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The Effects of Foreign Resource Inflow and Savings on the Economic Growth of South Africa: A VAR Analysis

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Abstract: This study adopts both the Vector Autoregressive (VAR) analysis and the Impulse-Response Function (IRF) to examine the importance and the effects of domestic savings and foreign direct investment (FDI) on South African economy, using data spanning over the period 1975 to 2011. While the level of domestic savings is quite low, compared to other emerging economies, South Africa has also been struggling to attract inflow of foreign resources. The form of savings in South Africa is different from the western way of savings; hence the low levels of domestic savings. The variables considered were tested for stationarity and they were all stationary before proceeding to test for cointegration and then estimate and VAR. The cointegration test revealed that there was at least one cointegrating equation; which signifies that there exists a long-run relationship among the variables. The results from the VAR Granger test of causality depicted that domestic savings lead economic growth, while economic growth leads investment. This result of the IRF also showed that while increased domestic savings is important to improve the level of economic growth in South Africa, it also leads FDI. This means that the economic environment needs to be suitable in order to attract foreign investments. The results obtained are reliable and stable as the model passes a battery of diagnostic tests. The study proposes some recommendations for policy.

Keywords: *Domestic savings, Economic growth, FDI, IRF, VAR*

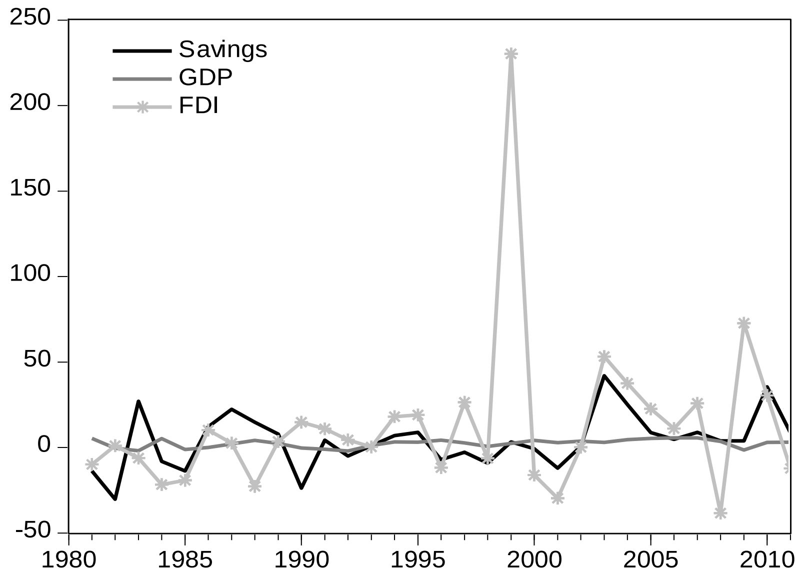
1. Introduction

Some major economic indicators, such as inflation and economic growth, are driven by many variables including savings and inflow of foreign resources, where savings is one of the major financial indicators. With high levels of gross national savings, a country can be protected from being exposed to the volatile global capital market (Cronje & Roux, 2010). However, with low rates of savings, an economy restrains its growth and avoids its sustainability therein (Adebiyi, 2005). According to the two schools of thought, Keynes and Solow, while the former school believes that economic growth causes savings, the opposite is the belief of the latter, whereby changes in savings drive economic growth. Many countries seem to believe the Solow theory including South Africa, hence the different campaigns urging people to save (Govender, 2013). Although, the level of savings in South Africa is quite low compared to other emerging economies (Holburn, 2011; Odhiambo, 2009) it does not mean that South Africans do not save; the form of savings is simply different from the western way of savings (Ismail, 2013).

