EXCHANGE RATE FLEXIBILITY, CAPITAL MOBILITY AND INFLATION TRANSMISSION IN MALAYSIA

Mansor H. Ibrahim
Department of Economics, International Islamic University Malaysia
email: mansorhi@iiu.edu.my

Abstract

The paper assesses the international transmission of inflation for a small economy, Malaysia, over three sample periods marked by different degrees of exchange rate flexibility. Contradicting to conventional wisdom of less pronounced foreign nominal influences under the flexible exchange rate regime, this research finds evidence that the inflation transmission from the US to Malaysia is strongest during the period marked by increasing exchange rate flexibility (i.e. 1993-1998). This research also observes significant inflation effects of exchange rate depreciation during the same period. While this research observe less pronounced impacts of the US during the limited exchange rate flexibility period (i.e. 1988-1999), the US influences are virtually absent during the recent fixed regime (i.e. 1998-2005). This research believes that the intensity of capital flows across the three periods might have explained the results.

Keywords: inflation transmission, VAR modeling, Malaysia

Abstrak

Penelitian ini menguji penyaluran inflasi untuk Negara berkembang seperti Malaysia, dengan menggunakan 3 periode sampel berdasarkan fleksibilitas nilai tukar. Penelitian ini menemukan bahwa penyaluran inflasi dari Amerika ke Malaysia sangat kuat pada periode ketika fleksibilitas nilai tukar itu meningkat (1993-1998). Penelitian ini juga menunjukkan hubungan yang signifikan antara inflasi terhadap depresiasi nilai tukar pada periode yang sama. Adapun pengaruh fleksibilitas nilai tukar di Amerika sangat rendah pada periode 1988-1999, sementara itu pengaruhnya tidak terjadi pada saat rezim nilai tukar tetap (1998-2005). Penelitian ini berargumen bahwa intensitas aliran modal selama 3 periode observasi mampu menjelaskan pengaruh penyaluran inflasi terhadap fleksibilitas nilai tukar

Kata kunci: *inflation transmission, VAR modeling,* Malaysia

1. Introduction

The role of exchange rate flexibility in the transmission of inflation across nations has received much attention. It is argued that adhering to a fixed exchange rate regime means loss of monetary independence. In this viewpoint, the standard open-economy macroeconomic model with no restrictions on capital mobility suggests unambiguously the positive responses of domestic prices to foreign price shocks. By contrast, the flexible exchange rate regime

allows an economy to pursue its own independent policies and to shield an economy from nominal disturbances abroad (Friedman, 1953). While theoretical arguments in favor of the flexible exchange rate regime are well articulated, uncertainty remains whether its insulation property holds under an environment of increasingly integrated international markets or whether choice of exchange rate regime matters (Lastrapes and Koray, 1990, Eun and Jeong, 1999). The exchange rate regimes may be of secondary importance in the transmission of nominal shocks. Instead, capital mobility or controls may have a more pre-dominant role in the issue.

Empirically, there are many studies that focus on the international transmission of inflation. Among recent notable studies include Eun and Jeong (1999), Jeong and Lee (2001), Cheung and Yuen (2002), Jeong et al. (2002), Basse (2006), and Yang et al. (2006). Eun and Jeong (1999) examine dynamic interdependence of consumer prices for the G-7 countries during the floating period of 1973 to 1996. Employing standard time-series techniques of cointegration and vector autoregression (VAR), they find strong evidence for the price interdependence among these countries. In addition, the United States emerges as the most influential nation in transmitting inflation to other countries, as should be expected. These results are generally substantiated in later studies by Jeong and Lee (2001) and Yang et al. (2006) for the G-7 countries and Basse (2006) for Germany. Jeong and Lee (2001) also note some evidence for the insulation property of the flexible exchange rate. Namely, given deviations from their long-run equilibrium path, consumer prices tend to adjust faster under the fixed exchange rate regime than under the flexible exchange rate regime. Furthermore, the exchange rate flexibility tends to absorb, though not completely, foreign price disturbance for Canada and the UK.

Cheung and Yuen (2002) argue that the focus on developed economies may not fit the small open economy assumption of most theoretical models on the subject. In other words, examining the influences of the United States (or other large economies) on small or developing economies would be more appropriate. Based on this argument, they examine the influences of the U.S. inflation on Hong Kong and Singapore. While they share many similar characteristics and fit the small open economy assumption, Hong Kong and Singapore are strikingly different in their exchange rate policies. Namely, the former adopts a fixed exchange rate regime while the latter has a managed floating system. Using cointegration, VAR, impulse-response functions and variance decompositions, they document evidence for the transmission of inflation from the U.S. to both economies. However, the propagation of inflation shocks is less pronounced for Singapore.

Meanwhile, Jeong et al. (2002) examine inflation dynamics of seven major African countries that have diverse exchange rate regimes[1]. Applying the

[1] These countries are South Africa, Nigeria, Ivory Coast, Kenya, Ghana, Cameroon, and Senegal. South Africa, Kenya, and Ghana adopt an independent floating system. Meanwhile, Ivory Coast, Cameroon and Senegal peg their currencies to the French Franc and Nigeria pegs its currency to the US dollar. Apart from these countries,

VAR analysis, they decompose the sources of inflation variations for each country into domestic, regional and inter-continental inflation shocks. From the results, they note a significant portion of domestic inflation variations attributable to shocks coming from foreign countries. Their analysis also substantiates early findings that the US plays a dominant role in influencing inflation dynamics of the seven African countries. More interestingly, there seems to be limited evidence supportive of the Friedman's (1953) argument for the flexible exchange rate system. Namely, the three countries that adopt an independent floating system, i.e. South Africa, Kenya, and Ghana, tend to be less influenced by foreign inflation shocks. However, there is no evidence that the countries with US-pegged and France-pegged exchange rate regimes are affected directly by inflation shocks of, respectively, the US and France.

The aforementioned studies, however, have sidelined the role of capital mobility or controls in the transmissions of nominal shocks and the independent influences of exchange rate changes on domestic inflation. In a recent study by Forssbæck and Oxelheim (2006), the link between exchange rate regimes, capital controls, and monetary policy autonomy is empirically assessed for the case of small European countries. More specifically, they estimate the responsiveness of small countries' interest rates to a benchmark interest rate as well as examine their dynamic interactions across alternative exchange rate and capital account regimes. Their results indicate little difference in the degree of monetary policy autonomy across exchange rate regimes. However, capital controls do offer at least temporary protection against international influences. At the same time, several studies have demonstrated significant influences of the exchange rate changes on aggregate prices. Among them include Bahmani-Oskooee and Malixi (1992) for thirteen less developed countries, Kim (1998) for the United States, and Akinlo and Odusola (2003) for Nigeria. Further, looking at the recent US experience, Parsley and Popper (1998) show modest response of prices to exchange rate after controlling for the mitigating effect of monetary policy.

