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Determinants of private investments in Malaysia: What causes the postcrisis slumps?

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DETERMINANTS OF PRIVATE INVESTMENT IN MALAYSIA: WHAT CAUSES THE POSTCRISIS SLUMPS?

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This paper examines the determinants of private investment in Malaysia, with an emphasis on the postcrisis investment slumps. A static private investment function is derived from the neoclassical framework, with appropriate modifications to account for the structural features observed in the country. To introduce dynamics into the model, we adopt a cost minimization problem, which assumes firms optimize investment levels with respect to a quadratic loss function. The results suggest that the availability of financial resources in the economy has a significant positive impact on private investment. Macroeconomic uncertainty exerts a negative influence on the investment climate in the private sector. Both foreign direct investment and public investment are found to have a complementary effect on private investment. Consistent with the prediction of the neoclassical model, a higher level of aggregate output raises private investment, whereas the user cost of capital has the opposite impact. (*JEL* O*16,* O*53*)

I. INTRODUCTION

There has been a sharp decline in gross domestic investment in Malaysia following the Asian financial crisis that hit the country in 1997–1998. This decline has emanated predominantly from private investment, while public investment has been boosted as part of the crisis management program. However, it is not clear whether such government pump-priming efforts will be sustainable in the long run. Therefore, the disappointing trend in private investment has become a major concern of researchers and policy makers (e.g., Jongwanich and Kohpaiboon, 2008; Kinkyo, 2007; Rousseau and Kim, 2007).

Although this persistent stagnation of private investment remains a major concern in the economic policy debate in crisis-affected Asian countries, no study has yet been undertaken to examine its underlying causes with particular reference to the Malaysian experience. The main purpose of this paper was to fill this gap. While it is widely accepted that expansion of private investment is the main catalyst for generating long-term growth, employment, and foreign direct investment (henceforth FDI), the response of private investment to its various adjustment factors has received relatively little attention in the analysis of investment behavior, especially in the context of developing countries. Hence, this study also aims to contribute to the general literature on the determinants of private investment in these economies.

From the policy perspective, there are several important questions regarding the effects of policy on investment. To what extent has financial sector liberalization, through the removal of credit constraints, contributed to private investment compared to other determinants? Is private investment driven by investment incentives? Does macroeconomic uncertainty influence private investment? Is public investment complementary to or competing with public investment? Does FDI encourage or retard private domestic investment? In this paper,

ABBREVIATIONS

AIC: Akaike's Information Criteria
ARDL: Autoregressive Distributed Lag
COC_t: Cost of Capital
ECM: Error-Correction Model
FDI: Foreign Direct Investment
GDP: Gross Domestic Product
HP: Hodrick-Prescott
PRI_t: Long-Run Private Investment
PDI_t: Private Domestic Investment
SBC: Schwarz's Bayesian Information Criteria

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we attempt to address these issues in light of the Malaysian experience, over the period 1960–2005.

The paper proceeds as follows. Section II provides an overview of the trends and patterns of investment in Malaysia. In Section III, we derive the investment function by modifying the neoclassical investment model and provide an alternative specification of the investment equation. However, this static long-run relationship does not contain any dynamics. We introduce dynamics into the model by adopting a cost minimization problem, which assumes firms optimize investment levels with respect to a quadratic loss function. The dynamic investment function is then estimated using the error-correction models (ECMs) described in Section IV. The private investment equation is estimated in Section V. The next section provides a sensitivity analysis of the results by considering the effects of the economic outlook, alternative measures of credit constraints, and macroeconomic uncertainty. The results are then presented and analyzed. The last section concludes.

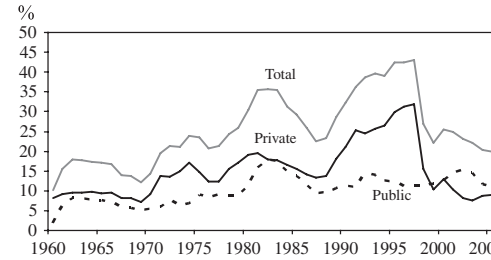
II. TRENDS AND PATTERNS OF INVESTMENT

A. Policy Context and Investment Patterns

On achieving independence in 1957, Malaysia inherited a relatively well-developed infrastructure and an efficient administrative system from the British government, which appeared to be conducive to capital formation. Given that capital formation is an important driver for sustained economic development, the Malaysian government enacted the Pioneer Industries Ordinance of 1958 to stimulate private investment. In 1960, Malaysia had a moderate level of both private and public investment accounting for 8.2 and 1.9% of gross domestic product (GDP), respectively. However, this total investment rate of 10.1% was well below the 21.3% average for lower and middle income countries. The rate increased to about 17% by the mid-1960s before declining in the latter part of that decade due to the increased political tension that culminated in the bloody racial riots following the outcome of the general election in May 1969.

The government attributed the poor performance of investment activities to inadequacies of the 1958 Ordinance, and many of its weaknesses were corrected in the Investment Incentives Act of 1968. Consequently, the 1970s saw a massive increase in capital formation that reached a record high level in the early 1980s.

FIGURE 1
Trends in Total, Private, and Public Investment Rates (1960–2005)



Nevertheless, investment rates were significantly curtailed when the global economic recession hit the country in 1985. Confronted with huge government budget and current account deficits following the recession, besides decreasing domestic investment and FDI, Malaysia began to offer attractive incentives to encourage local and foreign investment through the Promotion of Investment Act 1986.

Figure 1 presents the time series plots of the private, public, and total investment rates. As is evident, the private investment rate showed an upward swing in 1987 and increased at a rapid pace for a few years. Rapid capital formation, however, did not exert excess pressure on the balance of payments due to the impressive saving record of the country. Gross domestic investment was primarily funded by domestic saving, supplemented by foreign saving. The ability of the financial system to successfully mobilize abundant domestic saving has enabled the total investment rate to gradually increase over the years and reach a peak in 1997.[1]

Before the onset of the Asian financial crisis, Malaysia experienced huge short-term capital inflows following the liberalization of capital markets in the early 1990s. This influx of short-term financial capital, mainly in the form of portfolio capital, not only created a bubble in asset prices but also contributed to an investment boom in the country. As the financial crisis unfolded in Thailand in 1997, Malaysia also experienced a massive short-term capital flight, resulting in a collapse in the stock market and a sharp depreciation of its currency. These developments not only dampened the economic outlook but

1. See Ang and McKibbin (2007) and Ang (2008a, 2008b) for an analysis of the relationship between financial development and economic growth for Malaysia.

also adversely affected both consumption and investment, resulting in a substantial decline in GDP. While Malaysia's initial approach to crisis management was to follow the measures prescribed by the International Monetary Fund (IMF), the government eventually chose an unconventional route by adopting a capital control regime in September 1998.

