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SAVINGS, INVESTMENT, AND CAPITAL MOBILITY

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This study exploits the relationship between savings and investment implied by a country's intertemporal budget constraint to measure the degree of capital mobility. In particular, if savings and investment are cointegrated, there is an error correction model which describes the short-run dynamic behavior of savings and investment. If the degree of capital mobility is greater, we would expect the dynamic responses of savings and investment to shocks to be larger. Using annual data for the Philippines from 1946-1994, the study's findings are largely consistent with the hypothesis that capital mobility increased in the post-Bretton Woods period. The only finding that is not supportive of this is that which shows the contribution of US shocks to the variance of the forecast errors of Philippine saving and investment declining in the post-Bretton Woods period.

1. Introduction

There is an intuitively-appealing notion that in fully integrated world capital markets, there is no correlation between a nation's savings rate and its rate of investment (Feldstein and Horioka, 1980). This is because with perfect capital mobility, savings in each country responds to worldwide rather than domestic opportunities for investment, while investment in each country would be financed by worldwide capital. Empirical results such as those of Feldstein-Horioka for the OECD countries, in which there is a high correlation between long-

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term savings and investment, and a regression coefficient of investment on savings of close to unity, would seem incompatible with the large and persistent external imbalances in these countries as well as evidence of net capital inflows into these countries.

This study supports and closely follows Moreno's study (1994) which posits that an open economy's intertemporal budget constraint implies that domestic savings and investment are cointegrated. It is still possible to glean something about the mobility of capital using savings-investment data. In particular, the short-run divergence between savings and investment in response to shocks tends to be larger the greater the degree of capital mobility, and there tend to be differences in the magnitude and qualitative impact of external shocks on savings and investment when capital is more mobile. This study will examine the long-run relationship between savings and investment, and then examine the short-run dynamic relationship between them under different regimes to detect changes in capital mobility.

2. Empirical Methodology

If savings and investment are cointegrated, then there is an error correction representation of them such that there is a matrix of coefficients capturing short-run dynamics and another capturing long-run dynamics (Engle and Granger, 1987). The rank of the matrix indicates the number of cointegrating vectors (Johansen and Juselius, 1990).

To test for cointegration, error-correction models of savings and investment are estimated using annual data over the period 1946-1994 for the Philippines. The savings and investment data are obtained from national income series.

The results of the maximum eigenvalue test are reported in Table 1. The test result suggests that there is one cointegrating vector at the 1 percent level.

Table 1 – Test for Cointegration in Savings and Investment

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.791984	78.15366	25.32	30.45	None **
0.153468	7.497349	12.25	16.26	At most 1

* (**) denotes rejection of the hypothesis at 5% (1%) significance. L.R. test indicates 1 cointegrating equation(s) at 5% significance.

Table 2 reports the estimated cointegrating vector to shed light on the long-run relationship in the savings-investment data. For the Philippines, the estimated cointegrating vector is (1, -0.99), which is similar to the cointegrating relationship (1,-1) predicted by theory.

In addition, the Augmented Dickey-Fuller test was applied to the time series on net savings, i.e., savings less investment. The result shows that the null hypothesis of non-stationarity cannot be rejected at the 10, 5, or 1 percent level of significance. This test implicitly imposes the cointegrating vector (1, -1) rather than estimating the cointegrating relationship.

Table 2 – Estimated Cointegrating Regression of Investment on Savings

Normalized Cointegrating Coefficients: 1 Cointegrating Equations			
PHINV	PHSAV	@TREND(47)	C
1.000000	-0.998859	-514.4063	-13688.76
	(0.18799)	(270.530)	
Log likelihood	-966.3799		

3. Dynamic Relationships and Capital Mobility

Bivariate models can be used to assess the dynamic behavior of savings and investment in the Philippines.

The data sample is divided into two periods: 1946-1973 and 1974-1994 in order to assess the impact of capital controls. While it would have been preferable to break the sample around 1982, after the full implementation of the financial liberalization program, this was not possible as there would have not been a sufficient number of degrees of freedom. On the other hand, Moreno (1994) breaks the US sample in 1973. 1973 saw the collapse of the Bretton Woods system of fixed exchange rates and thereafter, the easing of capital controls in developed countries. Therefore, in general, we would expect smaller short-run responses to shocks in the first period than in the second period, assuming that capital mobility increased in the second period.

