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## AUGMENTED MCI: AN INDICATOR OF MONETARY POLICY STANCE FOR ASEAN-5?

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### ABSTRACT

This paper uses quarterly data from 1980 to 2004 for ASEAN-5 founder countries to estimate the weight of the Augmented Monetary Conditions Index (AMCI), and identifies the key transmission mechanism paths using Pesaran and Pesaran's (1997) ARDL procedure, and Pesaran et al.'s (2001) bounds procedure. The roles of credit and asset price channels are assessed for aggregate demand conditions and in the transmission of monetary policy. Results reveal evidence of cointegration for all the ASEAN-Five founder countries. The estimate of the interest and exchange rate elasticities of aggregate demand is used to determine the weight of the exchange rate in the AMCI, and ultimately the weight is then used to construct the AMCI ratio. Exchange rate, asset price, and interest rate channels are three key transmission mechanisms in the conduct of monetary policy in Indonesia and Thailand. Meanwhile in Malaysia and Singapore, exchange rate, both the long and short term interest rate, and credit channels are three key transmission mechanisms in the conduct of monetary policy. In the Philippines, four key transmission mechanisms take place, namely the interest rate, exchange rate, credit, and asset price channels, with short rate relatively weaker than the long rate at the margin. The estimated weights of real interest rates and real exchange rate are used to estimate the AMCI ratios. The AMCI ratios range from 0.052 to 0.664 [0.052:1 for Philippines, 0.056:1 for Thailand, 0.073:1 for Indonesia, 0.109:1 for Malaysia; and 0.664 for Singapore]. Monetary conditions during the period under-study are found to be reflected in each of the central banks' reaction to the prevailing economic situation, which implies that AMCI tracks the movements of the real GDP plausibly on the average, particularly after 1997.

JEL Classifications: E52

Keywords: Augmented Monetary Conditions Index; monetary policy; transmission mechanism;

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## INTRODUCTION

Previous studies have suggested Monetary Conditions Index (hereafter MCI) serves as an indicator of the monetary policy stance to capture the degree of tightness of the monetary policy. The weights of the MCI in the model reflect long-term effects of the interest rate and the exchange rate on the economic activity. Nevertheless, Central Banks have discontinued adopted MCIs as an operational target to guide monetary policy as has heavily been documented in the mainstream literature since it is not resilient to the problem of shock identification. MCI has been used by the Bank of Canada, Reserve Bank of New Zealand, the Central Banks of Norway, Sweden, Germany, Switzerland and United States, among others, to assess the effectiveness of monetary policy in navigating the economy to a sustainable level of economic growth. It is defined as the weighted sum of the percentage points change in the short-term real interest rate relative to their values in a base period and the percentage change in the real exchange rate relative to the base period (Freedman, 1995; Batini and Turnbull, 2002). In most open economies, the global financial and economic systems have undergone major transformation over the past decades following globalization and deregulation of financial markets. Thus policy makers recognize a wider range of monetary transmission mechanisms can impact the monetary conditions via other channels, such as credit and asset price (bond, equity, real estate) channels, apart from the short-term interest rate and exchange rate channels as measured in the conventional MCIs. Thus, the design of the modify MCI should extract the exact nature of the monetary transmission mechanism in the economy. In practice, the relative short-term interest rate and exchange rate elasticities from aggregate demand have been used as a guide to fine tune policy levers to achieve sustainable economic growth.

Recognizing the caveats upon its usage empirically, the augmented MCI (AMCI) is contemplated by incorporating more informative ‘other variables’ into the conventional model to account for possible channels in the transmission mechanisms. There are a large number of pitfalls<sup>2</sup> of MCIs concerning the issues and construction of MCIs. The RBNZ and the Bank of Canada came greatly unstuck in 1997-98 because of an excess reliance on an MCI. Hence, the MCI can be useful shorthand but it has to be interpreted cautiously. In particular, the monetary policy stance suggested by MCI depends significantly on the nature of the shock hitting the economy. An exchange rate move can be part of an equilibrium adjustment to a real shock in which case there may be no change to the overall policy stance or it can be more related to a financial shock in which case it may indicate a change in financial conditions.

The primary objective of this study is to incorporate a wider range on transmission mechanisms to assess the impact of monetary conditions on economic performance. This study is important because monetary policy affects the output gap that captures inflationary pressure via other potential variables such as long-term interest rate, credit, and share prices. The performance of the five-dimensional augmented MCI (AMCI) with respect to the movements in the real GDP is then compared. Two new transmission mechanism channels namely credit and asset price channels are included with the interest

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<sup>2</sup> Much of these are discussed in Stevens (1998), Eika et al. (1996), Ericsson and Eika (1996), Mayes and Viren (2000), Peeters (1999), and Gerlach and Smets (2000).

rate and exchange rate in the traditional measures. The asset prices are incorporated in the AMCI to capture innovations in the financial markets. Asset prices are featured in the transmission mechanism in three ways (Mayes and Viren, 2001). Firstly, asset prices may be directly incorporated in the Consumer Price Index (CPI), which takes into account the immediate effect and a short lag effect via credit charges and/or mortgage payments. Secondly, asset prices may be indirectly incorporated in the CPI via credit channel, which influences the firms' ability to finance investment. Thirdly, asset prices may be indirectly incorporated in the CPI through wealth and income effects, which may take longer lags impact economic performance. The credit channel is also included in the new framework. High equity prices improve the credit accessibility to equity holdings for lower-grade borrowers. A rise in asset prices reduces credit constraints. Credit channel of the monetary policy transmission exists when a rise in asset prices increases the borrowing capacity of individuals and firms by expanding the value of the collateral (Gauthier *et al.*, 2004).

This study examines the consistency of measuring monetary policy using AMCI and assesses if the index for ASEAN-5 countries are cointegrated. If a cointegrating relation does not hold, then the real GDP function is a short-run phenomenon and no long-run relationship exists. If the AMCI among the ASEAN-5 are cointegrated, this will provide evidence that monetary regime in one country impacts the other, and provide empirical evidence for possible monetary integration among ASEAN-5 countries, and it could help the policy makers refining monetary policies to achieve greater economic stability in the region. This is followed by the policy implications, limitations of the study, and lastly suggestions for future research.

