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RE-INVESTIGATION OF CAPITAL MOBILITY IN MALAYSIA: AN EMPIRICAL STUDY FROM 1971 TO 2007

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ABSTRACT

RE-INVESTIGATION OF CAPITAL MOBILITY IN MALAYSIA: AN EMPIRICAL STUDY FROM 1971 TO 2007

This paper re-examines the degree of capital mobility for Malaysia by applying the model proposed by Shibata and Shintani (1998), as well as the extension model by Cooray (2005). Three empirical contributions are derived from this paper. Firstly, the empirical results suggest that capital seems to be mobile in Malaysia, hence, suggesting Malaysia exhibited substantial amount of financial openness despite periodic exchange controls. Secondly, the empirical observation indicates the importance of incorporating relevant instrumental variables in testing capital mobility via GMM estimator. Lastly, this paper finds that the real interest rate differential is not associated to changes in consumption in Malaysia but the Asian Currency Crisis (1997-1998) is found to be significant and negative to the changes in consumption.

JEL Classification codes: F21; F32

KEYWORDS: Capital Mobility, Malaysia, Instrumental Variables, GMM

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1. Introduction

Capital mobility has been at the forefront of discussion in the international economics arena for a long time. The relaxation of financial restraints in the late 1970s coupled with the increased linkages in world markets have made the concept of free capital movement an integral part of financial practices of governments throughout the world. Nevertheless, growing capital mobility across countries is often associated with costly financial problems. The huge inflow and sudden reverse flow of international capital movements can be distorted on the macroeconomics and financial system, particularly to developing countries which have not developed an advanced domestic financial market (Edwards, 2001). Some countries resorted to capital controls or Tobin tax to reduce the volatility of international flows. Malaysia, for example, after a decade of financial market liberalization and substantial increase in capital flows into the country in the early 1990s, imposed selective capital controls twice in 1994 and 1998 respectively to put a stop to the destabilization of international capital flows (Goh, 2007). The controls seem to have reversed the process of financial liberalization.

This paper is motivated to evaluate the extent to which a liberal exchange control as opposed to a liberalized and controlled capital flows has led to a substantial integration of Malaysia's financial market with the rest of the world. Using the testing approach developed by Shibata and Shintani (1998), and the extended framework by Cooray (2005), this paper aims to re-affirm the international capital mobility in Malaysia. This is a more recent approach in assessing capital mobility by focusing on the correlation between the changes in a country's consumption and the changes in its net output.[1] They proposed that if capital mobility is perfect, then, consumption changes are independent of net output changes. The foundation of Shibata and Shantani (1998)'s model is anchored upon the permanent income model of Campbell and Mankiw (1989, 1990, 1991) with a version of an intertemporal current account framework.

Many empirical studies have often failed to provide rigorous statistical evidence about the degree of capital mobility for developing countries such as Malaysia. Broadly speaking, the statistical tests to capital mobility framework involving nominal interest rate comparisons, consumption correlation and consumption smoothing models generally indicate a high degree of capital mobility in Malaysia (De Brouwer, 1999; Ghosh & Ostry, 1995; Goh et al., 2006; Goh, 2007; Goh, 2008). Nevertheless, those involving saving-investment frameworks by regressing domestic saving on investment demonstrate relatively low levels of capital mobility in Malaysia (Mamingi, 1997; Bagnai and Manzocchi, 1996). The existence of the cointegration test provides a new framework to test for the correlation between savings and investments. The premise is that the savings and investment rates for a single country should not exhibit co-movement if there is a high degree of capital mobility. The idea being that if there is co-movement between these two variables then domestic investments is being financed domestically from domestic savings, and not from foreign investments. Hence, capital is not mobile. In this vein, Chan and Zubaidi (2003) found there is no cointegration between domestic savings and investment rates among the nine Asian countries including Malaysia, and they concluded that capital movements are highly mobile among the sample countries during the sample period. However, using the Malaysian data for the period from 1965 to 2003, Ang (2007) found a fairly robust long-run relationship between

[1] The conventional approaches are based on the Feldstin and Horioka's (1980) framework which considers the correlation between the domestic savings and investment rates. The other approach is based on deviations from international parity condition, i.e., uncovered interest rate parity, covered interest parity, and real interest rate parity. Consumption-smoothing in response to shocks to domestic expenditure is an alternative approach to determine the degree of capital mobility. The alternative approach is to compare the consumption patterns across countries.

domestic savings and investments, after controlling the effects of the Asian Currency Crisis 1997-98 on domestic investment rate, hence, concluding that capital is not mobile in Malaysia.

