Economic Crises, Stabilisation Policy and Output in Emerging Market Economies

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Stellenbosch Economic Working Papers: 20/09

KEYWORDS: ECONOMIC CRISES, STABILISATION POLICY, EMERGING MARKET ECONOMIES, BUSINESS CYCLES, POTENTIAL OUTPUT
JEL: C32, E32, E61, E63

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A WORKING PAPER OF THE DEPARTMENT OF ECONOMICS AND THE BUREAU FOR ECONOMIC RESEARCH AT THE UNIVERSITY OF STELLENBOSCH

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ABSTRACT

The recent macroeconomic history of emerging market economies is coloured with economic crises of all kinds, ranging from debt-crises, through hyperinflationary periods to currency crises to name but a few. Much of the empirical literature notes that alongside fast-paced structural change this has resulted in volatile business cycles and a difficult environment for stabilisation policy. Both short- and long-run output dynamics are shaped by the multidimensional exposure of EMEs to economic shocks. The paper uses an SVAR analysis and finds that in spite of high degrees of output volatility, the conduct of stabilisation policy has sometimes been successful in dampening short-run output fluctuations. However, even when stabilisation has been successful, the effect on overall output volatility has been negligible when compared to supply-side shocks. The results show that economic crises are associated with large negative supply shocks which are only counteracted by stabilisation policy to a very small extent. These crisis-related supply shocks, in turn, have large negative effects on potential GDP growth, which are only reversible when positive supply shocks regain lost ground. Given the institutional origin of the economic crises, the paper suggests that for stabilisation policy to become more effective in lowering output volatility and maintaining long-term growth potential, it must be supported by appropriate supply-side measures which insulate EMEs against large negative supply shocks and help them to recover in the wake of economic crises.

Keywords: Economic crises, Stabilisation policy, Emerging Market Economies, Business Cycles, Potential output
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1. INTRODUCTION

This paper analyses the contribution of stabilisation policy in the run-up to and in the wake of economic crises in a group of EMEs. In doing so it finds that economic crises are associated with large negative supply shocks and that the output volatility induced by these crises are not fully counteracted by demand-side fiscal and monetary policy, even when the response is appropriately counter-cyclical. When considering the effect of economic crises on long-run potential output growth, the role of stabilisation policy in regaining lost ground is similarly limited in size: although stimulatory fiscal and monetary policy can cushion the blow, deviations from long-run growth potential are only recovered by positive supply shocks. In this regard the paper also finds that potential GDP growth is typically smaller after financial or exchange rate crises, and that it accelerates after a country manages to rid itself of hyperinflationary periods or an unstable political environment. Despite the limited contribution of appropriate stabilisation policy to lower output volatility and crisis recovery, it remains important to craft the appropriate response, since pro-cyclical policy can contribute meaningfully to more volatility and prolonged deviations from long-run growth potential. The paper is structured as follows.

Section 2 discusses the SVAR methodology in the context of the broader empirical business cycle literature and why it is appropriate in tackling the research question given the jointly determined nature of output and stabilisation policy. Section 3 presents the empirical findings alongside a discussion of the econometric methods underlying the results – this serves to clarify both the sense and the limitations of the analysis. The SVAR model with long-run restrictions in the tradition of Blanchard & Quah (1989) and Clarida & Gali (1994) lends itself to a nuanced analysis of stabilisation policy and output dynamics. Firstly, innovation accounting results give a preliminary view of the cyclicality and transmission of fiscal and monetary policy to GDP, while, secondly, historical decomposition of GDP allows for a more nuanced analysis. This method, successfully used by Fackler & McMillin (1998) and Du Plessis, Smit & Sturzenegger (2007), allows a study of policy cyclicality over time and the quantification of the importance of stabilisation policy in its contribution to output volatility. The historical decomposition also yields a new estimate of potential GDP which allows for an analysis of the impact of economic crises on both actual and potential GDP. Section 4 summarizes the findings and discusses the implications for current design of stabilisation policy in EMEs. The paper is accompanied by an appendix with results supporting the empirical usefulness of the econometric model.

2. METHODOLOGY AND LITERATURE

The methods used in the empirical business cycle literature for EMEs are both non-model- and model based. Non-model based analyses of business cycles mostly rely on univariate techniques to study co-movements between different series (Du Toit, 2008). In both the classical cycles tradition, and the deviation cycles tradition, developed on the basis of filtering techniques such as the Hodrick-Prescott filter, authors have documented various stylised facts about developing country and emerging market economy business cycles and stabilisation policy. From the work of Agenor, McDermott & Prasad (2000), Rand & Tarp (2002), Kose, Prasad & Terrones (2006), Calderon & Fuentes (2006) and Du Plessis (2006), for example, consensus has been reached about higher overall output volatility among EMEs, when compared to developed economies.

Authors also agree on the importance of stability for economic performance, given the negative links between volatility and growth: policy mistakes at the aggregate level cause inflation, distort labour- and capital market decisions and can either end or prolong recessions (Du Plessis et al., 2007); and there is a negative link between high output volatility long-term economic growth driven by productivity (Ramey & Ramey, 1995 and Aghion & Banerjee, 2005). However, there remains some disagreement about the relative importance of supply- and demand-side shocks as the sources of overall volatility, and also about the relative contributions of fiscal and monetary policy to business fluctuations. The next section will investigate these short- and longer-term issues in the context of the crises experienced by EMEs, but using a model-based approach.

Even though all structural models impose theoretical discipline on reduced-form characterizations of the data, empirical analyses differ according to the relative importance attached to theory and data while the choice of emphasis is largely determined by the goals of the analysis. Growing out of a systematic critique of the systems-of-equations macroeconomic models built on the probabilistic foundations of Haavelmo (1944) and Koopmans (1949), two strands of macroeconometric modelling emerged. Lucas (1976, 1981, 1987) argued that variables and parameters that are endogenous with respect to policy regimes should be modelled explicitly in order to do policy simulations without altering the underlying structure of the model. Subsequent rational expectations and real business cycle developments in this modelling tradition (Hansen & Sargent, 1980; Kydland & Prescott, 1982 & 1991; Plosser, 1989), now commonly referred to as DSGE models, have been implemented to study EME business cycles by Aguiar & Gopinath (2004) and Neumeyer & Perri (2004), for instance. These authors find that supply-side shocks are more important than demand-side shocks in explaining output volatility among EMEs, a claim supported by the results presented in the next section.

The alternative modelling tradition used in this paper, structural VAR models, developed out of by Sims' (1980) critique of the 'incredible' a-priori parameter restrictions used in systems-of-equations models, imposes theoretical discipline on reduced-form characterizations in a slightly different way than DSGE models. Intuitively, the 'structure' of the model ensures that there is a unique mapping between the structural model which conforms to some theoretical priors about the economy itself, and the reduced-form characterization of the data. More formally, by restricting the cross-equation effects in the VAR system in a specific way we can trace out the effects of policy changes in accordance with the macroeconomic framework which informs the identification of the structural model. As discussed more fully in the next section, this paper uses an SVAR model with long-run restrictions in the tradition of Blanchard & Quah (1989) and Blanchard & Fischer (1989) which decomposes output fluctuations into orthogonal shocks that have permanent and transitory effects on the level of output. Additional restrictions necessary for model identification are imposed as done by Clarida and Gali (1994) and Du Plessis, Smit & Sturzenegger (2007): the demand shock is further decomposed into fiscal and monetary shocks.

While the univariate techniques referred to above are useful for studying co-movements between series, they cannot control for the jointly determined nature of policy and output, and struggle to quantify the magnitude of the impact of stabilisation policy on business fluctuations. Of course, using a SVAR model opens up new avenues of criticism (Faust & Leeper, 1997; Cooley & Dwyer, 1998; Gottschalk, 2001; Stock & Watson, 2001; Chari, Kehoe & Mcgrattan, 2005), but this paper uses the method because it is better suited to the jointly determined nature of business cycle policies than other methods used in the literature and has well-grounded theoretical economic foundations (Slutzky, 1937; Sims, 1980 & 1996; Shapiro & Watson, 1988; Blanchard & Fischer, 1989; Blanchard & Quah, 1989).
Apart from this, the identification scheme allows for a clear economic interpretation of the

structural shocks in the model. Macroeconomic analysis has reached a broad consensus regarding output and policy analysis summarised by Taylor, 1997: (1) long-term growth comes from the supply-side of the production function; (2) there is no long-term trade-off between inflation and unemployment, or money is neutral in the long-run; (3) there is, however, a short-term trade-off between inflation and unemployment, that is, money has real effects on output in the short-run; (4) expectations are highly responsive to policy; (5) and lastly, it is better to think about policy in terms of rule-like behaviour than a series of once-off responses. The SVAR analysis uses these principles explicitly: principles (1) to (3) play an important role in the model identification and economic interpretation of the results (supply-side and demand-side shocks), while (4) and (5) shape the policy analysis. Lastly, the usefulness and validity of the identification is an empirical matter, and will be discussed alongside the presentation of the results and model in the next section, with reference to the results presented in the appendix.

3. EMPIRICAL ANALYSIS

This section discusses the data, empirical method and presents the findings about the business cycle dynamics of stabilisation policies in the group of EMEs. To preserve the focus of the paper, relevant country history is introduced as the discussion develops, while references act as a guide to a deeper reading.

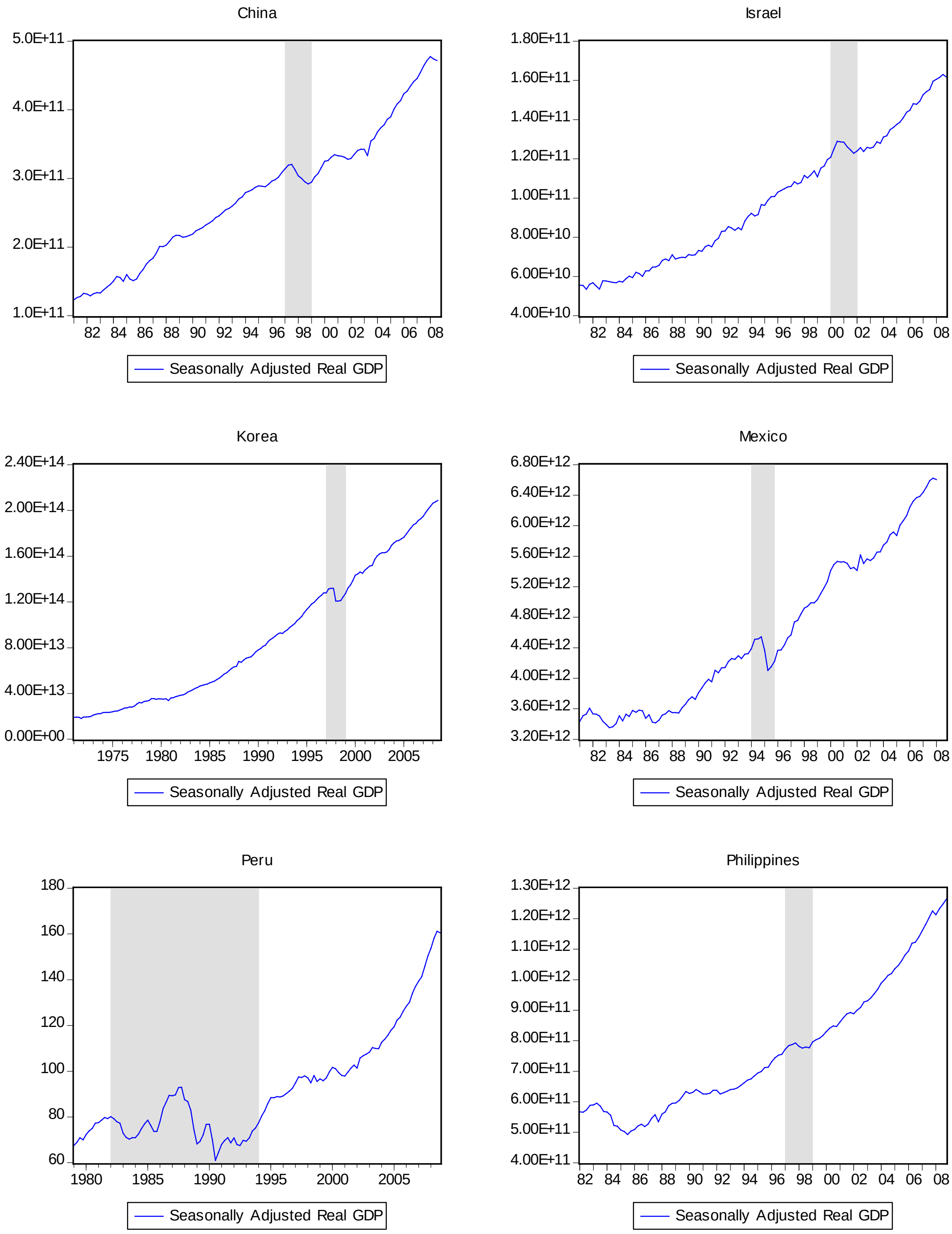
3.1 DATA AND BACKGROUND

Based on the different economic experience in terms of volatility and risk, Morgan Stanley Capital International (MSCI) has constructed an index of EMEs, measuring equity market performance. These countries making up the index are: Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Israel, Jordan, Korea, Malaysia, Mexico, Morocco, Pakistan, Peru, the Philippines, Poland, Russia, South Africa, Taiwan, Thailand, Turkey and Venezuela (www.msci.com/equity/indexdesc.html). The MSCI recognises that are considered “relatively risky because they carry additional political, economic and currency risks”, and that these countries are structurally different (Mody, 2004). Selection from this group into the empirical study follows the procedure of Du Plessis (2006: 10) and excludes all formerly centralised economies and also those lacking sufficient data. This leaves a group of six EMEs: China (Hong Kong), Israel, Korea, Mexico, Peru and the Philippines.