The remaining of the paper is organized as follows. Section 2 outlines the empirical model framework, variables selection and data sources for investigation. Section 3 analyzes the empirical results. Section 4 depicts the estimated AMCIs under consideration, and section 5 offers conclusions and policy implications.

### **Methodology: Model specification and data**

Several methods measure the conventional MCI in the extant literature. Among them, include Steven (1998), Ericsson et al. (1998), and Duguay (1994). Steven (1998) suggested that the MCI model is a function of the short-term real interest rate and real exchange rate, as shown in equation (1).

$$y_t = \gamma r_t + \delta e_t + \text{"other variables"} \quad (1)$$

where  $y$  is the natural logarithm of the real GDP [calculated by the ratio of nominal GDP on percent of consumer price index (CPI) (2000=100)]<sup>3</sup>,  $r$  is the short-term real interest rate<sup>4</sup> (the *ex-ante* short-term real interest rate is measured by the difference between the interest rate and inflation rate), and  $e$  is the natural logarithm of real exchange rate (as

<sup>3</sup> Due to data unavailability, nominal GDP is interpolated to obtain quarterly series from 1980:1-1990:4 using Gandolfo (1981) method. Data is available thereafter for the period under study.

<sup>4</sup> Fisher effect indicates the one-for-one adjustment of the nominal interest rate to the inflation rate. The real interest rate is the nominal interest rate adjusted for the effects of inflation.

units of Ringgit Malaysia per unit of US dollar, multiply by  $CPI_{us}/CPI_{Malaysia}$ , 2000=100). The parameters  $\gamma$  and  $\delta$  are the coefficients terms on interest and exchange rates in the demand equation that determine the weights of the AMCI.  $\delta/\gamma$  reflects the relative impact of interest rate and exchange rate on a policy goal. By construction,  $\gamma$  percentage point rise in  $r$  has the same effect on the goal of a  $\delta$  percentage rise in the domestic currency. The higher the weight for one variable implies greater role plays by this variable for adjusting compared to the other variable when shocks happen.

“Other variables” are related to the multiple monetary transmission channels identified in the literature by which monetary policy affects AD and inflation (see for example, Mishkin, 1995; Kuttner and Mosser, 2002). The details of “other variables” are as follows: 1) Government bonds rate (*BOND*) [bond denotes bond rate minus CPI, where the actual inflation rate is used as an estimator for expected inflation] (to account for interest rate channel); 2) share price (*SP*)<sup>5</sup> [to account for asset price channel]; and 3) claims on private sectors (*COPS*)<sup>6</sup>[to account for credit channel]. All variables with the exception of the interest rates are expressed in logarithms (Guender, 2001; Burger and Knedlik, 2003) and all series are expressed in real terms. *SP* is collected from *datastream*, *BOND* is gathered from *SEACEN Financial Statistics*, while other data are obtained from the *International Financial Statistics*.

Following Steven (1998), the reduced-form model<sup>7</sup> is used in this study. The major advantages of this approach are due to its simplicity of modeling framework and its robustness for small samples, and the weights of the MCI can be derived from the estimated AD equation directly.

Following Eika *et al.* (1996) and Ericsson *et al.* (1998), the simple transmission process of monetary policy can be depicted in the AMCI at time  $t$  as:

$$AMCI_t \equiv (R_t - R_b) + \beta/\alpha (e_t - e_b) \quad (2)$$

where superscript  $t$  is a time index, the superscript  $b$  is the base period,  $R_b$  and  $e_b$  are the real domestic interest rate and the natural logarithm of the real exchange rate at base period (2000=100) respectively.  $R_t$  is the real domestic interest rate at current period, and  $e_t$  is the real natural logarithm of the exchange rate at current period.  $\alpha$  and  $\beta$  are the

<sup>5</sup> An alternative variable to proxy for the asset price channel would be house price index, but it is not used here due to lack of data observation, alas data only available starting from 1990.

<sup>6</sup> Following Peng and Leung (2005), *RBOND* is calculated using the 5-Year coupon rate on Federal Government Securities minus inflation. While *RSP* is calculated by the KLCI deflated by the CPI% following Mayes and Viren (2001), and *RCOPS* is calculated as the Claims on private sectors divided by CPI.

<sup>7</sup> Meanwhile, Gottschalk (2001) and Ericsson *et al.* (1998) have employed similar estimation equation with Stevens (1998), by considering the changes of the variables as shown in equation (2). Duguay (1994) has estimated the reduced form IS model within the IS-LM framework and the components of MCI is linked to the output growth. But Duguay’s estimated model has restricted dynamic factor, Granger causality and parameter constancy remain untested and unaddressed, and all data series are assumed to be  $I(1)$ , and  $\Delta r$  and  $\Delta e$  are assumed to be exogenous.  $\Delta y_t = -\alpha \Delta r_t + \beta \Delta e_t + \Delta other\ variables_t + error_t$

relative weights of the effects of short-term real interest rate and exchange rate that change on  $y$  respectively.  $\beta/\alpha$  is the AMCI ratio, where  $\alpha = \gamma/(\gamma + \delta)$ ,  $\beta = \delta/(\gamma + \delta)$ . Intuitively, a decrease in AMCI signifies easing of monetary conditions, *vice versa*. The construction of MCI depends on the weights, the measures of exchange rate, interest rate, and the base year. A higher weight is seen from the relatively large economy.

Bruinshoofd and Candelon (2005) have held the fort for linear specification of monetary policy and economic activity for Germany, France, Italy, the Netherlands, Denmark and the UK. They tested for a smooth transition non-linearity against the linear benchmark for the period 1979:1 to 2002:1 using Lagrange-multiplier linearity test as proposed by Luukkonen *et al.* (1988). Results revealed that they cannot reject the hypothesis of monetary policy is a linear process. Due to the limited evidence of non-linearity in the European monetary policy, they argued that formal linearity should precede any nonlinear modeling.