The most popular form of savings in South Africa includes funeral policies, stokvels and life insurances, to mention a few. The levels of personal savings could generally be low in South Africa; nevertheless savings through stokvels, funeral policies and so on are quite high and this in a way contributes to national savings. The purpose of this study is to examine the effect of a one-time shock in domestic savings, inflation and foreign direct investment (FDI) on the gross domestic product (GDP) of South Africa. We further want to determine whether these variables, lead GDP or vice versa using a different econometric technique from what has been used for many countries. According to the 2011 research, which cut across socio-economic group, age and race, carried out by the African Response, an average stokvel had 27 members, each contributing R210 per month. The report showed that a total of about 350,000 savings stokvels, with 5.4 million members generate an annual savings of about R25.41billion (Ismail, 2013; The Savings Issue, 2013). Since this form of savings consists of a group of people, it stimulates savings behaviour; while it also assists members meet their various financial needs, ranging from groceries, school fees or funeral. Over 30,000 investment stokvels invest about R2.16billion in different instruments such as savings account (The Savings Issue, 2013). This shows that South Africans save, but as a group and this type of savings form part of the low domestic savings.

In addition, inflation and inflow of foreign resources play major roles in the South African economy. While high inflation is discouraged in the economy due to its detrimental effect on the economic growth (Leshoro, 2012), an important source of funds for investment purposes is required through foreign direct investment, given generally low national savings rate (Kransdorff, 2010). Increased inflow of foreign resources into South Africa not only provides capital, but enables the spread of new technology in order to boost the potential growth rate of the economy. For such to be attracted, the economy needs to be suitable, conducive and stable, hence, high inflation needs to be curbed. However, South Africa has not been able to attract FDI compared to other emerging economies, where its growth rate has been declining (Arvanitis, 2006; Kransdorff, 2010; Payi, 2012). Given the low domestic savings, higher domestic investment cannot be achieved, hence the need to attract foreign investment in order to achieve higher investment and growth.

Figure 1: Growth Rates of Savings, FDI and GDP in South Africa: 1980 – 2011



Although FDI is made up of 3 components namely, equity capital, reinvested earnings and other capital (mainly intra-company loans), many countries do not report each component, especially reinvested earnings as its collection depends on company surveys (UNCTAD, 2013). The rate of growth of FDI was low in the 1980s but it picked up towards the end of apartheid and it increased substantially in 1999 after which it declined as shown in figure 1. The possible reason for this drastic increase could include the sale and restructuring of state assets, such as the government shares in Telkom being sold in 1997, as well as the sale of South African Airways in 1999 (Arvanitis, 2006). Moreover, the report released by the United Nations Conference on Trade and Development (UNCTAD) showed that there was a decline in FDI from 2011 to 2012, where it dropped from US$6billion to US$4.6billion. The reason for the decline could be attributed to the labour unrest, policy uncertainty and technological progress. The relationships that exist between savings and GDP on one hand and between FDI and GDP on the other hand are not clearly seen from the figure above. Therefore, this study empirically tests the effect of a shock in national savings, inflation and FDI on economic growth, and further examines the causal effects of each variable on the others. The subsequent section provides a review of literature on the causality and relationship between these variables. Data and methodology are presented in section 3, followed by the discussion of results in section 4 while section 5 provides the conclusion and recommendation of policies.

2. Literature Review

Many studies have looked at the relationship between savings and growth in different countries, using different techniques. While quite a number of these studies considered this relationship using causality test technique, very few examined the relationship by means of a vector autoregressive (VAR), specifically the impulse-response function (IRF), which investigates the effect of a one standard deviation shock in one variable on the other. However, there are mix of results obtained concerning the direction of causality and the relationship between these variables. According to the Keynesian theory, economic growth leads to changes in investment which in turn leads to changes in savings. The Solow theory has a different view whereby increased savings leads to increased investment, which leads to an increase in economic growth (McKinnon, 1973; Shaw, 1973; Solow 1956 and Lucas, 1988). Furthermore, many studies considered bi-variate and trivariate regression models in different countries (Sinha and Sinha, 1998; Saltz, 1999; Agrawal, 2000, 2001; Anoruo and Ahmad, 2001; Mavrotas and Kelly, 2001; Sahoo, Nataraj, and Kamaiah, 2001; Konya, 2004; Adebiyi, 2005; Irandoust and Ericsson, 2005; Mohan, 2006; Odhiambo, 2009; Olajide, 2009; Abu, 2010). Adebiyi (2005) used both the VAR model as well as causality test techniques to observe the relationship and the direction of causality between savings to GDP ratio and per capita GDP in Nigeria. Quarterly data over the period 1970:1 to 1998:4 was used. The impulse-response function result showed a mix of positive and negative signs, but overall the sign was negative, implying that a negative relationship was found between these two variables. The result of the Granger causality test showed that the ratio of savings to GDP does not lead per capita GDP in Nigeria, but rather vice versa. The causality result was in line with the result that Abu (2010) obtained when the relationship between economic growth and savings growth was investigated, using Granger causality test and cointegration techniques also in Nigeria.