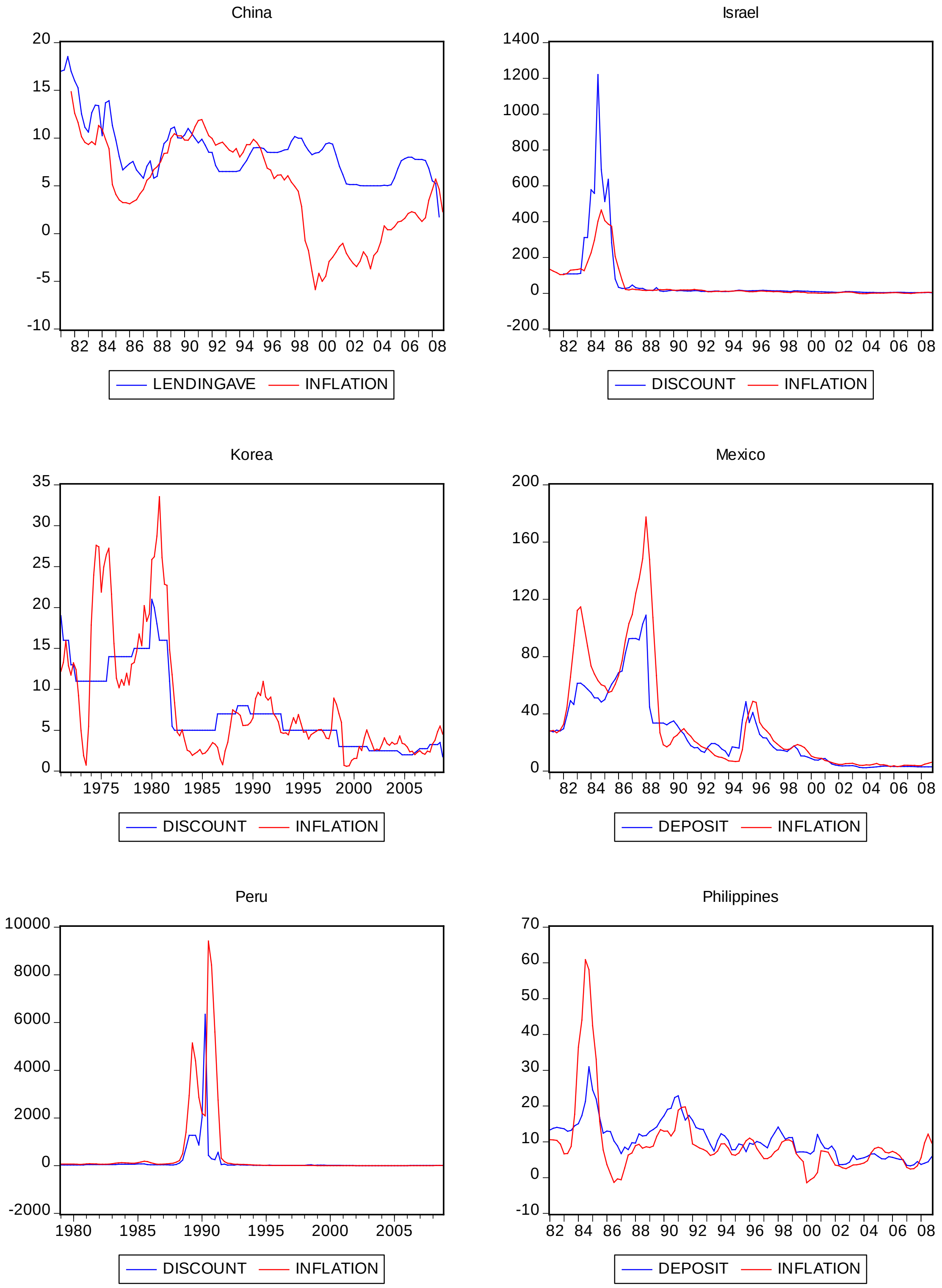
The paper uses a model similar to that used by Du Plessis, Smit and Sturzenegger (2007) to study the South African case: for output, the model uses quarterly log real GDP in first difference – this makes up supply-side shocks. Aggregate demand shocks are further decomposed into fiscal and monetary policy shocks, for which the model uses government expenditure as a proportion of GDP and a proxy of the real interest rate (for more detail see Appendix). The expenditure-side fiscal proxy is used because, given the jointly determined nature of the budget balance and the economic cycle, revenue-side measures are inappropriate to study policy responses to the business cycle (Fatas & Mihov, 2003; Du Plessis, Smit & Sturzenegger, 2007). As mentioned in Blanchard and Quah (1989), the identification requires a "cautious interpretation". Regarding the first two of the three restrictions, whether fiscal and monetary policies have only transitory effects on output is indeed an empirical issue. Further reason for caution is the validity of the assumption that preferences for public goods are independent of interest cost, as required by the third identification restriction that monetary policy has no permanent effect on fiscal policy (Du Plessis et al., 2007). There is also doubt about the stationarity of some of the series, while this and the afore-mentioned is properly investigated by looking at model stability. Parameters can, however, still be estimated consistently even if a unit root is present (Sims, Stock & Watson, 1990). The results in the appendix confirm that the SVAR models are stable in the sense that their roots lie within the unit circle, while it also presents theory consistent accumulated impulse response functions.

To return to the unresolved empirical issues that emerged from the brief literature review, a quick look at the GDP data for the 6 countries shows the large drops in aggregate economic activity associated with economic crises, or periods of instability (see the shaded areas on the graphs in Panel 1). The latter part of this section will investigate to what extent these drops have permanent effects on long-run potential GDP growth, and also the ability of demand-side policies to counteract negative effects of crises – this is especially relevant in China, Korea and the Philippines. In countries like Mexico and Peru, instability at the aggregate level is associated with erratic demand-side policies which resulted in hyper-inflationary periods, where much of the Israeli instability had political origins. Even though by looking at Panel 2 no single EME in this group can claim to be a model of stability on the monetary side, it is clear that Mexico, Peru and Israel have had periods of wild inflation and interest rate movements. A corresponding change in the profile of GDP in the absence of these instabilities warrants a similar investigation into the long-run impact and the short-run responses to periods of crisis.

Panel 1: Seasonally Adjusted Real GDP for EMEs and Economic Crises



Panel 2: Nominal Interest Rate and Inflation Rate for EMEs



It is insightful to mention some historical developments regarding economic crises and stabilisation policy developments. The Chinese (Hong Kong) economy was affected by speculation in the wake of the 1997/1998 Asian crisis, while discretionary monetary policy, in an environment of developing money markets, has only been active since 1998, and fiscal policy is actively used as an expansionary tool (Ruogu, 2003; Green, 2005; Dullien, 2006). Israel experienced a stock market crash in 1983 in the midst of problematic fiscal policy, while recent fiscal policy reforms aim at rolling back the state. Regarding monetary policy, central bank reform towards the pursuit of long-term price stability started in the early 1980s, with the adoption of inflation targeting type policies since 1992 (Strawczynski & Zeira, 2007; Debrun, Epstein & Symansky, 2008).

Korea was deeply affected by the 1997/1998 Asian crisis, and subsequently revised the credit system, and ever since has been pursuing a managed float with inflation targeting type monetary policy (Eichengreen, 2004; Lee, Rhee & Sung, 2006). Mexico experienced hyper inflations and was severely affected by currency devaluation in 1994, and has since been operating independent monetary policy under a floating exchange rate (Carstens & Werner, 1999). Peru had a hyper-inflationary period from 1980 until 1990, after which currency reform in 1991 led to monetary policy with money-base control, and since 2002 this has changed to an inflation target type regime (Armas, 2003). The Philippine economy was also affected by the 1997/1998 Asian crisis, while fiscal problems during the 1980s were associated with a large scale debt crisis. Also, while operating under money-targeting monetary policy until 1990, gradual reform in the direction of inflation targeting has been implemented since 2002 (Lim, 2007). With these facts in mind, we can proceed with the econometric analysis.

3.2 ECONOMETRIC MODEL

This section, presenting the econometric model, is intended to show how the structural VAR is recovered from the reduced form VAR using the identifying restrictions. Although some of these details are adequately discussed by Blanchard & Quah (1989), Clarida & Gali (1994) and Du Plessis, Smit and Sturzenegger (2007), this section presents the analytical setup of the model setup for the sake of continuity and discusses the algebraic and econometric detail for the sake of clarity. It will become clear how assumptions about the aggregate economy translate into econometric restrictions on the model, and how this allows us to study the cyclicality of fiscal and monetary policy.

3.2.1 MODEL SETUP

We start with a three-variable Structural VAR model, with a 3 x 1 column vector $X_t \equiv [\Delta y_t \quad g_t \quad r_t]^{\mathrm{T}}$ for the variables, and a 3 x 1 column vector $\varepsilon_t \equiv [\varepsilon_t^y \quad \varepsilon_t^g \quad \varepsilon_t^r]^{\mathrm{T}}$ for the structural shocks associated with the variables. The moving average representation of the model is given in (3.1),

$$X_t = C_0\varepsilon_t + C_1\varepsilon_{t-1} + C_2\varepsilon_{t-2} + \cdots, \qquad \varepsilon_t \sim IID(0,\Omega) \qquad (3.1)$$

where C_0 defines the contemporaneous structural relationship between the shocks and the variables, C_1 the lagged relationship and so forth. The reduced form model is given in (3.2),

$$x_t = u_t + R_1 u_{t-1} + R_2 u_{t-2} + \cdots, \qquad u_t \sim IID(0,\Sigma). \qquad (3.2)$$

Because the structural model is unobservable, we estimate the reduced form model in (3.2). When estimating (3.2) the structural moving average the model is not directly recovered from the data, but rather recovered by estimating a VAR with reduced form shocks u_t as in (3.2). The Blanchard-Quah approach to identification implies that we do not have to make strong assumptions about the model dynamics. Instead, we recover the Structural VAR and its structural matrices C_i by imposing long-run restrictions on the variance-covariance matrix of (3.2). To this end, we assume there exists some non-singular matrix S such that $u_t = S\varepsilon_t$, which maps the DGP into the model. From (3.1) and (3.2), it is clear that $C_0 = S, C_1 = R_1 S, C_2 = R_2 S$ and $C(L) = R(L)S$ in general, where L is the lag operator. By substituting the result into (3.1) it follows that

$$u_t = C_0\varepsilon_t. \qquad (3.3)$$

We recover the reduced form shocks by our estimation of (3.2) and also an estimate of the symmetric variance-covariance matrix of the shocks in (3.2):

$$\Sigma = E(u_t u_t^T). \qquad (3.4)$$

Because the reduced form VAR in (3.2) is under-identified, it is impossible to recover C_0 and ε_t without additional restrictions. If we assume that the shocks are orthogonal to each other and have a unit variance, with no loss of generality, then by substituting (3.3) into (3.4) and solving for the expectation, $E(u_t u_t^T) = E(C_0 \varepsilon_t \varepsilon_t^T C_0^T) = E(C_0 I C_0^T)$, and finally

$$C_0 C_0^T = \Sigma. \tag{3.5}$$

The variance-covariance matrix in (3.5) is a system of 9 equations in 6 unknowns. So we need 3 additional restrictions for the system to be just-identified. Only then can we identify C_0, the structural shocks ε_t and the system dynamics C_i.