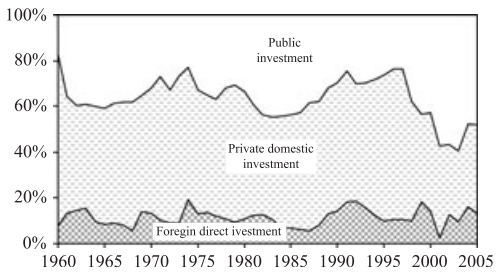
As such, notwithstanding its strong record, the private investment rate declined sharply in the aftermath of the crisis. This sharp contraction resulted in a downward trend in the total investment rate. Since then, capital formation has been mainly supported by public investment. However, it is not clear whether this will be sustainable. Hence, understanding the patterns and behavior of private investment is desirable for researchers and policy makers aiming to raise output in the long run.

B. Composition of Investment

Figure 2 reflects the shares of FDI, private domestic investment, and public investment in total investment. Private investment (which includes both FDI and private domestic investment) accounted for more than 80% of the total in 1960. This share declined dramatically over the next two decades before picking up again in the 1980s. On the whole, private investment dominated total investment in Malaysia before the 1997–1998 crisis. However, as would be expected, its share declined sharply after the crisis.

Malaysia is one of the most successful developing countries in attracting a large amount of FDI. According to the World Investment Report (2004), published by the United Nations Conference on Trade and Development, Malaysia appeared to be the most attractive country for foreign investors in 2003. The importance of FDI to domestic economic development is undeniable. Hence, the separation of FDI from private investment may be necessary given that FDI depends upon a quite different set of determinants than private investment.

FIGURE 2
Composition of Total Investment in Malaysia (1960–2005)



III. A MODEL OF PRIVATE INVESTMENT

In an empirical study of this nature, there is always a trade-off between estimating a specification derived directly from theoretical investment optimization models and an *atheoretical* reduced-formed specification obtained by incorporating many investment determinants. In view of this, we prefer to take an approach that strikes a balance between the two considerations. That is, in order to encompass a sound theoretical underpinning of the determinants of investment while taking into account the unique structural features of Malaysia, we derive our empirical specification using the neoclassical model, augmented with certain important macroeconomic features of Malaysia, rather than adhering to any narrow model of investment. This involves the consideration of aggregate income, the user cost of capital, bank credit, macroeconomic uncertainty, and public investment as the relevant determinants of private investment.

A. The Neoclassical Model and Its Modifications

The neoclassical investment model of Jorgenson (1963) postulates that the desired capital stock depends on the level of output and the user cost of capital. Lags in delivery and decision making create a gap between current and desired capital stocks, giving rise to an investment equation in the form of:

$$(1) \qquad I_t = \lambda \sum_{j=0}^{n} b_j \Delta(Y_{t-j}/C_{t-j}) + dK_{t-1},$$

where gross investment (I_t) is represented by the sum of a distributed lag on the past changes in desired capital stock and replacement investment, d is the rate of depreciation of capital stock (K_t), which is usually assumed to be constant. Hence, this simple neoclassical framework assumes that output levels (Y_t) and the user cost of capital (C_t) are the two key determinants of investment.

Bank Credit. The Jorgenson investment model assumes a perfect financial market, where the firm faces an unlimited supply of capital. It is

not difficult to see that under this framework, the user cost of capital is a crucial determinant of private investment. Within this context, attention has traditionally been focused on the implications of investment tax credits and depreciation rules on the cost of capital. Under repressed financial systems, however, firms do not have access to an unlimited supply of credit, as would be the case postulated under the neoclassical framework where a perfectly competitive market prevails. In fact, developing countries are often characterized by credit constraints due to market imperfections such as asymmetric information and agency problems (Stiglitz and Weiss, 1981). Imperfections in credit markets may prevent firms from borrowing as much as they would wish. Such a constraint will in general discourage the undertaking of investment projects. In contrast, the removal of financial constraints could increase the amount of funds available for investment. This would mitigate the liquidity constraints faced by entrepreneurs and encourage the undertaking of investment activities.

Macroeconomic Uncertainty. The important role of uncertainty in investment decisions has been highlighted in the early works of Keynes (1936), who argues that private investment is subject to volatility since return on investment is always uncertain. If investments are irreversible, firms are more prone to delay or abandon investment projects in an uncertain economic environment (Arrow, 1968). Postponing investment until the future becomes more certain may generate opportunity costs, whereas forgoing an investment project results in a loss of initial outlays. Furthermore, in an uncertain economic environment, firms will be encouraged to maintain a highly liquid asset position. Productive activities requiring commitments to long-term fixed investment will be discouraged. As such, less capital accumulation will occur in a highly uncertain economic environment. In this way, a negative link between investment and macroeconomic uncertainty is established.

Public Investment. A widely accepted view is that public investment may be complementary to, rather than competing with, private investment in developing countries. Public investment may facilitate and stimulate private investment through the provision of infrastructural support (Sundararajan and Thakur, 1980). This could raise the productivity of capital and expand the overall resource availability by increasing output. On the other hand, public investment may also crowd out private investment. This occurs when additional public investment requires raising future tax and domestic interest rates or if the public sector produces investment goods that directly compete with private goods. In addition, the utilization of additional physical and financial resources, which would otherwise be available to the private sector, may also depress private investment (Aschauer, 1989; Blejer and Khan, 1984).

FDI Flows and Private Domestic Investment. FDI can have both positive and negative effects on private domestic investment. It can stimulate domestic investment by providing new opportunities for local firms through the provision of machinery and technology, which would not otherwise be produced domestically. Local firms can emulate the new technology introduced by foreign firms, which may stimulate domestic investment (Noorzoy, 1979). On the other hand, FDI may crowd out domestic investment if foreign firms compete with local firms for the use of domestic scarce resources such as skilled labor, financial resources, etc. (Jansen, 1995). FDI may also substitute for domestic investment if foreign firms have an edge in technological or managerial expertise or receive tax benefits from the host country.