Literature search reveals that limited studies have been undertaken on Shibata and Shintani's (1998) model, and most of the results, in general, suggest capital immobility. Shibata and Shintani's (1998) study has confirmed imperfect capital mobility for 11 OECD countries including the United States, and Japan. In a recent study, Cooray (2005) had extended their framework by further considering the effect of interest rate differentials on the consumption variable. According to Cooray (2005), if the domestic interest rate is higher than the foreign interest rate, there will be a capital inflow, a currency appreciation and a fall in domestic consumption, and *vice versa*. Using the augmented version of Shibata and Shintani's (1998) model, Cooray (2005) has examined the degree of capital mobility in four South Asian countries (i.e., India, Sri Lanka, Pakistan and Bangladesh). The results indicated that capital is immobile in these countries. In fact, an empirical study of the degree of capital mobility in the Southeast Asian region is an important consideration. By and large, our literature survey revealed that this model has not been applied to many small open economies, particularly in Southeast Asia economies such as Malaysia.

By the same token, this paper also reveals the omission of a set of relevant instrumental variables in order to ensure the robustness of the statistical properties of the GMM (Generalized Method of Movements) estimator. A set of relevant instrumental variables would be correlated with the candidate endogenous variables, and this condition is referred to as instrument relevance in the GMM estimator. Again, this issue has not been taken into account by many researchers in this topic of the instrument prior to the GMM estimations. Thus, this paper fills this empirical gap of literature in GMM estimations with application of capital mobility framework.

The paper is organized as follows. Section II briefly demonstrates the theoretical frameworks proposed by Shibata and Shintani (1998) and extended by Cooray (2005). Section III describes the data (variables) employed in this paper. The empirical results are reported in Section IV. Section V concludes the paper.

2. Theoretical framework

The approach to test capital mobility based on consumption net output correlation proposed by Shibata and Shintani (1998) is principally derived from a basic model with a small open economy version of the permanent income approach of Campbell and Mankiw (1989,1990,1991). The model is re-stated as below:

Assuming a world interest rate of *i*, and a country's limit budget is given as follows:

$$\begin{aligned} F_{t+1} &= (1+i)F_t + GDP_t - C_t - I_t - G_t \\ F_{t+1} &= (1+i)F_t + V_t - C_t \\ V_t &\equiv GDP_t - G_t - I_t \end{aligned} \tag{1}$$

where F_t is foreign asset holdings; GDP_t is gross domestic product; C_t is private consumption; I_t is investment; G_t is government consumption; and V_t is a country's net output. From the national income accounting identity, an equation for current account balance, CA can be read as:

$$CA_t \equiv iF_t + V_t - C_t \tag{2}$$

where CA_t is the current account balance.

Constructively, there are two polar cases - perfect international capital mobility and financial autarky. If we assume that the utility function is quadratic, and the consumers' discount rate and the world interest rate are equal, optimal consumption in the case of perfect capital mobility can be written as:

$$C_t^* = i\left\{F_t + (\frac{1}{1+i})\sum_{n=0}^{\infty}(\frac{1}{1+i})^n E_t V_{t+n}\right\} \tag{3}$$

where $E_t V_{t+n}$ represents the future expectation of net output. By differentiating equation (3), we get the following consumption equation.

$$\Delta C_t^* = \frac{1}{1+i}\sum_{n=0}^{\infty}(\frac{1}{1+i})^n (E_t - E_{t-1})V_{t+n} \tag{4}$$

where $(E_t - E_{t-1})V_{t+n}$ is the change of expectations from time *t*-1 to *t*. However, the value at time *t*-1 is unpredictable under rational expectations. Thus, equation (4) can be expressed in this form:

$$\Delta C_t^* = \varepsilon_t \tag{5}$$

where ε_t is a rational forecast error, which is orthogonal to the information available at time *t*-1.

