CAN YIELD CURVE SPREAD MOVEMENTS PREDICT ECONOMIC ACTIVITY? EMPIRICAL EVIDENCE IN MALAYSIA

BY

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INTERNATIONAL ISLAMIC UNIVERSITY
MALAYSIA

MAY 2005

By the time,
Verily man is in loss
Except such as have Faith,
And do righteous deeds,
And (join together)
In the mutual enjoining
Of Truth, and of
Patience and Constancy.

Holy Qur'an, Sura Al-'Asr 103

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A research paper submitted in partial fulfillment of the requirements for the degree of Master of Science in Finance

Kulliyyah of Economics and Management Sciences
International Islamic University Malaysia

MAY 2005

ABSTRACT

This paper examines the predictive ability of the yield curve spread on real GDP in Malaysia. It also highlights the relationship between monetary policy instrument and the yield curve spread. The recent advanced techniques in time-series analysis; cointegration and error correction model were employed in order to detect the existence of a long run or trend relationship of the yield curve spread and Bank Negara Malaysia (BNM) policy rate. The results suggest that the yield curve spread does not able to predict real GDP. However, interestingly the policy rate is found to have considerable control on the yield curve spread, as well as cointegrated and has causality in the long-run.

ملخص البحث

قام هذا البحث بدراسة الكفاءة المتوقعة مستقبلاً للمعدلات الزمنية للفائدة في معرفة نمو الإنتاج المحلي الحقيقي في ماليزيا. وقد أشارت هذه الدراسة أيضاً إلى العلاقة بين وسيلة السياسة النقدية، وبين اختلاف المعدل الزمني للفائدة. وقد استخدمت هذه الدراسة التقنيات المتقدمة الحديثة في ميدان تحليل التتابع الزمني، ونموذج التكامل وتصحيح الخطأ من أجل إثبات وجود علاقة على المدى الطويل أو خط اتجاه بين اختلاف المعدل الزمني للفائدة وبين معدل سياسة البنك المركزي الماليزي. وقد أثبتت هذه الدراسة أن اختلاف المعدل الزمني للفائدة لا يقدِّم معلومات حقيقية عن نمو الإنتاج المحلي في ماليزيا. غير أنه من الضروري أن نقول بإننا وجدنا أن معدل السياسة النقدية يمكن أن يكون له تأثير كبير على اختلاف المعدل الزمني للفائدة، ويمكن أيضا أن نقوم بدمج معدل السياسة النقدية باختلاف المعدل الزمني للفائدة، وبذلك يكون لمعدل السياسة النقدية تأثيرٌ على معدل الاختلاف الزمني للفائدة على المدى الطويل.

APPROVAL PAGE

I certify that I have supervised and read this study and that in my opinion, it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a research paper for the degree of Master of Science in Finance.

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Wan Jamaliah Wan Jusoh
Head, Department of Business Administration

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Mansor Hj.Ibrahim
Dean, Kulliyyah of Economics and Management Sciences

DECLARATION

I hereby declare that this research paper is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

N.M.Khairul Rijal B. A.Ghazali

Signature ..... Date 20/7/2005

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For

My father Ahmad Ghazali Hj. Ismail, my mother T.Mariam T.Ibrahim and to those who place Truth above self.

ACKNOWLEDGEMENTS

All praise be to Allah, the Cherisher and Sustainer of the worlds, who blessed man with wisdom and knowledge. His blessings and peace be upon the Seal of Prophets, Muhammad.

For the successful completion of this work, I owe my gratitude to the encouragement of many of my lecturers, classmates and friends, too many to name here. However, I am particularly grateful to Assoc. Prof. Dr. Hassanuddeen Abd. Aziz for his sincere assistance in guiding, supervising and advising me. Also to Prof. Dr. Mansor Ibrahim and Bro. M. Shabri Abd. Majid who have shared their in-depth knowledge in issues relating to econometric. At the same time they have supervised the work with patience and understanding. May Almighty Allah reward them all. For all the shortcomings that remain, the responsibility is mine alone. May Almighty Allah accept this humble attempt.