The above theoretical considerations lead to the formulation of the following empirical specifications of the long-run private investment (PRI_t) and private domestic investment (PDI_t) equations:

$$\text{Model A}: \mathrm{PRI}_t = f_A(\mathrm{GDP}_t, \mathrm{COC}_t, \mathrm{CRE}_t^{\mathrm{BANK}}, \mathrm{UNC}_t, \mathrm{PUB}_t) \tag{2a}$$

$$\text{Model B}: \mathrm{PDI}_t = f_B(\mathrm{GDP}_t, \mathrm{COC}_t, \mathrm{CRE}_t^{\mathrm{BANK}}, \mathrm{UNC}_t, \mathrm{PUB}_t) \tag{2b}$$

$$\text{Model C}: \mathrm{PDI}_t = f_B(\mathrm{GDP}_t, \mathrm{COC}_t, \mathrm{CRE}_t^{\mathrm{BANK}}, \mathrm{UNC}_t, \mathrm{PUB}_t, \mathrm{FDI}_t). \tag{2c}$$

Although our main objective is to estimate for private domestic investment, a private investment function is also estimated in Model A to allow for comparison of the results with other

studies, which have largely focused on analyzing the behavior of private investment. The same set of regressors is used in both Model B and Model C except that FDI is included as an additional variable in the latter. The specification in Model C allows us to examine whether FDI crowds in or crowds out private domestic investment in Malaysia. The independent variables, with the expected signs in the parentheses, are defined as follows:

GDP_t = real output (+)
COC_t = real user cost of capital (−)
CRE_t^{BANK} = real bank credit to private sector (+)
UNC_t = macroeconomic uncertainty (−)
PUB_t = real public investment (?)
FDI_t = real foreign direct investment (?)

PRI_t and PUB_t are measured by gross fixed capital formation in the private and public sector, respectively. Private domestic investment (PDI_t) is obtained by taking private investment minus FDI. The gross fixed capital formation deflator is used to express them in real terms. Following the standard practice, we use gross domestic product at constant price as the measure of real output level (GDP_t). The user cost of capital (COC_t) is constructed using an analytical expression similar to that of Hall and Jorgenson (1969), which can be formulated as $COC_t = P_t^K(i_t - \pi_t^e + \delta_t)/P_t$. Price of capital ($P_t^K$) is measured by the gross fixed capital formation deflator, i_t is the average commercial bank lending rates, the expected rate of inflation (π_t^e) is constructed from the GDP deflator, the depreciation rate (δ_t) is assumed to be constant at 5%, and P_t is the GDP deflator. CRE_t^{BANK} is measured by the changes in domestic credit to the private sector, deflated by the GDP deflator. Macroeconomic uncertainty (UNC_t) in this study refers to a situation when there are severe fluctuations in real output levels, which may induce greater variations in expected returns on investment projects. It is constructed based on the 3-yr moving average deviation of the change in real GDP between the current period and the previous period.

The above specification includes three dummy variables to account for the racial riots in 1969, the 1997–1998 Asian financial crisis, and the capital control regime adopted during the period 1998–2005, defined as follows:

$$D_{69} = \begin{cases} 1 \text{ if } t = 1969 \\ 0 \text{ otherwise} \end{cases}, \quad D_{97-98} = \begin{cases} 1 \text{ if } t = 1997\text{–}98 \\ 0 \text{ otherwise} \end{cases}, \quad \text{and } D_{98-05} = \begin{cases} 1 \text{ if } t = 1998\text{–}05 \\ 0 \text{ otherwise} \end{cases}.$$

Annual time series data for the years 1960–2005 were used to estimate the private investment equation. PRI_t, PUB_t, PDI_t, GDP_t, and FDI_t were expressed in natural logarithms. Most of the data series were directly obtained or compiled from domestic sources, including the Economic Reports of the Ministry of Finance Malaysia, the Annual Reports of Bank Negara Malaysia, and the Monthly Statistical Bulletin of Bank Negara Malaysia. Some series were obtained from World Development Indicators of the World Bank and International Financial Statistics of the IMF.

B. Dynamic Specification

Although economic theory provides some guidance on the formulation of long-run steady-state relationships, it is not particularly helpful in explaining dynamic adjustments, which are critical in any time series investigation. Hence, to derive a dynamic investment model suitable for econometric estimation, we follow Sims' (1974) approach by postulating a dynamic cost-optimization problem that imposes costs on "mistakes" made by agents.

Suppose every year, each firm in the economy has a desired level of investment I_t^*. This ideal level of investment depends on a number of factors stated in Equations (2a–c). The actual level of investment (I_t) differs from that of the desired level (I_t^*) due to the costs associated with adjusting I_t. To illustrate how this would lead to a dynamic investment model, consider that in any period t, the representative firm's objective is to minimize the following penalty function by optimizing the level of investment:

$$\underset{I_t}{\text{Min}}\, E_t \left\{ \sum_{t=1}^{\infty} \delta^t \left[a(I_t - I_t^*)^2 + b(I_t - I_{t-1})^2 - 2c(I_t - I_{t-1})(I_t^* - I_{t-1}^*) \right] | \Omega_t \right\}, \quad (3)$$

where δ^t is the discount factor which takes a value between 0 and 1, and Ω_t is the firm's information set at time t. The first term in the square bracket represents the cost of deviation from the desired level of investment. The second term is the cost of rapidly changing the level of investment. The last term is included due to Hendry and von Ungern-Sternberg (1981), who argue the penalty is reduced if firms move in the correct direction, that is, toward the equilibrium level of investment. The last term will converge to zero if the desired level of investment remains unchanged.

The firm seeks to minimize the expected future stream of costs associated with investment decision making, conditional upon all available information Ω_t at time t. Since it is difficult to estimate the discount factor, we follow Callen, Hall, and Henry (1990) by setting it to unity for simplicity. This does not affect the general form of the solution to the model. Invoking the certainty equivalence theorem and the rational expectations hypothesis so that expectations are replaced by future realizations and choosing I_t at time t to minimize expected costs leads to the following Euler condition:

$$(a+2b)I_t - b(I_{t-1}+I_{t+1}) = (a+2c)I_t^* - c(I_{t-1}^*+I_{t+1}^*). \tag{4}$$

A solution for Equation (4) may be defined as:

$$\left[(a+2b) - bL - bL^{-1}\right] = \lambda(1-\theta L)(1-\phi\theta L^{-1}). \tag{5}$$

So that:

$$\left(I_t - \frac{c}{b}I_t^*\right) = \theta\left(I_{t-1} - \frac{c}{b}I_{t-1}^*\right) + \frac{a(b-c)}{\lambda b}\sum_{i=0}^{\infty}(\theta\phi)^i I_{t+i}^*. \tag{6}$$

