Hot money and economic performance: An empirical analysis

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HOT MONEY AND ECONOMIC PERFORMANCE: AN EMPIRICAL ANALYSIS

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Abstract

The present study empirically examines the importance of foreign portfolio investment (FPI) or hot money from certain investor(s) or country(s) on Malaysian economic performance. In methodology, the study uses vector error correction (VECM) model of FPI inflows from major investors such as the United States, United Kingdom, Singapore and Hong Kong and Malaysian real GDP using quarterly data covering the period of Q1:1991 to Q3:2007. For further inferences, the study adopts an innovation accounting by simulating variance decompositions (VDC) and impulse response functions (IRF). It is found that the country's GDP is highly attributable to UK FPI inflow especially in the long run.

Keywords: *Foreign portfolio investment, Economic performance, VECM, Impulse Response, Variance Decomposition*

JEL classification: G15, C32, C12

INTRODUCTION

The relationship between foreign portfolio investment (FPI) and a country's economic performance remains a subject of intense debate among the researchers and policymakers alike. Proponents of capital market integration generally point to the virtues of FPI that promotes economic growth such as promoting the development of host country's financial market and providing easy access to financing for the local deficit units. Among others, La Porta *et al*. (2000) and Bekaert and Harvey (2003) highlight that increase in liquidity due to greater inflow of FPI in the capital market results in easier access to financing at lower cost of capital, which is crucial to support economic activity. The inflow of FPI into the local stock markets helps to alleviate financial constraints of firms (Laeven 2003; Knill, 2004; Beck, Demirguc-Kunt and Maksimovic, 2005). Better access to financing provided by the free flow of portfolio investments contributes to efficient allocation of capital, thus greater economic output (Wurgler, 2000; Love, 2003; Rajan and Zingales, 1998). In short, FPI contributes positively to the economic growth of the host country. At the financial market level, increased FPI inflows result in a further development of the capital market as the greater liquidity means a deeper and broader market (Levine and Zervos, 1996). Studies by Patro and Wald (2005) and Kim and Singal

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(2000) relate FPI and the domestic stock markets and document favorable contribution of FPI in supporting the domestic stock market. At the consumption level, the multiplier effect further propagates the impact of growth in the stock market through the wealth effects. In this regard, capital flows act as catalyst to economic growth and contribute towards increased wealth creation. Due to the several virtues of capital market integration, there are competitions among countries to create positive "pull" factor to attract foreign investment. As a result, host countries would undertake higher industry standards and better regulations, improve corporate governance and business transparency, resulting in greater investor protection, thus increased investor confidence (Feldman and Kumar, 1995; Shinn, 2000).

Despite the rich literature on the virtues of cross border capital flows, critics highlight that the potentially damaging aspects of FPI is rooted in its nature which is short-term, thus volatile in nature (see for example, Baghwati, 1998; Boyd and Smith, 1992). Volatility of FPI has often been quoted as the major reason resulting to the financial market distress, leading to financial crisis. Large and abrupt reversal of portfolio investment is often associated with financial market panics, since it is taken as a manifestation of impending financial crisis (Knill, 2004; Sula and Willet, 2006). More importantly, as highlighted by Henry (2003) and Demirguc-Kunt and Detragiache (1999), based on the experience of many countries which experience financial crisis, the volatility of portfolio investment further exacerbate the impact of a financial crisis. Foreign portfolio instability complicates the implementation of macroeconomic stabilization policies by the policymakers. Uncertainties in the flow of FPI result in unpredictable impact on money supply, exchange rate level and stock market volatility (Patro and Wald, 2005). In particular, sustained periods of excessive capital inflows due to high capital mobility could result in the formation of asset price bubbles, thus sparking inflationary pressure. Sudden withdrawals in portfolio investment accompanied by major correction in asset prices may pose risk to the economy (Bank Negara Malaysia, 2006).