The present paper attempts to add further to this line of research by analyzing the experience of Malaysia. In line with Cheung and Yuen (2002), Malaysia fulfils the small economy assumption and, thus, provides another good opportunity to test the transmission of inflation across countries. Moreover, prior to the 1997/1998 Asian crisis, its exchange rate system has evolved to a managed floating system with allowance given for increasing exchange rate flexibility. Then, in response to the Asian crisis, Malaysia adopted capital controls and officially fixed its ringgit against the US dollar from September 1998 to July 2005 after surrendering to speculative attack at the onset of the Asian crisis in July 1997. These experiences by Malaysia, thus, allow us to empirically assess the role of exchange rate flexibility and capital controls in the transmission of inflation. Empirically, this research improves on existing analyses by explicitly accounting for the independent influences of exchange rate fluctuations and monetary conditions on domestic prices.

---

the consumer prices of the USA, UK, France and Japan are also included to examine inter-continental transmission of inflation.

The rest of the paper is structured as follows. In the next section, this research briefly reviews Malaysia's exchange rate regimes. Section 3 details the empirical approach. The data and results of the analysis are presented in section 4 and 5. Lastly, section 6 contains a summary of the main findings and some concluding remarks.

2. Exchange Rate Regimes in Malaysia

Prior to the imposition of capital controls and officially fixed exchange rate regime in September 1998, Malaysia had witnessed varying degrees of exchange rate flexibility. Initially, Malaysia adopted a fixed exchange rate system, pegging its currency against pound sterling from 1967 to June 1972 and then to the US dollar until June 1973. In linking to the US dollar, the monetary authorities allowed fluctuations of the Malaysian currency within fluctuation ranges for the effective rate. However, with the floating of major currencies after the breakdown of the Bretton Woods system, the fluctuation range of the exchange rate was abandoned in June 1973. Still, in the face of exchange rate fluctuations, the Central Bank of Malaysia (i.e. Bank Negara Malaysia) attempted to manage the exchange rate to be close to its target level. Then, from September 1975 to June 1993, Malaysia pegged its currency against a weighted basket of currencies of its major trading partners (Kawai, 2002, Table 5). Indeed, during the later years of 1975-1993, the exchange rate in Malaysia was characterized as limited flexibility (January 1986-February 1990) and fixed (March 1990-November 1992) (Hernandez and Montiel, 2001). Afterwards, Malaysia was placed under the managed floating system where allowance was given to more exchange rate flexibility to be consistent with prevailing market conditions.

It is normally noted that the aforementioned *de jure* exchange rate arrangements may not necessarily reflect the actual practices by monetary authorities. While there seems to be a preference for exchange rate stability through a *de facto* US dollar peg prior to the Asian crisis by Malaysia's Central Bank, the observed exchange rate arrangement documented by Kawai (2002) collaborates the increasing flexibility of the Malaysian Ringgit. In his devoted efforts, Kawai (2002) applies Frenkel and Wei's (1993, 1994, 1995) regression technique to characterize exchange rate arrangements in East Asia. From the regressions, he classifies countries into pegged, intermediate, and flexible regimes based on the size of exchange rate volatility as captured by the estimated standard errors of the regressions. Malaysia is placed under the pegged regime from 1980 – 1984, the intermediate regime from 1985 to 1994, and the flexible regime from 1995 to 1999. Yap (2002) also observed an upward trend in the regression standard error in his fiver-year rolling regressions.

In short, the exchange rate arrangements in Malaysia after the Bretton Woods era can roughly be characterized by three distinct phases. The first phase corresponds to the period of limited exchange rate flexibility from 1975 to June 1993. The second phase is the managed floating regime lasting from mid-1993 to September 1998. Lastly, the third phase is the recent fixed regime adopted by Malaysia in September 1998 in response to the Asian crisis, which lasted until 2005. During the third phase, the Malaysian economy was also characterized by

limited or decreasing capital mobility, especially capital outflows, due to the imposition of capital controls. Meanwhile, relative to most developing countries, Malaysia's capital account regime had been liberal prior to the crisis (Athukorala, 2001). Indeed, the acceleration of capital opening in the 1990s led to drastic surges in capital inflows with a significant compositional shift towards higher portfolio inflows[2]. An important question against this background of varying 6 exchange rate flexibility and varying degree of capital mobility or control is the extent of international transmission of inflation as experienced by Malaysia. More specifically, it would be interesting to see whether increasing exchange rate flexibility from the first to the second phases and whether the adoption of capital controls together with the officially fixed Ringgit rate in the third phase plays any role in the spillover of inflation from abroad, the focus of the present paper.

3. Empirical Approach

In line with existing studies, this research adopts a vector autoregressive (VAR) framework to examine the international inflation transmission for Malaysia. This research however differs in the variables that make up the VAR model. Due to their multi-countries focus, existing studies generally assess the international inflation transmission via a system of equations consisting of only national prices. This research contends that this is not appropriate for countries that allow for some fluctuations in their exchange rates. The reason is the exchange rate changes can exert independent influences on domestic inflation. Accordingly, this research adds an exchange rate measure in the analysis. In addition to the exchange rate, this research also incorporates relative interest rates to capture monetary stances or conditions of the countries in question. In the context of a highly integrated small economy such as Malaysia, this addition seems reasonable as the monetary stances or conditions and interdependence between countries may have significant bearing on inflation and exchange rate fluctuations. Moreover, as noted by Parsley and Popper (1998), the interest rates may have been used to mitigate the inflation effects of exchange rate fluctuations. Thus, our analysis is based on a 4-variable framework, namely, domestic prices (P), foreign prices (P), exchange rate expressed as domestic f, currency price of foreign currency (E), and interest rate differential (I)[3].

In the implementation of the VAR model, this research proceeds in steps[4]. First, this research examines the data stochastic properties to establish their integration orders or stationarity property as well as their long-run relations. Briefly stated, a variable is said to be integrated of order d, written I(d), if it requires differencing d times to achieve stationarity. Thus, an I(d)

---

[2] It needs mentioning that, due to the appreciation pressure on the Ringgit, the process of capital account liberalization was halted in 1994 to stem capital inflows. Yet, capital inflows resumed an upward trend after the controls were lifted in mid-1995. See Athukorala (2001) for more details.