After some manipulation, we obtain:

$$\Delta I_t = (\theta-1)I_{t-1} + \frac{c}{b}\Delta I_t^* + \frac{c(1-\beta)}{b}I_{t-1}^* + \frac{a(b-c)}{\lambda b}\sum_{i=0}^{\infty}(\theta\phi)^i I_{t+i}^*. \tag{7}$$

We follow Nickell (1985) by assuming that I_{t+i}^* follows a random walk with drift:

$$I_{t+i}^* = I_t^* + gi, \tag{8}$$

where g is the drift term. Then substituting Equation (8) into Equation (7) and rearranging the terms we obtain the familiar error-correction representation of the dynamic investment demand model:

$$\Delta I_t = a_0 + a_1\Delta I_t^* - a_2(I_{t-1} - I_{t-1}^*). \tag{9}$$

The error-correction term $(I_{t-1} - I_{t-1}^*)$ captures the long-run equilibrium relationship between variables, whereas the differenced terms (ΔI_t^*) capture the short-run dynamics. The use of an ECM is appropriate in this context since investment decisions are likely to be gradual and subject to revision in a developing country. Although equilibrium investment I_t^* is unobservable, Equation (9) can be estimated by using the long-run steady-state investment functions in Equations (2a–c).

IV. ECONOMETRIC METHODOLOGY

The dynamic adjustment of the private investment process can be characterized by a conditional ECM, which can be used to test for the existence of a long-run relationship using the autoregressive distributed lag (ARDL) bounds test developed by Pesaran, Shin, and Smith (2001) and the ECM test of Banerjee, Dolado, and Mestre (1998) to test for the presence of a cointegrated relationship. The former involves a standard F-test, whereas the latter is a simple t-test. To illustrate, let us consider the steady-state private investment function in Equation (2a). Using Equation (9) with appropriate modifications and replacing the long-run equilibrium level of investment with the variables in Equation (2a), we obtain the following conditional ECM:

$$\Delta \mathrm{PRI}_t = \alpha_0 + \beta_0 \mathrm{PRI}_{t-1} + \sum_{j=1}^{k}\beta_j \mathrm{DET}_{j,t-1} + \sum_{i=1}^{p}\gamma_{0i}\Delta \mathrm{PRI}_{t-i} + \sum_{i=0}^{p}\sum_{j=1}^{k}\gamma_{ji}\Delta \mathrm{DET}_{j,t-1} + \epsilon_t, \tag{10}$$

where PRI_t is real private investment and DET_t is a vector of the determinants of real private investment, which includes GDP_t, COC_t, $\mathrm{CRE}_t^{\mathrm{BANK}}$, UNC_t and PUB_t.

TABLE 1
Unit Root Tests

	ADF		PP		KPSS		
	Level	**First Difference**	**Level**	**First Difference**	**Level**	**First Difference**	**Conclusion**
PRI_t	−1.991	−5.027***	−1.544	−4.951***	0.132*	0.181	$I(1)$
PUB_t	−2.557	−8.114***	−4.364***	−8.114***	0.102	0.081	$I(0)/I(1)$
PDI_t	−2.237	−5.642***	−1.819	−5.526***	0.155**	0.146	$I(1)$
FDI_t	−3.947**	−9.056***	−4.091**	−9.341***	0.075	0.081	$I(0)$
GDP_t	−3.395*	−5.637***	−2.011	−5.463***	0.076	0.121	$I(0)/I(1)$
COC_t	−4.050***	−6.176***	−4.615***	−12.241***	0.505**	0.269	$I(0)/I(1)$
CRE_t^{BANK}	−7.486***	−5.517***	−7.488***	−17.193***	0.376*	0.298	$I(0)/I(1)$
UNC_t	−0.418	−2.537*	0.161	−6.699***	0.222***	0.339	$I(1)$

Notes: For ADF, AIC was used to select the lag length and the maximum number of lags was set to be five. For PP and KPSS, Barlett-Kernel was used as the spectral estimation method. The bandwidth was selected using the Newey-West method. ADF, Augmented Dickey-Fuller; KPSS, Kwiatkowiski-Phillips-Schmidt-Shin; PP, Phillips-Perron.
*Significant at 10%; **significant at 5%; ***significant at 1%.

The above equation can be estimated by ordinary least squares. Pesaran and Shin (1998) show that the OLS estimators of the short-run parameters are consistent and the ARDL-based estimators of the long-run coefficients are superconsistent in small sample sizes. Hence, valid inferences on the long-run parameters can be made using standard normal asymptotic theory. The main advantage of this approach is that it can be applied to the model regardless of whether the underlying variables are $I(0)$ or $I(1)$.

Specifically, two separate statistics are employed to test for the existence of a long-run relationship in Equation (10): (1) an F-test for the joint significance of coefficients of lagged levels terms ($H_0 = \beta_0 = \beta_1 = \cdots = \beta_k = 0$), and (2) a t-test for the significance of the coefficient associated with PRI_{t-1} ($H_0 = \beta_0 = 0$). The test for cointegration is provided by two asymptotic critical value bounds when the independent variables are either $I(0)$ or $I(1)$. The lower bound assumes all the independent variables are $I(0)$, and the upper bound assumes they are $I(1)$. If the test statistics exceed their respective upper critical values, the null is rejected, and we can conclude that a long-run relationship exists.

V. RESULTS

Three unit root tests were used to assess the order of integration of the variables. The Augmented Dickey-Fuller and Phillips-Perron test the null of a unit root against the alternative of stationarity, while the Kwiatkowiski-Phillips-Schmidt-Shin tests the null of stationarity against the alternative of a unit root. As shown in Table 1, the testing results are mixed. However, none of the variables appear to be integrated at an order higher than one, allowing legitimate use of the ARDL bounds procedure.

Next, to perform the bounds test, we estimate Equation (10) with one and two lags for each model. Table 2 gives the t-statistics and F-statistics for the bounds tests, as well as the Akaike's and Schwarz's Bayesian information criteria (denoted by AIC and SBC, respectively). The results indicate the null hypothesis that there exists no level private investment equation is rejected at the conventional significance levels for all models, regardless of the lag length chosen. However, both AIC and SBC prefer a richer dynamic specification of two lags. Therefore, we will follow this lag structure in the remaining analyses.