The gross dynamic responses of nominal Philippine savings and investment to Philippine shocks over the two sub-periods 1946-1973, 1974-1994 are illustrated in Figures 1a and 1b.

In general, we would expect that shocks to saving will lower the interest rate and stimulate investment, while shocks to investment will raise interest rates and stimulate saving. These are generally borne out by the results in Figure 1, particularly in the first period. The patterns of responses in the two periods, however, are different. In the first period, shocks to saving lead to an increase in investment and vice-versa. In the second period, there is a cyclical pattern of response, first rising, then falling, then rising again, on investment from shocks to saving, and on saving from shocks to investment. The reverse pattern of that on investment is observed for the effects of savings shocks on saving. In general, the point estimates indicate that the gross response of investment to savings shocks in the first period is smaller than that for the second period. The same is generally true of the gross response of

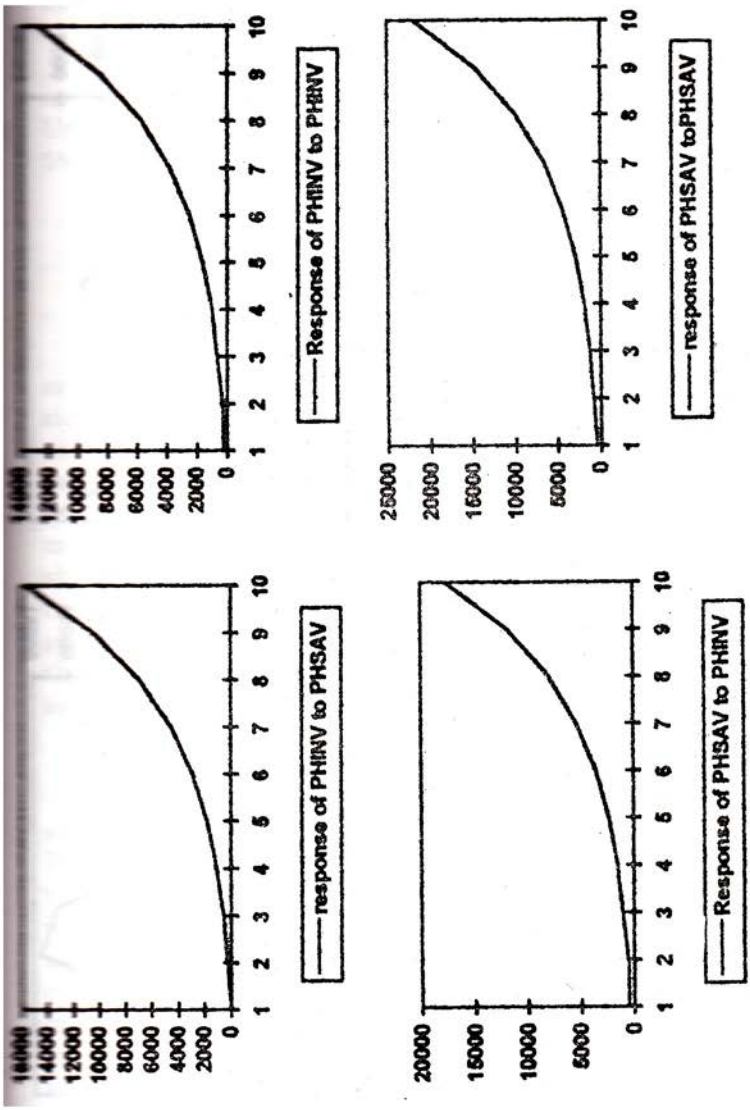

Figure 1a - Gross Dynamic Responses of Nominal
Philippine Savings and Investments, 1946-1973