### ***Estimation Method***

Autoregressive Distributed Lag (ARDL) bounds test is conducted to assess if the variables are cointegrated. The bounds test has several advantages over the conventional cointegration methods. First, ARDL estimation technique is possible even with the problems of endogenous regressors (Alam and Quazi, 2003). Second, the UECM test has better statistical properties since it does not push the short-run dynamics into the residual term as in the case of Engle-Granger technique (Pattichis, 1999). Third, ARDL estimation strategy is a valid asymptotic inference that uses the ordinary least square estimates, provided the values of the maximum lag lengths are appropriately chosen to mitigate any residual serial correlation (Mah, 2000). Fourth, this technique has the advantage of not acquiring a precise identification of the order of the underlying series (Hsiao, 1997; Pesaran *et al.*, 2001). Therefore, pre-testing the order of integration of the explanatory variables is not required for bounds test procedure once a conclusive finding of cointegration is made.

### ***The Model***

A general function of the real GDP in the equation (1) can be written as:  $y_t = f(r_t, e_t, BOND_t, COPS_t, SP_t)$  to account for different transmission mechanisms channels, namely  $r$  and  $BOND$  for short- and long-term interest rate channels respectively,  $e$  for exchange rate channel,  $SP$  for asset price channel, and  $COPS$  for credit channel.

$$\begin{aligned} \Delta L y_t = & \beta_0 + \beta_1 L y_{t-1} + \beta_2 r_{t-1} + \beta_3 L e_{t-1} + \beta_4 BOND_{t-1} + \beta_5 COPS_{t-1} + \beta_6 SP_{t-1} + \sum_{i=1}^p \delta_i \Delta L y_{t-i} \\ & + \sum_{j=0}^p \gamma_j \Delta r_{t-j} + \sum_{k=0}^p \lambda_k \Delta L e_{t-k} + \sum_{l=0}^p \beta_l \Delta BOND_{t-l} + \sum_{m=0}^p \pi_m \Delta COPS_{t-m} + \sum_{n=0}^p \rho_n \Delta SP_{t-n} + \varepsilon_{1t} \end{aligned} \quad (3)$$

where  $\beta_0$  is an intercept term,  $\Delta$  is difference operator,  $\varepsilon_{1t}$  is the random error terms, and  $p$  is the lag length. 4-lag is used in the estimation considering the common practice of using quarterly data for the optimum order of the  $p$ -lag in the ARDL model (Pesaran and Pesaran, 1997). Positive values are expected for  $\beta_5$  and  $\beta_6$ , while negative values are expected for  $\beta_2$  and  $\beta_3$ , and  $\beta_3$  is ambiguous. To carry out the cointegration bounds test, Unrestricted Error Correction Model (UECM) in equation (3) is converted. To obtain a

parsimonious UECM model, a general-to-specific approach is employed by dropping those insignificant first differenced variables sequentially<sup>8</sup>. The long-run elasticity can be derived from the estimated coefficient of the one-lagged explanatory variables, multiplied with a negative sign, and divided by the estimated coefficient of the one lagged dependent variable (Bardsen, 1989). Long run elasticities of the coefficient will be used to compute the modified MCI indices. Meanwhile, the estimated short-run elasticity coefficient is derived from the first differenced variable in UECM.

## EMPIRICAL RESULTS

The parsimonious estimated UECM has passed a battery of diagnostic tests<sup>9</sup>. Table 1 shows the summary of key transmission mechanisms and bounds test for ASEAN-Five countries. Results of the bounds test for cointegration analysis show that the computed  $F$ -statistic exceeds the upper critical value  $I(1)$  band at 1 percent level for all the five ASEAN founder countries.

The computed  $F$ -statistics,  $F(Ly|e, BOND, SP)$  of 12.1022 exceed the upper critical value  $I(1)$  band of 6.36 at 1 percent level in Indonesia. This implies an evidence of cointegration between the real GDP and its determinants, namely the bond rate, the exchange rate, and the share prices from 1983:2-2004:4. Nevertheless, credit channel does not appear to be significant in the model. Meanwhile  $F(Ly|r, BOND, e, COPS)$  of 6.5358 and 5.3229 in Malaysia and Singapore respectively exceed the upper critical value  $I(1)$  band of 5.06 at 1 percent level. The ARDL approach validates the existence of cointegration between the GDP and the exchange rate, both the long and short term interest rate, and credit. Nevertheless, the asset price channel does not fit into the model significantly. In Thailand, the  $F(Ly|r, e, SP)$  of 9.9700 exceeds the upper critical value  $I(1)$  band of 5.61 at 1 percent level. The bounds test reveals an evidence of the cointegration between the real GDP and the interest rate, exchange rate, and share price; and  $F(Ly|r, e, BOND, COPS, SP)$  of 11.0017 exceeds the upper critical value  $I(1)$  band of 5.23 at 1 percent in the Philippines. The bounds test reveals an evidence of a cointegration that address all the key transmission mechanisms channels in the conduct of the monetary policy, namely the interest rate channel, the exchange rate channel, the credit channel, and the asset price channel. These inferences show that the null hypothesis of no cointegration can be rejected. The finding of a cointegrating relation indicates that the real GDP equations used in this study are specified correctly with their determinants, and indicates that stimulation of the monetary conditions is linked to the real GDP. Specifically, Indonesia is affected by the long-term interest rate, exchange rate, and the asset price channels. Malaysia and Singapore are significantly influenced by three major

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<sup>8</sup> General-to-specific strategy is used by Peng (2000) to calculate the MCI for Hong Kong with 4 lags included for each explanatory variables.

<sup>9</sup> There is uncorrelated Breusch-Godfrey serial correlation, constant variance of residuals, correct Ramsey RESET specification test, and normality at 5 percent level, and CUSUM test also indicates that the estimated parameters of UECM equation are stable over the sample period. Unit root tests (ADF, PP, KPSS, and Ng and Perron) have been employed to examine stationarity of the series, and results revealed that all series are nonstationary,  $I(1)$  variables. Results of estimated UECM and unit root tests are not shown here, but are available upon request.

transmission mechanisms, namely the interest rate channel, the exchange rate channel, and the credit channel. Thailand is influenced by the interest rate, exchange rate, and the asset price channels; while the Philippines is affected by the interest rate, exchange rate, credit, and asset price channels.