However, the results obtained from these two studies differ from the one obtained by Olajide (2009), while testing the causal relationship between domestic savings and economic growth in Nigeria. This study further included the inflow of foreign resources variable in order to capture the effect of increased foreign direct investment in Nigeria. The study employed annual data from 1970 to 2006 to estimate the causality between these variables, using Toda Yamamoto test of non-causality. Olajide (2009) found that the variables are cointegrated in the long-run and both savings and foreign direct investment granger cause economic growth. Saltz (1999) also used both VAR and Vector Error Correction Model (VECM) model to determine which variable leads the other for eight and nine third world countries respectively. The author concluded that real GDP growth leads savings growth because the majority of the countries depicted a unidirectional relationship from GDP growth to savings growth while few showed that there was bidirectional causality. Anoruo and Ahmad (2001) examined the causality between domestic savings growth rates and economic growth of seven African countries including South Africa. The result obtained for South Africa and Cote d'Ivoire amongst other countries showed that there is cointegration among the variables with a bi-directional causality.

Furthermore, the result obtained by Odhiambo (2009) in testing the direction of causality in a trivariate model of savings rate, economic growth and foreign capital inflow in South Africa, showed a bi-directional causality between savings rate and economic growth only in the short run. He also found a bi-direction causality between savings and FDI, but a unidirectional causality from economic growth to FDI. The study used annual data over the period 1950 to 2005 and an error-correction based causality test technique. Mavrotas and Kelly, (2001) used the data for Sri Lanka and India to examine the causality between savings and economic growth. The authors used gross domestic savings and private savings. Their results showed no evidence of causality between private savings and economic growth in India, while bi-directional causality was found for Sri Lanka. On the other hand, Sinha and Sinha (2008) also estimated the causal relationship between disaggregated savings and economic growth in India. Their disaggregated savings was different from that of Mavrotas and Kelly, (2001), where Sinha and Sinha (2008) disaggregated savings into household savings, corporate savings and public savings. The result obtained showed that the Keynesian theory holds for India because change in savings was rather found to be caused by changes in economic growth and not vice versa.

3. Methodology

Data was sourced from the *World Bank, World Development Indicators* database. The data spanned over the period 1975 to 2011, making 37 data points. Foreign resource inflow is the foreign direct investment (FDI); Gross Domestic Savings (SAV) is the total domestic savings, INF is the inflation rate and Gross Domestic Product (GDP) is the measure of economic growth. All these variables are at constant prices (2005), FDI and SAV were deflated using inflation rates at 2005 prices. This study uses the impulse-response function (IRF) of estimated vector autoregressive (VAR) model. The VAR model is suitable for investigating shock transmissions among variables via the impulse responses. Quite a number of studies considered bivariate or trivariate models to estimate the savings-growth nexus. This study will adopt a multivariate linear simultaneous structural vector autoregressive (SVAR) model and this is written as follows:

$$FDI_t = \beta_0 + \sum_{i=1}^{k} \beta_1 FDI_{t-i} + \sum_{i=1}^{k} \beta_2 SAV_{t-i} + \sum_{i=1}^{k} \beta_3 INF_{t-i} + \sum_{i=1}^{k} \beta_4 GDP_{t-i} + \varepsilon_t \quad \text{... (1)}$$

$$SAV_t = \alpha_0 + \sum_{i=1}^{k} \alpha_1 FDI_{t-i} + \sum_{i=1}^{k} \alpha_2 SAV_{t-i} + \sum_{i=1}^{k} \alpha_3 INF_{t-i} + \sum_{i=1}^{k} \alpha_4 GDP_{t-i} + \mu_t \quad \text{... (2)}$$