However, the relationship between private investment (or private domestic investment) and its determinants may be driven by reverse causality and hence bias our results. To address the concern of endogeneity bias, we have attempted to use the right-hand-side variables in Equations (2a−c) as alternative dependent variables but no evidence of cointegration is found (e.g., Kinkyo, 2007). Hence, the results suggest that the right-hand-side variables considered in the specification can be interpreted as the long-run forcing variables explaining the evolution in private investment (or private domestic investment) where a reverse causation is absent. This procedure is proposed by Pesaran, Shin, and Smith (2001) to examine the presence of a feedback relationship and is similar to the notion

TABLE 2
Cointegration Tests for the Existence of a Long-Run Relationship

	Model A (Dependent Variable = ΔPRI_t)		Model B (Dependent Variable = ΔPDI_t)		Model C (Dependent Variable = ΔPDI_t)	
	$p = 1$	$p = 2$	$p = 1$	$p = 2$	$p = 1$	$p = 2$
Test statistics						
F-statistic	4.353**	7.7631***	7.238***	10.985***	3.773**	9.204***
t-statistic	−4.576**	−6.306***	−6.179***	−6.229***	−4.852**	−6.243***
Lag length selection criteria						
AIC	−1.497	−2.460	−1.097	−1.731	−1.001	−2.260
SBC	−0.596	−1.178	−0.196	−0.656	0.023	−0.936

Notes: The bounds tests are performed based on Equation (10). p is the optimal lag length. The test statistics of the bounds tests are compared against the critical values reported in Pesaran, Shin, and Smith (2001). No evidence of cointegration is found when we use other variables as the dependent variables.
**Significant at 5%; ***significant at 1%.

of the weak exogeneity test performed under a vector error-correction model framework (see also Granger and Lin, 1995).

The long-run relationship and short-run dynamics of the private investment model are reported in Table 3. As is evident, the estimated results are remarkably similar across all models. In particular, all variables enter the equations with the predicted signs, and the coefficients are quite precisely determined. The magnitudes of the estimated coefficients also appear reasonable. The results highlight a number of points, which could explain the collapse in private investment following the damaging consequences of the Asian financial crisis.

The finding that private investment varies positively with aggregate output is consistent with the neoclassical model. Specifically, 1% increase in aggregate output is associated with a 1.344–1.532 percentage point increase in private investment. The finding that aggregate output is an important determinant of private investment is consistent with the empirical evidence of Blejer and Khan (1984), Greene and Villanueva (1991), Emran, Shilpi, and Alam (2007) and Ang (2009). In line with the prediction of the neoclassical model, the user cost of capital is found to be statistically significant in all models at the conventional levels.

Bank credit is found to have a strong positive and statistically significant impact on private investment, with a long-run elasticity in the range of 0.987–1.231. The size of the coefficient is found to be largest in Model A where the dependent variable also considers FDI. This perhaps suggests that foreign investors also rely on the domestic financial system to obtain funding. The finding of a positive impact of bank credit on investment corroborates the empirical evidence of Shafik (1992), Guncavdi, Bleaney, and McKay (1998), Emran, Shilpi, and Alam (2007), and Jongwanich and Kohpaiboon (2008). Hence, the evidence suggests that the significant reduction in lending to the private sector in 1998–1999 was in part responsible for the sharp contraction in private investment in the postcrisis period.

An increase in macroeconomic uncertainty exerts a negative effect on private investment. The long-run elasticity derived from the coefficient on UNC_t suggests that 1% increase in macroeconomic uncertainty yields a 0.002–0.003 percentage point reduction in private investment. The results tend to support the empirical findings of Greene and Villanueva (1991), Ozler and Rodrik (1992), and Jongwanich and Kohpaiboon (2008). The findings of the analysis seem to suggest that to provide a favorable investment climate for entrepreneurs, it is crucial for the government to maintain a sound and stable economic environment.

There is also some evidence that public investment crowds in private investment, confirming the hypothesis of complementarity between private and public investment. However, given that the effect is insignificant in Models B and C where the dependent variables exclude FDI, it appears that greater public investment tends to attract more inward foreign investment. On the whole, the finding of a crowding-in effect from government investment is in line with a majority of studies, including Aschauer (1989) for the United States, Greene and Villanueva (1991) for 23 developing

TABLE 3
The Long-Run and Short-Run Results of the Private Investment Equation

	Model A (Dependent Variable = PRI_t)		Model B (Dependent Variable = PDI_t)		Model C (Dependent Variable = PDI_t)	
	Coefficient	***p* value**	**Coefficient**	***p* value**	**Coefficient**	***p* value**
The long-run relationship						
Constant	−7.398***	0.000	−8.328***	0.000	−7.294***	0.000
GDP_t	1.344***	0.000	1.532***	0.000	1.405***	0.000
COC_t	−1.296***	0.005	−1.140***	0.002	−0.651**	0.034
CRE_t^{BANK}	1.231***	0.000	1.037***	0.000	0.987***	0.006
UNC_t	−0.003***	0.000	−0.003***	0.000	−0.002***	0.000
PUB_t	0.191**	0.028	0.051	0.459	−0.025	0.785
FDI_t					0.122**	0.048
The short-run dynamics						
Intercept	−0.214***	0.000	−0.274***	0.000	−0.230***	0.002
ECT_{t-1}	−0.391***	0.001	−0.623***	0.000	−0.628***	0.000
ΔGDP_t	4.067***	0.000	3.149***	0.000	3.081***	0.000
ΔCRE_t^{BANK}	0.285***	0.009	0.331**	0.024	0.335**	0.020
ΔUNC_t	−0.001**	0.047	−0.003***	0.003	−0.002**	0.023
ΔGDP_{t-1}	1.147**	0.023	1.983**	0.012	1.715**	0.028
ΔCOC_{t-2}	−0.547***	0.007				
D_{69}	−0.183*	0.062	−0.281***	0.008	−0.414***	0.002
D_{98-05}	−0.347***	0.004	−0.524***	0.000	−0.598***	0.000
Diagnostic Checks	**Test Statistic**	***p* value**	**Test Statistic**	***p* value**	**Test Statistic**	***p* value**
$\chi^2_{NORMAL}(2)$	1.076	0.584	0.683	0.710	0.133	0.936
$\chi^2_{SERIAL}(1)$	1.205	0.272	0.061	0.805	1.221	0.269
$\chi^2_{SERIAL}(2)$	4.415	0.109	0.438	0.803	1.901	0.387
$\chi^2_{ARCH}(1)$	0.169	0.681	0.216	0.642	1.649	0.199
χ^2_{WHITE}	11.382	0.836	20.322	0.622	24.018	0.629

Notes: $\chi^2_{NORMAL}(2)$ refers to the Jarque-Bera statistic of the test for normal residuals, $\chi^2_{SERIAL}(1)$ and $\chi^2_{SERIAL}(2)$ are the Breusch-Godfrey Lagrange multiplier (LM) test statistics for no first and second order serial correlation, respectively, $\chi^2_{ARCH}(1)$ is the Engle's test statistic for no autoregressive conditional heteroskedasticity, and χ^2_{WHITE} denotes the White's test statistic to test for homoskedastic errors, with degrees of freedom equal to the number of slope coefficients.