Again, under perfect capital mobility, the current account equation can be derived from equations (1) to (3). Then, the optimal current account equation is demonstrated by equation (6):

$$CA_t = -(\frac{i}{1+i})\sum_{n=0}^{\infty}(\frac{1}{1+i})^n E_t(V_{t+n} - V_t)$$

$$CA_t = -\sum_{n=1}^{\infty}(\frac{1}{1+i})^n E_t(\Delta V_{t+n}) \quad (6)$$

Equation (6) demonstrates that if ΔV follows a stationary process, *I*(0), then, the current account balance follows a stationary process, *I*(0) as well, under perfect capital mobility. It is worth assuming that the current account and consumption are determined by future expectations of net output. However, in the case of financial autarky, there are no capital movements between countries at all. Therefore, a country's consumption is constrained by its current net output:

$$C_t^a = V_t \quad (7)$$

And, the trade account balance equality now reads as:

$$TB_t \equiv CA_t - iF_t \quad (8)$$

where TB_t is a trade balance that always equals zero, i.e., $S^n = I^n$ (where S^n is national saving and I^n is national investment).

Aggregate consumption relation in the case between the two polar cases where capital is mobile but not perfectly mobile across countries is given by:

$$C_t = (1-\delta)C_t^* + \delta C_t^a = (1-\delta)C_t^* + \delta V_t \quad (9)$$

where δ measures the degree of international capital mobility. The estimated value of δ is ranged between zero and unity. The smaller (larger) the estimated value of δ, the higher (lower) the degree of international capital mobility of a country is. If the value of δ is zero (unity), it indicates perfect capital mobility (perfect capital immobile). Note that, in equation (9), C_t^* is dependent on unobservable terms, which is $E_t V_{t+n}$ (n = 1, 2, …, n). By differentiating both sides of Equation (9), we obtain:

$$\Delta C_t = (1-\delta)\Delta C_t^* + \delta \Delta C_t^a = (1-\delta)\varepsilon_t + \delta \Delta V_t \quad (10)$$

where ΔC_t describes the changes in aggregate consumption. Shibata and Shintani (1998) examined the degree of international capital mobility by estimating the parameter of δ in equation (10).

A recent study by Cooray (2005) has extended Shibata and Shintani (1998)'s model (i.e. equation (10)) by further considering the interest rate differential variable. This would imply that if the domestic interest rate is higher than the foreign interest rate, there will be a capital inflow, a currency appreciation and a loss of competitiveness in the international market that leads to a fall in aggregate demand and therefore consumption or vice versa. The augmented model is indicated by equation (11).

$$\Delta C_t = \delta \Delta V_t + (1-\delta)[(i - i_f) + \varepsilon_t] \tag{11}$$

where i is domestic interest rate, and i_f is world interest rate. If the interest rate differential is statistically significant (insignificant) from zero, it implies that the interest rate differential appears (does not appear) to affect the changes in consumption. Note that δ measures the degree of international capital mobility.

We noted the importance of the Asian Currency Crisis (1997-1998) as a key break date for Malaysia's financial and other macroeconomic variables, hence, a dummy variable (D_i) is included in Equation 10 and Equation 11 in order to capture any possible regime shifts in the Malaysian economic conditions during the Crisis. D_i, is set equal to one during the crisis period, defined as 1997 and 1998, and zero otherwise. In general, this dummy variable is expected to have negative impact on the change of consumption.