$$INF_t = \varphi_0 + \sum_{i=1}^{k} \varphi_1 FDI_{t-i} + \sum_{i=1}^{k} \varphi_2 SAV_{t-i} + \sum_{i=1}^{k} \varphi_3 INF_{t-i} + \sum_{i=1}^{k} \varphi_4 GDP_{t-i} + \gamma_t \quad \text{... (3)}$$

$$GDP_t = \delta_0 + \sum_{i=1}^{k} \delta_1 FDI_{t-i} + \sum_{i=1}^{k} \delta_2 SAV_{t-i} + \sum_{i=1}^{k} \delta_3 INF_{t-i} + \sum_{i=1}^{k} \delta_4 GDP_{t-i} + \psi_t \quad \text{... (4)}$$

Where all the variables are as earlier defined, β, α, φ and δ are coefficients and ε, μ, γ and ψ are the error terms also called impulses or innovations. The error terms capture the unexpected shocks and each is assumed to be uncorrelated with the others. The structural VAR model, which is derived from economic theory has the longest lag length, the k-th order VAR, that is VAR(k). The four models above therefore show that, for instance, equation (1) explains the current FDI in terms of the lagged FDI, SAV, INF and GDP, equation (2) explains the current SAV in terms of the lagged FDI, SAV, INF and GDP, and so on. This shows that each of these variables is endogenous, that is, each variable is explained or determined by other variables. The VAR model system does not have any exogenous variables; however, the causal ordering has to be known apriori, that is, the variable that is caused by other variables should be known. The formulation of the structural VAR model does not rely strictly on economic theory, but some level of economic theory will tell us of the relevant variables that should appear in the equation. Therefore, this study focuses on the effects of the inflow of foreign resources, gross domestic savings and inflation rate on the economic growth of South Africa.

The above equations (1) to (4) of the VAR system can be written in a vector notation as shown in equation (5):

$$\overline{Z}_t = \overline{\Pi} + \phi \overline{Z}_{t-i} + \bar{\varepsilon}_t \quad \text{……………….. (5)}$$

The optimum lag length, *i*, which ranges from 1 to k in equations (1) to (4), of the VAR model, will be selected by using the minimum value of some of the lag length selection criteria, which are Akaike, Schwarz or Hannan-Quinn information criteria. The impulse response analysis, which uses the vector moving average (VMA) of the VAR model, allows us to examine the impact of the lagged variables on the current variables, that is, the VMA assists us to trace out the time path of the shocks of the lagged variables on the current variables. In order to avoid spurious results of the VAR, all the variables in the system are required to be stationary, and the VAR should satisfy the stability condition. However, the coefficients of the SVAR cannot be interpreted.

4. Results

We first tested all the variables for stationarity and the results showed that, while only FDI was stationary at level, SAV, INF and GDP became stationary after the first difference. This means that FDI was integrated of order zero, I(0), while SAV, INF and GDP were integrated of order one, I(1). Furthermore, the lag length was determined, using the lag length selection criteria of Akaike, Schwarz and Hannan-Quinn information criteria. A lag of 2 was selected based on the criterion with the lowest value (See Appendix, Table 1). The result of the VAR is shown in table 1; although there is no direct interpretation for the coefficients in the VAR estimates, the relationship depicted as well as the levels of significance are still important. The results obtained from the IRF are shown in figure 2. The cointegration test carried out using Johansen test of cointegration showed that there was at least one co-integrating equation. The result obtained from the diagnostic tests showed that the VAR is stable and hence the results obtained in the IRF are reliable and consistent.