3.2.2 IDENTIFICATION

The Blanchard-Quah long-run restriction is that the demand shock does not affect output in the long run. This is consistent with the principles mentioned by Taylor (1997). The 3 additional restrictions required for identification (Du Plessis, Smit & Sturzenegger, 2007; Clarida & Gali, 1994) are represented as follows. Letting $C(1) \equiv C_0 + C_1 + C_2 + \cdots$ the restriction that neither fiscal nor monetary policy, the components of aggregate demand, have a long run effect on output is given by,

$$C_{12}(1) = C_{13}(1) = 0. \tag{3.6}$$

To complete the identification, the long-run effect of monetary policy on the fiscal policy stance is restricted to zero such that,

$$C_{23}(1) = 0. \tag{3.7}$$

The additional restrictions (3.6) and (3.7) yield a lower triangle matrix $C(1)$,

$$C(1) = \begin{bmatrix} C(1)_{11} & 0 & 0 \\ C(1)_{21} & C(1)_{22} & 0 \\ C(1)_{31} & C(1)_{32} & C(1)_{33} \end{bmatrix}. \tag{3.8}$$

Now, letting $R_0 \equiv I, R_1 \equiv C_1 C_0^{-1}, R_2 \equiv C_2 C_0^{-1}$ and so forth, then the reduced form VAR in (3.2) can be written as,

$$x_t = R_0 u_t + R_1 u_{t-1} + R_2 u_{t-2} + \cdots. \tag{3.9}$$

Since $R(1) \equiv R_0 + R_1 + R_2 \dots = C(1)C_0^{-1}$, we can obtain the matrix (3.10) and see that by substituting (3.5) into (3.10) we get the equivalent expression in (3.11) in terms of the restricted matrix $C(1)$ from the structural model. We now have,

$$R(1)\Sigma R(1)^T \tag{3.10}$$

and,

$$R(1)\Sigma R(1)^T = C(1)C(1)^T, \tag{3.11}$$

which can be computed from the estimates of Σ and $R(1)$. Now if H is the unique lower triangle Choleski decomposition of $R(1)\Sigma R(1)^T$, then $H = C(1)$ and by the definition of $R(1) \equiv C(1)C_0^{-1}$, then

$$C_0 = R(1)^{-1}H. \tag{3.12}$$

From the result in (12) we see that the restricted lower triangle matrix $C(1)$ identifies the structural matrix C_0 via our estimates obtained in the reduced form VAR. Practically speaking, we estimate the reduced form VAR in (3.2), calculate $R(1)$, compute the lower triangle Choleski matrix H and $HH^T = R(1)\Sigma R(1)^T$, then get an estimate of C_0 from the relation in (3.12). From this procedure we get the contemporaneous structural relationship, the system dynamics and the shocks in the system. This will allow for explicit study of the cyclicality of fiscal and monetary policy. All SVARs include 4 lags.

3.3 INNOVATION ACCOUNTING

Apart from providing support for the empirical usefulness of the identification scheme discussed in the previous section, the innovation accounting also gives a suggestive look at the response of variables to different shocks in the VAR system. In keeping with the issues addressed in this paper, the innovation accounting is used to gauge the cyclicality and transmission of fiscal and monetary policy. In the notation introduced above, the IRF is made up of the effects of the impact multipliers C_i via the structural shocks ε_t - these impact multipliers contain contemporaneous and cumulative effects of the shocks on the variables or short- and long-term effects. An appropriate summation of the effects yields the cumulative effect after *n* periods,

$$\sum_{i=0}^{n} C_{jk}(i), \qquad (3.13)$$

where i is the number of periods, $j = 1,2,3$ and $k = 1,2,3$, the rows and columns of the $C(1)$ matrix, and where $\sum_{i=0}^{\infty} C_{jk}(i)$ is finite because the variables in the system are stationary (Enders, 2004). The meaning of the long-run restrictions discussed in the previous section are immediately clear – when the cumulative effect of monetary and fiscal policy on output is restricted to zero in the long-run, as well as the effect of monetary policy on fiscal policy, we expect to see the restriction when we study the IRFs of the respective structural shocks. In this way, IRF analysis allows a consistency and stability check on model identification, to see whether the actual model for the given data set corresponds to our priors about the structure of the economy. Graphically, we see the IRF by plotting $C_{jk}(i)$ against i, which is a visual representation of the behaviour of the given series in X_t in response to the structural shock ε_t. We can also learn about the importance of the sources of these fluctuations by studying the relative contributions of each shock to the variation of the forecast errors of the variables in the system – this is the essence of variance decomposition. Formally, for any n-period ahead forecast, the forecast error is given by,

$$x_{t+n} - E_t x_{t+n} = \sum_{i=0}^{n-1} C_i \varepsilon_{t+n-i}. \qquad (3.14)$$

For the same forecast, the forecast error variance, denoted as $\sigma_{\Delta y}(n)^2$, is given by,

$$\sigma_{\Delta y}(n)^2 = \sigma_{\Delta y}^2\left[\sum C_{jk}(i)\right] + \sigma_g^2\left[\sum C_{jk}(i)\right] + \sigma_r^2\left[\sum C_{jk}(i)\right] \qquad (3.15)$$

where i is the number of lags in the model. From (3.15) we get the variance decomposition by simply dividing both sides by the forecast error variance, in which case they simply sum to 100, when expressed in terms of percentages. In this application we can gauge the relative importance of monetary and fiscal policy in contributing to variation in output.

3.3.1 RESULTS

Table 1 presents the findings about the cyclicality, coordination and transmission of fiscal and monetary policy, based on the innovation accounting. Worrisome pro-cyclical fiscal policy is identified in Peru and the Philippines while pro-cyclical monetary policy is observed for China and Israel. Otherwise fiscal and monetary policies have been mostly anti- or a-cyclical, while coordination varies from country to country. Variance decompositions suggest that the pro-cyclical policies have been quite aggressive which could add to, rather than subtract from output volatility. In China, Israel and Peru, monetary policy has a larger share in its contribution to the variability of output, whereas fiscal policy's contribution is larger for Korea, Mexico and the Philippines. Of course, these results are for the whole sample period, and the advantage of the historical decomposition is that we can observe the changes in policy behaviour over time to get a more nuanced picture. The next section delves deeper into the issues of policy responses and transmission.

Table 1: Innovation Accounting Results on Stabilisation Policy

	Cyclicality		Coordination		Transmission	
Country	Fiscal	Monetary	Fiscal	Monetary	Fiscal	Monetary
China	*anti/a*	*pro*	*accom*	*counter*	*1.5*	*4.0*
Israel	*anti/a*	*pro*	*counter*	*counter*	*4.9*	*6.3*
Korea	*anti/a*	*anti/a*	*counter*	*accom*	*16.8*	*1.0*
Mexico	*anti/a*	*anti*	*a*	*counter*	*23.9*	*1.3*
Peru	*pro*	*anti*	*accom*	*counter*	*2.8*	*17.1*
Philippines	*pro*	*anti*	*counter/a*	*a*	*38.8*	*1.2*

3.4 HISTORICAL DECOMPOSITION

Historical decomposition allows us to decompose the data, each variable in the system, into the sum of the accumulated shocks and a base projection - a type of in-sample forecast excluding all information contained in the shocks. From this we construct a new aggregate supply and demand series, which gives us a new measure of potential output. To see this from another perspective, following Fackler and McMillin (1998: 650), we can look at the technique algebraically. The structural model (3.1) can also be written as (3.16)

$$X_t = A_0 X_t + A_1 X_{t-1} + \cdots + A_p X_{t-p} + \varepsilon_t \tag{3.16}$$

Where A_i are structural coefficients and ε_t are structural shocks, the latter forming the basis of the moving average representation in (3.1). Reduced-form shocks are given by $u_t = (I - A_0)^{-1}\varepsilon_t = S\varepsilon_t$. If the reduced-form coefficient matrices are denoted as π_i, then $\pi(L) = (I - \pi_1 L - \cdots - \pi_p L^p)$, and the moving average matrix is given by $R(L) = [\pi(L)]^{-1}$.

This leads to the familiar moving average representation for the reduced-form VAR given in (3.2),

$$x_t = \pi(L)^{-1}u_t = R(L)u_t = \sum_{s=0}^{\infty} R_s u_{t-s}. \qquad (3.17)$$

Now, when the reduced-form VAR is rewritten in structural terms, the historical composition of the data becomes clear. The structural version of (3.17) is given purely by substitution as,

$$x_t = \sum_{s=0}^{\infty} R_s (I - A_0)^{-1}\varepsilon_t, \qquad (3.18)$$

$$= \sum_{s=0}^{\infty}[R_s(I - A_0)^{-1}](I - A_0)u_t \,, \qquad (3.19)$$

$$= \sum_{s=0}^{\infty} D_s \varepsilon_t. \qquad (3.20)$$

For a given period $t + j$ the structural representation of x_t can be written as,

$$x_{t+j} = \sum_{s=0}^{j-1} D_s \varepsilon_{t+j-s} + \sum_{s=j}^{\infty} D_s \varepsilon_{t+j-s}, \qquad (3.21)$$

which is the historical decomposition of the observed data. To make (3.21) easier to interpret, consider the case where $j = 1$,

$$x_{t+1} = D_o \varepsilon_{t+1} + \sum_{s=1}^{\infty} BP_t. \qquad (3.22)$$

The actual data at time $t + 1$ is the sum of the weighted mutually orthogonal structural shocks, summed over the period, plus the base projection of the data, conditional on the information available at time t.

3.4.1 RESULTS

Panel 3 shows the resulting decomposition of GDP into different cumulative supply and policy shocks, without the base projection. To complete the analysis of the cyclicality of stabilisation policy, we can determine whether demand-side shocks are correlated with supply-side shocks at business cycle frequencies, by using the historical decomposition.

Panel 3: Accumulated Supply, Fiscal and Monetary Shocks for EMEs

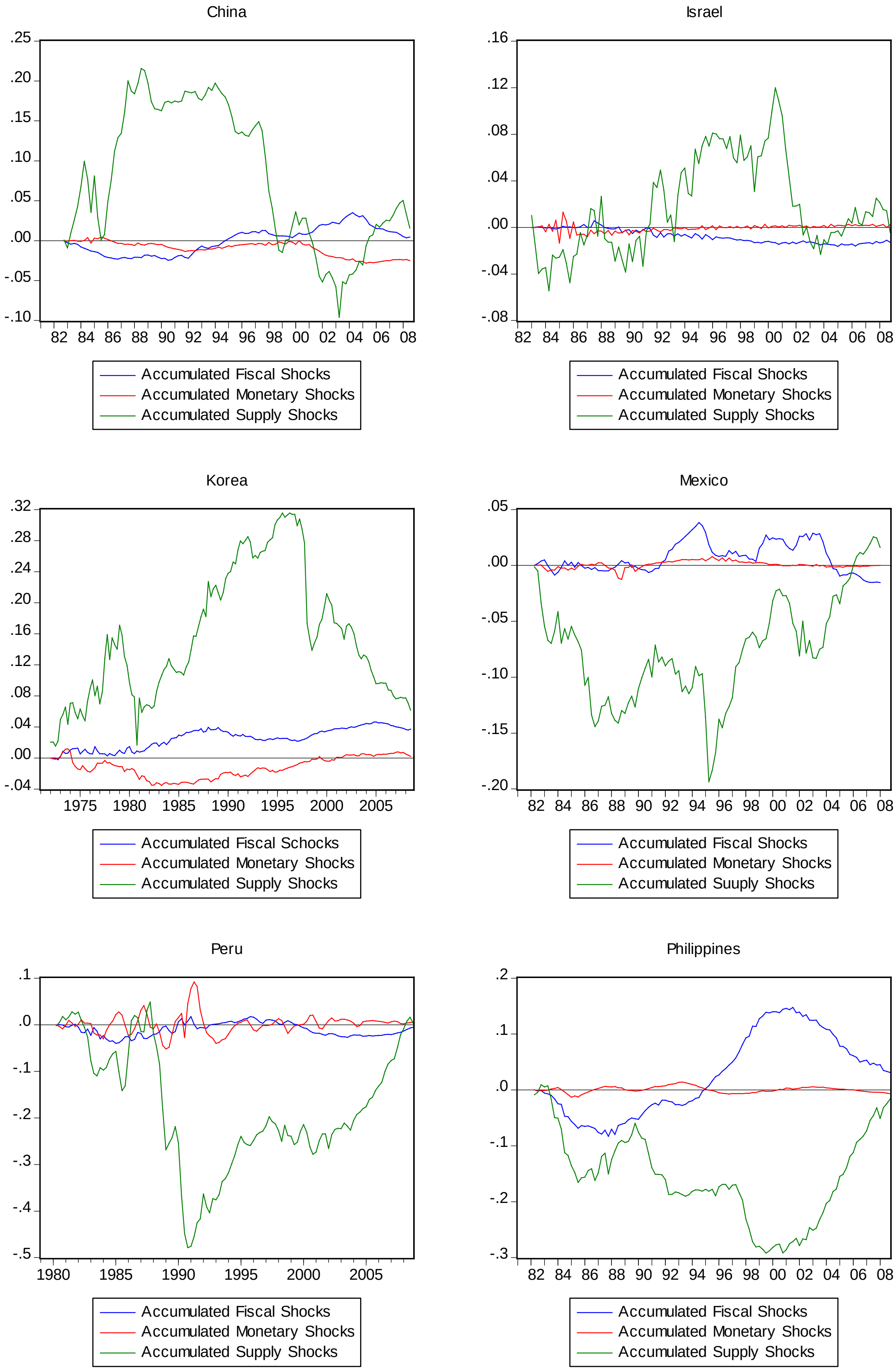


Table 2 shows the correlation of fiscal and monetary shocks with supply-shocks over different sample periods.