[3] It should be noted that the 4-variable framework utilized in the present study is consistent with Cheng (1999), Beng and Ying (2000), and MacDonald and Marsh (1997). They investigate empirically the purchasing power parity theory, but add an interest rate variable in the analysis.

[4] These steps are now standard in time series analyses and, thus, are not discussed in details. Here, we mention only aspects relevant to the present analysis.

variable with $d \geq 1$ is non-stationary. Then, a set of non-stationary variables is said to be cointegrated if their linear combination is stationary. The presence of cointegration means that the variables are tied together in the long run and, thus, they will not drift arbitrarily away from each other. This is interpreted as the presence of their long-run equilibrium relation. For these purposes, this research apply the standard augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests to establish the variables' integration orders. Then, this research adopt a new method suggested by Pesaran et al. (2001), known as the bounds testing procedure, to test for cointegration among the variables. The test is applicable irrespective of whether the variables concerned are stationary or contain unit root, i.e. I(0) or I(1). Moreover, compared to the two-step Engle and Granger's (1987) and multivariate Johansen's (1988) cointegration tests, the bounds test has better small sample properties.

These preliminary tests on the data stochastic properties are now imperative as they provide guidelines for proper specification of the VAR model. Namely, the finding of non-cointegration among non-stationary variables invalidates the use of levels variables in VAR specification. Instead, the variables must be expressed in their stationary forms, normally in first difference. However, the vector error-correction modeling (VECM) should be used for the cointegrated series. The appealing property of the VECM is that it preserves and integrates the long-run information contained in the data with their short-run dynamics. Basically, the VECM is written as:

$$\Delta X_t = \mu + \varphi Z_t + \sum_{i=1}^{k} \Gamma_i \Delta X_{t-1} + \alpha \varepsilon_{t-1} + \nu_t$$

Where $X' = (P, P^f, E, I)$, Z is a vector of exogenous variables such as seasonal dummies, $(\mu, \varphi, \Gamma_i, \alpha)$ are parameters to be estimated, and $\varepsilon_t = P_t - \beta_0 - \beta_1 P_t^f - \beta_2 E_t - \beta_3 I$ is the error correction term. Note that the error correction is omitted from (1) if the variables are not cointegrated.

The matrix Γ_i captures the short-run dynamics interactions among the variables. Meanwhile, the vector a represents the adjustments or responses of the variables to their deviations from the long run relations, the error correction term. Thus, specification (1) enables us to assess the transmission of foreign prices to Malaysia via two channels. The first channel pertains to the response of domestic price changes to foreign price changes as captured by the coefficients of lagged foreign price changes. This is normally interpreted as short-run causality in Granger-sense between the variables. Meanwhile, in the second channel, domestic inflation corrects for deviations from its long-run value as reflected by the coefficient of the error correction term, which is aptly termed as long-run Granger causality between the variables[5]. Needless to state, this research may also assess dynamic behavior of other variables in the system.

To further assess the inflation transmission for Malaysia, this research also simulates variance decompositions (VDC) and impulse response functions

[5] In his analysis of European stock market integration, Garcia-Pascual (2003) uses error correction term coefficients to signify the degree of stock market integration. Likewise, the alleged interdependence among national prices under the fixed exchange rate regime should be reflected by high speed of adjustments, as noted by Jeong and Lee (2001).

(IRF) from the estimated VAR models. The variance decompositions indicate the percentage of a variable's forecast error variance attributable to its own shocks and shocks of other variables in the system. Thus, the relative strength of various shocks in explaining domestic inflation can be assessed. Meanwhile, the impulse response functions trace the temporal effects of a one standard deviation shock in each variable on the variables of interest. In our context, this research can observe the temporal and directional response of domestic inflation to innovations in foreign inflation. Unlike the Granger causality test, variance decompositions and impulse response functions capture both direct and indirect effects of shocks on the variables under investigation. Accordingly, the dynamic linkages among the variables can be fully addressed.

4. Preliminary Data

This research employs monthly data spanning from January 1988 to June 2005. The analysis is carried out over three sample periods. These periods are (I) January 1988-June 1993, (II) July 1993-August 1998, and (III) September 1998-June 2005. The first period is characterized by limited exchange rate flexibility. Meanwhile, the second period is the managed floating period where allowance is made for increasing exchange rate flexibility. Lastly, the final period corresponds to the fixed exchange rate and capital control regime. While it is acknowledged that the division of the data for the first two periods contains a discretionary element, this research stick to the reported official exchange rate regimes as a guideline. Additionally, this research does not extend the first sample back to 1975, the start of the pegged exchange rate regime, so that the three estimation periods have comparable sample sizes. Respectively, this research term the three estimation periods as (i) limited flexibility period, (ii) increasing flexibility period, and (iii) fixed and control period.

In the analysis, the United States is used as a foreign country. This is justifiable given the US economic dominance and, more importantly, the exchange rate policy of Malaysia in giving the dominant weight to the US dollar. The consumer prices are used for the price levels of both countries, Malaysia and the US. The exchange rate is the ringgit price of the US dollar. Note that the Ringgit-US rate is not included in the third sample due to its fixed value. For the interest rates, this research uses the overnight interbank rate and the federal fund rate for, respectively, Malaysia and the United States. These interest rates are normally used to capture the countries' monetary policy stances and conditions. Monthly data on these variables are sourced from the IMF's *International Financial Statistics* (CD-ROM) and Bank Negara's *Monthly Statistical Bulletin* (various issues).

As a priori step to Granger causality tests and VAR modeling, this research first evaluates the variables' temporal stochastic properties. Table ADF and PP Unit Root Tests on appendixes presents the ADF and PP unit root tests for the three periods. In implementing the test, this research incorporates both drift and trend terms. The lag order of the first-differenced terms in the ADF test is based on the Akaike information criterion (AIC). As may be observed from the table, the tests suggest non-stationarity of all variables. Namely, the unit root null hypothesis cannot be rejected when they are expressed in levels.

However, when expressed in first difference, they turn stationary. Thus, they can be characterized as an I(1) process.