Table 1: Result of the VAR estimates: GDP, FDI, SAV and INF (1975 – 2011)

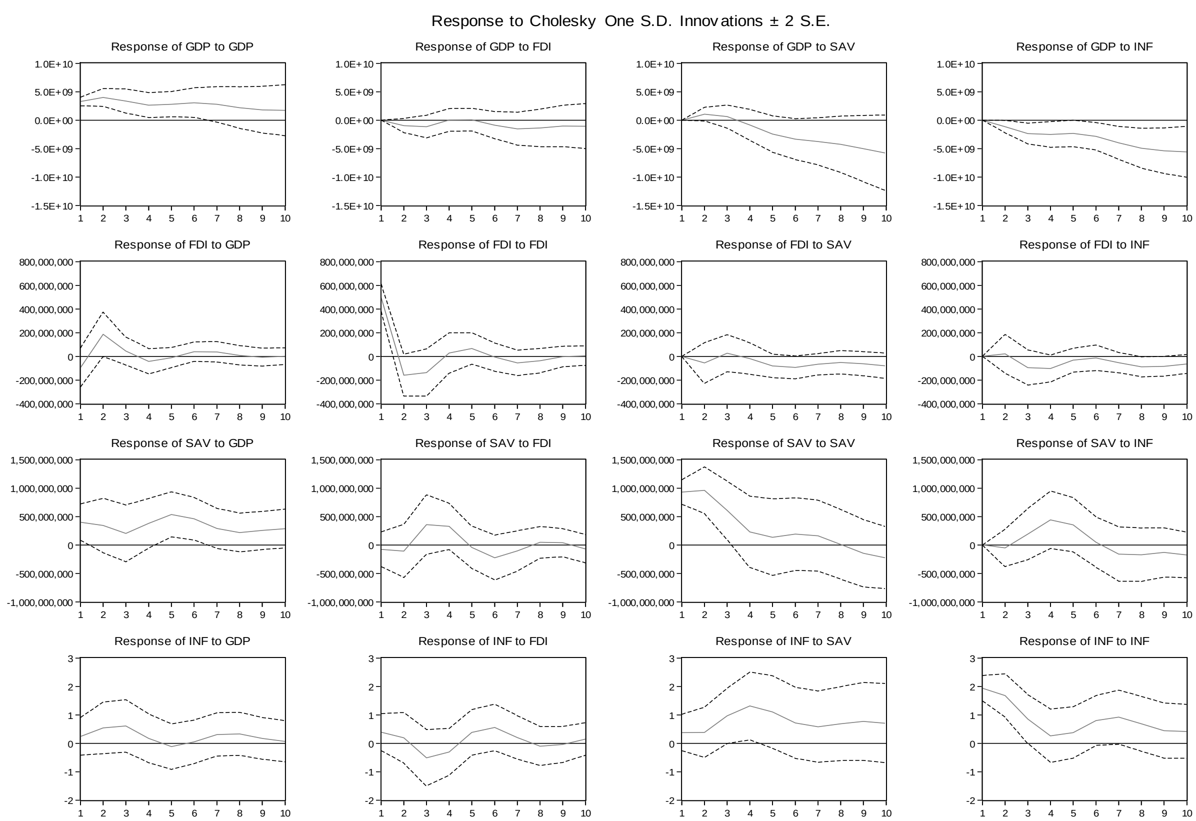
Variables	GDP	FDI	SAV	INFLATION
GDP(-1)	1.051416***	0.053929*	-0.022596	8.60E-11
	(0.19013)	(0.02929)	(0.05873)	(1.2E-10)
	[5.52989]	[1.84140]	[-0.38477]	[0.73355]
GDP(-2)	-0.016603	-0.036125	0.052171	-1.35E-10
FDI(-1)	-1.284038	-0.337741	-0.034035	-2.84E-10
FDI(-2)	-0.387563	-0.275137	0.720633	-9.78E-10
SAV(-1)	1.379930	-0.064701	1.046011	6.08E-11
SAV(-2)	-1.784422	0.019044	-0.449236	6.03E-10
INFLATION(-1)	-6.03E+08	10355256	-26795922	0.865877
INFLATION(-2)	-12250967	-23858104	1.37E+08	-0.251800
C	7.27E+09	-2.35E+09*	-3.58E+09*	8.315650*
R-squared	0.996641	0.645497	0.938747	0.825769
Adj. R-squared	0.995681	0.544210	0.921247	0.775988