This study seeks to analyze FPI in the Malaysian case and provides recent empirical evidence on whether the FPI brings benefit to the Malaysian economy or otherwise. While studies analyzing the relationship between FPI and the Malaysian economic performance are abundant, these studies have been analyzing total or aggregate FPI data. An area of novelty of this study is that it analyzes FPI data in Malaysia based on the country of origin. This disaggregated or country-by-country analysis enables detailed inferences to be made with respect to the investment behavior of the major investing countries in Malaysia. In this regard, this study hopes to provide a new perspective on the analysis of the characteristics of FPI and its impact on the Malaysian economy.

The rest of the paper is organized as follows: the next section provides some background information on foreign portfolio investment based on the Malaysian experience. In particular, this section highlights investment behavior from the largest four investing countries in Malaysia. Section 3 presents the empirical methods and preliminary analysis of the data. Section 4 highlights the empirical findings including the data preliminaries and the results based on the unrestricted VAR and VECM tests. Further inferences are then made based on the VDC and IRF analysis. Finally, section 5 concludes and draws several policy recommendations from the major findings of the paper.

FOREIGN PORTFOLIO INVESTMENT INFLOWS IN MALAYSIA

During the period 1991 to 2007, inflows of FPI into Malaysia have been substantial and rather volatile. The amount of total FPI inflow ranged from RM19.3 billion in 1991 to a historical high of RM376.4 billion in 2007 (Table 1). Inflows of FPI have been very volatile in the pre-1997 period but have become more stable in the post-1997/1998 Asian crisis period. For example, in the pre-1997 period, inflows of FPI reached a high of RM238.4 billion, which is higher than the nominal GDP during the year at RM195.5 billion. Following the crisis in mid 1997, inflows of FPI declined substantially to RM57 billion in 1998 and reached a low of RM37.9 billion in 2001. Thereafter, there seems to be a stable increase in FPI inflows and the inflow reached a record high of RM376.4 billion in 2007. In comparing inflows and outflows, net portfolio investment recorded the largest negative flow during the crisis in 1997 at RM28.4 billion and deficits were frequent in the years following the crisis. However, since 2003, Malaysia continues to record FPI surpluses, except for the small deficit in 2005. In particular, Malaysia recorded a positive net FPI amounting to RM23.8 billion in 2007 in view of the record high inflow of FPI during the year.

Table 1: Total Foreign Portfolio Investment Inflow in Malaysia, 1991-2007 (in RM Million)

	Nominal GDP	Total FPI Inflow	Total FPI Outflow	Net
1991	135,123	19,346	21,274	-1,928
1992	150,681	60,935	53,043	7,892
1993	172,193	187,779	162,128	25,651
1994	195,460	238,454	224,425	14,029
1995	222,472	106,414	101,054	5,360
1996	253,732	144,933	136,090	8,843
1997	281,889	156,162	184,517	-28,355
1998	284,474	57,028	58,286	-1,258
1999	299,193	43,598	42,532	1,066
2000	356,401	54,529	63,274	-8,745
2001	352,579	37,910	39,891	-1,981
2002	383,212	54,383	59,381	-4,998
2003	418,769	76,013	65,164	10,849
2004	474,049	135,107	100,419	34,688
2005	519,451	127,298	134,137	-6,839
2006	572,555	172,661	161,579	11,082
2007	641,864	376,444	352,612	23,832
Average	336,123	120,529	115,283	5,246

Of total FPI into Malaysia, approximately 80 percent originated from four countries, namely the US, the UK, Singapore and Hong Kong. On average, in the 1991-2007 period, 11.5 percent of total FPI comes from the US, 17.1 percent from the UK, 36.6 percent from Singapore and 22.6 percent from Hong Kong. An interesting observation of FPI from these countries is that the share of FPI inflows from these countries has continued to decline. In particular, in 1991, around 94.4 percent of total FPI came from these countries, while in 2007, the share has dropped significantly to only 79.3 percent. The decline was contributed by lower FPI from Singapore (from 54.5 percent in 1991 to 23.2 percent in 2007) and Hong Kong (from 24.4 percent in 1991 to 17.4 percent in 2007). The contribution of FPI from the US has increased from 5.1 percent in 1991 to 20 percent in 2007, while that from the UK has also increased from around 15 percent in the 1990s to around 22 percent in the post-2000 period. On aggregate basis, the decline in the contribution of these countries to total FPI inflow also indicate the increasing importance of FPI from other sources such as from "other countries" which details are not being specified by the Malaysian central bank - Bank Negara Malaysia.