Table 2: Correlations Between Shocks: the Cyclicality of Stabilisation Policy

CHINA	**Fiscal Shock**	**Monetary Shock**	**Intra-policy**
1981q1-2008q4	-0.72	0.37	-0.61
1981q1-1990q1	-0.68	-0.81	0.45
1990q1-2000q1	-0.57	-0.77	0.74
2000q1-2008q4	-0.77	0.09	-0.40
ISRAEL			
1982q1-2008q4	-0.44	0.18	-0.49
1982q1-1990q1	0.43	-0.15	0.002
1990q1-2000q1	-0.70	0.63	-0.77
2000q1-2008q4	0.23	-0.13	-0.39
KOREA			
1971q1-2008q4	0.29	-0.20	0.18
1971q1-1980q1	0.18	-0.39	-0.34
1980q1-1990q1	0.86	0.16	-0.18
1990q1-2000q1	-0.68	-0.60	0.19
2000q1-2008q4	-0.43	-0.77	0.48
MEXICO			
1981q1-2008q4	-0.28	-0.25	0.45
1980q1-1990q1	0.23	0.14	-0.26
1990q1-2000q1	-0.05	-0.60	0.52
2000q1-2008q4	-0.85	-0.27	0.57
PERU			
1979q1-2008q1	-0.47	-0.09	-0.07
1979q1-1994q4	-0.56	-0.10	0.00
1994q1-2008q4	-0.36	0.19	-0.48
PHILIPPINES			
1980q1-2008q1	-0.62	-0.16	-0.09
1980q1-1990q1	0.90	0.27	-0.01
1990q1-2000q1	-0.86	0.23	-0.67
2000q1-2008q1	-0.99	-0.80	0.76

For China, fiscal policy has been counter-cyclical over the whole sample, while monetary policy turned pro-cyclical only over the last 10 years. Israeli fiscal and monetary policy has been pro- and anti- in turn, while Korean stabilisation policies show similar variation in its stance with improved cyclical conduct for the past two decades. Mexican stabilisation policy also shows improvement in its cyclical stance after the crisis-years before 1995. Peruvian fiscal policy has been consistently anti-cyclical while monetary policy has been both mildly anti- and pro-cyclical in turn. Lastly, fiscal policy in the Philippine economy has been either largely pro-cyclical or largely anti-cyclical, while monetary policy, after being pro-cyclical in the 1980s and the 1990s, turned anti-cyclical after 2000. Given the variation in policy behaviour over the sample period, and in order to study the extent of policy stabilisation in view of crisis events, we can do two things using the historical decomposition: firstly, form an expectation about the likely impact of fiscal and monetary policy on output volatility when compared to crisis-related shocks, and secondly do a counterfactual thought experiment in which we construct alternative GDP series which allow for the quantification of the contribution of fiscal and monetary shocks to output volatility. In this way the historical decomposition sheds light on the sources of volatility and on policy behaviour in the run up to, and the follow up after economic crises.

Table 3 shows that accumulated supply shocks are up to 8 times larger than accumulated demand shocks, in terms of standard deviations. Table 4 shows that fiscal shocks to GDP have been larger in all EMEs in the group except for Korea and Peru. Panels 4 and 5 represent the findings of these tables graphically: casual visual inspection of supply- and demand-shocks show that the culprit driving high EME output volatility is most likely to be supply-side shocks, although stabilisation policy may still make a difference.

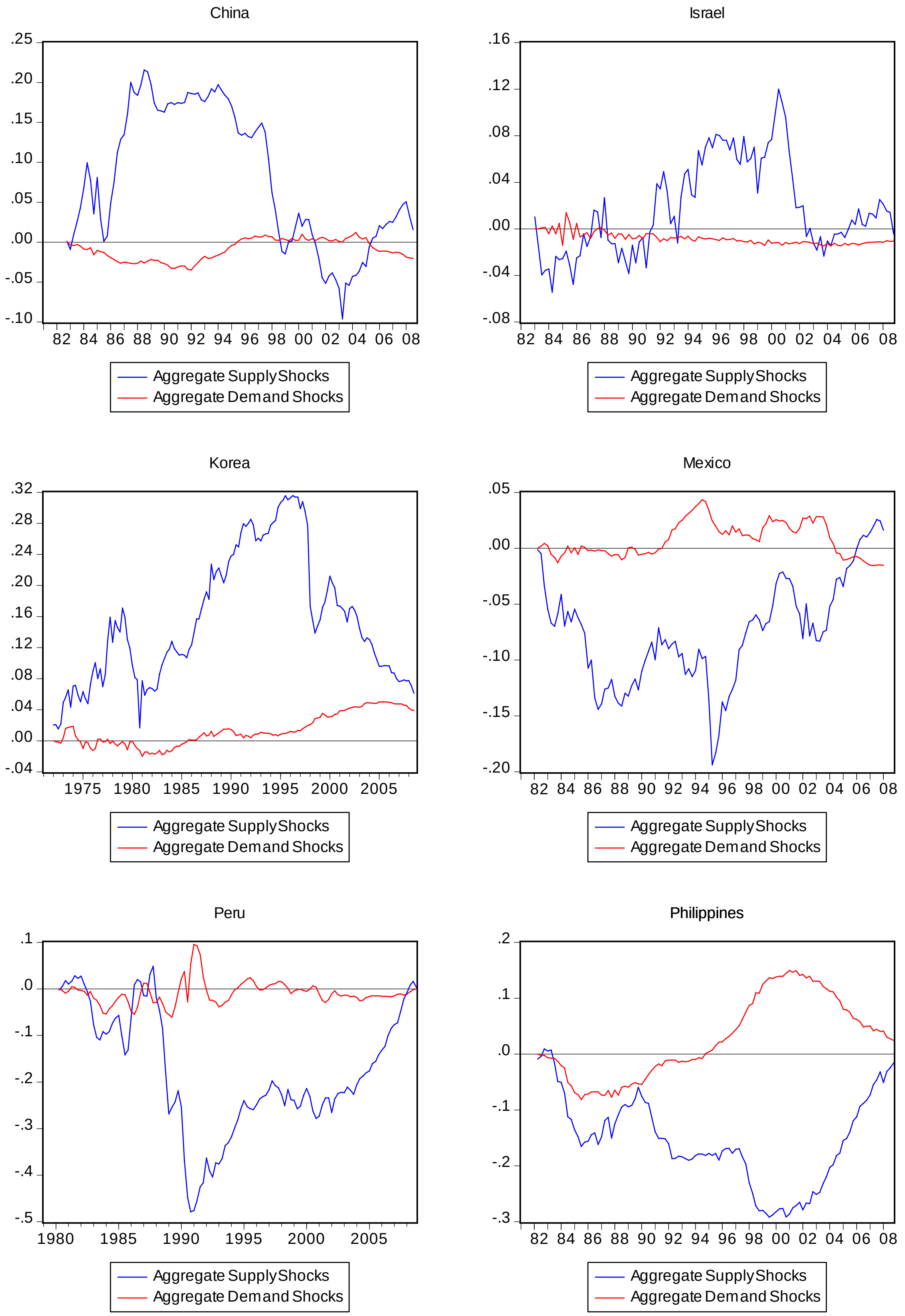
Table 3: Relative Size of Aggregate Shocks

Country	AS	AD	Factor
China	0.09	0.01	6.57
Israel	0.04	0.01	7.73
Korea	0.08	0.02	4.09
Mexico	0.05	0.02	3.12
Peru	0.13	0.03	5.29
Philippines	0.08	0.07	1.12

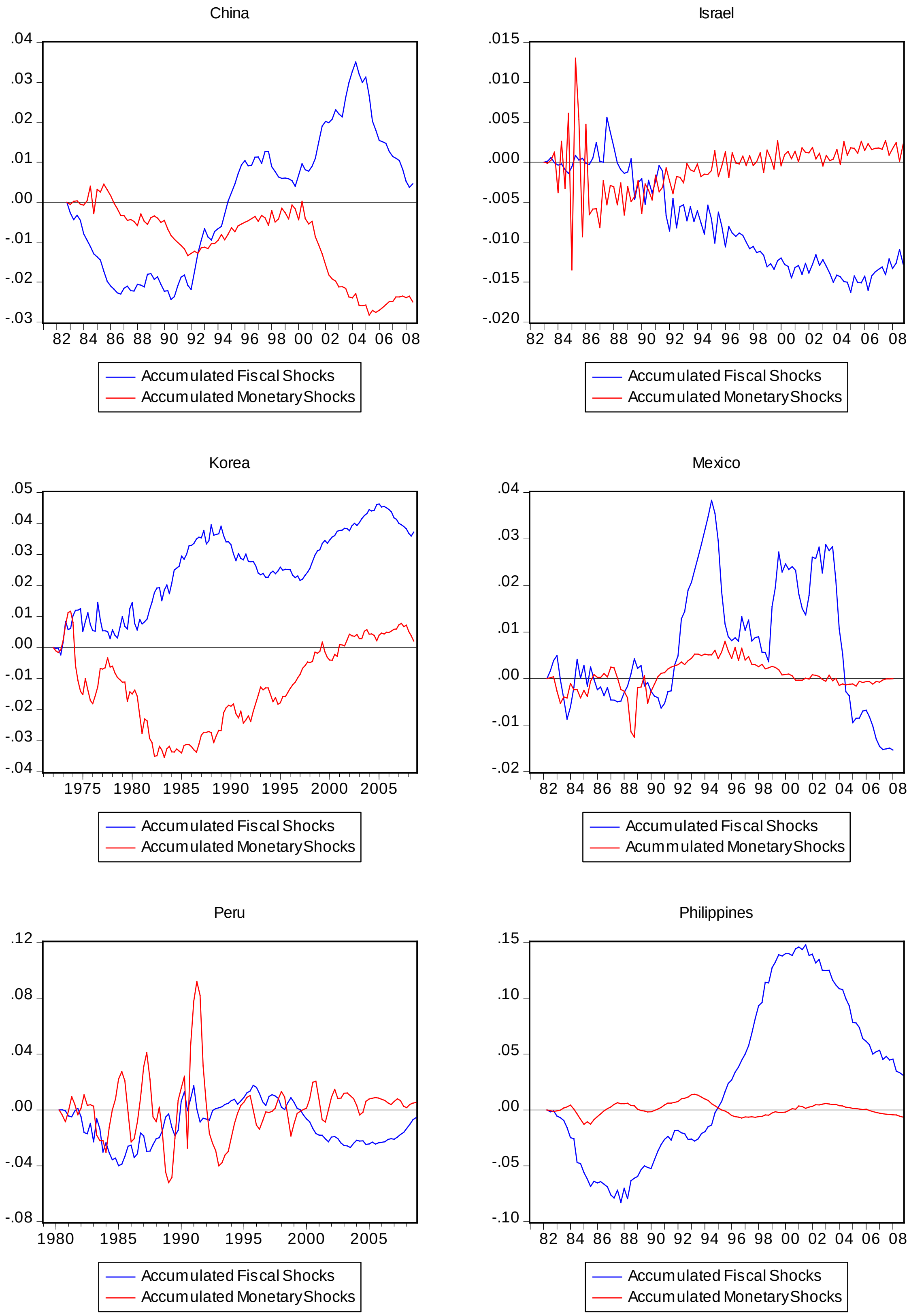
Table 4: Relative Size of Policy Shocks

Country	Fiscal	Monetary	Factor
China	0.02	0.01	1.80
Israel	0.006	0.003	1.75
Korea	0.0132	0.0133	0.99
Mexico	0.013	0.003	4.07
Peru	0.014	0.022	0.66
Philippines	0.07	0.01	13.17