* denotes 10%, ** denotes 5%, *** denotes 1%

The main focus of this study is to examine the impacts of foreign direct investment (inflow of foreign resources), gross domestic savings and inflation rates on the economic growth of the country; this is equation (4). The IRF is derived from the VAR system that was estimated. The dashed lines show the 95% confidence intervals. The effect of a one standard deviation shock in the foreign resource inflows to GDP shows that GDP will be stable in the first period after which it will decline and be negative from the second period to the third period. It will increase in periods four and five, after the fifth period, it will become negative up until the last period. On overall, FDI depicted a negative relationship with GDP, as shown in the VAR model. This shows that if there was a shock in FDI, the economic growth of South Africa will be adversely affected for about ten periods. The negative sign on FDI implies that at least one of its components is negative, that is, the particular component is not counterbalanced by the other 2 components, which are positive, and this is called disinvestment or reverse investment. There is generally an inverse effect of a one standard deviation shock in savings on GDP, such that in the event of a shock in gross domestic savings in the country, GDP will initially be positive, although declining, up until the third period. However, this will turn negative after the third period onwards. This supports the result obtained from the VAR regression model, where savings was positively related to GDP in the first period and later became negative. This also shows that the overall effect of a shock in savings on the economic growth is generally negative.

Lastly a shock in inflation largely depicts an inverse effect on economic growth. Given a one standard deviation shock in inflation, economic growth will decline from the first period all the way to the last period considered, ten periods in this case, although it will be stable between period three and period six. The response of a shock in inflation on GDP is also generally negative. This means that it is important to curtail inflation in order to avoid its negative and harmful effect on the economy. A similar effect is seen in the impact of a shock in inflation on FDI (equation 1), where although FDI will be stable from period one to period two, it declines and becomes negative up until period four, after which it increases but still negative until period five. It becomes stable again from period five to period six, after which it declines further till the last period, although it is stable from period eight. The study further tests for possible structural break taking into the account the sale and restructuring of state assets, such as the sale of the government shares in Telkom in 1997, as well as the sale of South African Airways in 1999, as earlier mentioned. Another structural change that was considered is the financial crisis of 2008 to 2011, which led to labour unrest, policy uncertainty and technological progress, within these periods (See Appendix, Table 2). The dummy that captured the effect of the restructuring of state assets is DUM_RES, while the dummy that was used for the period of the financial crisis is DUM_FC. The results obtained after incorporating the structural break did not so much change the result of the VAR, except FDI which became more significant in the GDP model, that is, δ_1. This showed that the effect of the structural breaks were not significant enough to cause any major change in the economy.

Figure 2: Impulse-Response Functions: GDP, FDI, SAV and INF (1975 to 2011)



The result for the block exogenity test of no causality was carried out and it was found that while savings significantly lead economic growth in South Africa; economic growth only leads savings at 10% level of significance (See Appendix, Table 3). This confirms that South Africa strongly follows the Solow theory. This is confirmed by the result obtained from the IRF in figure 2, whereby given a shock in savings, GDP will decline and become negative. However, if there was a shock in GDP, the response of this shock on savings will still be positive, although it increases and decreases over the entire period; it generally remains positive. This shows that although South Africa is not a savings economy in the western way, the other form of savings, which makes up the total domestic savings, still contributes to the economic growth of the economy. In addition, there is a highly significant uni-directional causality from GDP to FDI; that is, FDI does not Granger cause GDP, but rather GDP leads FDI in South Africa. This is in line with the result obtained by Odhiambo (2009). This shows that in order for South Africa to be able to attract FDI, the economy needs to be encouraging and suitable. Not only does increased FDI increase the potential economic growth of any economy, in the case of South Africa, the domestic economy needs to create an environment suitable to attract FDI. Although, the causality test result shows that there was no causality between FDI and savings; the importance of FDI in South Africa is clearly seen in the IRF result where a shock in savings results in a generally negative effect on FDI. This again shows the importance of savings to the South African economy, this time by attracting foreign resources.