Table ARDL Cointegration Tests on appendixes presents the ARDL cointegration test results. Again, this research applies the AIC to select the optimal lag length. In conducting the test, this research use alternative normalizations using the domestic variables, i.e. domestic prices, exchange rate, and interest rate differentials. Moreover, this research also includes the 1997/1998 Asian crisis dummy variable in the ARDL specification for the second sample. The test provides strong evidence for cointegration among the variables during the second period, the period marked by increasing exchange rate flexibility. Namely, the ARDL F-test statistics exceeds the upper-bound critical value at 1 percent significant level when normalized on the domestic price level. Likewise, the variables also seem to move together in the long run in the first period. These results rule out non-causality among the variables and are indicative of potential influences of the included variables including foreign prices on domestic prices. Interestingly, this research finds no evidence for cointegration among the variables during the fixed regime-capital control period. In this case, the only interactions that may exist among the variables would be only in the short run.

5. Estimation Results

5.1. Granger Causality

Given cointegration among the variables in the first two samples, this research applies a VECM to examine their short-run causal interactions and their error corrections to restore long run equilibrium. As in the ARDL specification, the Asian crisis dummy is included in the second sample. Meanwhile, a VAR model in first difference is used for the third sample. The orders of the VECM and VAR are based on the AIC and the requirement that the error terms be serially uncorrelated. The results of the tests are given in Table Granger Causality Tests (on appendixes).

Focusing on short-run causality among the variables by examining the significance of lagged first-differenced variables, this research finds limited evidence for their causal interactions. During the limited flexibility period, only the interest rate variable tends to exert a causal impact on the exchange rate. No other directions of causality are detected. Likewise, this research finds no evidence of causation among the variables in the third estimation period except from the interest rate to domestic prices at 10% significance level. However, during the second estimation period, domestic inflation and US inflation precede changes in the Ringgit exchange rate. This research also finds evidence suggesting a unidirectional causality that runs from the exchange rate to interest rate differentials in the short run. These results are intuitive in light of varying degrees of exchange rate flexibility across the two periods. Since the exchange rate responds to the interest rate, a variable that represents the country's monetary policy stance or monetary conditions, the exchange rate changes seem to be managed through changes in the interest rate. However, in the second period, the exchange rate accommodates changes in domestic and foreign consumer prices, in line with PPP-based exchange rate model. At the same time,

the increasing integration of financial markets and resulting capital flows are perhaps captured by the responses of interest rates to exchange rate changes. Lastly, the capital controls adopted by Malaysia, may have played a role in insulating the domestic economy from foreign influences in the short run.

Turning to the error correction coefficients, this research documented a supporting evidence of the US influences on Malaysia's inflation prior to the imposition of capital controls in 1998. As can be noted from Table Granger Causality Tests on appendixes, the error correction coefficient of domestic price equation is negative as expected and significant in both estimation periods. This means that domestic prices respond to deviations from the long run relations. Interestingly, unlike Jeong and Lee (2001) for the G-7 countries, consumer prices in Malaysia tend to adjust faster in response to deviations from the long run equilibrium during the increasing exchange rate flexibility period. In other words, the increasing exchange rate flexibility has not alleviated the long-run influences of other included variables including foreign inflation on domestic inflation, which contradicts the Friedman's view.

Apart from the adjustments made by domestic prices, this research also note significant error corrections by the interest rates in both periods. Note that the error correction coefficient in the interest rate equation is negative. This result conforms to the negative long-run relations between interest rate differentials and domestic prices. Reasonably, higher interest rate differential or relatively more tightening monetary conditions depress domestic inflation in the long run. Accordingly, once domestic price level is above its equilibrium value, the relative interest rate is expected to decrease to restore equilibrium. Finally, conforming to higher exchange rate flexibility in the second period, the Ringgit exchange rate does adjust to deviations of the variables from their long run path in the second period. Meanwhile, there is no adjustment made by the exchange rate in the first period, i.e. the limited exchange rate flexibility period.

5.2. Variance Decompositions and Impulse Response Functions

To further assess international transmission of nominal shocks for Malaysia such that concrete conclusion can be drawn, this research simulate VDC and IRF. To this end, this research use levels VAR for the first two samples, which is a valid specification for the cointegrated series. The VDC and IRF are generated by orthogonalizing the VAR innovations using the so-called Cholesky decomposition with the following ordering: P^f, I, P, and E. Reasonably, the foreign prices should be most exogenous in the system. However, it is not treated as purely exogenous since it may respond with lags to the interest rate differential due to changes in the federal fund rate. This research allows the interest rate to respond to domestic prices and exchange rate with lags. In the ordering, this research assumes that the exchange rate is most endogenous given its characteristic of being a speculative price. It should be noted that alternative orderings yield qualitatively similar results since the off-diagonals of the error covariance matrix are small. Table Variance Decompositions on appendixes presents the VDC results while Figure Impulse-Response Functions (January 1988-June 1993) on appendixes to Figure Impulse-Response Functions (September 1988-June 2005) on appendixes plot

the impulse-response functions. To conserve space, this research only reports the results for the domestic prices, exchange rate and interest rate differential[6].

Overall, while reaffirming the Granger causality results, the results are illuminating and provide further insights on the role of exchange rate regimes and capital mobility in the inflation transmission. During the first period, both foreign prices and relative interest rate account for quite substantial portion of the variations in domestic price (Table Variance Decompositions on appendixes, panel a). At 18-month horizon, roughly 30% of domestic price forecast error variance is attributable to foreign price shocks. Meanwhile, the relative interest rate shocks account for about 16% of the variations in domestic prices. The impulse response functions reported in Figure Impulse-Response Functions (January 1988-June 1993) on appendixes indicate that domestic prices exhibit a delayed response to foreign price shocks. Namely, the response becomes positive and significant after roughly 1 year.

The significant role of foreign prices in accounting for domestic price fluctuations prevails in the second sample of increasing exchange rate flexibility (Table Variance Decompositions on appendixes, panel b). While the percentage of domestic price variations accounted by foreign price shocks is marginally less than that of the first period (i.e. 26% at 18-month horizon), the domestic price level tends to respond faster. Namely, the positive response of domestic price level to foreign price shocks turns significant after 7 months (Figure Impulse-Response Functions (July 1993-August 1988) on appendixes). Unlike the first period, exchange rate fluctuations exert significant influences on the domestic prices accounting for more than 25% after 6-month horizon. The impulse response function reported in Figure Impulse-Response Functions (July 1993-August 1988) on appendixes indicates that the domestic prices react quickly to exchange rate depreciation. Thus, the exchange rate does exert an independent influence on the domestic price level. The interest rate differential, however, does not seem to play a significant role in the second period.