*Significant at 10%; **significant at 5%; ***significant at 1%

countries, Shafik (1992) for Egypt, and Jongwanich and Kohpaiboon (2008) for Thailand.

Public investment expenditure has been used in Malaysia as a key policy tool to stimulate economic growth, particularly after the Asian financial crisis. The evidence obtained in this study seems to suggest public investment is complementary to private investment given that a rise in government investment is associated with an increase in private sector investment. Hence, the ongoing pump-priming efforts made by the Malaysian government to revive total investment appear to be effective for private capital formation. The sharp decline in private investment during the postcrisis period may be attributable to other factors.

The coefficient of FDI_t in Model C is statistically significant with a positive sign. All coefficients in Model C have a smaller magnitude when FDI is included in the specification. Specifically, 1% increase in FDI inflows will lead to a 0.122% increase in private domestic investment. The results suggest that FDI has a complementary role to play in domestic capital formation, consistent with the findings of Noorzoy (1979) for the Canadian experience and Jansen (1995) for the Thai experience.

With regard to short-run dynamics, the regressions perform relatively well on the basis of statistical significance. The results reported in panel B of Table 3 show that all coefficients are statistically significant at the conventional levels. In first-differenced form, all variables (i.e., ΔGDP_t, ΔCRE_t^{BANK}, and ΔUNC_t) have expected signs, consistent with their long-run counterparts. The coefficients of ECT_{t-1},

which measure the speed of adjustment back to the long-run equilibrium value are statistically significant at the 1% level and correctly signed, that is, negative. In Model A, private investment adjusts at the speed of 39.1% every year. In other words, it takes about 2.5 yr to restore equilibrium when there is a shock to the steady-state relationship. Models B and C adjust at a faster rate of about 62% a year, that is, it takes only about 1.6 yr to restore long-run equilibrium whenever there is a deviation from the steady state. These results are not surprising given that there is little government control of private domestic investment.

The coefficient of D_{69} was found to be negative, implying that the racial riots in 1969 had a negative impact on private investment. The dummy variable that captures the effects of the Asian financial crisis, that is, D_{97-98}, was found to be statistically insignificant and had the wrong sign. Therefore, it was dropped from the estimation. The insignificance of the crisis dummy is probably due to its correlation with the aggregate output variable. Another important aspect is the adoption of capital controls by the Malaysian government in the aftermath of the Asian financial crisis. This policy choice (captured by D_{98-05}) was found to have important implications in explaining the behavior of private investment. Specifically, its effect is found to be negative and significant in all equations, implying that increasing isolation from international capital markets has a dampening effect on private capital accumulation. Finally, it is evident that the regression specifications fit remarkably well and pass the diagnostic tests against nonnormal residuals, serial correlation, heteroskedasticity, and autoregressive conditional heteroskedasticity.

VI. ROBUSTNESS CHECKS

A. Controlling for Expectations Regarding the Economic Outlook

Figure 1 clearly shows that investment activities in Malaysia follow a boom-bust cycle, and these fluctuations can be due to changes in expectations about the economic outlook. The consideration of expectations is important in this context for another reason—the economic outlook not only affects investment demand but also determines the supply of credit. Thus, our earlier finding that a reduction in the availability of bank credit is associated with lower investment may be the result of a weaker economic outlook rather than reflecting the extent of credit constraints. It is therefore important to consider the effect of this cyclical factor in the specification so that the model is not subject to omitted variable bias.[2]

In this study, expectations about the economic outlook are proxied by the output gap (GAP_t) so that a large deviation of actual output from potential output indicates a weak economic outlook. In contrast, a reduction in excess capacity implies that the economic outlook is improving and thus firms are likely to expand their productive capacity (see Jongwanich and Kohpaiboon, 2008). The trend level of output is taken to be the potential level of output (see Blejer and Khan, 1984), and it is obtained using the Hodrick-Prescott filter method with a smoothing parameter of 100. The results in the first column of Table 4 clearly indicate that an increase in the output gap, which reflects a weaker macroeconomic outlook, tends to dampen private domestic investment. The inclusion of this variable, however, does not alter our previous findings except that the real cost of capital now becomes insignificant at the conventional significance levels.

B. Alternative Measures for Macroeconomic Uncertainty

Next, to provide some sensitivity checks for the uncertainty measure used in this study, we consider two alternative measures. For a small open economy like Malaysia's, fluctuations in the real exchange rate can substantially affect profitability of investment and result in drastic changes in foreign capital flows. Therefore, we also consider the variations in the real exchange rate as an alternative measure of macroeconomic uncertainty. According to Serven (2003), the conditional variance from a generalized autoregressive conditional heteroskedasticity [GARCH(1,1)] specification of the real exchange rate (in natural logarithms) can be used as a proxy for real exchange rate volatility (UNC_t^{RER}). The real exchange rate is given by the nominal exchange rate adjusted by the ratio of the domestic GDP deflator to the U.S. GDP deflator.

For the second uncertainty measure, we follow Serven (1998) by considering the first principal component ((UNC_t^{PCA})) of the conditional variances of the real exchange rate,