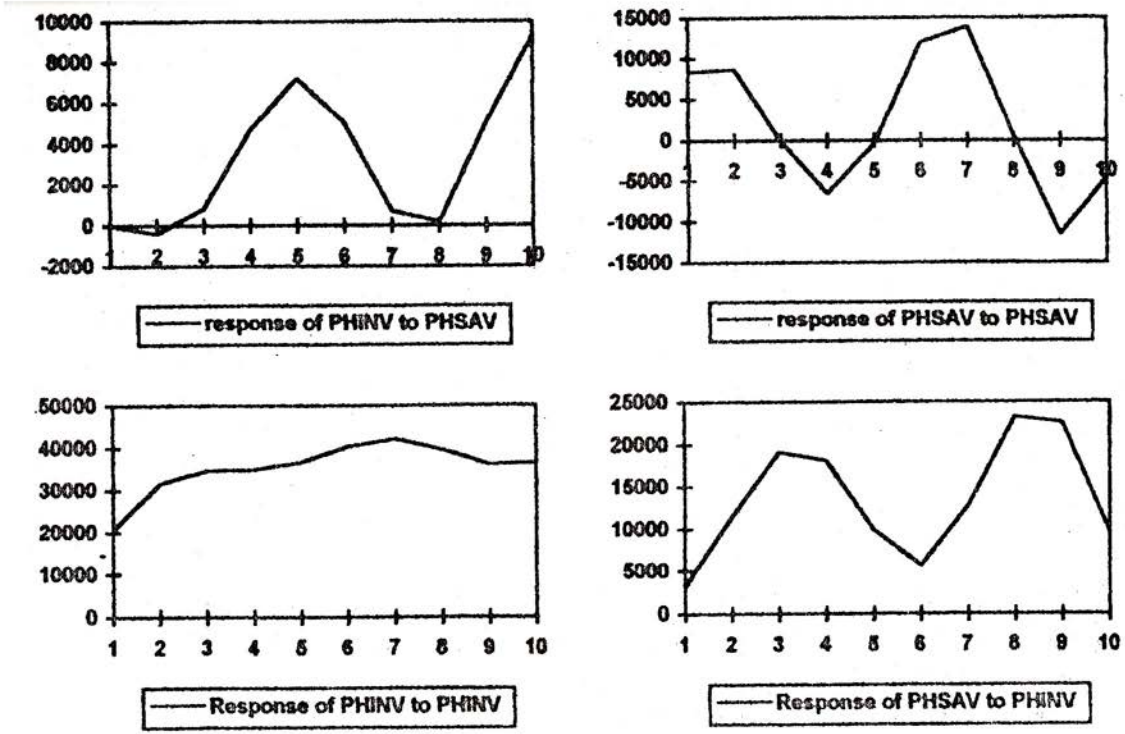

Figure 1b - Gross Dynamic Responses of Nominal Philippine Savings and Investment, 1974-1994

savings to investment shocks. This seems to indicate that capital mobility in the Philippines increased in the post-Bretton Woods era.

The net Philippine savings response, i.e., savings less investment, to Philippine shocks was also examined. Unfortunately, the results reject any cointegration at the 5% level.

4. The Impact of US Shocks on Philippine Saving and Investment in Nominal Terms

Figures 2a and 2b illustrate the gross responses of Philippine savings and investment to US shocks. It is assumed that since the Philippines is a smaller economy highly dependent on the US as a trading partner and investment source, Philippine savings and investment behavior would be affected by developments in the US but not vice-versa. A 4-equation error correction model is estimated, with $Z_t = (S_t^{us}, I_t^{us}, S_t^{phil}, I_t^{phil})$. To capture short-run dynamics, the model is estimated using one lag of the first differences of savings and investment on the right-hand side. The error correction model is estimated without imposing the restriction that there is one cointegrating vector (1, -1) linking savings and investment in each economy.

The results in Figure 2a indicate that, in general, a US savings shock stimulates both Philippine savings and Philippine investment in the first period. This is not the typical reaction one would expect. Typically, an increase in US savings would tend to lower the world interest rate as well as lower the demand for Philippine goods because US output may contract. In turn, the lower world interest rates may dampen Philippine savings while stimulating investment. In other words, one would typically expect Philippine savings and investment to move in opposite directions in response to a shock to US savings. On the other hand, a lower demand for Philippine goods may reduce Philippine investment.