3. Variables and Data

The sample period covers annual data from 1971 to 2007. The official data are obtained from the *International Financial Statistics* (International Monetary Fund). The net output variable (V_t) is constructed by subtracting the government consumption expenditure, gross fixed capital formation and the changes in inventories from gross domestic product (GDP). Government consumption is excluded from the data for consumption. Both net output (V_t) and consumption variables convert into real terms by deflating them with the GDP deflator. The differences between the domestic interest rate and foreign interest rate ($i - i_f$) are constructed by subtracting the world real interest rate from the domestic real interest rate, i; the money market rates are used for Malaysia and the United States Federal Funds Rate is used to proxy the world interest rate, i_f. The nominal interest rates for both countries are converted into real terms by subtracting the nominal interest rate from the respective inflation rate.

4. Empirical Results

Prior to the OLS (Ordinary Least Square) and GMM estimation of equations (10) and (11), we need to examine the stationarity or the degree of integration, *I*(d) of the variables of interest i.e., the change in consumption (ΔC) and change in net output (ΔV) and the interest rate differential (i-i_f). The results of both Augmented Dickey Fuller (ADF) and Phillips Perron (PP) test are tabulated in Table 1, showing that all series are stationary in levels, or are in *I*(0) process.

Table 1: Unit Root Tests

ΔC		ΔV		i-i_f	
ADF	PP	ADF	PP	ADF	PP
-4.63***	-4.52***	-4.09***	-4.07***	-4.85***	-3.33**

Notes: The ADF test is based on the following model, $\Delta x_t = \beta_0 + \beta_1 x_{t-1} + \sum_{i=1}^{T} \beta_2 \Delta x_{t-i} + \varepsilon_t$. The PP test is based on the following model, $x_t = \beta_0 + \beta_1 x_{t-1} + \varepsilon_t$. The MacKinnon (1991) t-critical values for the ADF tests for the sample size of 50 with a constant are 1% = -3.58, 5% = -2.93 and 10% = -2.60, with a constant and trends are 1% = -4.15, 5% = -3.50 and 10% = -3.18. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels respectively. Only significant lags are included in the ADF and PP test.

Equations (10) and (11) were estimated by OLS and GMM estimators. According to Shibata and Shintani (1998), the error term may be correlated with **ΔV** since higher output usually implies good news for the country's expected future net output. Hence, the GMM estimation method is employed in this paper in order to discard any potential inconsistencies in the OLS estimates.

On the other hand, it is relevant to incorporate a set of instrumental variables for GMM estimation exercise. Again, the instrumental variables must satisfy two requirements: First, they must be orthogonal to the error process, which is also known as "*instrument exogeneity*"; and, second, they must be correlated with the included endogenous variables, more formally known as "*instrument relevance*". The formal condition of instrument exogeneity is readily tested by the J-statistics.[2]

It must be noted though that the issue of relevant instrumental variables has been the subject of much recent research in time series econometrics. If the instrumental variables are weak (i.e. they are weakly correlated or uncorrelated with the corresponding endogenous variables), the statistical properties of GMM can be inconsistent, that is, the coefficient estimates are biased and incorrect statistical inferential may have occurred. A general rule of thumb for identifying the relevant instrument variables is to estimate an OLS regression of the endogenous variable(s) on the full set of instrumental variables, and compute the *F*-statistics of the excluded instruments in the regression. If the *F*-statistic is statistically different from zero at a conventional level of significance (i.e., 10%), the candidate instrumental variables are weak instrumental variables. Consequently, the GMM estimator is not a reliable estimator and significance tests are

[2] *J*-statistic is the value of the GMM objective function, evaluated at the estimated coefficients. The *J*-statistics computed by Eviews is actually not the real J statistics (Harris, 2007). It is necessary to multiply the computed J statistics in Eviews with sample size to obtain the J statistics.

unrealiable. In this paper, both instrument relevance and instrument exogeneity were checked for their suitability before we determined the robustness of the GMM estimates.