Apart from the above results, this research also document quite sizable explanatory power of the interest rate differential shocks for exchange rate fluctuations and of domestic and foreign price shocks for the relative interest rate in the first sample (Table Variance Decompositions on appendixes, panel a). From Figure Impulse-Response Functions (January 1988-June 1993) on appendixes, in response to higher interest rate differentials, the exchange rate tends to appreciate as should be expected. Likewise, higher US prices lead to widening of the domestic and US interest rates. However, in the second sample, the significant contribution of the interest rate disappears. Instead, the contribution of foreign price shocks to variations in the exchange rate increases to more than 10%. The impulse-response functions from Figure Impulse-Response Functions (July 1993-August 1988) on appendixes indicate that, following foreign price shocks, the Ringgit appreciates. Meanwhile, only the domestic price remains significant in accounting for fluctuations in the interest

[6] The results for the US price level conform well to our expectations of its being most exogenous, where its variations are explained mostly by its own shocks and it does not respond significantly to shocks in other variables. Accordingly, they are not reported.

rate variable.

In line with the Granger causality results, this research find no significant interactions among the variables in the third period. The forecast error variances of both domestic prices and interest rate differentials are explained mostly by their own innovations, namely, in excess of 90%. Similarly, the impulse-response functions suggest no significant reactions of the variables to shocks in other variables.

5.3. Discussion

International transmission of nominal shocks has been extensively analyzed in light of the merits or demerits of alternative exchange rate regimes. While recent conventional wisdom tends to admit a less pronounced influence of foreign price shocks on countries adopting a more flexible exchange rate regime, doubts remain on whether exchange rate regimes matter under an environment of increasingly integrated financial markets and increasing mobility of capital. Indeed, the degree of capital mobility may play a more dominant role in the international transmission of inflation. Moreover, instead of fending off foreign price disturbances, wide exchange rate fluctuations under the flexible exchange rate regime may be a source of shocks to domestic inflation.

Our results tend to reaffirm the doubt on the role of exchange rate regimes and, at the same time, verify the importance of capital mobility and controls in the international transmission of inflation using Malaysia's experiences. Contradicting conventional wisdom, the evidence shows most pronounced influences of US inflation shocks on Malaysia's inflation during the period characterized by increasing exchange rate flexibility. While there is some evidence showing the transmission of US inflation to Malaysia during the limited exchange rate flexibility period, no significant evidence is found during the recent fixed exchange rate regime. Exchange rate flexibility tends to impose additional inflation risk on the economy as this research also note significant contributions of exchange rate fluctuations on inflation during the managed floating period.

These results lead to our contention that capital mobility may have played a more dominant role in the issue. As noted, capital outflows have been restricted during the third period via various control measures. Thus, despite the fixed exchange rate regime during the third period and the supposedly increasing international influences, inflation in Malaysia does not seem to be affected by nominal disturbances abroad. While capital inflows were temporarily moderated in 1994-1995 due to capital controls on the inflows, the 1990s marked the acceleration of capital account opening and consequently of capital inflows especially portfolio inflows. This corresponds to the period with strongest US influences. In short, the intensity of capital movements may be central in Malaysia's vulnerability to nominal disturbances abroad.

6. Conclusion

The paper empirically evaluates the international transmission of inflation from the US to Malaysia over three sample periods marked by varying

degrees of exchange rate flexibility and intensity of capital mobility. The empirical analysis is framed in a 4-variable VAR framework consisting of Malaysian and US consumer prices, the Ringgit exchange rate, and interest rate differential. As bases for inferences, this research examine the adjustments of each variable to deviations from the variables' long run relationship using VECM, conduct Granger causality tests, and simulate variance decompositions and impulse response functions.

Our analysis offers no evidence that higher exchange rate flexibility during the 1990s helped insulating the economy from US nominal disturbances. Instead, during 1993-1998, the transmission of US inflation to Malaysia is strongest. Namely, the VECM suggests speedier adjustment by Malaysia's inflation to disequilibrium during 1993-1998 than during the earlier period marked by limited flexibility of the Ringgit. Moreover, the portion of inflation forecast error variance attributable to US inflation shocks is substantial. The impulse response functions also indicate faster reaction of domestic inflation to US inflation. Lastly, this research also observes the independent impacts of exchange rate shocks on inflation in Malaysia during the same period. While this research note some evidence for the US influences on inflation in Malaysia during the limited exchange rate flexibility period (1998-1993), the evidence is virtually absent during the recent fixed regime (1998-2005). These results add further doubts on a view by flexible exchange rate regime opponents that, while the fixed regime results in the pronounced transmission of nominal shocks abroad, the flexible exchange rate regime offers protection through fluctuations in the exchange rate. Instead, capital mobility or controls may have been more important in the issue. This arises from our observation that the strongest US influences come from the period characterized by accelerated capital flows while the absence of influence was documented for the recent fixed regime that was adopted together with several capital control measures.

References

Akinlo, A.E. and A.F. Odusola, 2003, Assessing the Impact of Nigeria's Naira Depreciation on Output and Inflation, *Applied Economics,* 35 (6), 691-703.

Athukorala, P., 2001, *Crisis and Recovery in Malaysia: The Role of Capital Control,* Cheltenham: Edward Elgar.

Bahmani-Oskooee, M. and M. Malixi, 2002, Inflationary Effects of Changes in Effective Exchange Rates: LDCs Experience, *Applied Economics*, 24 (4), 465-71.

Basse, T., 2006, Floating Exchange Rates and Inflation in Germany: Are External Shocks Really Irrelevant?, *Economics Letters*, 93 (3), 393-97.

Beng, G.W. and S. Ying, 2000, Exchange Rate and Interest Rate Differential: The Case of the Malaysian Ringgit/US Dollar, *Applied Economics Letters,* 7 (2), 95-97.

Cheng, B.S., 1999, Beyond the Purchasing Power Parity: Testing for Cointegration and Causality between Exchange Rates, Prices, and Interest Rates, *Journal of International Money and Finance*, 18 (6), 911-24.

Cheung, Y. and J. Yuen, 2002, Effects of U.S. Inflation on Hong Kong and Singapore, *Journal of Comparative Economics*, 30 (3), 603-19.

Engle, R.F. and C.W.J. Granger, 1987, Co-integration and Error Correction: Representation, Estimation, and Testing, *Econometrica* , 55 (2), 251-276.

Eun, C.S. and J. Jeong, 1999, International Price Level Linkages: Evidence from the Post-Bretton Woods Era, *Pacific-Basin Finance Journal,* 7 (3-4), 331-49.