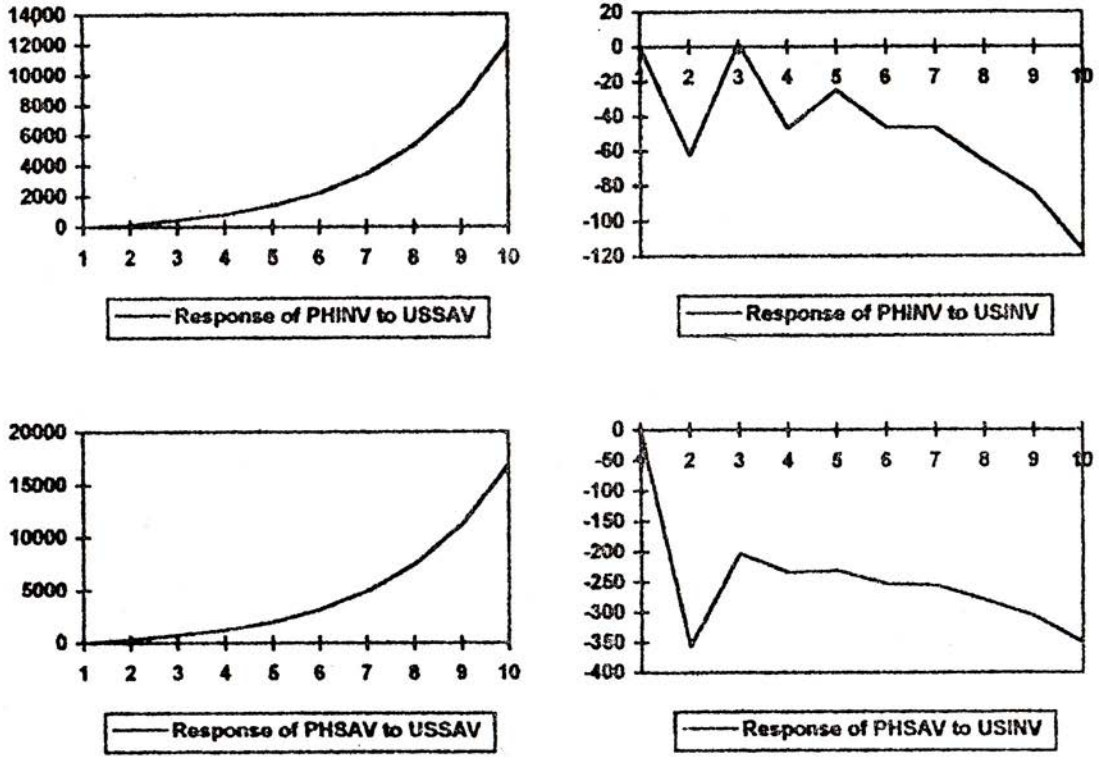

Figure 2a - Gross Dynamic Responses of Philippine Savings and Investment to US Shocks, 1946-1973