Table 2: Inflow of Foreign Portfolio Investment in Malaysia by Major Investing Countries, 1991-2007 (in RM Million)

	US	UK	Singapore	Hong Kong	% of Total FPI Inflow
1991	995	2,174	10,359	4,731	94.38
1992	4,361	13,471	31,596	9,853	97.29
1993	9,135	26,100	113,307	31,343	95.80
1994	35,028	36,004	114,018	37,267	93.23
1995	13,778	12,304	52,154	24,109	96.18
1996	8,870	17,654	70,198	41,699	95.51
1997	9,878	20,646	75,373	42,229	94.85
1998	5,625	6,867	22,239	17,477	91.55
1999	2,871	5,856	18,157	8,474	81.10
2000	4,749	8,160	16,072	17,155	84.61
2001	7,353	7,578	7,530	8,703	82.21
2002	7,258	12,085	11,068	13,720	81.15
2003	9,171	19,621	15,192	20,279	84.54
2004	20,131	28,943	34,990	29,900	84.35
2005	20,116	27,331	31,737	25,904	82.55
2006	30,030	36,946	31,169	28,537	73.37
2007	74,758	71,077	87,177	65,441	79.28
Average	15,536	20,754	43,667	25,107	87.17

METHODOLOGY

Data of FPI inflows from the United States, United Kingdom, Singapore and Hong Kong as well as Malaysian real GDP are quarterly, ranging from Q1:1991 to Q3:2007 and sourced from Bank Negara Malaysia's *Monthly Statistical Bulletin* of various issues. The raw data obtained for all variables are in RM million and the base year for real GDP is 1987. All variables are expressed in their logarithmic transformation, denoted by small letters. Δ denotes the first difference operator.

To evaluate the integration properties of the variables, we employ standard augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests (Dickey and Fuller, 1981; Phillips and Perron, 1988). A variable is said to be integrated of order d, written $I(d)$ if it requires differencing d times to achieve stationarity. For cointegration, we employ the VAR based tests of Johansen (1988) and Johansen and Juselius (1990).

In examining the importance of FPI inflows from these foreign countries to Malaysian performance, the VAR model is applied on all FPI inflows and Malaysian real GDP. In this analysis, therefore, there is a set of p=5 endogenous variables, *z = [rgdp, fpiius, fpiiuk, fpiis, fpiihk]*.

Following Johansen(1988,1991) and Johansen and Juselius(1990,1992), we consider a *p*-dimensional vector time series z_t and model it as an Unrestricted Vector Autoregression (VAR) involving up to *k*-lags of z_t.

$$z_t = A_1 z_{t-1} + \ldots.. + A_k z_{t-k} + \mu + \varepsilon_t, \quad \varepsilon_t \sim niid(0, \Sigma) \tag{4}$$

where z_t is a *(px1)* matrix and each of the A_i is a *(pxp)* matrix of parameters. The Johansen approach is used with the consideration that it enables hypotheses tests concerning the matrix and the number of equilibrium relationships to be carried out.

Before test of cointegration could be done, we have to choose the maximum lag length, *k*, in the Unrestricted Vector Autoregression Model (VAR). Choosing the appropriate lag length is important since a *k* too small will invalidate the tests, whereas a *k* too large may result in a loss of power (Kanioura, 2001). The appropriate lag is chosen by checking the residuals of VAR model with one lag after another and the selection of lag is based on the one that has the absence of serial correlation in the residuals.

Being aware of the lag order, then we construct the long-run equations (Unrestricted VAR model) for the series. The analysis is carried out further by doing the Johansen cointegration test with *k-1* lag. The determination of the number of cointegrating vectors is based on the *maximal eigenvalue* and the *trace* tests.