Forssbæck, J., and L. Oxelheim, 2006, On the Link Between Exchange Rate Regimes, Capital Controls and Monetary Policy Autonomy in Small European Countries, 1979-2000, *World Economy*, 341 – 368.

Frenkel, J.A. and S. Wei, 1995, Emerging Currency Blocks, in Hans Genberg, ed., *The International Monetary System*, 111-170.

Frenkel, J.A. and S. Wei, 1994, Yen Bloc or Dollar Bloc? Exchange Rate Policies of the East Asian Economies, in Takatoshi Ito and Anne O. Krueger, eds., *Macroeconomic Linkages: Savings, Exchange Rates, and Capital Flows,* Chicago: University of Chicago Press, 295-329.

Frenkel, J.A. and S. Wei, 1993, Is There a Currency Bloc in the Pacific? in Andrian Blundell-Wingnall and Stephen Grenville, eds., *Exchange Rates, International Trade and Monetary Policy*, Sydney: Reserve Bank of Australia, 275-307.

Friedman, M., 1953, The Case for Flexible Exchange Rates, *Essays in Positive Economics*, Chicago: University of Chicago Press, 157 – 203.

Garcia-Pascual, A., 2003, Assessing European Stock Markets (Co)integration, *Economics Letters*, 78 (2), 197-203.

Hernandez, L. and P. Montiel, 2001, Post-Crisis Exchange Rate Policy in Five Asian Countries: Filling in the "Hollow Middle"?, *Unpublished manuscript.*

Jeong, J. and Y. Lee, 2001, International Transmission of Inflation under Alternative Exchange Rate Regimes: Empirical Evidence and Its Implications, *Global Finance Journal*, 12 (1), 121-37.

Jeong, J., Fanara, Philip and C.E. Mahone, 2002, Intra- and Inter-Continental Transmission of Inflation in Africa, *Applied Financial Economics* 12 (10), 731-41.

Johansen, S., 1988, Statistical Analysis of Cointegration Vectors, *Journal of Economic Dynamics and Control* 12 (2-3), 169-210.

Kawai, M., 2002, Exchange Rate Arrangement in East Asia: Lessons from the 1997-98 Currency Crisis, *Monetary and Economic Studies*, 20 (S-1), 167-204.

Kim, K., 1998, US Inflation and the Dollar Exchange Rate: A Vector Error Correction Model, *Applied Economics*, 30 (5), 613-19.

Lastrapes, W.D. and F. Koray, 1990, International Transmission of Aggregate Shocks under Fixed and Flexible Exchange Rate Regimes: United Kingdom, France, and Germany 1959 to 1985, *Journal of International Money and Finance*, 9 (4), 402-423.

MacDonald, R. and I.W. Marsh, 1997, On Fundamentals and Exchange Rates: A Casselian Perspective, *Review of Economics and Statistics*, 79 (4), 655-64.

Narayan, P.K., 2005, The Saving and Investment Nexus for China: Evidence from Cointegration Tests, *Applied Economics*, 37 (17), 1979-90.

Parsley, D.C. and H.A. Popper, 1998, Exchange Rates, Domestic Prices, and Central Bank Actions: Recent U.S. Experiences, *Southern Economic Journal*, 64 (4), 957-952.

Pesaran, H.M., Shin, Yongcheol and R.J. Smith, 2001, Bounds Testing Approaches to the Analysis of Level Relationships, *Journal of Applied Econometrics*, 16 (3), 289-326.

Yang, J., H. Guo and Z. Wang, 2006, International Transmission of Inflation among G-7 Countries: A Data-Determined VAR Analysis, *Journal of Banking and Finance*, 30 (10), 2681-2700.

Yap, M.M., 2002, P-Star, Exchange Rate Regime and Inflation Determination: The Malaysian Case, *Journal of the Asia Pacific Economy*, 7 (3), 379-407.

Appendixes

ADF and PP Unit Root Tests

	Levels		First Differences	
Variables	**ADF**	**PP**	**ADF**	**PP**
(a) January 1988-June 1993				
P	-1,78	-1,883	-7,086*	-7,033*
P^f	-0,841	-0,508	-6,512*	-6,382*
E	-2,627	-2,192	-4,864*	-7,027*
I	-2,04	-2,061	0,464	-7,478*
(b) July 1993- August 1998				
P	-3,195	-2,341	-6846*	-6,860*
P^f	-0,313	-0,382	-5,474*	-6,345*
E	-0,76	-0,788	-7,513*	-7,513*
I	-3,391	-3,462	-4,762*	-13,99*
(c) September 1998- June 2005				
P	-2,766	-2,895	-9,801*	-9,801*
P^f	-2,336	-2,354	-7,579*	-6,777*
I	-2,089	-1,978	-5,043*	-5,028*

Note: The tests include both drift and trend terms. The lag order of the first-differenced terms in the ADF test is set using the Akaike Information Criterion (AIC)

*, ** denote significance at 1% and 5% levels respectively.

ARDL Cointegration Tests

	Normalization		
	P	**E**	**I**
(a) January 1988-June 1993			
F-Stat	2,756	4,455**	4,060***
[Lags]	[1]	[3]	[1]
(b) July 1993- August 1998			
F-Stat	6,401*	2,732	2,949
[Lags]	[5]	[1]	[1]
(c) September 1998- June 2005			
F-Stat	1,54	-	2,624
[Lags]	[2]		[4]

Note: The lag order of the ARDL test is based on the AIC. The F statistics are compared to critical values provided by Narayan (2005).
*, **, and *** denote significant at 1%, 5% and 10% respectively.

Granger Causality Tests

(a) January 1988-June 1993

Dep.	**χ^2 - statistics of lagged first-differenced terms**				**Coefficient of**
Variables	**ΔP**	**ΔP^f**	**ΔE**	**ΔI**	**ECT (t-ratio)**
ΔP	-	0,1736	0,0762	0,3337	-0,0705
		[0,677]	[0,7826]	[0,563]	(2,036)
ΔP^f	1,621	-	0,3754	1,0946	-0,0045
	[0,203]		[0,540]	[0,295]	(0,196)
ΔE	1,2578	0,0266	-	6,9244	-0,0862
	[0,262]	[0,8705]		[0,008]	(0,794)
ΔI	0,4057	1,5063	0,0931	-	-13,373
	[0,524]	[0,220]	[0,760]		(3,570)