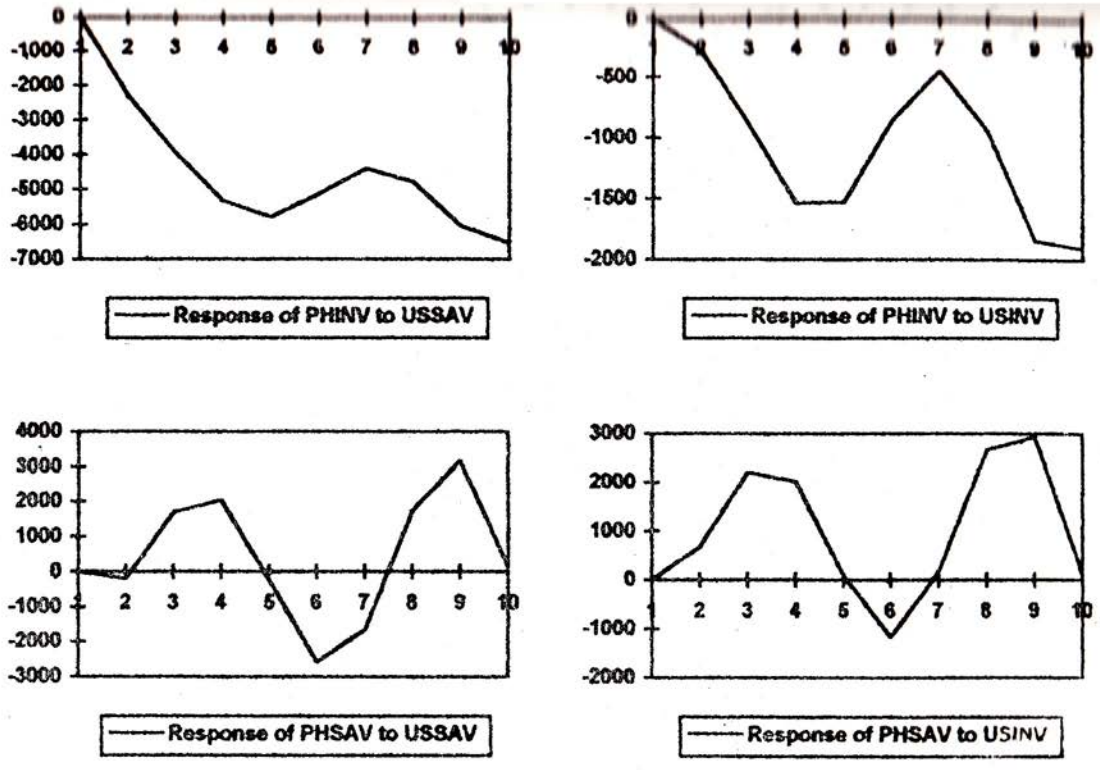

Figure 2b - Gross Dynamic Responses of Philippine Savings and Investment to US Shocks, 1974-1994

a US savings shock generally stimulates Philippine savings but unambiguously lowers Philippine investment. In other words, when US savings contracted in the 1980s, world interest rates increased, which then raised Philippine savings and reduced the quantity of Philippine investment. Shocks to savings, therefore, tend to lead to savings-investment surpluses.

The point estimates indicate that the savings-investment gaps were smaller in the first sub-period, suggesting that capital mobility may have increased in the second sub-period. In the first sub-period, US investment shocks have a small effect on either Philippine savings or Philippine investment. In the second sub-period, US investment shocks have a larger negative effect on Philippine investment and a generally positive effect on Philippine savings, in contrast to the earlier period results in which US investment shocks had a negative effect on Philippine savings. This can be explained in the following manner: an increase in US investment demand would raise world interest rates and the demand for Philippine goods. The rise in world interest rates would stimulate Philippine savings and lower the quantity of Philippine investment. Hence, in the second period, the Philippines tended to have a net savings surplus.

On the other hand, the increase in the demand for Philippine goods may lower Philippine savings while increasing Philippine investment. If the responses of Philippine investment and Philippine savings to US investment shocks are compared, it will be noted that Philippine savings and investment move counter-cyclically against each other in response to US investment shocks, especially in the second period.

If one looks at the variance decomposition of the forecast errors of US shocks on Philippine savings and investment, as shown in Figures 3a and 3b, it is apparent that the contribution of US shocks declines in the second period. This smaller contribution of external shocks is surprising, assuming greater capital mobility in the second period. There may be several explanations for this. First, the size