The estimated long- and short-run elasticities of the real GDP function are presented next. The long-run coefficients are derived from the UECM based on the Bardson (1989) method. The estimated long-run elasticity of the real GDP functions for ASEAN-five founder economies are as follows:

$Ly = 4.289 - 0.049r - 0.038BOND - 0.454e + 0.623COPS$	(Malaysia) (4a)
$Ly = 11.881 - 0.123e + 0.009BOND + 0.049SP$	(Indonesia) (4b)
$Ly = 4.963 + 0.924r - 1.393e - 0.561BOND + 0.576COPS$	(Singapore) (4c)
$Ly = 2.135 - 0.046r + 0.833e + 0.389SP$	(Thailand) (4d)
$Ly = 9.615 - 0.023r + 0.459e + 0.028BOND + 0.152COPS - 0.048SP$	(Philippines) (4e)

**Table 1: Key transmission mechanisms and bounds test for ASEAN-Five countries**

Country	Period	Key transmission mechanisms	Bounds test: F statistics	Cointegration
Indonesia	1983:2- 2004:4	Interest rate channel (long term), exchange rate channel, asset price channel.	12.1022	Yes
Malaysia	1980:1- 2004:4	Interest rate channel, exchange rate channel, credit channel.	6.5358	Yes
Singapore	1981:1- 2004:4	Interest rate channel, exchange rate channel, credit channel.	5.3229	Yes
Thailand	1980:1- 2004:4	Interest rate channel, exchange rate channel, asset price channel.	9.9700	Yes
The Philippines	1983:2- 2004:4	Interest rate channel, exchange rate channel, credit channel, asset price channel.	11.0017	Yes

All the series are correctly signed as expected in Malaysia and Thailand. For instance, in Malaysia, the  $Ly$  is negatively associated with the  $r$ ,  $BOND$ , and  $e$ , and positively related to  $COPS$ . This implies that a rise in interest rate serves to dampen aggregate demand, *vice versa*. A one-percent point increase in real interest rate decreases real  $GDP$  by about 0.05 percent, a one-percent point rise in bond rate reduces real  $GDP$  by 0.038 percent, *ceteris paribus*.

The estimated coefficient of exchange rate is negatively signed for Malaysia, Indonesia and Singapore, implying appreciation (depreciation) in the countries brings an expansionary (contractionary) effect on aggregate demand. For Malaysia, one-percent depreciation (appreciation) depresses (stimulates) the real  $GDP$  by 0.454 percent. The change in the quantity demanded of a good is heavily dependent on a change in price on consumer purchasing power. A fall in interest rates counterintuitively leads to appreciation in the ringgit instead of depreciation. Meanwhile, there is structural change in the Indonesian economy. The crisis of 1998 highlighted the possible contractionary effects of large depreciations in the exchange rate, due to the balance sheet effects on companies of borrowing in foreign currencies. In Malaysia, the response of the foreign exchange earnings on devaluation follows a *J-curve* in which it first declines and then rises as the current account improves following the improve net exports and/or import substitutes found. Thus, appreciation does impose cost on the risk adverse market participants, and respond in favor of trade, and they will induce exports at the margin in the short-run (Poon et al., 2005). This impact is particularly true when the income effect exceeds the substitution effect.



In Singapore, the coefficient of interest rate is positive, which shows that an increase in the interest rate boosts up the output. It has reversed the standard New Keynesian economics or the liquidity effect view, and supported the Fisher equation view. To justify this condition, Dupor (2001) found a temporary exogenous increase in the nominal interest rate that causes a temporary increase in output. Which view applies depends on the time in the change of money occurring and how long the public expects it to last. As Monnet and Weber (2001) reason out, if the inflation deviated from the target were expected to be permanent, as might be true if the real interest rate decreased, then the money and interest rate would move in the same direction. The central bank would have to lower its interest rate target; and to achieve this it would have to lower the expected future rate of money growth. On the other hand, positive coefficients sign of *BOND* for both the Philippines and Indonesia signify that a decrease in the bond rate is associated with a decrease in *GDP*. Implicitly it shows that the bond market in the nations is shallow and suffers from insufficient liquidity, perhaps it could be due to the domination of the bond market by the government securities or by a few investors, and limited diversification of the private bond issues.

In the Philippines, the estimated long-run coefficients of the real exchange rate and the bond rate are positively signed. Depreciation in the exchange rate (as indicated by an increase in  $e$  is inexorably to be associated with the rising interest rate. Since the depreciation is likely to prompt many investors to withdraw funds from investments, this has inevitably led to a higher interest rate (see Brash, 1997, p.5). Meanwhile, the negative coefficient of share price in the Philippines implies that share price is negatively related to *GDP*. This may suggest that the listed companies have a negative effect on volatility, perhaps the stock market is mostly presided over the economical small-cap cyclical. Deregulation of the financial market, and political instability, and several coup attempts have adversely affected the relationship between the share market in particular and the economy in general in the Philippines. Moreover, Bayangos (2000) argues that the stock market continues to be thin and suffers from insider trading and price manipulation in the Philippines. It is suggested that the market with more listed companies may offer more diversification opportunities, and reduce the overall expected volatility. Overall, an explanation of the different behaviour of the Filipino *GDP* with respect to share price suggests that the asset price channel in influencing the conduct of monetary policy in the Philippines could be argued to be slim.

#### ***Augmented Monetary Conditions Index (AMCI)***

The weights of AMCI are derived and the AMCI indices for ASEAN-five founder economies are constructed. The AMCI index is then compared among the ASEAN-five economies. The AMCI derived from the estimated AD function for each country is as follows:

$AMCI_t = -0.079 \Delta r + 1.079 \Delta e$	(Indonesia) (5a)
$AMCI_t = 0.0983 \Delta r + 0.9016 \Delta e$	(Malaysia) (5b)
$AMCI_t = -1.9754 \Delta r + 2.9754 \Delta e$	(Singapore) (5c)
$AMCI_t = -0.0595 \Delta r + 1.0595 \Delta e$	(Thailand) (5d)
$AMCI_t = -0.055 \Delta r + 1.055 \Delta e$	(Philippines) (5e)

where  $\Delta$  denotes the difference operator. The weight  $e/r$  is termed as the AMCI ratio. The estimated weights of AMCI ratio are computed and summarized in Table 2.