The vector error correction model (VECM) restricts the long-run behaviour of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. In this case, the cointegration terms are the correction terms since a series of partial short-run adjustments correct gradually the deviation from long-run equilibrium. The VECM corresponds to a restricted VAR of order *k-1* for the first differenced series, with the inclusion of error-correction terms for the cointegrating vectors.

We write a *p*-dimensional vector error correction model (VECM) as follows:

$$\Delta y_t = \sum_{i}^{k-1} \Gamma_i \Delta y_{t-i} + \Pi y_{t-1} + \mu + \varepsilon_t, \quad t = 1, \ldots T$$

where y_t is the set of $I(1)$ variables discuss above; $\varepsilon_t \sim niid(0,\Sigma)$; μ is a drift parameter, and Π is a $(p \times p)$ matrix of the form $\Pi = \alpha\beta'$ where α and β are both $(p \times r)$ matrices of full rank, with β containing the r cointegrating vectors and α carrying the corresponding loadings in each of the *r* vectors. The adjustment coefficients in matrix α refer to the coefficients of the Error Correction (ECM) terms.

Additionally, we adopt an innovation accounting by simulating variance decompositions (VDC) and impulse response functions (IRF) for further inferences. VDC and IRF serve as tools for evaluating the dynamic interactions and strength of causal relations among variables in the system. The VDC indicate the percentages of a variable's forecast error variance attributable to its own innovations and innovations in other variables. Thus, from the VDC, we can measure the relative importance of fluctuation of one country FPI inflow in accounting for fluctuation in FPI inflows from other countries. Moreover, the IRF trace the directional responses of a variable to a one standard deviation shock of another variable. This means that we can observe the direction, magnitude and persistence of FPI inflow of each country to variation in Malaysian real GDP.

FINDINGS

As a preliminary step, we first subject each series/variable to Augmented Dickey Fuller (ADF) and Phillip-Perron (P-P) unit root tests. The results of the tests are displayed on Table 3. The results generally suggest that most variables are integrated of order one as the null hypothesis that the series are not stationary is accepted at level but rejected at first difference. In other words, the variables are stationary at first difference or I(1).

Table 3: Unit Root Tests Results

	ADF test statistic (with trend and intercept)		**P-P test statistic (with trend and intercept)**	
Variable	***Level***	***First Difference***	***Level***	***First Difference***
rgdp	-2.44	-3.71**	-3.34*	-9.48***
fpiius	-3.40*	-10.52***	-3.33*	-10.77***
fpiiuk	-3.47*	-10.83***	-3.46*	-10.69***
fpiis	-2.71	-7.92***	-2.69	-7.87***
fpiihk	-2.97	-6.96***	-2.97	-6.83***

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

For this model, the maximum lag length, *k*, of 6 is chosen. Based on cointegration tests, *Maximum Eigenvalue* statistic suggests one cointegrating vector and *Trace* statistic suggest two cointegrating vectors existed among the variables. Table 4 provides detail results of these cointegration tests. We decide to select only one cointegrating vector based on Maximum Eigenvalue test.

Table 4: Johansen Cointegration Tests Results

Null Hypothesis about Rank (r)	*Max-Eigen* Statistic	5% Critical Value	*Trace* Statistic	5% Critical Value
r=0	36.04	33.88	90.21	69.82
r≤1	27.58	27.58	54.17	47.86
r≤2	15.24	21.13	26.59	29.79
r≤3	11.01	14.26	11.35	15.49
r≤4	0.34	3.84	0.34	3.84

Normalising *rgdp* for cointegrating vector 1, following is the suggested vector:

$CV1 = rgdp + 3.23fpiihk - 1.94fpiis + 7.91fpiiuk - 7.38fpiius$

We then proceed with an estimated error correction model to illustrate how the cointegration results might be utilised. The vector error correction model (VECM) restricts the long-run behaviour of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. Table 5 displays short-run equation. All coefficients of short-run equation are coefficients relating to the short run dynamics of the model's convergence to equilibrium and coefficient of lag CV (error correction term) represent the speed of adjustment. The error correction term ($CV1_{t-1}$) in the equation is significant with negative sign. The significant of an error correction term shows the evidence of causality in at least one direction. The significant coefficient of $\Delta rgdp_{t-4}$ with positive sign indicates that in the short-run, previous 4th quarter of real GDP affects present quarter of real GDP positively. Significant and positive coefficients of $\Delta fpiiuk_{t-1}$ $\Delta fpiiuk_{t-2}$ also indicates the importance of UK capital inflows on Malaysian real GDP in short-run. Similar contribution made by FPI from Singapore as coefficient of $\Delta fpiis_{t-5}$ is positive and significant even though at only 10 percent level. Although few FPI variables of US and Hong Kong are significant but their negative signs reflect their opposite contributions on the Malaysian economic growth in short-run.

A number of diagnostic tests are conducted on the error correction model. We find no evidence of serial correlation and ARCH (Autoregressive Conditional Heteroskedasticity) effect in the disturbances. The model also passes the Jarque-Bera normality test which suggests that the errors are normally distributed

Table 5: The Vector Error Correction Model Results

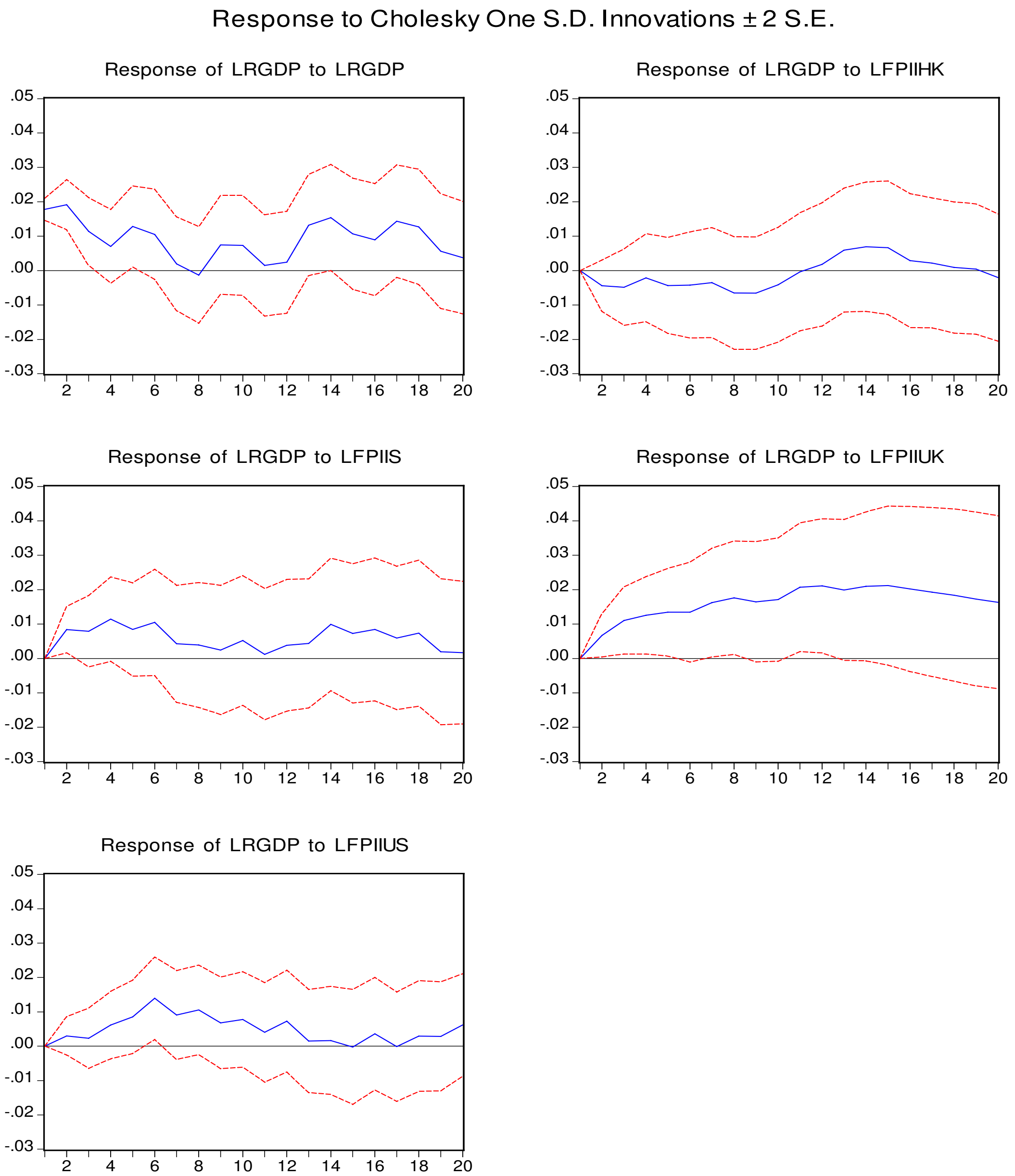
Ind. Variable	Dependent Variable: *rgdp*
constant	0.013**
$\Delta rgdp_{t-1}$	0.103
$\Delta rgdp_{t-2}$	-0.246
$\Delta rgdp_{t-3}$	-0.106
$\Delta rgdp_{t-4}$	0.582***
$\Delta rgdp_{t-5}$	-0.242
$\Delta rgdp_{t-6}$	-0.097
$\Delta fpiius_{t-1}$	-0.028*
$\Delta fpiius_{t-2}$	-0.035**
$\Delta fpiius_{t-3}$	-0.008
$\Delta fpiius_{t-4}$	-0.005
$\Delta fpiius_{t-5}$	0.003
$\Delta fpiius_{t-6}$	0.005
$\Delta fpiiuk_{t-1}$	0.052**
$\Delta fpiiuk_{t-2}$	0.048**
$\Delta fpiiuk_{t-3}$	0.022
$\Delta fpiiuk_{t-4}$	0.019
$\Delta fpiiuk_{t-5}$	-0.009
$\Delta fpiiuk_{t-6}$	-0.009
$\Delta fpiis_{t-1}$	0.001
$\Delta fpiis_{t-2}$	0.006
$\Delta fpiis_{t-3}$	0.012
$\Delta fpiis_{t-4}$	0.017
$\Delta fpiis_{t-5}$	0.025*
$\Delta fpiis_{t-6}$	0.014
$\Delta fpiihk_{t-1}$	-0.004
$\Delta fpiihk_{t-2}$	-0.005
$\Delta fpiihk_{t-3}$	0.005
$\Delta fpiihk_{t-4}$	-0.019*
$\Delta fpiihk_{t-5}$	0.007
$\Delta fpiihk_{t-6}$	-0.004
$CV1_{t-1}$	-0.006***
Included observation	60
Adjusted R^2	0.77
F-statistic	7.24***
Diagnostic test:	
Far	0.015
Farch	0.046
JBnormal	2.712