Panel 4: Accumulated Supply and Demand Shocks to GDP



Panel 5: Accumulated Fiscal and Monetary Shocks to GDP



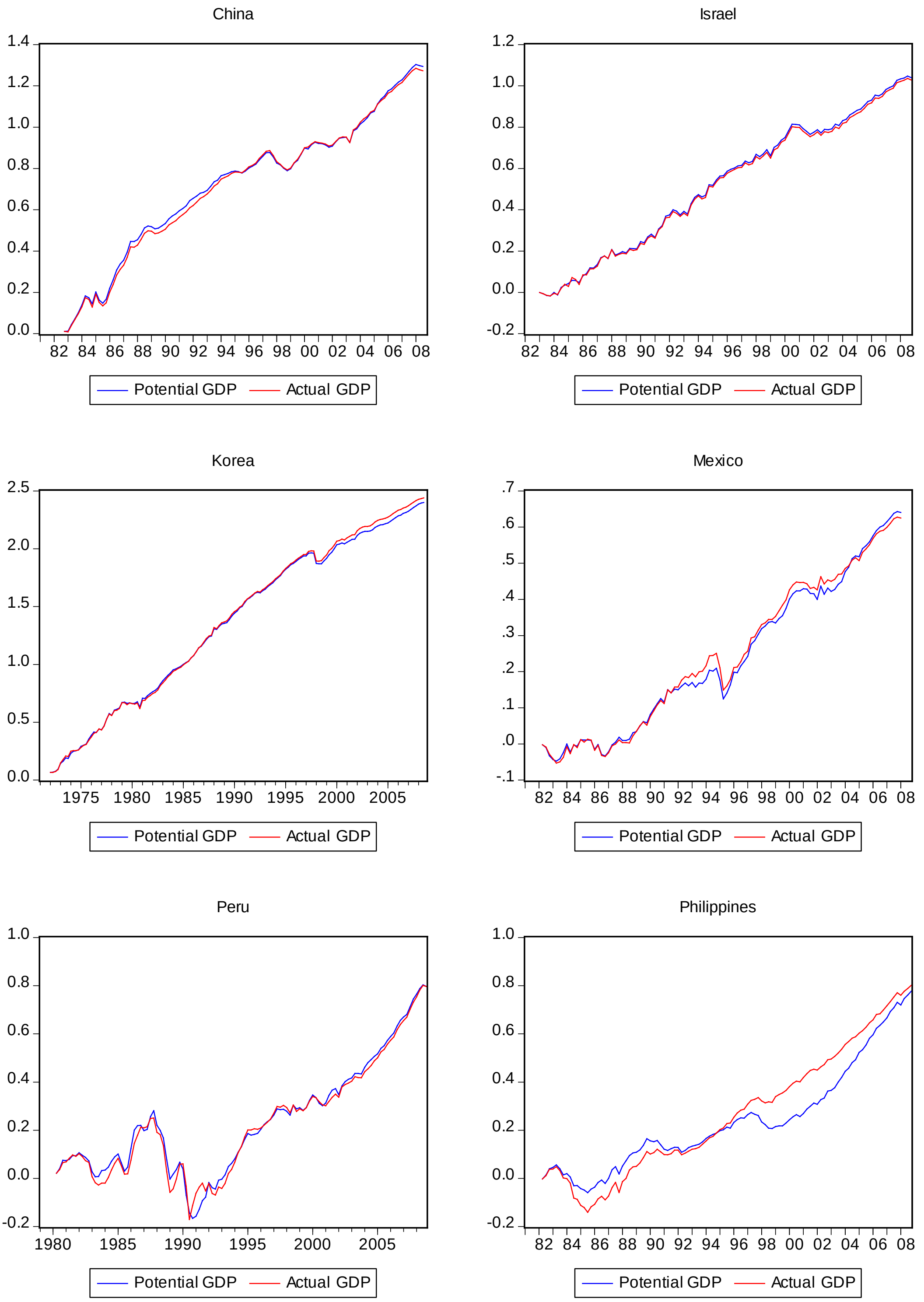
To conclude the analysis of the contribution of fiscal and monetary policy to output volatility, Table 5 presents the findings of the following counterfactual thought experiment: by how much would output have been more or less stable without policy shocks, both fiscal and monetary together, and without either? To get an answer we measure the standard deviation of GDP comparing it to what it would have been without various shocks.

Table 5: Counterfactual GDP Series and Volatility

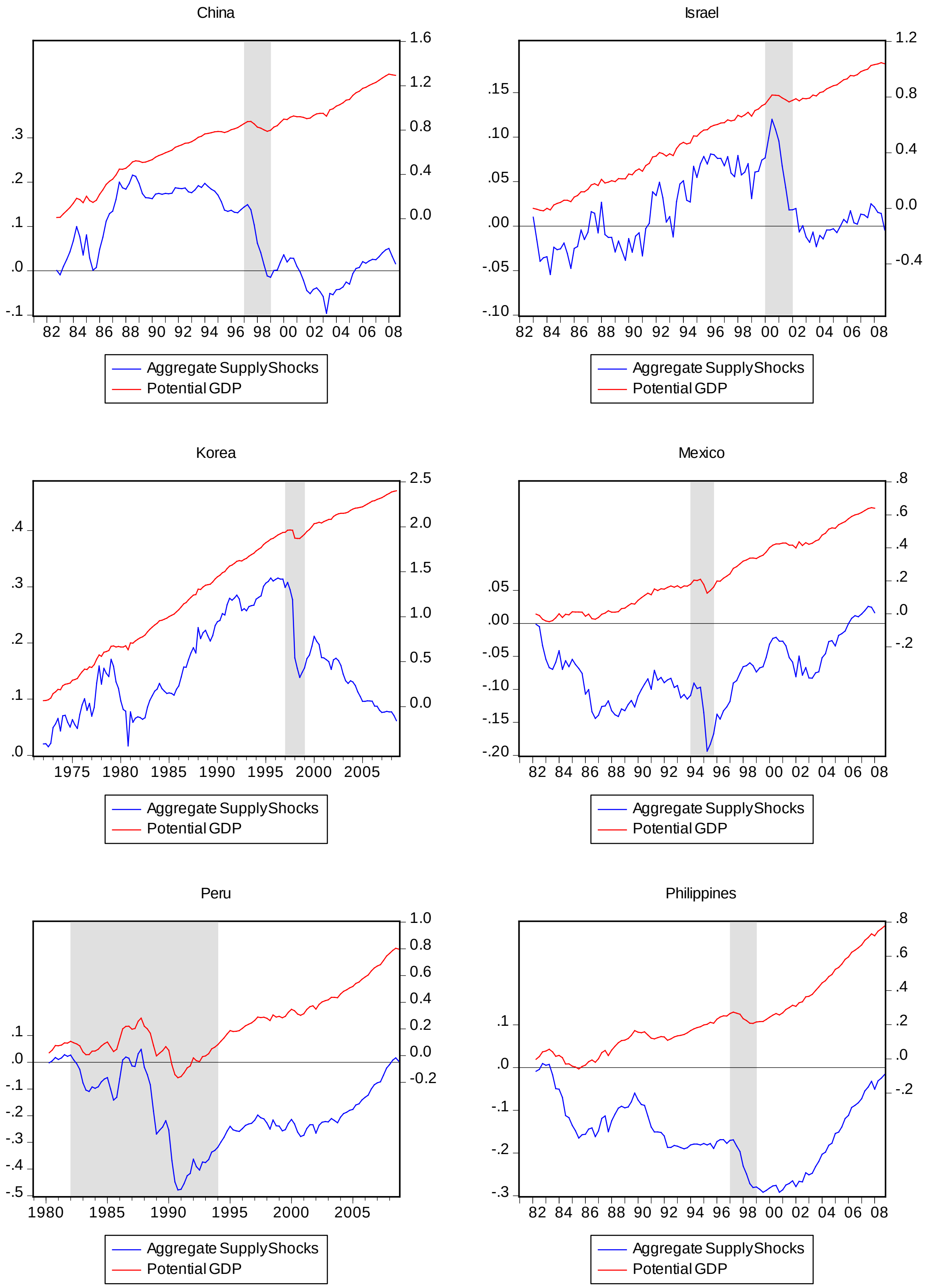
	Actual	No shocks	No fiscal shocks	No monetary shocks
CHINA				
Std Dev	0.339	0.334	0.327	0.346
% change		*-1%*	*-4%*	*2%*
ISRAEL				
Std Dev	0.321	0.325	0.327	0.319
% change		*1%*	*2%*	*0%*
KOREA				
Std Dev	0.722	0.706	0.711	0.717
% change		*-2%*	*-2%*	*-1%*
MEXICO				
Std Dev	0.212	0.210	0.211	0.212
% change		*-1%*	*-1%*	*0%*
PERU				
Std Dev	0.229	0.231	0.233	0.227
% change		*1%*	*2%*	*-1%*
PHILIPPINES				
Std Dev	0.263	0.216	0.215	0.264
% change		*-18%*	*-18%*	*0%*

With the exception of Israel and Peru, stabilisation policy has managed to increase output volatility from the miniscule amount of 1% in China and Mexico, or 2% in Korea, up to a massive 18% in the Philippines. In China, fiscal policy destabilised output by 4% while monetary policy stabilised by 2%. In Israel, fiscal policy managed to stabilise as a whole, while monetary policy has been neutral. Korean policies have been slightly negative, adding 2% and 1% from the fiscal and monetary sides respectively. Mexican monetary shocks have been neutral, but fiscal shocks added 1% volatility. Peruvian stabilisation was successful from the fiscal side with a 2% gain, but lost out on the monetary side with a 1% loss. In all of the above cases, the aggravated or dampened volatility has been negligible, but despite, on the whole, neutral monetary shocks in the Philippines, fiscal shocks managed to increase output volatility by 18%. Getting it wrong can indeed make a difference to volatility, but given the massive size of supply shocks when compared to demand shocks, it is not surprising that stabilisation policy could have done very little to counteract the crisis-related shocks experienced in these EMEs. It is also no surprise that both potential and actual GDP take a substantial knock in crisis times (see Panel 6 below). These crisis-related drops, in turn, are associated with large negative supply shocks (see Panel 7).

Panel 6: Potential and Actual GDP



Panel 7: Potential GDP and Supply Shocks in Response to Economic Crises



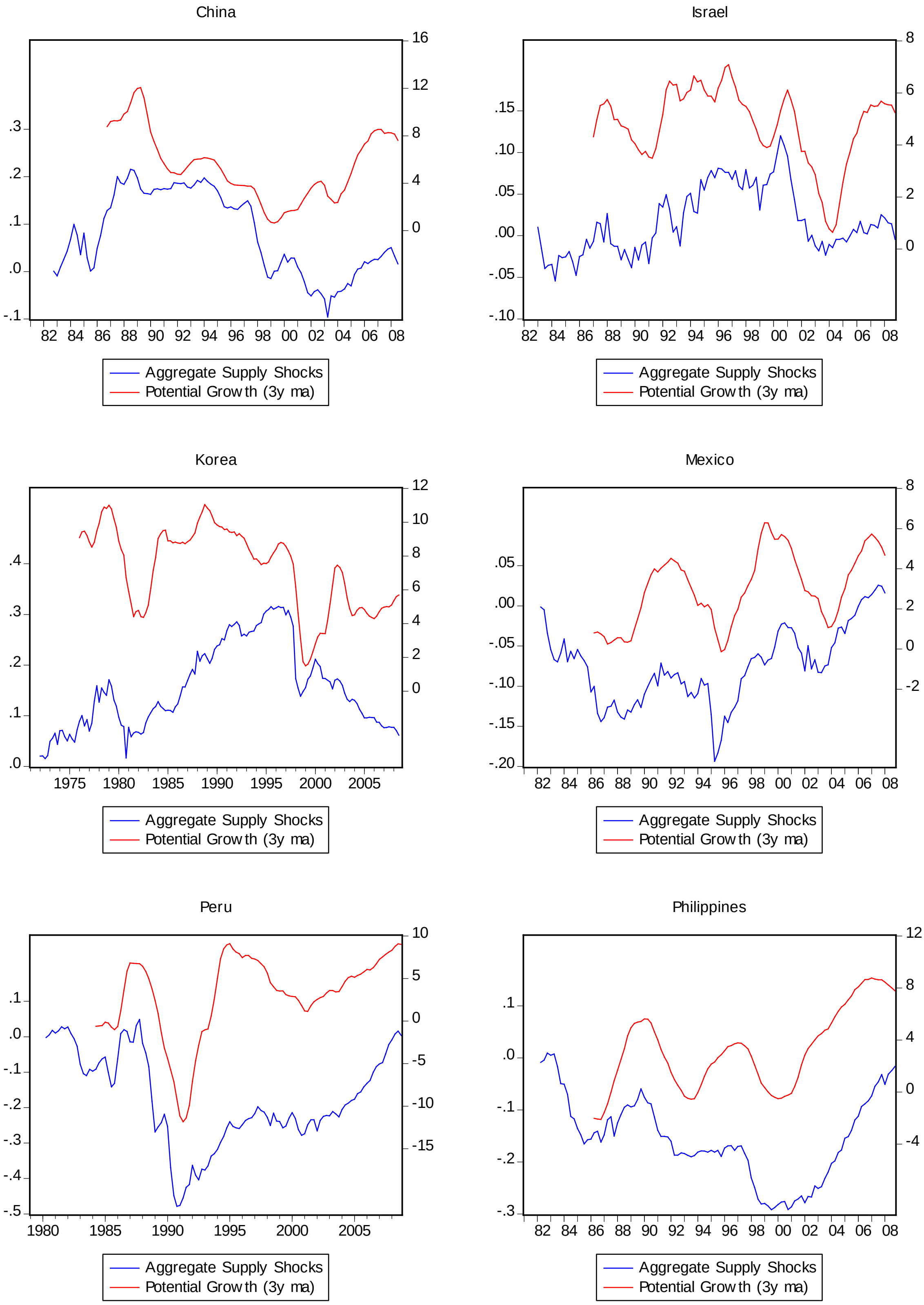
China, Korea and the Philippines experienced financial crises, while the Israeli political Intifada hit the economy alongside the dot-com bust in 2001. Mexico and Peru, on the other hand experienced crises-times with irresponsible inflationary policies and currency problems which led to prolonged periods of crises. One set of crises is short, sharp and deep, while the other is more protracted. The former is likely to negatively impact on potential GDP growth, while the latter is more in line with the lifting of a constraint on economic activity, rather than a massive shock to already existing production processes. We can use the new measure of potential GDP growth, as estimated but the SVAR model, to have a look at the range of effects that economic crises have had on the long-term dynamism of these EMEs: to what extent does the crisis affect long-run growth potential? Panel 8, showing that potential GDP growth moves tightly with supply shocks, hints that sustaining long-run growth potential relies on maintaining positive supply shocks in the wake of, and during economic crises. The results from the analysis of stabilisation policy also suggest that fiscal and monetary stabilisation can do little to cover ground lost on the supply side, although it can certainly make things worse if handled inappropriately.