**Table 2: Relative Weights of AMCI Ratio for ASEAN-Five Countries**

Country	AMCI ratio: Weights on exchange rate relative to interest rate, 1:X	AMCI ratio: Weights on interest rate relative to exchange rate, X:1
Indonesia	-13.658	-0.073
Malaysia	9.171	0.109
Singapore	-1.506	-0.664
Thailand	-17.806	-0.056
The Philippines	-19.181	-0.052

Source: Author's own computation.

In Indonesia the associated weights of AMCI index,  $\alpha$  and  $\beta$ , are -0.079 and 1.079 respectively. The AMCI ratio for Indonesia is estimated at -13.658 (or equivalently, the weight of the interest rate over the exchange rate is -0.073:1). The results suggest that a one-percentage point rise in the real interest rate induces 0.073 times the change in AMCI as a one-percentage fall in real exchange rate ( $\downarrow e$ : appreciation). For Malaysia, the associated weights of AMCI index are 0.0983 and 0.9016 respectively, and the AMCI ratio is estimated at 1:9.2. This suggests that a one-percentage-rise in the real exchange rate has the same effect on AMCI as a 9.2 percent point increase in real interest rate, *vice versa*. For Singapore, the AMCI ratio is estimated at 1:-1.51, implying a one-percentage-depreciation (appreciation) in the real exchange rate would have the same effect on AMCI as a 1.51 percent point increase (decrease) in the short-term interest rate, *ceteris paribus*. For Thailand, the relative estimated weight is -0.056:1, suggesting a one-percentage point rise in the real interest rate has about the same effect on AMCI to 0.056-percentage depreciation in the real exchange rate; and the AMCI ratio in the Philippines is estimated at -0.052:1. The results suggest that a one-percentage point rise in the real interest rate has about the same effect on *GDP* to 0.052-percentage depreciation in the real exchange rate.

Comparatively, this study shows that the estimated AMCI ratios are ranging from 0.052 to 0.664. The lowest AMCI ratio of 0.052 is in the Philippines. Indonesian AMCI ratio of 0.073 is about the same as the AMCI ratio for Thailand which is 0.056. While Singapore AMCI ratio of -0.664 is relatively higher than the other four ASEAN countries. Compare to other open economies, the estimated values of the AMCI ratio are reported to be in an approximate value of 2:1 for both New Zealand (Nadal-de Simone, *et al.*, 1996) and Sweden (Hansson and Lindberg, 1994); 3:1 for Canada (Freedman, 1995); and 3.63:1 for Mainland China (Peng and Leung, 2005). Therefore, overall the estimates for these five ASEAN small open economies indicate generally smaller ratio of the real interest rate against the real exchange rate. It is not surprising and consistent with Peng (2000).

For all the five countries, the results give a much lower weight to the real interest rate than the real exchange rate, which means that a one-percent point change in the real interest rate has less effect on the output than one-percent change in the real exchange rate. It is evidently revealed that the estimates for all the ASEAN-five economies show generally smaller ratios of the real interest rate against the real exchange rate. The effect of the interest rate on AD is usually found to be higher than that of the exchange rate

(generally 3:1 in industrial countries) (Ozer and Mutluer, 2005). Meanwhile, because of the direct effect on prices through imported goods, the relative weight of the exchange rate would be higher (Grande, 1997). If we compare the Thailand AMCI ratio of 0.056:1 in this study with Hataiseree (1998)'s study of 3.3:1, it is much lower here. The possible attribute to a relatively larger weight on the interest rate in Hataiseree's study would be associated with the fact that Thailand has pursued a monetary policy based on the flexible exchange rate within a shorter examined period where exchange rate system of Thailand has been changed from a basket-pegging regime to a managed floating regime in July 1997.

Next the consistency of the central bank of ASEAN-five economies in response to the exchange rate and the interest rate changes to stabilize the real output are visualized (Figures 1-5). The results reveal that the policy implemented by the central bank of ASEAN-five economies is corresponding reasonably well to the AMCI. Visual inspection shows that AMCI tracks the inversed movements of the real GDP reasonably well after the onset of Asian Financial crisis in 1997 for Indonesia; after 1998 for Singapore; during 1990s for Thailand, over time except in 1997 for the Philippines. While for Malaysia, after the onset of crisis in 1997, the interest rate traced the movement of AMCI extremely well as compared to the exchange rate. This is probably due to the implementation of the pegging exchange rate system since Sept 2, 1998. As such, the empirical model of the AMCI provides some assertions on the degree of tightening or easing of monetary conditions over time.

Specifically, in Malaysia, monetary conditions were volatile from 1980 to mid-1981. Thereafter, increasing AMCI supported the notion that aggressive tightening monetary stances were implemented. A more pronounced easing stance of monetary policy was pursued since 1984Q4. During the period of 1987-1997Q1, monetary conditions were eased almost monotonically on the average. During the onset of Asian financial crisis, monetary policy was tightened, reached its peak in 1998Q3; thereafter, relatively ease monetary conditions were pursued.

In Indonesia, tight stance was pursued from mid 1983-mid 84. Moderation of monetary conditions was executed almost monotonically on average during the period of 1984 until the onset of Asian financial crisis in 1997. In between, a relatively tight policy was implemented during the period 1990, reaching its peak in 1991Q1. Since the mid of 1997, a tight stance was pursued, reaching its twin peak in 1997Q3 and 1998Q3. Thereafter, monetary conditions were loosening drastically until 2000. Next, a tightened policy from mid-2001 to mid-2002, and an eased monetary condition were then followed thereafter.