CONTENTS

Abstract ii
Abstract in Arabic iii
Approval Page iv
Declaration Page v
Copy right Page vi
Dedication vii
Acknowledgements viii
List of Tables xi

CHAPTER 1: INTRODUCTION 1
1.1 Introduction to the Term Structure of Interest Rates 1
1.1.1 Interpreting the Term Structure 1
1.2 Research Hypothesis 3
1.3 Research Objective 3

CHAPTER 2: LITERATURE REVIEW 5
2.1 Monetary Policy Instrument and the Yield Curve Spread 5
2.2 The Yield Curve Spread as a Predictor of Future Real Activity 7

CHAPTER 3: DATA AND METHODOLOGY 15
3.1 Data 15
3.2 Methodology 16
3.2.1 Unit Root Test 16
3.2.2 Contemporaneous and Forecasting Model 18
3.2.3 Cointegration Analysis 19
3.2.4 Granger Causality Test 20

CHAPTER 4: EMPIRICAL RESULTS 23
4.1 Unit Root Test 23
4.2 Instrument of Monetary Policy and its Effect on the Yield Curve Spread 24
4.2.1 Episodes of Monetary Tightening During the Financial Crisis in Malaysia 25
4.3 The Yield Curve Spread as a Predictor of Future Real Activity 27
4.3.1 Predictive Power of the Yield Curve Spread 27
4.3.2 The Role of Other Variable in Predicting Real Activity 29
4.3.3 The Immature Bond Market in Malaysia 31
4.4 Cointegration Analysis 34
4.5 Causality Test with VECM 36

CHAPTER 5: CONCLUSION 38

BIBLIOGRAPHY 41

APPENDIX I 44
APPENDIX II 44
APPENDIX III 45
APPENDIX IV 45
APPENDIX V 46
APPENDIX VI 46

LIST OF TABLES

Table No.		Page No.
1	Unit Root Test	23
2	Instrument of Monetary Policy and its Effect on the Yield Curve Spread	24
3	Predictive Power of the Yield Curve Spread	27
4	The Role of Other Variable in Predicting Real Activity	29
5	Correlation Matrix between Variable *CB* and *Spread*	31
6	Bivariate Johansen-Juselius Cointegration Tests	34
7	Multivariate Johansen-Juselius Cointegration Tests	35
8	Temporal Causality Tests Based on Vector Error-Correction Model (VECM)	36

CHAPTER 1

INTRODUCTION

1.1 Introduction to the Term Structure of Interest Rates

The term structure of interest rates especially the yield curve spread has long been of interest to monetary policy makers and their advisers. A study conducted by Estrella and Mishkin (1997) suggest that it serves the role as an economic indicator. This finding has allowed central banks able to monitor the response from the action taken in formulating monetary policy on the changes in real economic activity. Consequently, a positive yield curve spread between a 10-year government bond and a 3-month treasury bills is associated with the future increase in real economic activity. While the negative yield curve spread is associated with the future decrease in economic activity.

1.1.1 Interpreting the Term Structure

The empirical relationship between the yield curve spread and real economic activity is based on two pertinent reasons. Firstly, the yield curve spread reflects the stance of monetary policy. One of the transmission mechanisms that show the stance of monetary policy is short term policy rate, which we refer to in this paper as central bank rate. Tightening in monetary policy will result in the increase in the yield on a 10-year government bond and a 3-month treasury bills. However, the increase in the yield of a 3-month treasury bill is more than the increase in the yield of a 10-year government bond. Subsequently, resulting in the yield curve spread to be narrower. In an extreme case, the yield curve spread turns negative and sloping downwards.

However, easing in monetary policy will result in the yield on a 10-year government bond and a 3-month treasury bill to decrease. However, the decrease in the yield of a 3-month treasury bill is more than the decrease in the yield of a 10-year government bond, resulting in a wider yield curve spread and sloping upwards. This phenomenon indicates that the central bank rate has negative relationship with the yield curve spread.