2. We thank the anonymous referee for drawing our attention to this point.

TABLE 4
Sensitivity Analysis for the Private Domestic Investment Equation

	1	2	3	4	5	6
The long-run relationship (dependent variable = PDI_t)						
Constant	−6.691***	−6.960***	−6.587***	−6.033***	−4.856***	−5.958***
GDP_t	1.116***	1.509***	1.523***	1.143***	1.003***	1.171***
COC_t	−0.205	−1.039*	−1.222*	−1.418*	−1.641**	−1.505***
CRE_t^{BCF}	1.053***	0.605**	0.063			
CRE_t^{FCF}				0.294***		
CRE_t^{PCF}					0.113***	
CRE_t^{SEC}						0.309***
UNC_t	−0.003***			−0.004***	−0.004***	−0.003***
UNC_t^{RER}		−0.182***				
UNC_t^{PCA}			−0.171**			
PUB_t	0.238*	0.032	0.001	0.274*	0.308**	0.248**
GAP_t	−0.226**					
The short-run dynamics (dependent variable = ΔPDI_t)						
Intercept	0.318**	−0.077	−0.220***	−0.147**	−0.120	−0.124**
ECT_{t-1}	−0.551***	−0.487***	−0.481***	−0.456***	−0.520***	−0.334***
ΔPDI_{t-1}	0.244**					0.233***
ΔGDP_t	3.342***		1.362*	2.769***	2.712***	2.641***
ΔGDP_{t-1}	2.257***	2.332***	1.758**	2.341***	2.166***	
ΔCRE_t^{BCF}	0.296**					
ΔCRE_t^{FCF}				0.117**		
ΔCRE_t^{PCF}					0.037**	
ΔCRE_t^{SEC}						0.305**
ΔCRE_{t-1}^{SEC}						0.419***
ΔUNC_t	−0.004***			−0.003***	−0.003***	−0.005***
ΔUNC_t^{PCA}			−0.091**			
D_{69}	−0.366**	−0.425***	−0.440***	−0.336**	−0.330**	−0.276*
D_{98-05}		−0.751***	−0.738***			
Diagnostic checks						
χ^2_{NORMAL} (2)	0.041	1.039	0.447	1.391	5.437*	1.192
$\chi^2_{SERIAL}(1)$	0.083	0.003	0.018	1.792	1.643	1.349
$\chi^2_{SERIAL}(2)$	0.093	0.227	0.678	2.511	1.675	4.121
$\chi^2_{ARCH}(1)$	0.266	0.066	0.003	0.389	0.404	0.263
χ^2_{WRITE}	7.127	3.761	35.601	2.906	4.363	7.560

Note: See Table 3

the rate of inflation, the terms of trade, the relative price of capital, and the GDP growth rate, where each series is obtained from a univariate GARCH(1,1) specification. The consideration of these five macroeconomic variables provides a broader coverage of macroeconomic volatility and therefore their summary measure can serve as an overall indicator of macroeconomic uncertainty (Eberly, 1993).[3]

The relevant results are reported in columns 2 and 3 of Table 4. It is evident that both GARCH-based measures of macroeconomic uncertainty give similar findings that greater uncertainty is associated with lower investment in the private sector. The coefficients of UNC_t^{RER} and UNC_t^{PCA} are significant at the 1 and 5% levels, respectively. The results are consistent with Serven (1998, 2003). This provides some support that our empirical specification is robust to different measures of macroeconomic uncertainty.

C. Alternative Measures for Credit Constraints

Our findings so far suggest that the availability of bank credit is an important determinant

3. We are grateful to the referee for recommending this approach.

TABLE 5
Cointegration Tests for Sensitivity Checks

	1	2	3	4	5	6
Test statistics						
F-statistic						
$p = 1$	4.155**	3.508*	6.554***	5.057***	3.907**	4.088**
$p = 2$	1.894	5.783***	7.972***	2.016	2.675	1.758
t-statistic						
$p = 1$	−4.574**	−4.370**	−6.055***	−4.401**	−4.278**	−3.888*
$p = 2$	−2.464	−4.867***	−6.114***	−3.113	−3.246	−2.185
Lag length selection criteria						
AIC						
$p = 1$	−0.831	−0.811	−0.475	−0.877	−0.820	−0.882
$p = 2$	−0.825	−1.177	−1.010	−0.783	−0.790	−0.714
SBC						
$p = 1$	0.111	−0.033	0.303	−0.058	−0.001	−0.063
$p = 2$	0.416	−0.143	0.025	0.293	0.286	0.362

Note: See Table 2

of private domestic investment. However, this measure of credit constraints does not consider funds raised from the stock markets and foreign financial capital inflows. To address this concern, we also consider three other indicators of credit constraints: financial capital flows (CRE_t^{FCF}), private capital flows (CRE_t^{PCF}, and new issue of shares (CRE_t^{SEC}). CRE_t^{FCF} refers to short-term financial capital flows to the private sector. It includes financial institutions, borrowing and portfolio investment. These short-term capital inflows to Malaysia are mainly in the form of portfolio investment, especially during the precrisis period. However, it is not possible to disaggregate the series due to data unavailability. The second measure gives the sum of short-term financial capital flows, and bank credit flows to the private sector. Finally, CRE_t^{SEC} is measured by the gross issue of corporate securities excluding redemptions. These variables are expressed in real terms using the gross capital formation deflator.

Columns 4–6 of Table 4 show that the availability of credit plays a significant role in determining private domestic investment, irrespective of how it is measured. In other words, our results are not sensitive to alternative measures of credit constraints. The results are both economically and statistically significant at the 1% level. The short-run results are in line with their long-run counterparts. Furthermore, there is also little evidence of econometric problems. Importantly, the results also indicate that short-term capital flows to Malaysia and funds raised from financial markets are critical sources of finance for firms undertaking investment activity.

Table 5 reports the cointegration results for each of the model specifications considered in Table 4. The ARDL bounds test and ECM test are suitable in this context given that none of the underlying variables are integrated at an order greater than one. Results of the unit root tests are not reported here to conserve space. It should be highlighted that the evidence of cointegration remains robust to the inclusion of an additional control variable (output gap) and different measures of uncertainty and credit constraints. The optimal lags suggested by both AIC and SBC have been used to guide the estimation in Table 4. They appear to be consistent with the cointegration results. Finally, no evidence of cointegration is found when alternative dependent variables are considered, suggesting that we can interpret the right-hand-side variables as long-run forces explaining the changes in private domestic investment. That is, the results provide some support for entering the right-hand-side variables "exogenously" in our specifications.

VII. CONCLUSIONS

This study is motivated by the persistent decline in private investment in Malaysia during the postcrisis era and the lack of any previous attempts to analyze the underlying causes. The analysis makes use of a private investment model, drawing on the neoclassical framework while incorporating relevant institutional

and structural features of Malaysia into the specification. The determinants of real private investment were examined in an ARDL framework, paying particular attention to the testing for a long-run cointegrating relationship between the variables under consideration.

The estimated results based on annual data for the period 1960–2005 suggest that aggregate output has a large positive impact on private investment, and higher real user cost of capital tends to discourage private investment. The evidence also indicates that increased availability of credit contributes positively to private investment implying that financial sector development is crucial for the undertaking of investment projects in the private sector. Macroeconomic uncertainty exerts a negative influence on private investment. The results further suggest that public investment complements private investment and FDI crowds in private domestic investment. Moreover, the adoption of capital controls in Malaysia in the aftermath of the Asian financial crisis tends to discourage private capital formation.