Table 6: Potential GDP growth and Crises

	Overall	*sd*	*Time*	*Type*	Before	*sd*	After	*sd*	*Factor*
China	**5.28**	*4.74*	*1997q1*	*Financial*	**6.19**	*4.75*	**4.24**	*4.51*	*1.95*
Israel	**4.33**	*3.1*	*2000q1*	*Political*	**4.67**	*2.91*	**3.85**	*3.45*	*0.82*
Korea	**6.75**	*3.98*	*1997q1*	*Financial*	**7.97**	*3.14*	**4.2**	*4.3*	*3.77*
Mexico	**2.72**	*3.24*	*1995q4*	*Inflation*	**1.41**	*3.19*	**3.8**	*2.9*	*-2.39*
Peru	**2.96**	*7.3*	*1995q1*	*Inflation*	**1.14**	*9.58*	**4.93**	*2.9*	*-3.79*
Philippines	**2.93**	*3.95*	*2000q1*	*Financial*	**1.21**	*3.6*	**6.09**	*2.03*	*-4.88*

Table 6 presents the average potential GDP growth calculated from the SVAR estimate of potential GDP (that is, GDP unconstrained by demand), for periods before and after sudden crises, and for periods during and after prolonged crises. The results suggest that economic crises have a strong negative effect on potential GDP growth: EMEs that experienced financial crises, directly or indirectly, have potential GDP growth rates up to 3 percentage points lower than before the crisis, whereas EMEs that managed to rid themselves of hyper-inflationary and political crises gain up to 4 percentage points of potential GDP growth. Not only do crisis-induced supply shocks dominate the sources of output volatility in EMEs, but they also damage potential GDP growth to a meaningful extent; damage which, apart from an important supportive role played by fiscal and monetary stabilisation, is only fully reversible if supported by a supply-side recovery.

Panel 8: Potential GDP Growth and Supply Shocks



4. IMPLICATIONS

Reinhart & Rogoff (2008) find that serial default is "a nearly universal phenomenon as countries struggle to transform themselves from emerging markets to advanced economies" and that many other crises like inflation, exchange rate crises, banking crises and currency debasements, accompany these periods of default. Crises, as demonstrated since October 2008, often transmit from financial centres to more peripheral markets, and this has often been the case in EMEs. The economic crises experienced by these EMEs are, therefore, hardly unique. The analysis has shown that these crises are the main sources of output volatility and the demand-side stabilisation policy can play a limited but nonetheless important role in dampening or worsening fluctuations. The previous section also showed that when supply shocks continue to be negative in the wake of a sudden deep crisis, as for China, Israel and Korea, potential GDP growth does not recover until the supply shocks are reversed. When EMEs manage to rid themselves of prolonged inflationary and debt crises, as for Mexico, Peru and the Philippines, potential GDP growth picks up speed as supported by supply-side shocks. The crises typically make a 3% difference to potential GDP growth according to the SVAR analysis, which is roughly in line with the findings of Furceri & Mourourgane (2009).

Furcerci & Mourougane (2009) find that financial crises lower potential GDP growth for OECD countries from 1.5% to 2.4% on average, and that the effect takes 4 years to work through completely. This, and the findings of the previous section, takes the paper to the heart of the issue raised by Ramey & Ramey (1995) and Aghion & Banerjee (2005): the negative link between volatility and long-term growth. Of course, the actual content of the event that translates into the so-called volatility matters a great deal. Financial crises affect potential GDP growth through direct and indirect effects, such as (Furcerci & Mourougane, 2009): lower incentives to invest by increasing uncertainty and risk premia and increasing the cost of finance; prolonged and increased unemployment; a priori uncertain effects on total factor productivity; spiral into bad stabilisation policy, and so forth. Apart from the more direct negative links, the indirect link between the onset of crises and stabilisation policy responses is particularly important in this context.

The variables used to proxy for fiscal and monetary policy have excluded many important dimensions of actual stabilisation policy, such as whether the fiscal stimulus is financed by unsustainable debt run-up, or whether that debt is monetised, or whether interest rate movements weaken the balance of payments, leading to depreciations, devaluations and subsequent drops in real economic activity, for instance. In other words, although the identification scheme imposes the long-run restriction that demand shocks do not have permanent effects on the level of output, it is only approximately correct to do so. It is also not the case that there are no short-run feedbacks between aggregate demand and aggregate supply shocks. As the SVAR analysis has shown, getting stabilisation wrong in cyclical terms can add a substantial amount of volatility to output, and in the absence of a recovery on the supply side of the economy, appropriate demand-side measures can make an important difference by adding stability, and counteracting the negative effects of economic crises. The quantitative answers of this analysis, however, suggest that such stabilisation should be done in conjunction with supportive supply-side policy measures (institutional for instance) to be effective.

5. CONCLUSION

The paper used an SVAR model with long-run restrictions to study the dynamics of fiscal and monetary stabilisation policy in a group of EMEs. These dynamics have been characterised by responses to the phases of the business cycle and to economic crises. Results suggest that the main source of volatility in output is supply-side shocks, and that where stabilisation policy has been conducted appropriately, the stabilising effect has been quite small. When, however, policies have been pro-cyclical, volatility has seen quite dramatic increases. Apart from analysing these short-run policy responses and output fluctuations, the paper also looked at the long-run implications of economic crises for potential GDP growth and the role of stabilisation policy in supporting recoveries. Based on the SVAR estimates of potential GDP, and the identification of aggregate shocks, the paper shows that economic crises are associated with large negative supply shocks and that experiencing economic crises lower potential GDP growth by about 3%. This is only fully recovered once supply shocks become supportive, which means that stabilisation policy has a limited though important temporary role in cushioning the blow dealt by economic crises. For demand-side policies to become more effective, and for EMEs to lower volatility, it is necessary to institutionally support the supply side of the economy in ways that insulate against the adverse effects of economic crises and the associated negative impacts on real economic activity. This message is especially relevant in the context of the present global financial crisis and recession.

APPENDIX

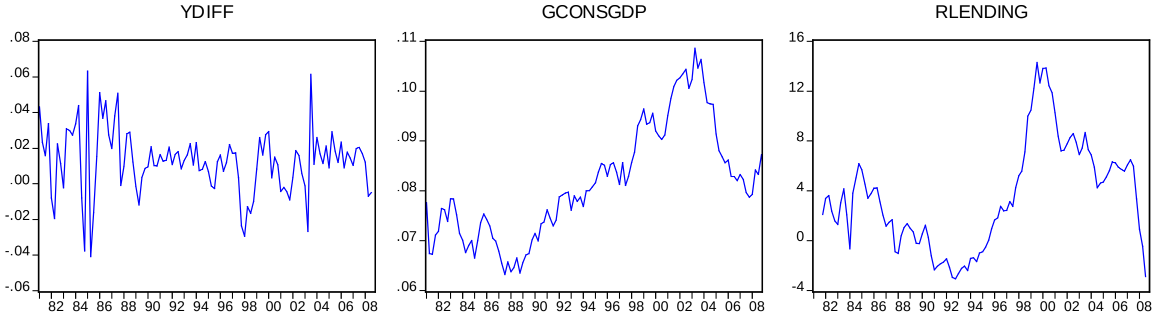
Table A1: Data Sources

Country	Source	GDP	GDP Deflator	Gov Cons	Interest Rate	Consumer Prices
China (HK)	IFS/IMF	53299B..ZF...	53299BIPZF...	53291F..ZF...	Censtadt*	53264...ZF...
Israel	IFS/IMF**	43699B..ZF...	43699BIPZF...	43691F..ZF...	43660P..ZF...	43664...ZF...
Korea	IFS/IMF	54299B..ZF...	54299BIPZF...	54291F..ZF...	54260...ZF...	54264...ZF...
Mexico	IFS/IMF	27399B.CZF...	27399BIRZF...	27391F.CZF...	27360L..ZF...	27364...ZF...
Peru	IFS/IMF	29399B..ZF...	29399BIPZF...	29391F..ZF...	29360...ZF...	29364...ZF...
Philippines	IFS/IMF	56699B..ZF...	56699BIPZF...	56691F..ZF...	56660C..ZF...	56664...ZF...