Secondly, the term structure of interest rates rest on the expectation theory. According to Fisher equation, the nominal long term interest rate is composed of average expected future short real rates and expected inflation (Mehra,1996). Assuming that changes in real interest rates are known (or can be ignored), then changes in nominal rates can be translated into changes in inflation expectations (Rudebusch,1997). Thus, when the initial credit tightening takes place to slow down the economy, there will be an increase in both the short term interest rates and the long term interest rates. However, the change in the long term interest rates is in smaller magnitude than the short term interest rates as the component of investors' expectations on future inflation will decrease. The combination effect of increase in expected future short real rates, on the one hand, and a decrease in expected inflation on the other hand, explains why an increase in the long term interest rates is lesser than an increase in the short term interest rates. The resultant effect is the yield curve spread slopes downward in line with the anticipation of future contraction in the real economic activity. Conversely, when a central bank loosens the monetary policy to boost the economy, the short term and long term interest rates will decrease. However the decrease in the long term interest rates is lesser than the short term interest rates

which is largely due to the expectation of investors on future inflation to increase. Hence the expectation of decrease in expected future short real rates and an increase in expected inflation, results in a decrease in the long term interest rates which is lesser than decrease in the short term interest rates. Therefore the yield curve spread slopes upward which is in accordance with the anticipation of future expansion in the real economic activity. Thus, the yield curve spread shows positive relationship with future real economic activity.

1.2 Research Hypothesis

There are two hypotheses in this study. Firstly, Bank Negara Malaysia (BNM) is expected to have considerable control over the yield curve spread of interest rates. Secondly, the yield curve spread of interest rates is expected to contain information on the future real economic activity in Malaysia.

1.3 Research Objective

The motivation of this study is triggered by the fact that research on the yield curve spread in predicting real economic activity for the ASEAN developing country such as Malaysia is limited. Whereas extensive empirical researches have been conducted in the United States and other developed countries. As such, as an emerging market, Malaysia with a small and immature market of government securities, it would be interesting to see if the findings of the study on interest rates spreads, will provide useful information about future economic activity as proven in studies conducted in industrialized economies. Also, this study examines the ability of BNM to control the yield curve spread through the movement in the central bank rate.

The remainder of the paper is organized as follows. The next chapter gives an overview of the selected literature review on monetary policy and the predictive ability of yield curve spread on future economic activity. Chapter 3 describes the data and methodology employed in the estimation of the statistical results. Chapter 4 presents the results of the empirical analysis and chapter 5 concludes based on the results of the empirical analysis.

CHAPTER 2

LITERATURE REVIEW

Numerous studies have been carried out to measure the relationship of the yield curve spread to monetary policy instrument and to subsequent real activity in various countries such in United States, UK, Germany, France, Belgium, Denmark, Netherlands, Canada, Australia, Japan and Singapore. The results show that monetary policy is an important determinant of the yield curve spread. Also, these results indicate that, there is significant predictive power of the yield curve spread for real economic activity.

2.1 Monetary Policy Instrument and the Yield Curve Spread

The existence of monetary policy instrument's influence on the yield curve spread has been recognized by many researchers. The following are some literatures that discuss this fact.

Kozicki (1998) examines the correlation coefficients between short-term real rates and the term structure spread that exhibit substantial negative correlations, with correlation coefficients more negative than -0.45 in eight of the eleven industrialized countries under his study. Because short term real rates move closely with the real rate that reflects the stance of monetary policy (i.e. the real federal funds rate in the United States) the latter result support the hypothesis that the term structure spread reflects the stance of monetary policy.

Estrella and Mishkin (1997) study on U.S and European countries has confirmed a negative relationship between the monetary policy instrument (CBR) and the term structure spread. They adopt a vector autoregressive (VAR) formulation for the central bank, short- and long-term interest rates. The results show that the absolute value of the coefficient varies considerably from country to country: the values range from a decline of 20 basis points in the SPREAD for every percentage point rise in the central bank rate in Italy to 90 basis points in France. The fit of the overall results is fairly good, especially for Germany, United Kingdom and United States. They bring to bear that central bank can influence the term structure, but cannot control it in any meaningful sense. However, the result suggests that the yield curve spread may offer meaningful information about the stance of monetary policy.