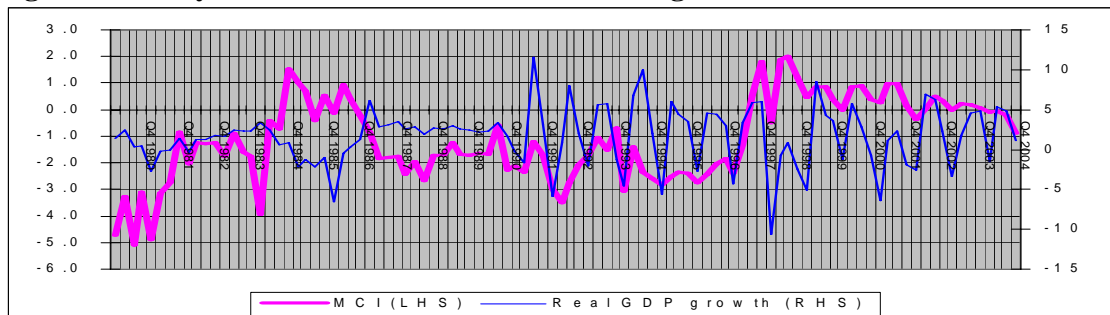
In Singapore, changes in AMCI seem to track the inversed movements of the real GDP growth reasonably well after 1988. Generally, an easing monetary policy was implemented from 1981-84, but discrepancies of tight policy are notable in 1982Q2 and 1984Q1. Thereafter, moderation of monetary conditions was executed almost monotonically during 1985-1992. Further easing stance was then pursued until reaching its trough at the end of 1993. Relatively tight monetary conditions were then accomplished until reaching its peak in the mid-1998. Easy monetary conditions were

then followed until 2003. Thereafter monetary conditions have generally tightened in 2004.

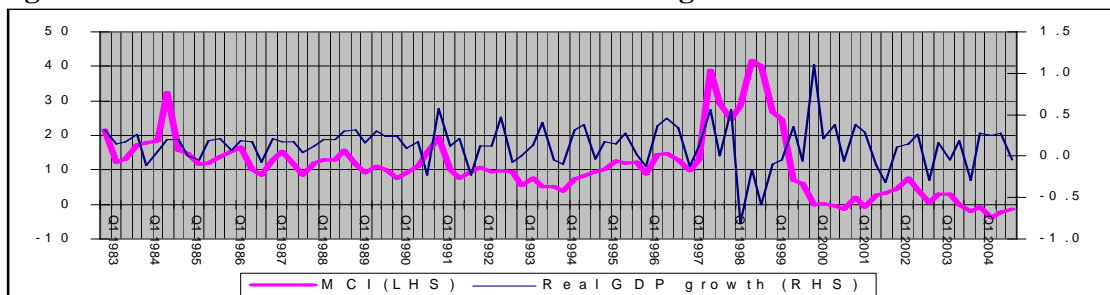
In Thailand, visual inspection shows that the AMCI tracks the inverse movements of the real GDP growth reasonably well during 1990s, and the real GDP growth appeared to fluctuate monotonic after the Asian financial crisis in 1997. Tight stance was pursued from mid 1980-1981Q3. Easing monetary conditions were executed during the period of 1984-1987Q3. Tight policy was followed thereafter, reaching its peak in 1990Q3. Next, moderation of monetary conditions was pursued until the onset of Asian financial crisis in mid-1997. Radical changes of monetary conditions from easing conditions (1997Q2-Q4) to tighten conditions (1997Q4-1998Q1) were accomplished. Harsh easing of monetary conditions was set in from 1998Q1-1999Q3; easing monetary conditions were then followed almost monotonically until the end of 2004.

In the Philippines, Visual inspection shows that monetary conditions are found to be reflected in the BSP's reaction to the prevailing economic situation, implying the AMCI tracking the inversed movement of *LRGDP* plausibly well except in 1997 following the Asian financial crisis. The easing monetary policy was implemented for a year until 1984Q1. Tight monetary stance was employed thereafter, reaching its peak in 1985Q2. Easing stance was then pursued, reaching its trough in 1988Q1. A tight monetary condition was then followed until 1990Q4. Moderation of monetary conditions were executed during the period of 1991 until the advent of Asian financial crisis. A short tight policy was imposed following the Asian crisis for four consecutive quarters until 1998Q1. Thereafter, monetary conditions were loosening almost monotonically till 2004.

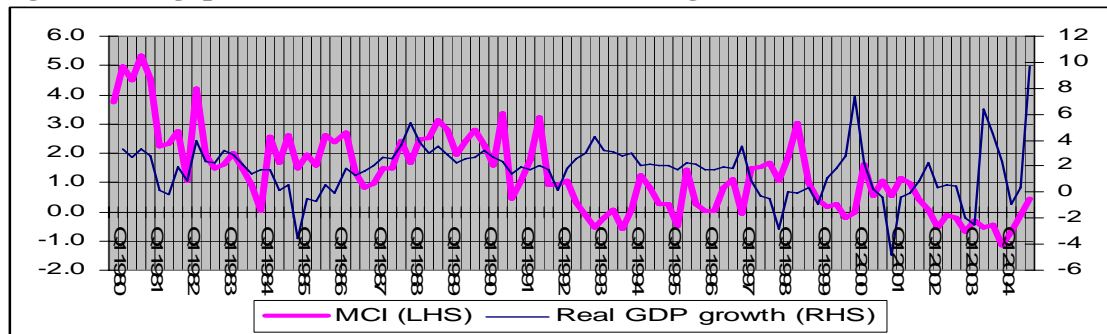
**Figure 1: Malaysia: The real AMCI and real GDP growth**



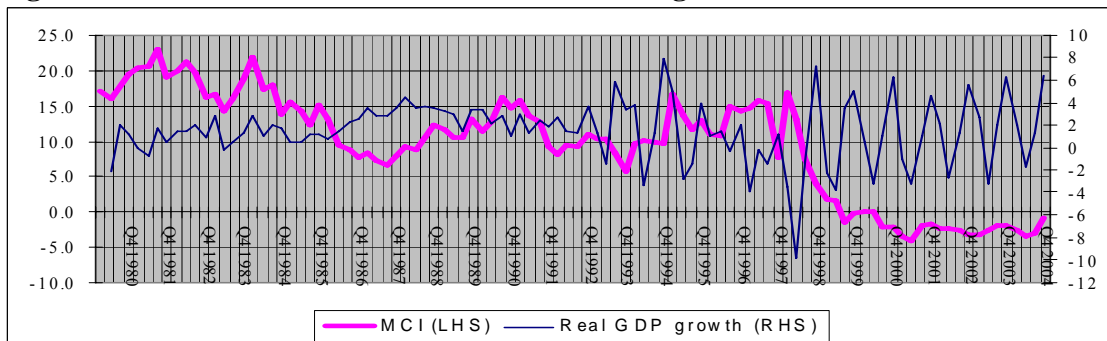
**Figure 2: Indonesia: The real AMCI and real GDP growth**