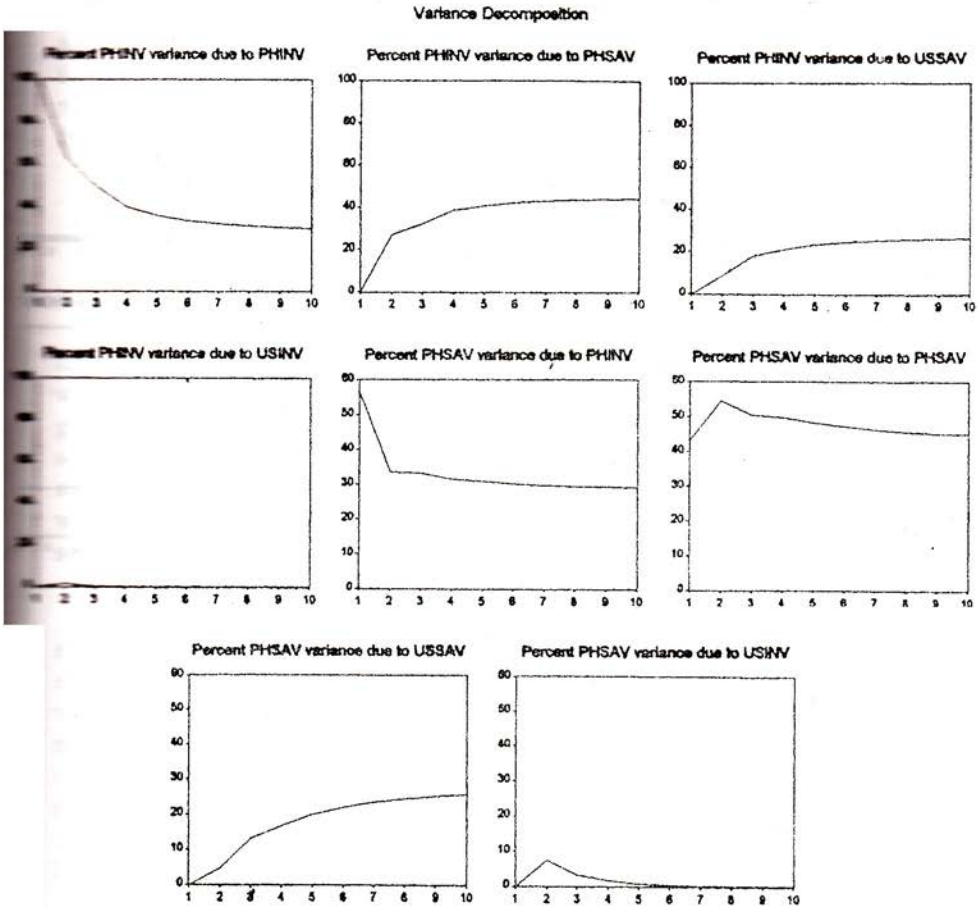

Figure 3a - Variance Decomposition of Forecast Errors, 1946-73

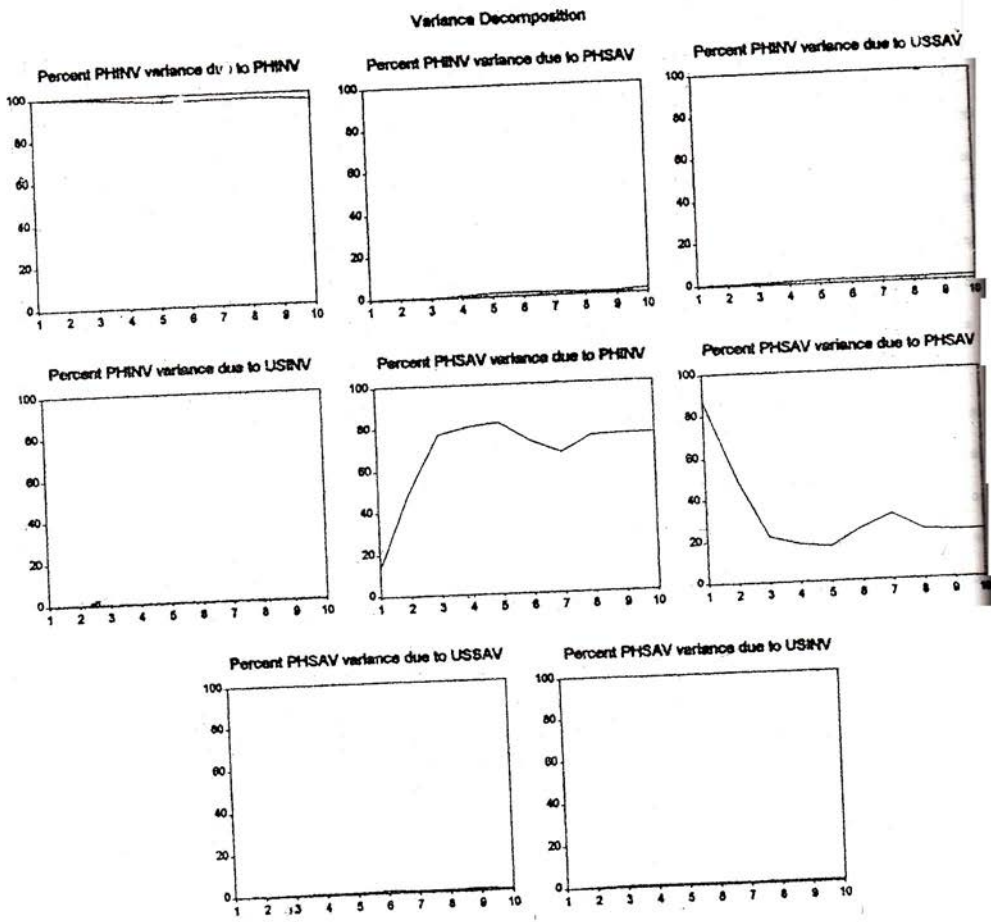

Figure 3b - Variance Decomposition of Forecast Errors, 1974-94

of Philippine domestic shocks increased in the 1980s, particularly domestic investment shocks, as seen in the percentages of the variances in Philippine investment and Philippine savings due to Philippine investment shocks in Figure 3b. Another reason could be that the US has become less important in the '80s and '90s as a source of capital relative to some other country like Japan, for example. Another reason could be that more flexible exchange rates in the post-Bretton Woods era have insulated the economy from foreign disturbances.