Similar results were found by Estrella and Hardouvelis (1991) using OLS regression with Newey and West (1987) method of standard errors adjustment, find that the current monetary policy in United States influences the slope of the yield curve. The analysis was carried out by including current level of short term rates as an additional explanatory variable to the existing model that consists of only term structure as the explanatory variable. The result confirms that a higher real federal funds rate today is associated with a lower growth in future real output. This negative correlation can be interpreted in a causal manner that a higher real federal funds rate today will result in a low current investment opportunities and output in the future.

Besides, there are several researchers who have stated without conducting any empirical analysis categorically to back their claims about the possibility of current monetary policy instrument to influence yield curve spread. Researchers such as

Mensah and Tkacz (2001) highlight that when short term rates exceed long term rates it will result in an inversion of the yield curve spread with a fall in inflation expectations and tight monetary policy. Smets and Tsatsaronis (1997) stress that monetary policy plays a central role in determining the intensity of the relationship between the term structure and output growth. They conclude that monetary policy is the contributing factor to the positive correlation between the term spread and future output growth. Neal and Morley (1997) emphasize that when monetary policy is tightened, short term interest rate rise; long term rates also typically rise but by less. As a result, the yield curve spread narrows and turns negative.

2.2 The Yield Curve Spread as a Predictor of Future Real Activity

This section will deliberate on the earlier study that was conducted by past researchers who examine the predictability of the term structure spread on future real economic activity namely GDP, industrial production index, consumption (nondurable plus services), consumer durables and investment.

A study conducted by Ang,Piazessi and Wei (2003) reveals that the maximal maturity difference is the best measure of slope in the United States . This finding is robust to the maturity of the yields used to compute the slope. The study also shows that, lagged GDP growth is informative about the future economic activity, and should not be omitted from the predictive regression specifications, especially for short forecasting horizons. Greater efficiency enables the yield-curve model to produce superior out-of-sample GDP forecasts than unconstrained OLS at all horizons. Over the out-of-sample period, post-1990, the OLS regressions place little weight on the spread but significantly large negative weights on the short rate. Prior to 1970,

the 5-year spread is insignificant (with negative point estimates) and the coefficients on short rates are large in magnitude, highly statistically significant, and negative. It is only from 1971-1989 that the term spread significantly predicts future GDP growth with a positive sign and drives out the predictive power of the short rate.

Peel and Taylor (1998) using OLS regression with a method-of-moments correction to the estimated covariance matrix, find that in the U.S a strongly significant slope is found for horizons up to twelve quarters. The greatest predictive power is recorded in the five and six quarter horizons, where 28 % of the variation on the cumulative GDP growth is explained by the slope of the yield curve. In the U.K, the percentage of variation explained is somewhat lower around 16 percent at the five and six quarter horizons and the slope coefficient is more often closer to 0.5 than unity. The estimated slope coefficient of the study conducted in the U.K is strongly significant for all horizons up to six quarters.

Estrella and Mishkin (1997) using OLS regression with Newey and West (1987) method of standard errors adjustment , find that the term structure spread by itself is useful in predicting real economic activity, especially between 4 and 8 quarters ahead, independently of which measure of activity used. The spread remain significant even after introducing other explanatory variables such as central bank rate, bill rate and real central bank rate. These variables are included in the regression model individually with the spread. Moreover, the predictive power does not seem to be attributable solely or primarily to known information about other monetary policy variables. In France, Germany and the United States, the significance appears in even shorter horizons and remains for longer ones.

