4486 (1.2945)	0.2148

* Significant at 1% level

CONCLUSIONS

The literature have founds that interest rate uncertainty became an important role to determine the interest rate spread and lead to business cycle. By using a method from Chuderewics (2002) and implemented to the Malaysia financial market, we found that its follows the same result as well as Chuderewics (1992) for the interest rate uncertainty using CVMEAN but not CVARIMA. Using CVMEAN the result for spread and interest rate uncertainty shows an insignificant for all low-grade spread (except for 3 and 5 years maturity). And all high-grade spread shows that increased in liquidity in the corporate bond weaken relationship between the spread and interest rate uncertainty. This imply that the spread rise with tighter monetary policy. Furthermore, the negative relationship between interest rate uncertainty and economic activity imply that the investor had information's about the market. They can predict even a small probability of the change in the corporate bond.

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