(b) July 1993- August 1998

Dep.	**χ^2 - statistics of lagged first-differenced terms**				**Coefficient of**
Variables	**ΔP**	**ΔP^f**	**ΔE**	**ΔI**	**ECT (t-ratio)**
ΔP	-	0,0088	0,048	0,586	-0,1761
		[0,925]	[0,827]	[0,444]	(3,221)
ΔP^f	1,3692	-	0,9564	0,6044	0,0508
	[0,242]		[0,3281]	[0,437]	(1,957)
ΔE	4,4251	3,5027	-	0,0998	1,758
	[0,035]	[0,061]		[0,752]	(2,436)
ΔI	0,06265	0,0134	3,6821	-	-55,77
	[0,429]	[0,908]	[0,055]		(3,033)

(c) September 1998-June 2005

Dep.	**χ^2 - statistics of lagged first-differenced terms**		
Variables	**ΔP**	**ΔP^f**	**ΔI**
ΔP	-	1,279	4,755
		[0,528]	[0,093]
ΔP^f	2,888	-	1,124
	[0,236]		[0,570]
ΔI	1,178	0,061	-
	[0,555]	[0,970]	

Note: numbers in squared brackets are p-values.
*, ** denote significant at 1% and 5% respectively

Variance Decompositions

(a) January 1988-June 1993

Horizon	Explained by variation in :			
	P	P^f	E	I
(i) Variance decompositions of P				
3	85,25	12,33	0,46	1,95
6	84,64	9,48	3,86	2,02
12	66,4	15,99	7,6	10,01
18	50,61	29,91	5,89	13,58
(ii) Variance decompositions of E				
3	1,47	6,623708	89,39	2,52
6	3,92	4,863847	87,25	3,97
12	4,85	6,219459	77,98	10,95
18	5,44	5,997488	73,32	15,24
(iii) Variance decompositions of I				
3	1,04	0,36	0,19	98,41
6	3,91	1,15	0,35	94,58
12	11,29	8,63	3,38	76,7
18	14,34	20,36	4,71	60,58

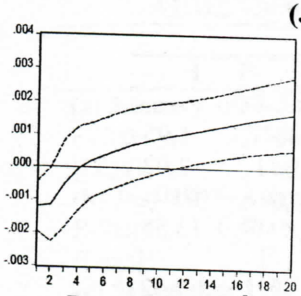
(b) July 1993- August 1998

Horizon	Explained by variation in :			
	P	P^f	E	I
(i) Variance decompositions of P				
3	81,34	5,16	12,12	1,38
6	64,93	7,96	26,19	0,93
12	52,16	17,12	29,9	0,82
18	46,77	25,79	26,51	0,92
(ii) Variance decompositions of E				
3	2,15	10,25	85,13	2,47
6	2,83	12,65	82,24	2,28
12	3,03	13,4	81,33	2,24
18	3,06	13,5	81,19	2,24
(iii) Variance decompositions of I				
3	4,65	1,43	1,85	92,07
6	9,51	1,28	3,59	85,62
12	10,94	1,87	4,24	82,95
18	10,8	2,79	4,24	82,17

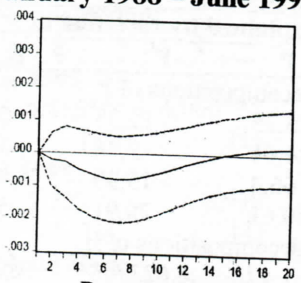
(c) September 1998-June 2005

Horizon	Explained by variation in :		
	P	P^f	I
(i) Variance decompositions of P			
3	92,15	1,5	6,34
6	91,72	1,6	6,69
12	91,67	1,61	6,7
18	91,69	1,61	6,7
(iii) Variance decompositions of I			
3	1,21	1,64	97,15
6	1,54	1,57	96,89
12	1,62	1,56	96,82
18	1,62	1,56	96,82

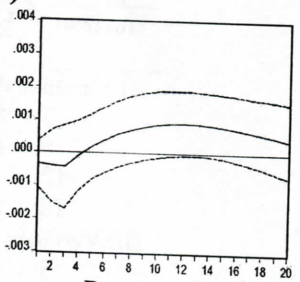
Impulse-Response Functions
(January 1988 – June 1993)



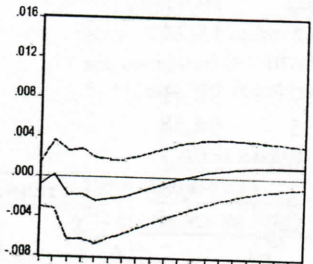
Response P to P^f



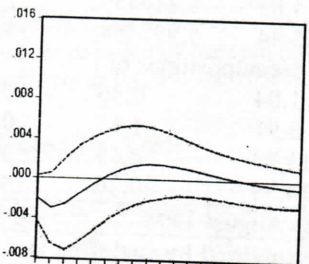
Response P to E



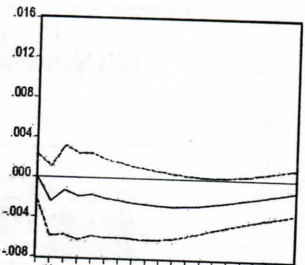
Response P to I



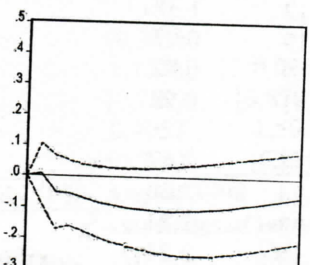
Response E to P



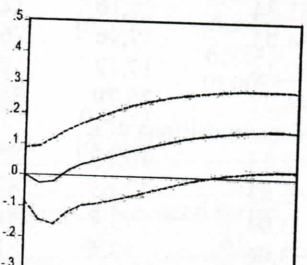
Response E to P^f



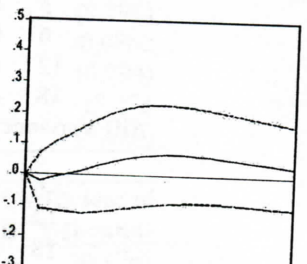
Response E to I



Response I to P

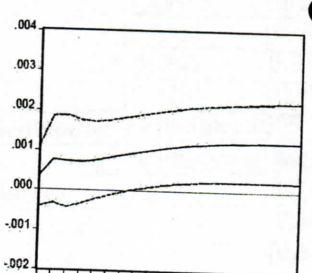


Response I to P^f

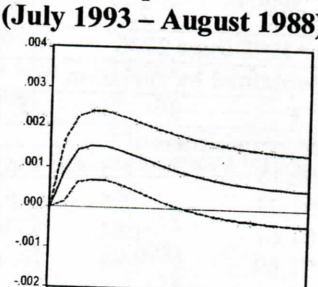


Response I to E

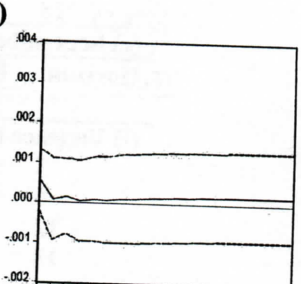
Impulse-Response Functions
(July 1993 – August 1988)