Neal and Morley (1997) using OLS regression for an in-sample forecast and Root Mean Squared Error (RMSE) statistics for an out-of-sample forecast, conclude that the yield curve spread is a statistically and economically significant predictor of economic activity in several industrialized countries besides the United States. Increases in the yield curve spread are followed by increases in real economic growth, while decreases in the spread are followed by decreases in growth. The size of the spread is also related to the level of real economic growth as the larger the spread between long-term and short-term interest rates, the higher the future level of real economic growth. The empirical results of this study also show that the strength of the relationship between the yield curve spread and future economic growth varies across 11 industrialized countries. The predictive power of the spread is strongest in Canada, Germany and the United States. In these three countries the yield curve spread consistently explains roughly 30 to 50 percent of the variation in future real economic activity. The ability of the yield curve spread to forecast real economic activity is the weakest in Japan and Switzerland, where the yield curve spread on average explains less than 10 percent of variations in future real economic activity. Thus, in these countries the yield curve spread is not a useful indicator of future growth.

Kozicki (1997) using OLS regression, in his study on 10 industrialized countries, finds that the spread is statistically and economically significant as a predictor of real GDP growth. Estimates of the coefficient on the spread are positive and statistically significant at a four quarter horizon for nine out of the ten countries examined. Only Japan registers an insignificant estimate of the coefficient on the spread. The other nine countries indicate that the spread helps to predict real GDP growth, explaining

between 10 and 47 percent of the variation in real GDP growth. Therefore, the spread has maximum predictive power for real GDP growth at a horizon of four quarters and the prediction falls rapidly as the horizons increases.

Harvey (1997) using OLS regression modeled with asset-pricing framework, finds that the Canadian bond market contains valuable information about the future real economic growth. The predictive power of the three year yield curve spread is contrasted with the longer maturity ten year yield curve spread. He suggests that the shorter maturity spread is more appropriate for the estimation. The relationship between the term structure and economic growth in Canada is remarkably stable with coefficient of the term structure is 1.1 on average, through the time. The three year term structure in Canada explains 47 percent of real economic growth compares to U.S term structure that explains only 30 percent of the variation in real GDP growth.

Davis and Fagan (1997) using relative out-of-sample RMSE (Root Mean Square Error) output growth forecasts generated by bivariate VAR (Vector Autoregressive) reveal that yield curve predictive ability is significant in Germany, France, United Kingdom, Belgium, Denmark and Netherlands. Out-of-sample performance for the Netherlands is favourable, but in this case stability is rejected. Belgium, Denmark and the U.K are the only cases where the estimated equations jointly satisfy the conditions of significance, stability and improved out-of-sample forecasts.

Kim and Limpaphayom (1997) employ bivariate Generalized Method of Moments (GMM) regression model, conclude in the study in Japan that the coefficients of the term structure are not statistically significant for the first sub period (1975-1983).

However, in the second sub period (1984-1991), where the financial market liberalization and interest rate deregulation have taken place, they obtained many statistically significant and correct signs for the term structure spread coefficient. In the second sub period the model predicts two to five quarters ahead with spread coefficient gradually declines but maintains a significance level of 1 percent. For the entire period the term structure has very low explanatory power on GDP growth. The X^2 statistics (d.f. =4) are not statistically significant throughout the entire period, indicating that the models are well specified. They also examine a multivariate model which include Bank of Japan official discount rate, money supply (M2) and stock market quarterly returns as other explanatory variables into the existing model. The results of this multivariate model yielded consistent findings with the bivariate model and observed that the term structure outperformed other explanatory variables in the second sub period. The recommendation to the finding emphasizes the importance of considering the existing economic regimes and government intervention in conducting empirical economic research.

In his study, Bange (1996) using OLS regression with standard-errors corrected for heteroskedascity (White, 1980), assess the predictive ability of financial variables such as stock return, term structure of interest rates and inflation term structure on future industrial production in Germany, Japan and the United States. The study shows that both the term structure of interest rates and the stock return indicate the ability to forecast industrial production. All countries show a positive sign with significant coefficient. Analyzing the goodness of fit statistics by comparing the adjusted R-Square and residual variance; the superior model for Japan is stock return, and Germany is term structure of interest rate. As for the United States the best model