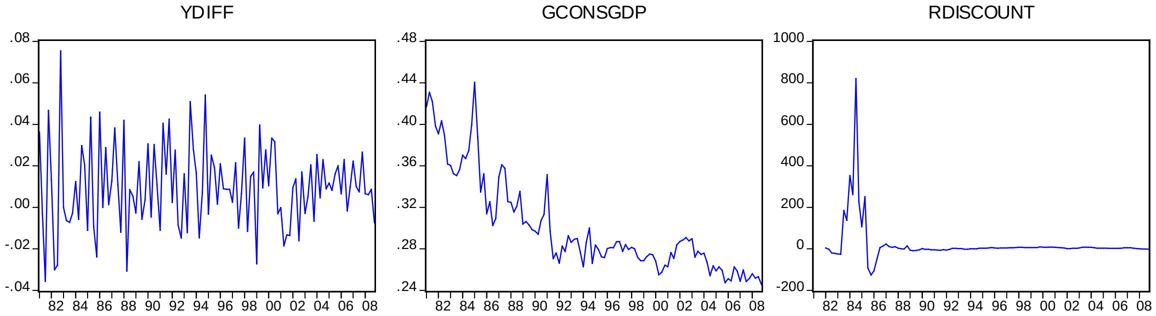
*www.info.gov.hk/censtadt/eng/hkstat/

**www.imfstatistics.org

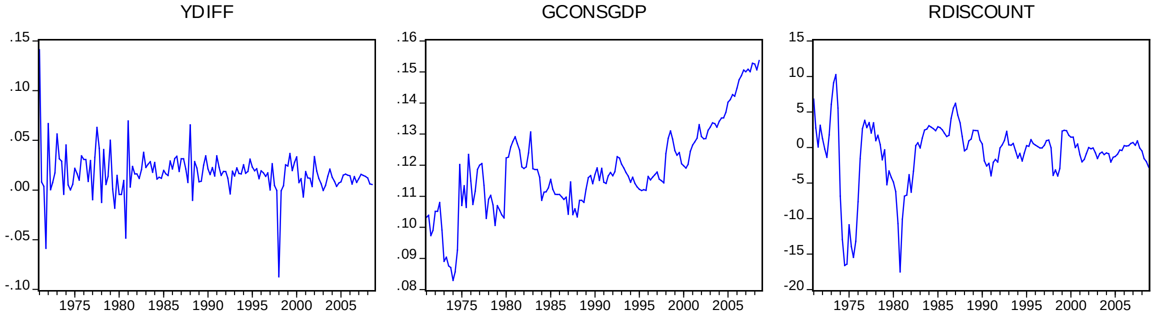
Panel A1: China Input Series



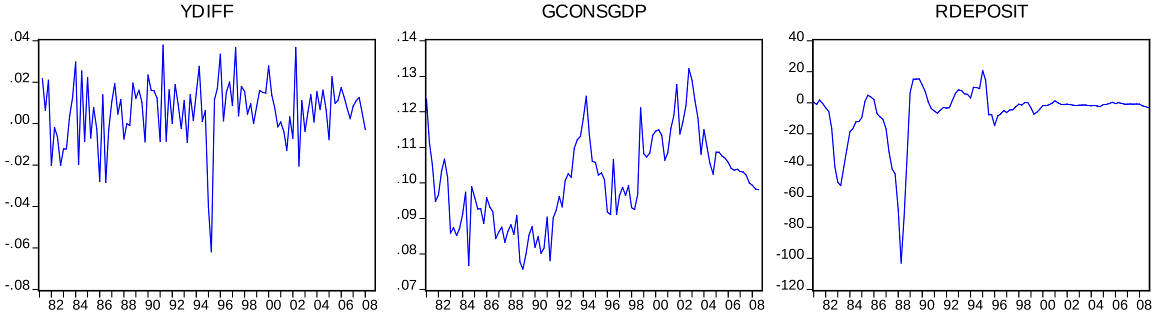
Panel A2: Israel Input Series



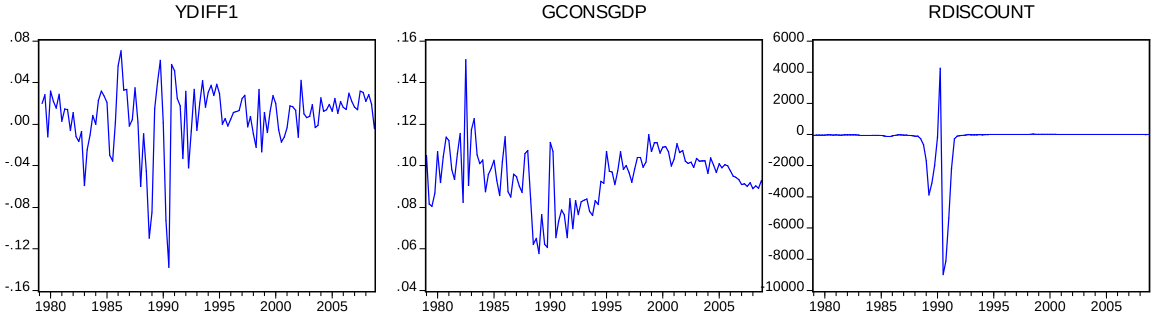
Panel A3: Korea Input Series



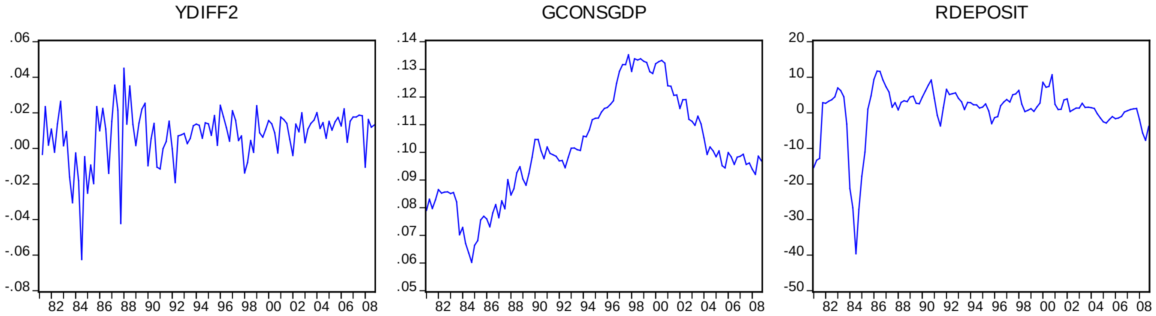
Panel A4: Mexico Input Series



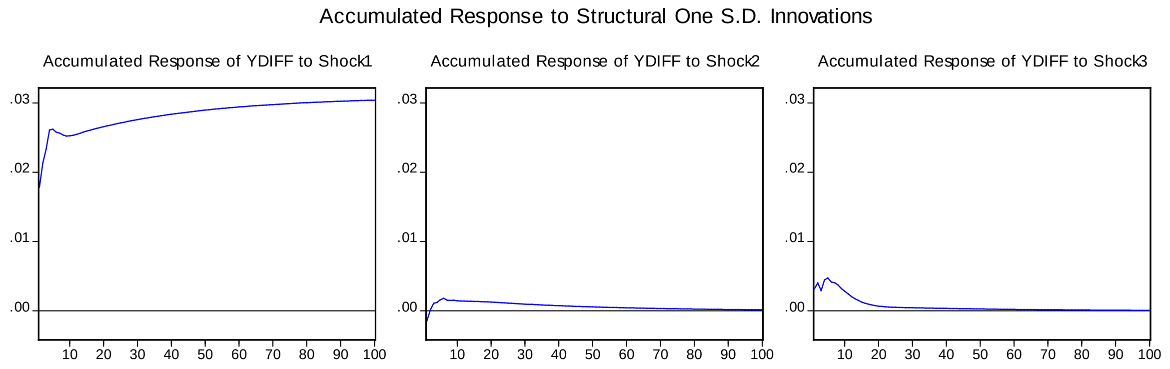
Panel A5: Peru Input Series



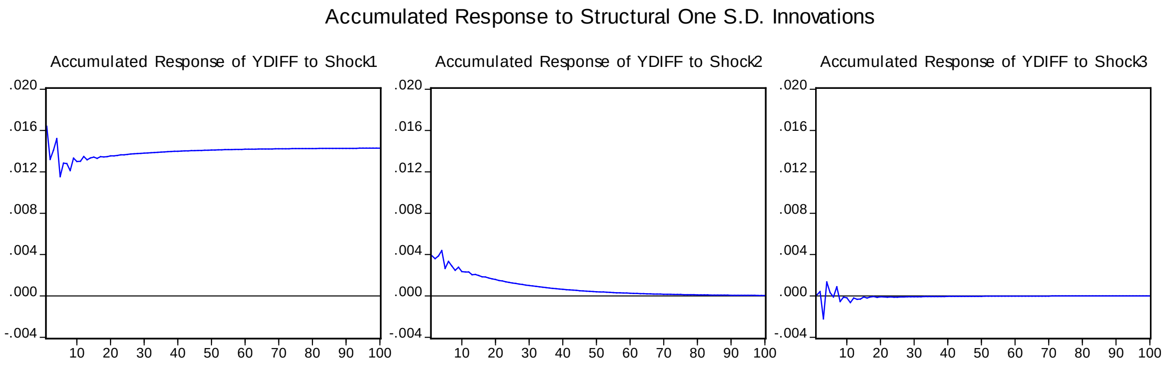
Panel A6: Philippines Input Series



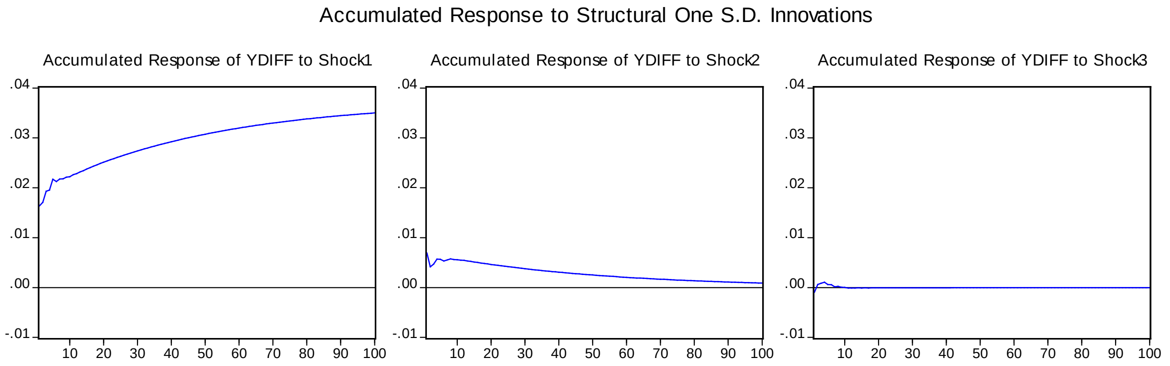
Panel A7: China Accumulated Impulse Response Functions



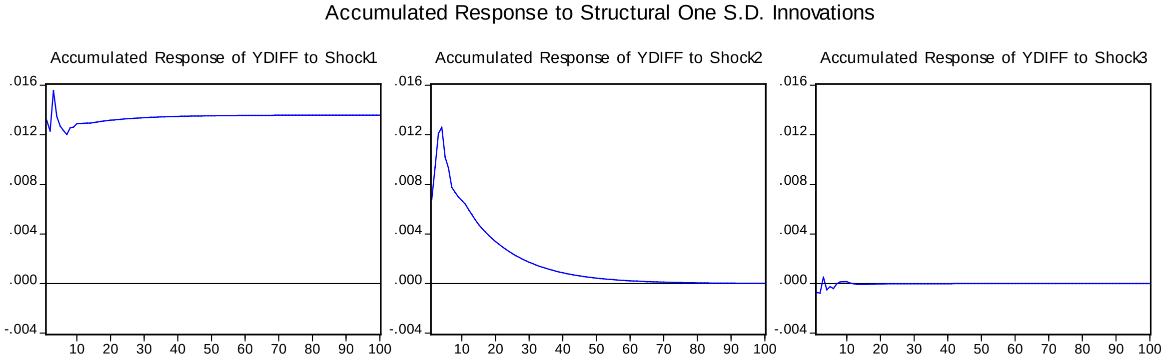
Panel A8: Israel Accumulated Impulse Response Functions



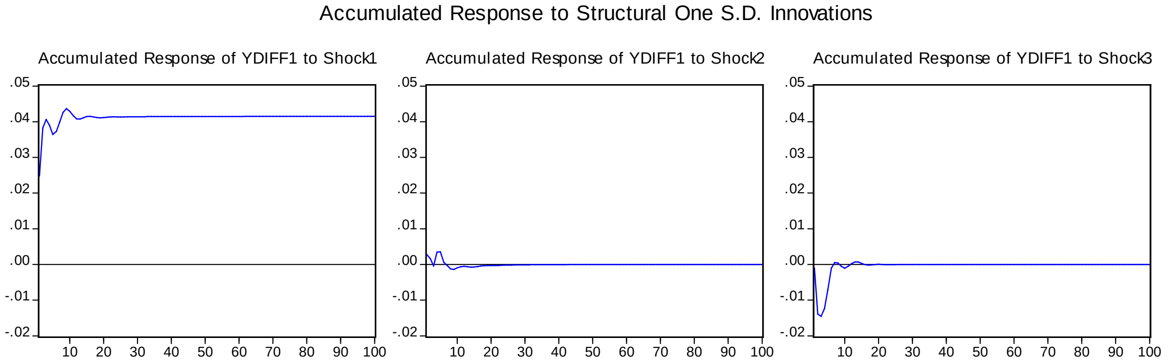
Panel A9: Korea Accumulated Impulse Response Functions



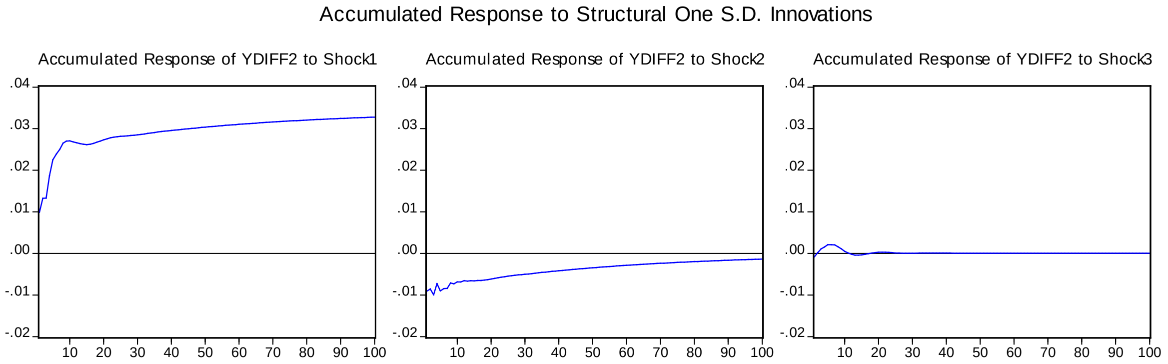
Panel A10: Mexico Accumulated Impulse Response Functions