Notes: 1. *Far* is the F-statistic of Breusch-Godfrey Serial Correlation LM Test.
Farch is the F-statistic of ARCH Test.
JBnormal is the Jarque-Bera Statistic of Normality Test.
2. ***, ** and * denote significant at 1%, 5% and 10% levels, respectively.

From an estimated VAR, we compute variance decompositions and impulse-response functions, which serve as tools for evaluating the dynamic interactions and strength of causal relations among variables in the system. The results of variance decomposition and impulse response functions are displayed in Table 5 and Figure 1, respectively.

From Figure 1, the IRF shows that real GDP does react significantly to UK FPI inflow innovation from 3 quarters until 12 quarters before it subsides to zero. The positive response of real GDP to capital inflow from UK in these quarters implies that FPI inflow from UK is important in contributing to economic performance of the country. However, IRF illustrate lesser importance of capital inflows from other countries (Singapore, US and Hong Kong) on Malaysian economic performance as in most quarters, response of real GDP on the innovations of the inflows are insignificant.

Figure 1: Impulse Response Functions



The variance decomposition is an alternative method to IRF for examining the effects of shocks to the dependent variables. It determines how much of the forecast error variance for any variable in a system is explained by innovations to each explanatory variable, over a series of time horizons. Usually own series shocks explain most of the error variance, although the shock will also affect other variables in the system. From Table 6, the own series shocks of real GDP explain most of the error variance (of real GDP) only up until 6 quarters. Afterwards, error variance of real GDP is highly affected by shock of other explanatory variables. This indicates that real GDP is highly endogenous. In particular, the VDC substantiate the significant role played by FPI inflow from UK in accounting for fluctuations in Malaysian real GDP. At two quarter horizon, the fraction of Malaysian real GDP forecast error variance attributable to variation in capital inflow from UK is only about 4 percent. But then it increases sharply to almost 19 percent within 2-quarter period and keep increasing to 55 percent in quarter 20 as compared to contribution from other countries' inflows. The second contributor to the forecast error variance of real GDP is FPI inflow from Singapore. The percentage of real GDP forecast variance explained by innovation in FPI from Singapore is bigger than from UK in quarter 2 with 15 percent. The trend is increasing only up to quarter 6. But then, it is declining at longer time horizon with only 12 percent at quarter 20. The percentage of Malaysian real GDP forecast variance explained by innovations in FPI from Hong Kong and the US are rather small with less than 8 percent in the long-run. Therefore, the VDC results also highly support the importance of FPI inflow from UK to Malaysian economic performance.

Table 6: Variance Decompositions

Variance Decomposition of *rgdp*						
Period (Qtr)	**S.E.**	***rgdp***	***fpiihk***	***fpiis***	***fpiiuk***	***fpiius***
2	0.028765	75.49872	4.279186	14.65673	4.179026	1.386342
4	0.039371	51.65426	2.352223	23.31562	18.97908	3.698821
6	0.051678	40.03162	1.381554	22.58055	23.47356	12.53272
8	0.059424	30.55622	2.478418	18.12536	33.85309	14.98691
10	0.066364	28.02165	2.382579	15.71447	39.33902	14.54228
12	0.073317	23.13764	2.065679	13.21255	48.36033	13.22380
14	0.082642	22.07499	4.973116	12.77929	49.66925	10.50335
16	0.089834	20.15218	5.755988	12.73269	52.29387	9.065275
18	0.096188	20.83634	5.753348	12.56133	52.83310	8.015880
20	0.099602	19.97484	5.419326	11.83191	54.81468	7.959239

Cholesky Ordering: LFPIIHK LFPIIS LFPIIUK LFPIIUS LRGDP

CONCLUSION

This study empirically examines the importance of the inflows of FPI from the four major investing countries on the Malaysian economic performance. The results of the study based on several tests find consistent evidence of a significant positive association between Malaysia's GDP and the UK FPI inflow both in the long run and the short run. In particular, in the short run, the test results revealed the importance of UK and Singapore capital inflows on Malaysian real GDP. However, the results show that only FPI inflows from UK contribute positively and significantly to Malaysia's economic growth in the long run. Interestingly, the results of the study point towards a negative contributions of the US and Hong Kong FPI inflows on the Malaysian economic growth especially in short-run.

These results are further strengthened by IRF which also shows a positive and significant response of real GDP to capital inflow from UK, while the response of real GDP to other countries inflows are insignificant. Similar conclusion can be made based on the VDC results, which further substantiate the significant role played by FPI inflow from UK in accounting for fluctuations in Malaysian real GDP. Specifically, innovations in the capital inflow from UK accounts up to 55 percent of the variation in the Malaysian real GDP.

Based on these results, it is conclusive that FPI inflows from the UK and to a lesser extent from Singapore are shown to contribute positively to Malaysia's economic performance. In view of this, it would be beneficial to Malaysia if preferential policy incentives can be provided to foreign portfolio investors, particularly from these two countries. It would be interesting if we could understand the type or composition of FPI coming from the UK and Singapore for the formulation of more effective and specific policy recommendations. This is an area of further extension of the research that would further enrich the literature in this context.

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