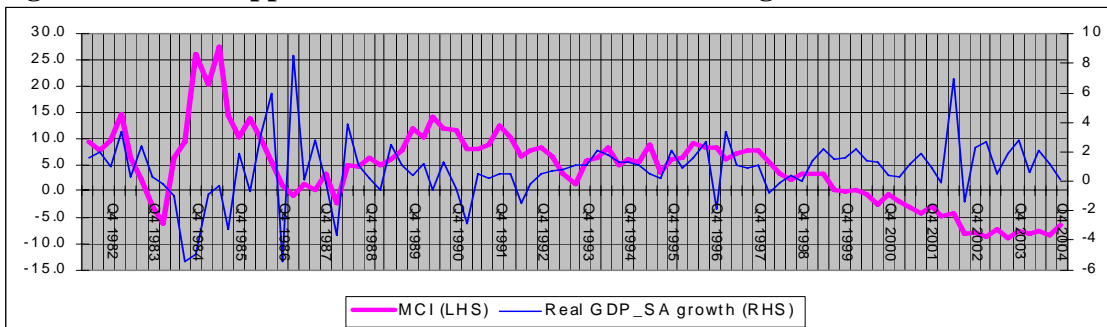
**Figure 3: Singapore: The real AMCI and real GDP growth**



**Figure 4: Thailand: The real AMCI and real GDP growth**



**Figure 5: The Philippines: The real AMCI and real GDP growth**



## Conclusions

The conventional MCI is based on an overly simplistic transmission process of the monetary policy (Guender, 2001). Previous studies have questioned the appropriate weight of the conventional MCI. The size of the elasticities to be attached to the different components of the MCI would differ relatively should there be incorporation of other transmission mechanisms into the benchmark model. AMCI has a few advantages. First, it is a reference measure of the monetary policy stance to gauge the outlook for the real GDP growth, and the future path of the interest rate. It provides a convenient gauge of the relative importance of changes in the interest rate, bond yields, stock prices, credit availability, and the exchange rate. Second, AMCI guides investors and policy makers to assess the future course of the monetary policy, whether the policy stance has been too

tight or too loose that enables them to anticipate on how the monetary policy will ultimately adjust to set monetary conditions right. Therefore the AMCI is still a useful tool to measure the monetary condition. However, it may be difficult to measure AMCI due to: Firstly, unavailability of data; and secondly, when there are changes in the risk premium and risk assessment, either nominal interest rate or the nominal exchange rate or both will be volatile. The condition will become worse when the countries suffer from erratic speculative capital flows. As claimed by Burger and Knedlik (2003, p.19), this is a common problem in the small and open emerging market economies where the risk assessment of the countries is subjected to erratic speculative capital flows that may change abruptly.

### **Policy Implications**

This section presents policy implications for the ASEAN-5 countries in general. Towards this end, there are possible light of policy implications for each country.

- The ability of the AMCI to capture all the possible transmission mechanism channels is particularly useful to the monetary authorities as a short-run measure of domestic monetary conditions. It can be used as one of the leading indicators to guide the monetary policy stance determinant that ultimately affects the inflation rate.
- Lower AMCI weights for all the ASEAN-5 countries imply that the conduct of the monetary policy via the exchange rate channel tends to be more effective than the interest rate channel in controlling inflation during the period under study.
- With direct mechanism of AMCI that entails signal of too loose or too tight of a monetary stance, the monetary authority would have a greater likelihood to take timely policy actions. Nevertheless, the AMCI index should be interpreted cautiously. It cannot be viewed as a static measure seeking continuously varied framework of domestic monetary conditions that is essential to deal with the evolving financial globalization.
- Monetary conditions need to be changed in order to allow inflation to move in the range of inflation target. Principally, over the short-run, there may be some downside risks in the inflation forecast due to the lagged effect of the strong rise on the currency over the past few years. To face it, a small increase in inflation target leads to some easing level of the desired monetary conditions. However, offsetting it to a certain extent may encounter the risk of increasing the public's inflationary expectations. The increase in inflationary expectations may lead to higher prices, elevate wage settlements, increase borrowing demand, reduce saving and so on. Therefore, sharp easing monetary conditions in the short term would leave the economy with very little spare capacity to absorb the stimulus, arising from both the lingering effects of monetary easing and the fresh stimulus of tax cuts and/or the increase government spending. Further easing of the monetary policy stance would exacerbate economic problems later on due to the risks of accelerating inflation.
- Before revising the expected inflation downward in view of the softer short-term demand, a more cautious approach is needed. If the exchange rate passed-through is lower than what we expect, then inflation will be higher than projected in the short term. However, the projections are subject to a number of uncertainties. The

mix of monetary conditions may differ substantially from the projection. For instance, a substantial depreciation for given loosening monetary conditions would cause inflation to increase quicker until the direct price exchange rate passed-through effects take place. To the contrary, a substantial appreciation for a given tightening monetary conditions would reduce inflation temporarily relative to the Central Bank's initial assessment value of the stronger than expected exchange rate depreciation value. Therefore, the Central Bank has to be explicit and transparent in its objective of promoting a low inflation environment conducive for sustainable growth. Steps might include the publication by the central bank of regular assessments of AMCI, and immediate announcements of policy changes should there be any. Also, it is suggested that a regular dialogue between the central bank and bankers should be observed to maintain transparency between these institutions. The design of the prudential regulation also plays an important role for economic growth. Supervision has to be there to ensure a comprehensive monitoring of all the potential threats to financial stability, and pay sufficient exposure to systemic issues, identify potential threats to financial stability arising from the potential risk of contagious effects.

Section below presents policy implications for each country specifically.