Most of the existing studies [Shibata and Shintani (1998), Bayoumi and MacDonald (1995), and Cooray (2005)] employed the lagged endogenous variables (X_{t-i}) as instrumental variables.[3] Hence, this paper performed a series of statistical tests, and found that the lagged endogenous variables are weak instrumental variables for Malaysia, where the F statistics is less than 10. In this context, this paper considered another set of instrumental variables. The variables include the growth rate of real GDP in the US, and the US consumption share of real GDP. The justification for using these instrumental variables is intuitively suggested by the fact that if the US is a major trading partner for Malaysia, then changes or fluctuations in the growth rate of real GDP and consumption in the US may affect the level of GDP and hence consumption for small open economies such as Malaysia.

Table 2 reports the OLS and GMM estimates for equation (10). As suggested by the OLS estimation, the estimated coefficient on net output variable is extremely small (-0.023) and statistically insignificant. The *t*-statistics fail to reject the null hypothesis of perfect capital mobility (δ =0) for Malaysia, suggesting capital mobility. The last two columns of Table 2 show the GMM estimates of net output. It is found that the high *F*-statistics reveal that the included set of instrumental variables are empirically supported for the case of Malaysia. Meanwhile, the *J*-statistics also statistically confirm that the null hypothesis of the instruments variables are exogenous is not rejected for Malaysia. As is similar to the OLS estimate, the GMM estimates show that the estimates of δ remain small and statistically insignificant for Malaysia. Again, it suggests perfect capital mobility for Malaysia.

By taking into account the possible influences of the Asian Currency Crisis 1997-1998, it is interesting to note that the Asian Currency Crisis has negative impact on the change of consumption. By and large, when the Asian Currency Crisis hit Malaysia, the impact was shocking. The stock market, the currency and the property market nearly collapsed. That in turn affected the overall economy. The huge drop of the Ringgit and the stock market had a devastating impact on domestic consumption. Domestic consumption fell by nearly 9% from 1997 to 1998.

[3] For example, Shibata & Shantani as well as Cooray used lagged of consumption and lagged of net output as their set of instrumental variables.

Table 2: Consumption-net output correlations (Equation 10)

	OLS estimates	GMM estimates	
		IV(1)	IV(2)
δ	-0.023 (-0.19)	0.40 (0.74)	0.47 (0.50)
D_i	-13.12 (-2.65) ***	-20.9 (-2.30)***	-19.60 (-2.10)***
R^2	0.210	-	-
DW test	1.458		
J-statistics		0.1396 [p-value: 0.1598]	0.156 [p-value: 0.214]
F-statistics		15.8467	12.9311

Notes: *t*-statistics are reported in parentheses (.). *** denotes significant at 1 per cent. Equation (10): $\Delta C_t = (1-\delta)e_t + \delta \Delta V_t$. The sets of instrumental variables (IV) used in the GMM estimation are IV(1) {US's openness, US's growth rate of real GDP per capita and US consumption share of real GDP}. IV (2) {US's growth rate of real GDP per capita and US consumption share of real GDP}. The J statistics reported in Eviews are multiplied by *n*. The p-values of the J statistics are reported in parentheses, [.]. F statistics is obtained by estimating an OLS regression of ΔV on the set of instrumental variable and obtain the F-statistics for the joint significance of instrumental variables in the equation.

This section also applied the extended framework by Cooray (2005) written as equation (11). The empirical estimates are reported in Table 3. The OLS estimates (second column) are found to be consistent with the previous estimates tabulated in Table 2. The estimated parameter of net output remains small and statistically insignificant. In fact, it is not a surprise finding given the fact that the interest rate differential variable is statistically insignificant from zero, i.e. this differential (interest rate) is not associated with the growth rate of consumption.[4] The Asian Currency Crisis has negative impact on the change in consumption. For the GMM estimates, the *F*-statistics show that both sets of instrumental variables are correctly identified for Malaysia. Again, the GMM estimates show the net output variable remains insignificant, and the null hypothesis of perfect capital mobility is not rejected for Malaysia. Overall, these initial analyses indicate that capital flow is relatively mobile in Malaysia.

[4] Similarly, Cooray (2005) documented that the interest rate differential is not related to changes in consumption in four South Asian countries, namely, India, Sri Lanka, Pakistan and Bangladesh.