5. The Impact of US Shocks on Philippine Savings and Investment in Real Terms

Since inflation may distort the sizes of saving and investment gaps across regimes, responses based on real models were obtained. The results are shown in Figures 4a and 4b. In general, it is apparent that Philippine responses to both US saving or investment shocks were of a larger magnitude in the second sub-period than in the first sub-period. This is consistent with the hypothesis that capital mobility was higher in the second sub-period than in the first.

The finding that US investment shocks have a negative effect on savings in the first period and a large, positive effect on Philippine savings in the latter period is consistent with the findings using nominal values. However, using the real model, in the second sub-period, US investment shocks have a large positive effect on Philippine investment. In the earlier sub-period and in the nominal models, the reverse is true. This unexpected finding is possible if the increase in the demand for Philippine goods following an increase in US investment demand led to an increase in Philippine investment.

6. Conclusion

This study exploits the relationship between savings and investment implied by a country's intertemporal budget constraint. It examines the short-run dynamic behavior of savings and investment

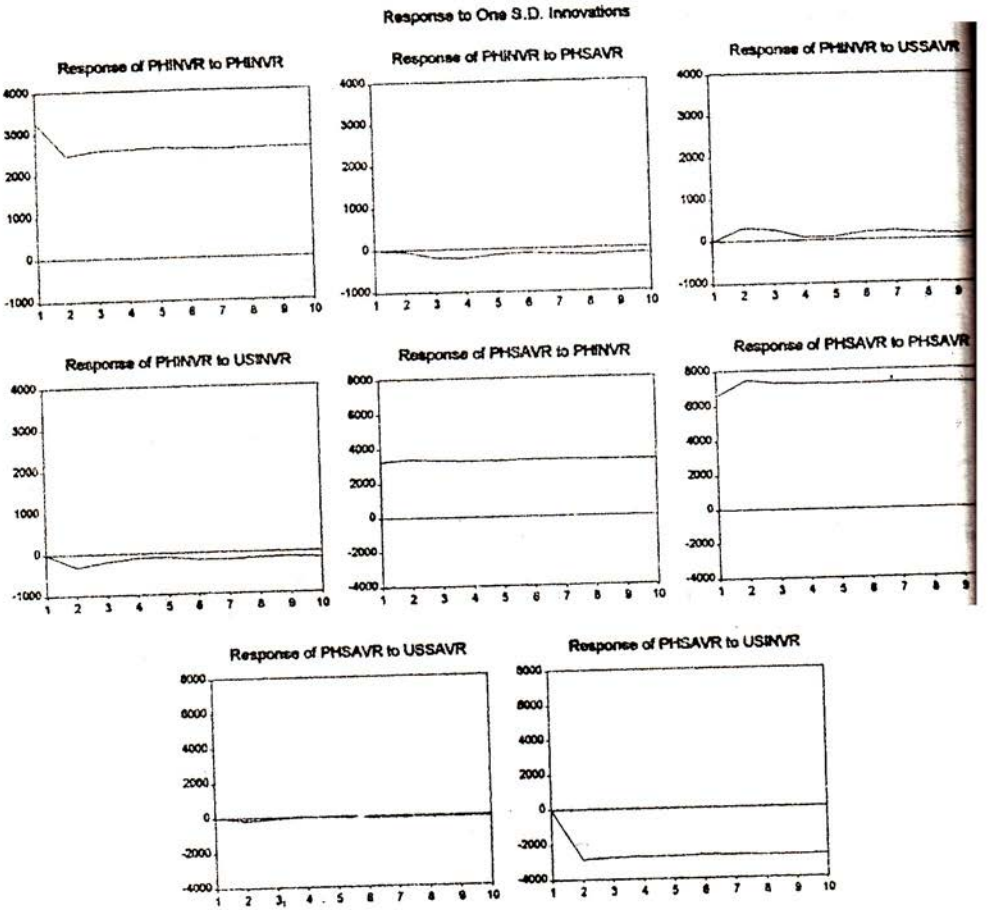

Figure 4a - Gross Dynamic Responses of Real Philippine Savings and Investment to US Shocks, 1946-73