In sum, the results suggest the sharp decline in private investment during the postcrisis period is largely attributable to the above-mentioned factors. In order to revive private investment, the government should consider adopting policies that boost aggregate demand, offering more investment incentives, easing credit constraints by shaping a more efficient and robust financial system, reducing macroeconomic uncertainties, facilitating infrastructure development, and encouraging inflows of foreign investment. While relaxing credit constraints has been found to be an effective mechanism to boost private investment, it must be stressed that credit growth without adequate financial supervision may be crisis prone. It may lead to an investment boom that will eventually bust and result in more devastating effects. The recent subprime mortgages crisis experienced by the United States serves as a vivid reminder of the importance of financial supervision. Thus, further strengthening of the regulatory framework in the Malaysian financial system is critical to ensure sustained growth in investment activity along with credit expansion.

REFERENCES

Ang, J. B. "Are Financial Sector Policies Effective in Deepening the Malaysian Financial System?" *Contemporary Economic Policy*, 62, 2008a, 623–35.

———. "What Are the Mechanisms Linking Financial Development and Economic Growth in Malaysia?" *Economic Modelling*, 38, 2008b, 38–53.

———. "Private Investment and Financial Sector Policies in India and Malaysia." *World Development*, 2009, doi:10.1016/j.worlddev.2008.12.003.

Ang, J. B., and W. J. McKibbin. "Financial Liberalization, Financial Sector Development and Growth: Evidence from Malaysia." *Journal of Development Economics*, 84, 2007, 215–33.

Arrow, K. "Optimal Capital Policy with Irreversible Investment," in *Value, Capital, and Growth: Essays in Honor of Sir John Hicks*, edited by J. Wolfe. Edinburgh, UK: Edinburgh University Press, 1968, 1–20.

Aschauer, D. A. "Does Public Capital Crowd Out Private Capital?" *Journal of Monetary Economics*, 24, 1989, 171–88.

Banerjee, A., J. Dolado, and R. Mestre. "Error-correction Mechanism Tests for Cointegration in a Single-equation Framework." *Journal of Time Series Analysis*, 19, 1998, 267–83.

Blejer, M. I., and M. S. Khan. "Government Policy and Private Investment in Developing Countries." *International Monetary Fund Staff Papers*, 31, 1984, 379–403.

Callen, T. S., S. G. Hall, and S. G. B. Henry. "Manufacturing Stocks: Expectations, Risks and Co-integration." *Economic Journal*, 100, 1990, 756–72.

Eberly, J. C. "Economic Instability and Aggregate Investment: Comment." *NBER Macroeconomics Annual*, 8, 1993, 303–12.

Emran, S., F. Shilpi, and I. Alam "Economic Liberalization and the Price Response of Aggregate Private Investment: Time Series Evidence from India." *Canadian Journal of Economics*, 40, 2007, 914–34.

Granger, C., and J. -L. Lin. "Causality in the Long Run." *Econometric Theory*, 11, 1995, 530–36.

Greene, J., and D. Villanueva. "Private Investment in Developing Countries: An Empirical Analysis." *International Monetary Fund Staff Papers*, 38, 1991, 33–58.

Guncavdi, O., M. F. Bleaney, and A. McKay. "Financial Liberalisation and Private Investment: Evidence from Turkey." *Journal of Development Economics*, 57, 1998, 443–55.

Hall, R. E., and D. W. Jorgenson. "Tax Policy and Investment Behavior: Reply and Further Results." *American Economic Review*, 59, 1969, 388–401.

Hendry, D. F., and T. von Ungern-Sternberg. "Liquidity and Inflation Effects on Consumers' Expenditure," in *Essays in the Theory and Measurement of Consumer Behavior (In Honour of Sir Richard Stone)*, edited by A. S. Deaton. Cambridge: Cambridge University Press, 1981, 237–60.

Jansen, K. "The Macroeconomic Effects of Direct Foreign Investment: The Case of Thailand." *World Development*, 23, 1995, 193–210.

Jongwanich, J., and A. Kohpaiboon. "Private Investment: Trends and Determinants in Thailand." *World Development*, 36, 2008, 1709–24.

Jorgenson, D. W. "Capital Theory and Investment Behavior." *American Economic Review Papers and Proceedings*, 53, 1963, 247–59.

Keynes, J. M. *The General Theory of Employment, Interest and Money*. London, UK: Macmillan, 1936.

Kinkyo, T. "Explaining Korea's Lower Investment Levels After the Crisis." *World Development*, 35, 2007, 1120–33.

Nickell, S. "Error Correction, Partial Adjustment and All That: An Expository Note." *Oxford Bulletin of Economics and Statistics*, 47, 1985, 119–29.

Noorzoy, M. S. "Flows of Direct Investment and Their Effects on Investment in Canada." *Economics Letters*, 2, 1979, 257–61.

Ozler, S., and D. Rodrik. "External Shocks, Politics and Private Investment: Some Theory and Empirical Evidence." *Journal of Development Economics*, 39, 1992, 141–62.

Pesaran, M. H., and Y. Shin. "An Autoregressive Distributed-Lag Modelling Approach to Cointegration Analysis," in *Econometrics and Economic Theory in the Twentieth Century: The Ragnar Frisch Centennial Symposium*, edited by S. Strom. Cambridge: Cambridge University Press, 1998, 371–413.

Pesaran, M. H., Y. Shin, and R. J. Smith. "Bounds Testing Approaches to the Analysis of Level Relationships." *Journal of Applied Econometrics*, 16, 2001, 289–326.

Rousseau, P., and J. H. Kim. "Credit Market Conditions and the Propagation of Korea's 1997 Financial Crisis." *Southern Economic Journal*, 74, 2007, 524–45.

Serven, L. "Macroeconomic Uncertainty and Private Investment in Developing Countries: An Empirical Investigation." The World Bank Policy Research Working Paper No. 2035, 1998.

———. "Real-Exchange-Rate Uncertainty and Private Investment in LDCs." *Review of Economics and Statistics*, 85, 2003, 212–18.

Shafik, N. "Modeling Private Investment in Egypt." *Journal of Development Economics*, 39, 1992, 263–77.

Sims, C. A. "Output and Labour Input in Manufacturing." *Brookings Papers in Economic Activity*, 3, 1974, 695–735.

Stiglitz, J. E., and A. Weiss. "Credit Rationing in Markets with Imperfect Information." *American Economic Review*, 71, 1981, 393–410.

Sundararajan, V., and S. Thakur. "Public Investment, Crowding Out, and Growth: A Dynamic Model Applied to India and Korea." *International Monetary Fund Staff Papers*, 27, 1980, 814–55.