Table 3: Consumption-net output correlations with interest rate differential (Equation 11)

	OLS estimates	GMM estimates	
		IV(1)	IV(2)
δ	-0.03	0.49	0.46
	(-0.24)	(0.83)	(0.94)
γ	-0.38	-0.53	-0.40
	(-0.89)	(-1.84)	(-1.48)
D_i	-12.87 (-2.58)***	-18.8 (-2.02)**	-20.15 (-2.19)**
R^2	0.229	-	-
DW test	1.495	-	-
J-statistics	-	0.146 [p-value: 0.14]	0.142 [p-value: 0.26]
F-statistics		16.93	16.77

Notes: *t*-statistics are reported in parentheses. ** and *** denote significant at 5% and 1%, respectively. Equation (11): $\Delta C_t = (1-\delta)[e_t + (i - i_f)] + \delta \Delta V_t$. The sets of instrumental variables (IV) used in the GMM estimation are IV (1) {US's openness, US's growth rate of real GDP per capita and US consumption share of real GDP, interest rate differential}. IV (2) {US's growth rate of real GDP per capita and US consumption share of real GDP, interest rate differential}. The J statistics reported in Eviews are multiplied by n. The p-values of the J statistics are reported in parentheses, (.).F statistics is obtained by estimating an OLS regression of ΔV on the set of instrumental variable and obtain the F statistics for the joint significance of instrumental variables in the equation.

5. Concluding Remarks

In general, many countries in Southeast Asia such as Malaysia have taken several measures in deregulating and liberalizing their financial markets. Malaysia took major steps towards deregulating the financial markets in the late 1970s. Although financial liberalization was undertaken at a "stop-go-stop" pace, [5] the capital account generally remained open. Using the most recent measure of international capital mobility proposed by Shibata and Shintani (1998) and the extension model by Cooray (2005), this paper reinforces the recent findings in the literature (De Brouwer, 1999; Ghosh & Ostry, 1995; Goh, 2007; Goh *et al.,* 2006, Goh, 2008) that Malaysia has exhibited a substantial amount of free capital movement despite the periodic exchange controls. Nevertheless, this finding does not suggest that capital controls are ineffective in Malaysia. The capital controls implemented in 1998 have helped to lower interest rates and to encourage a revival of domestic consumption and investment without precipitating capital flights (IMF,2001) which provided a breathing space for Malaysia to carry out economic adjustment and structural reforms (Autokorala, 2001). The Malaysian economy recovered in 1999 with a positive growth and portfolio flows began to resurge after 2000. However, capital controls have its own costs too, in the long run as it creates uncertainty for foreign investors and eroded their confidence or a more cautious approach towards making investments in Malaysia.

One of the important lessons that Malaysia learnt from the past Asian Currency Crisis is that the issues arising from economic globalization and financial liberalization have to be seriously addressed. While contributing to market volatility, capital inflows have also increased market liquidity, an essential condition for further financial market developments. After 2001, instead of resorting to capital controls, Malaysia chose to liberalize her capital account, with increasing freedom given to both inflows and outflows of funds. This process was guided by the Financial Sector Master plan and the Capital Market Master plan, both launched in 2001. Malaysia had also made two important decisions during the recent Global Financial Crisis (2008), that is, to liberalise 27 services subsectors, followed by the liberalization of selected financial services[6] and to do away with the 30% Malay equity for listed companies. All these bold moves are to make Malaysia economy more liberal and more open in the international arena.

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[5] There have been two distinct periods of capital controls in Malaysia, 1994, and 1998. The 1994 selective capital controls were to discourage short term capital inflows, whereas, the 1998 controls were to limit short term capital outflows. Both controls were selective in the sense that they covered mainly short term capital flows, there was no control on inward foreign direct investment or any other long term capital flows.

[6] In April 2009, the Malaysian government announced a financial sector liberalization plan that included the issuance of new licences of banking and insurance players. It also, eased foreign ownership rules by increasing limits of equity ownership from 49% to 70% for investment banks, Islamic banks and insurance companies.

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