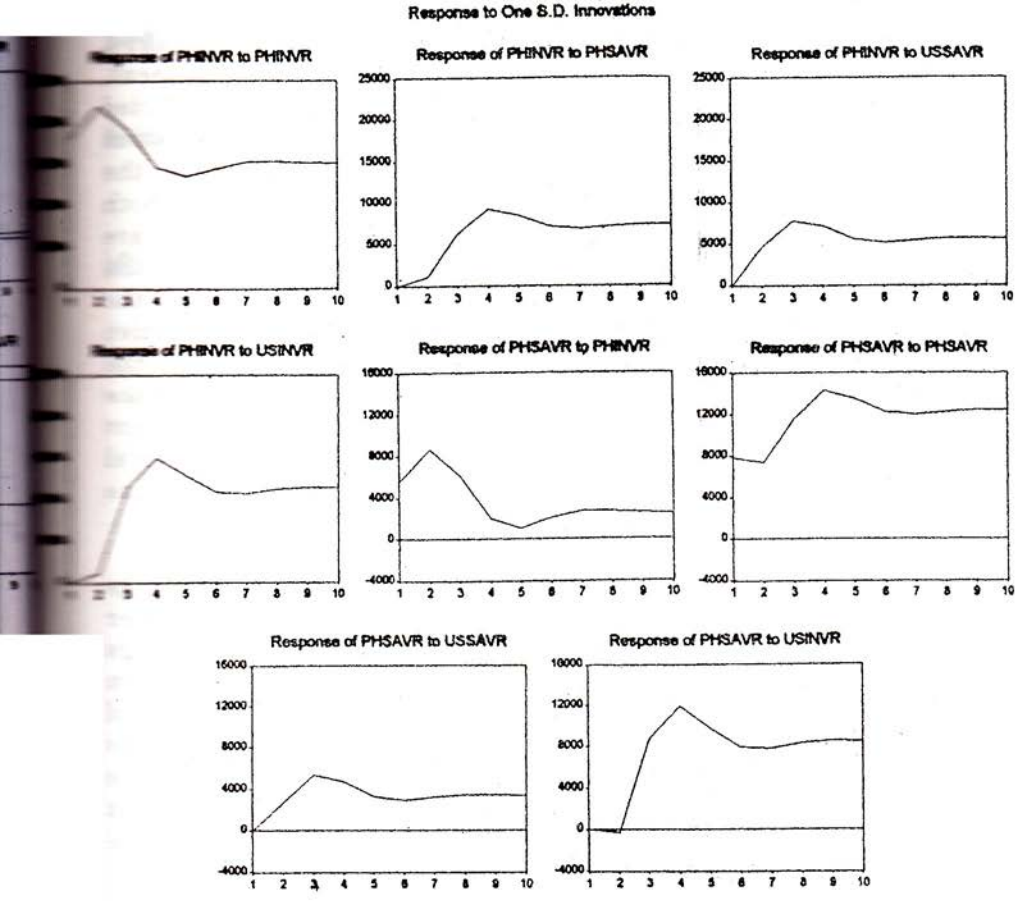

Figure 4b - Gross Dynamic Responses of Real Philippine Savings and Investment to US Shocks, 1974-94

to measure the degree of capital mobility. In particular, if capital mobility is greater in a particular period, we would expect the dynamic responses of Philippine savings and investment to shocks to be greater.

Using annual data for the Philippines from 1946-1994, there is evidence of cointegration in savings and investment, with the cointegrating vector close to (-1, 1) as predicted by theory. In general, the study's findings are consistent with the hypothesis that capital mobility increased in the period 1974-1994, post-Bretton Woods. In particular, using both nominal and real models, the savings-investment gaps are smaller in the period, and the point estimates of the magnitudes of responses indicate larger responses in the second period. The only finding which is not supportive of greater capital mobility in the second period is the finding that the contribution of US shocks to the variance of the forecast errors of Philippine savings and investment declined in the latter period, but this may be due to several reasons, including the relatively large domestic Philippine shocks to investment in the latter period.

In general, US savings shocks tend to raise Philippine savings while reducing Philippine investment, particularly in the latter period. This is consistent with the story that when US savings contracted in the 1980s, world interest rates increased. This, in turn, stimulated Philippine savings and reduced the quantity of Philippine investment. Also, US investment shocks tend to reduce Philippine investment, but the effect on Philippine savings is less clear. In the first period, US investment shocks tend to reduce Philippine savings while in the second period, the opposite is true.

As Moreno points out, in the long run, any degree of capital mobility is consistent with the tight relationship between savings and investment, such as that obtained in this study. The short-run dynamic responses of savings and investment to shocks, rather than the long-run relationship between savings and investment, are ultimately needed to provide information on capital mobility.

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