Possible light of policy implications for Indonesia are: Firstly, credit channel does not significantly determine the real *GDP* as shown by the insignificant *Ly* in the model. This is not a surprise. By viewing the fund structure of the Indonesia, the banks had limited ability to provide a fresh long-term credit because mobilized bank deposits were mainly dominated by the short-term funds. Limited banks capacity for credit provision was one of the markers that depict the non-fully recovered intermediation function and disrupted the smooth transmission of the monetary policy through the interest rate channel. Secondly, an observation of the long-term interest rate and share price would be a source of information to be incorporated into the AMCI to set the operating target for the monetary policy instrument. Transmission of monetary policy to real sector through the interest rate channel was not effective entirely due to the sluggish recovery in the bank intermediation. Hence, a lower banks' interest rate was effectively transmitted through the asset price channel. Relatively low interest rate eventually enables the capital market to gain a higher profit than the bank deposits. Thus, some public funds were shifted away from the conventional bank savings account and diverted to the stock market investment to prudentially protect their net wealth. Obviously, an increased financing through the stock and bond issues was one of the consequences of slow intermediation recovery. Bond issues have become a cheaper alternative source of financing for corporations instead of bank loans. Therefore, it is not surprised to find that the short-term interest rate is insignificant in the model, but the long-term interest rate does<sup>10</sup>. The crucial issue here is to establish a more liquid secondary market. To do this, an enforcement of transparency and back by prudent regulations from the Bank Indonesia is crucial.

Possible light of policy implications for Malaysia are: Firstly, it is noteworthy that the inclusion of both short-run and long-run interest rate to AMCI is sensible. The direction

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<sup>10</sup> Peng (2000) has also confirmed that the conventional short-term and backward looking measure of the real interest rate often create problems, and suggested the use of a longer term real interest rate.

of AMCI appears to be in line with the movements of both short- and long-run interest rate. Interest rate is attributed with a higher weight, and the AMCI confines considerably to the interest rate as compared to the exchange rate. The key issue here involves the trade-off between the interest and the exchange rate in the AMCI. Monetary authorities need to consider what an exchange rate movement means, and its sources of movement before deciding as to whether the interest rate should be moved in the offsetting direction. Secondly, credit channel determines the real *GDP* significantly during the period under study. From the domestic asset side, the central bank should monitor the quality of loans that were extended by the monetary system to the private sector not only to tradable sectors but also to non-tradable sectors, such as financial services and real estate, to avoid overheating of the economy. Another schedule in the domestic asset side is the need of scrutiny of the quality of banks' investments.

Some possible light of policy implications can be drawn for Singapore are: Firstly, an observation of the long-term interest rate and credit availability would be a source of information to set the operating target for the monetary policy instrument. By observing the AMCI as an indicator to target inflation or deflation might be a fit strategy in the long-run. The insignificant share price variable in the model implies that asset price channel does not really matter in influencing monetary conditions in Singapore. This peculiar result was uncommon, but expectations is consistent with Lee (1992)'s study. By using a multivariate vector autoregression approach, Lee found that the stock price explained little variation in the inflation and the real output. Perhaps, the reason behind this feature can be explained in terms of the household saving rate in Singapore. There is forced savings to a large extent from mandatory national social security savings plan contributions to the Central Provident Fund (CPF). In 1988, Singapore appeared to be the world's highest savings rate of 42 percent of income. Collectively, it serves as a mechanism for curtailing private consumption, and thus retains at a controlled level of inflation rate. The bloated size of the CPF is one of the factors behind the bulkiness of public savings. Given the high savings, the public has less emphasis on other types of investments.

Possible light of policy implications for Thailand are: Firstly, credit channel does not significantly determine the real *GDP* during the period of study. Secondly, despite substantial change in the short-term interest rate, the inelasticity of interest rate has prevented the loan rate from accurately reflecting the economic and financial conditions. Next, the insignificant long-term interest rate in the model may entail that liquidity in the primary market is mature, but the liquidity conditions are less satisfactory and inactive in the secondary market. Bond issues might become an advance alternative source of financing for corporations instead of bank loans alone following financial liberalization. It is crucial to keep an eye on the liquidity condition on the secondary market. Thirdly, an observation of the share price would be a source of information to be incorporated into the AMCI to set the operating target for the monetary policy instrument. To sum up, the AMCI weight of 0.056 implies that the conduct of the monetary policy through the exchange rate channel tends to be more effective than the interest rate channel in controlling inflation in Thailand during the period under study.



Possible light of policy implications for the Philippines are drawn. Firstly, an observation of the bond, COPS, and SP would be a source of information to be incorporated into the AMCI to set the operating target for the monetary policy instrument, apart from the interest rate and the exchange rate of the conventional MCI model. Secondly, the transmission of monetary policy to real sector via the short-term interest rate channel is efficient. For the long rate, results show a positive relation in bond yields associated with aggregate demand. The rationale behind to explain the uncommon feature of bond yield is that falling bond yield represents an easing monetary condition. Hence, if the Bangko Sentral ng Pilipinas (BSP) boosts up the short-term interest rate continuously and the bond rate would continue to fall, then the BSP may fall into the disaster of recession. As remedy, the crucial thing is to firmly establish its liquid secondary bond market by opening up the market for the private sector and promote transparency. Apart from that, separation supervisory authority and the BSP are alleged to evade a conflict of interest between the monetary policy and the prudential supervision. Thirdly, the asset price channel in influencing the conduct of monetary policy in the Philippines could be argued to be slim. As suggested by Bayangos (2000), it is argued that the stock market continues to be thin and suffers from insider trading and price manipulation.

### **Limitations and Recommendations for Future Research**

The AMCI is formed as a linear combination of real interest rate and real exchange rate. However, the relationship may not be accurately capture nonlinearity and asymmetry. It is partly for this reason that most central banks have been willing to accept quite a marked divergence between the actual and desired conditions, and policy makers expect actual monetary conditions to be within a range of plus or minus 50 MCI points as desired in weeks immediately following a comprehensive inflation projection (Brash, 1997, p.6). Moreover, AMCI fails to check for shock identification because of the aggregation of both the interest and exchange rate. One may need to use an Impulse Response Function to see the movement of each component when shock occurs.

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