5. Conclusion and Policy Recommendations

This study empirically examines the effect of a one period shock in FDI, domestic savings and inflation on the economic growth of South Africa. Data spanning over the period 1975 to 2011 was used while adopting the VAR analysis and the impulse-response function analysis. The results obtained showed the importance of savings to the South African economy. The VAR Granger causality test showed that Solow theory holds for South Africa, whereby savings significantly leads economic growth. Further result confirmed that the direction of causality is one-way from economic growth to FDI, which means that economic growth has to be high enough to invite foreign investments. However, given the current low levels of economic growth in South Africa, this study therefore confirms the fact that South Africa has been struggling to attract foreign direct investment. Hence, for the country to have substantial inflow of foreign resources, the domestic economy should be suitable enough for such. This is also shown in figure 2, the IRF, which depicts the effects of a shock in these variables on the other. It is therefore advisable to encourage increases in savings because, not only does it directly lead to increased economic growth; it also has a significant impact on attracting FDI. Additional policies include lowering of restrictions or the rules and regulations concerning foreign investors and entrepreneurs. Focus for further studies could rather consider disaggregated forms of savings while including the other common types of domestic savings, such as funeral policies, life insurances and so on.

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Appendix

Table 1: Lag Order Selection Criteria

Endogenous variables: GDP FDI SAV INFLATION
Exogenous variables: C

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2687.826	NA	1.83e+58	145.5041	145.6783	145.5655
1	-2551.756	235.3643	2.79e+55	139.0138	139.8846*	139.3208
2	-2529.456	33.75136*	2.05e+55*	138.6733*	140.2407	139.2259*
3	-2518.702	13.95144	2.97e+55	138.9569	141.2208	139.7550

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 2: Result of the VAR estimates with dummy:
GDP, FDI, SAV and INF (1975 – 2011)

	GDP	FDI	SAV	INF
GDP(-1)	1.044027***	0.060092**	-0.002098	1.21E-10
	(0.19142)	(0.02384)	(0.05933)	(1.2E-10)
	[5.45404]	[2.52108]	[-0.03536]	[1.02205]
GDP(-2)	0.015707	-0.047075	0.043391	-1.56E-10
FDI(-1)	-0.235221	-0.672238	-0.213160	-8.14E-10
FDI(-2)	0.177116	-0.444377	0.679037	-1.17E-09
SAV(-1)	1.706739	-0.191312	0.877076	-2.88E-10
SAV(-2)	-2.030280	0.093054	-0.429486	6.91E-10
INF(-1)	-5.98E+08	-1603531.	-78840157	0.780057
INF(-2)	-4588008.	-29513385	1.20E+08	-0.282021
C	2.87E+09	-1.10E+09	-3.59E+09	9.313594
DUM_FC	-5.55E+09*	1.78E+09**	1.01E+09	2.907701
DUM_RES	-2.25E+09	4.16E+08	-1.15E+09	-1.345266
R-squared	0.996984	0.791966	0.944607	0.842692
Adj. R-squared	0.995823	0.711953	0.923303	0.782189

* denotes 10%, ** denotes 5%, *** denotes 1%

DUM_FC = dummy to capture financial crisis

$$DUM\_FC = \begin{cases} 1 & if \ \ financial \text{ crisis} \\ 0 & otherwise \end{cases}$$

DUM_RES = dummy to capture the restructuring of state assets.

$$DUM\_RES = \begin{cases} 1 & if \ \ assest \text{ restructuring} \\ 0 & otherwise \end{cases}$$

Table 3: VAR Granger Causality/Block Exogeneity Wald Tests

Dependent variable: GDP

Excluded	Chi-sq	df	Prob.
FDI	1.155221	2	0.5612
SAV	9.243460	2	0.0098
INFLATION	7.964748	2	0.0186
All	29.63608	6	0.0000

Dependent variable: FDI

Excluded	Chi-sq	df	Prob.
GDP	6.746708	2	0.0343
SAV	0.578903	2	0.7487
INFLATION	0.197456	2	0.9060
All	36.51828	6	0.0000

Dependent variable: SAV

Excluded	Chi-sq	df	Prob.
GDP	4.578113	2	0.1014
FDI	4.139639	2	0.1262
INFLATION	1.990597	2	0.3696
All	23.33989	6	0.0007

Dependent variable: INFLATION

Excluded	Chi-sq	df	Prob.
GDP	4.007120	2	0.1349
FDI	1.741500	2	0.4186
SAV	3.898071	2	0.1424
All	16.22471	6	0.0126