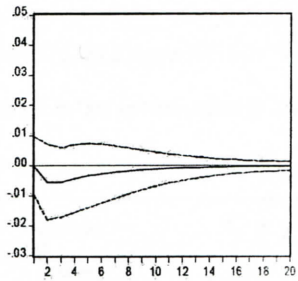
Response P to P^f

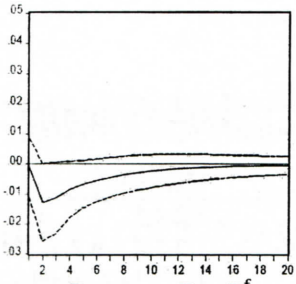


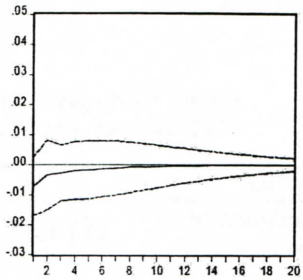
Response P to E

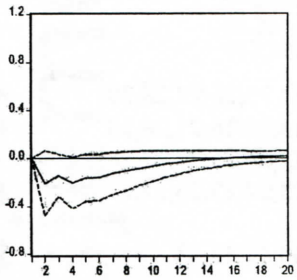


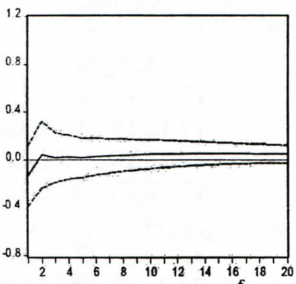
Response P to I

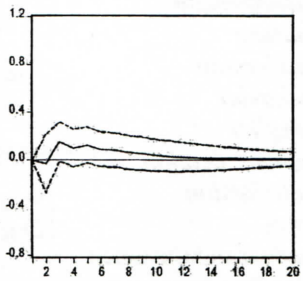




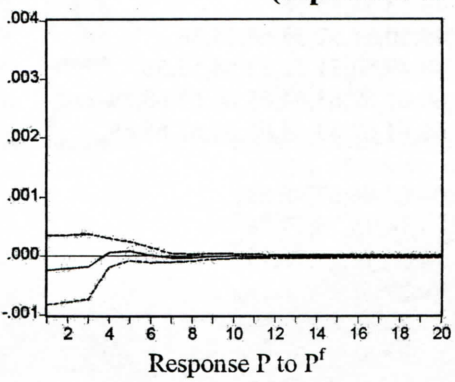


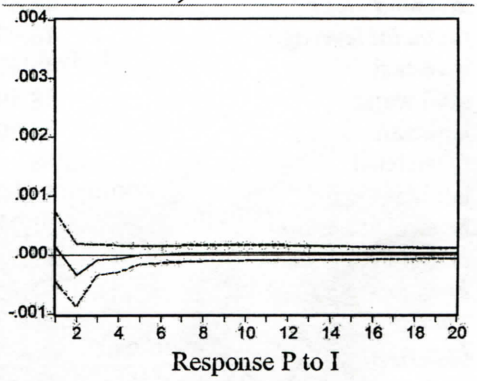


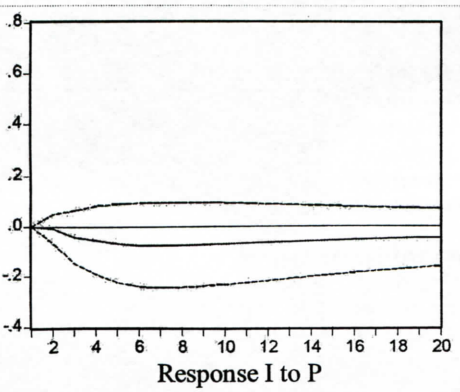


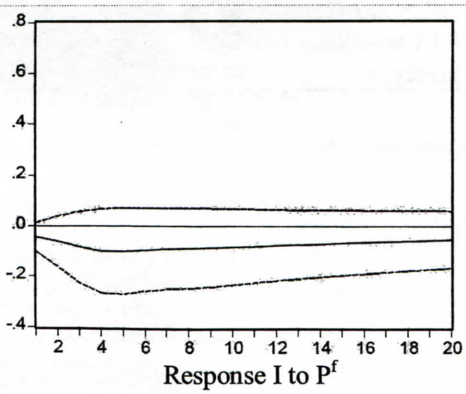


Impulse-Response Functions
(September 1988 – June 2005)









INDEKS SUBJEK

Subjek	Halaman
sustainable	1,2,4,5
tourism	1,2,3,4,5,6,8,12,14
policy	1,2,3,11,12,14,15
business	1,2,3,5,6,8,11,12,14
management	1,2,3,4,10,13
culture	1,2
leadership	17,18,20,28,
behavior	17,18,19,20,22,23,24,25,26,27,28,29
conflict	17,18,19,21,22,23,24,25,26,27,28,29
communication	17,18,19,20,21,22,23,24,25,26,27,28,29
satisfaction	17,18,19,20,21,22,23,24,25,26,27,28,29
citra	32,34
kepuasan konsumen	32,34,36,37,38,39,40,41,42,43
loyalitas konsumen	32,34,35,37,38,44
hipermarket	32,33,34,38,39,42
regresi	32,40,41,42,43
pecking order	46,47,48,50,51,56
dividend yield	46,48,49,53,54,55,56
financial leverage	46,47,49,50,51,52,53,54,55,56
investasi	46,47,48,49,50,51,52,53,54,55,56
nilai wajar	58,59,60,61,62,63,64,65,66,67,68,69
kerataan	58,59,60,61,62,63,64,65,66,67,68,69
persistensi	58
kualitas akrual	58,60,64,65,66,67,68,69
brand association	71,72,73,74,75,76,77,78
brand image	71,73,74,75,76,77,78,79
brand identity	71,74,78,79
innovation capability	80,83,85,86,87,88
business performance	80,85,86,87,88
path analysis	80,86,87
inflation transmission	90,94,95,99
VAR modeling	90,96
Malaysia	90,92,93,94,95,96,98,100,101