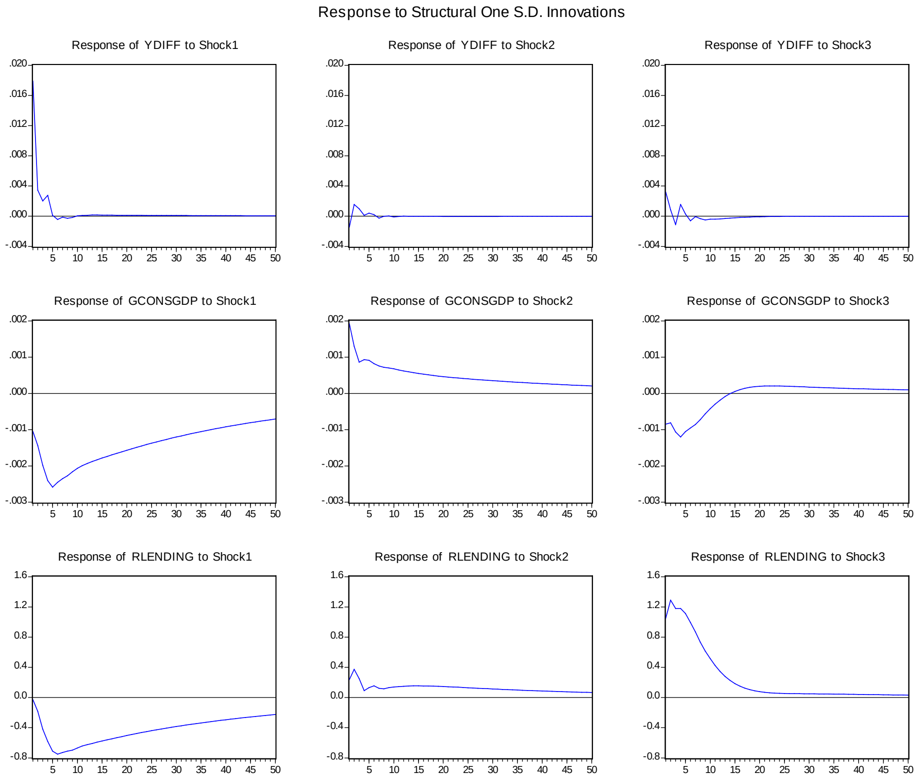
Panel A11: Peru Accumulated Impulse Response Functions



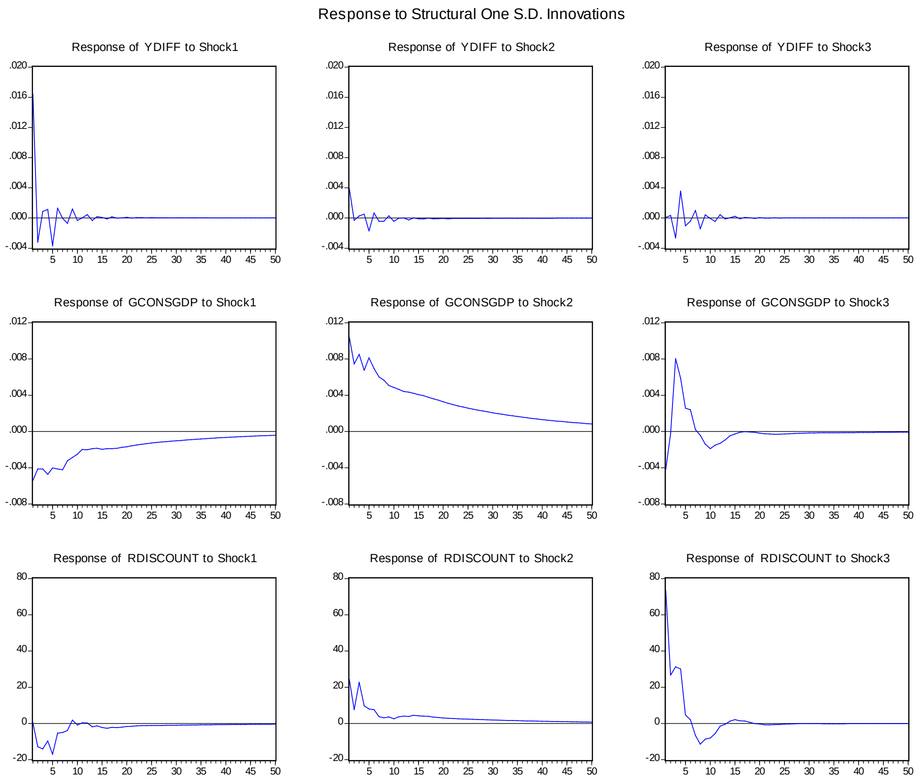
Panel A12: Philippines Accumulated Impulse Response Functions



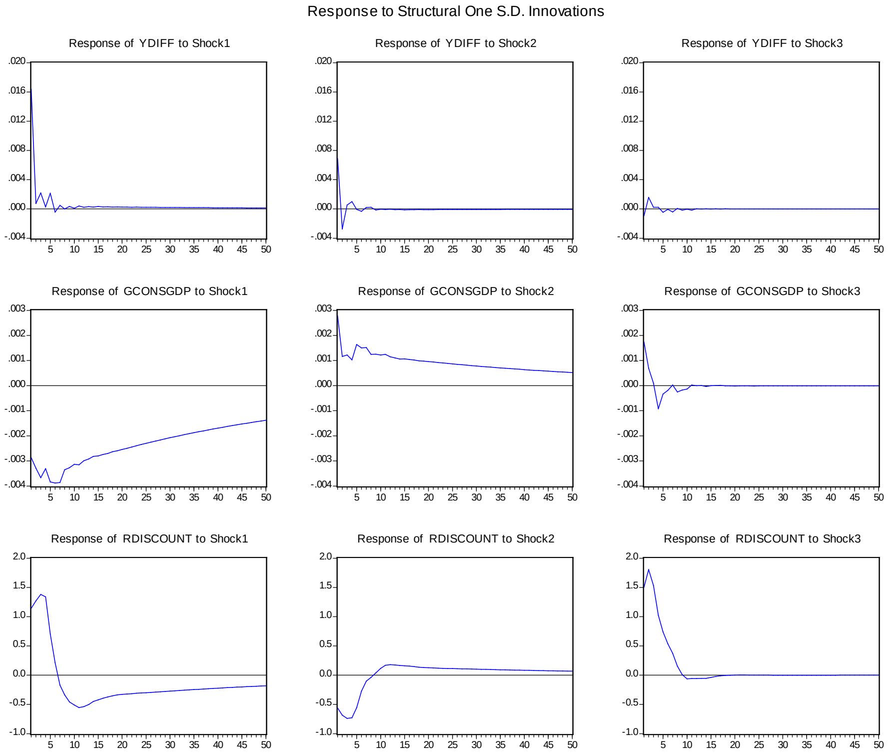
Panel A13: China IRFs



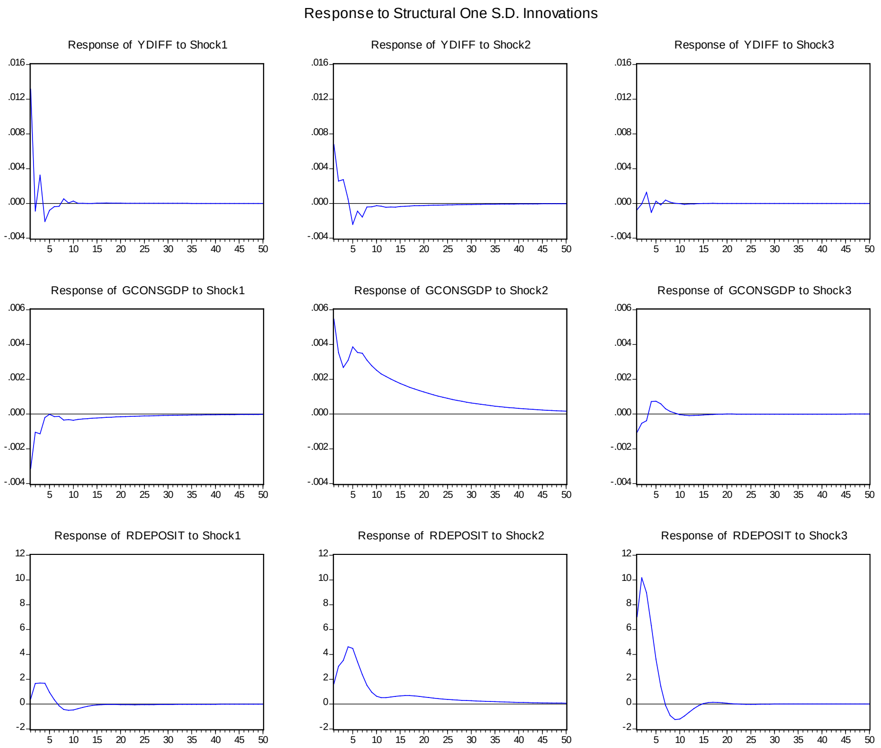
Panel A14: Israel IRFs



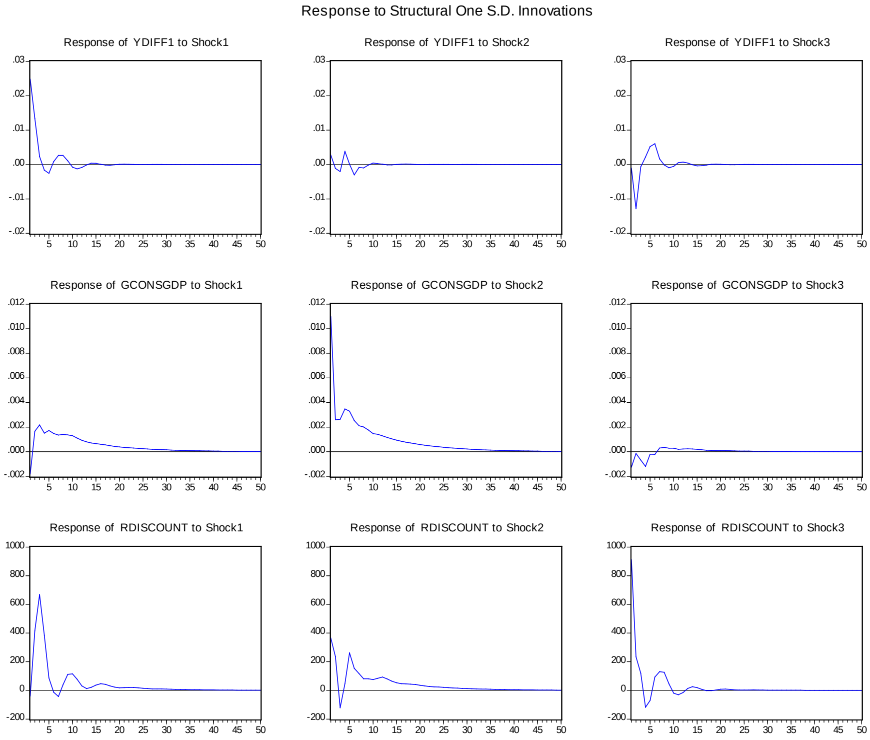
Panel A15: Korea IRFs



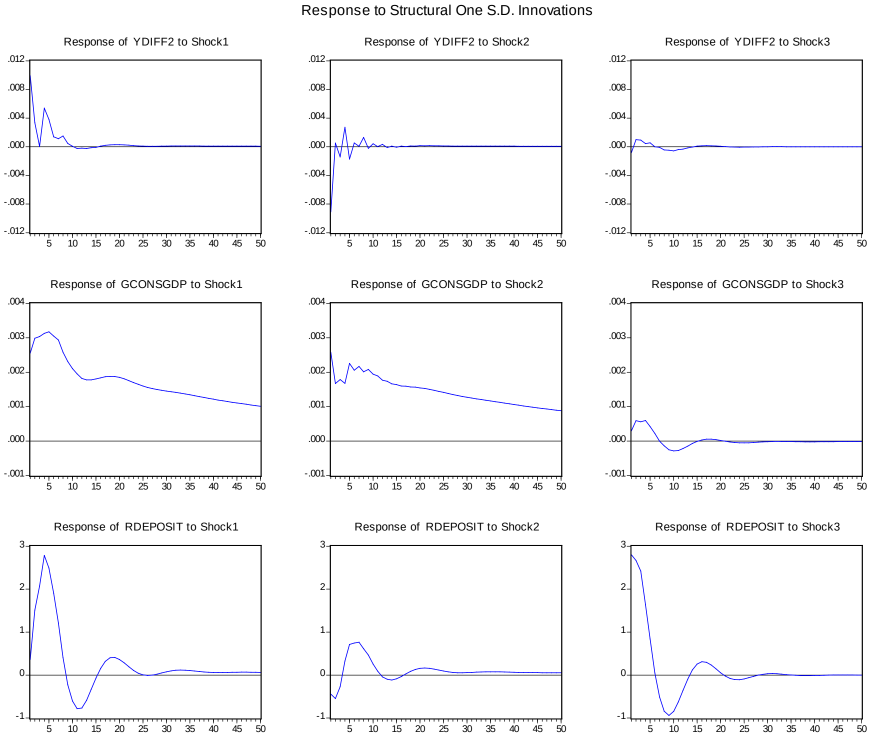
Panel A16: Mexico IRFs



Panel A17: Peru IRFs



Panel A18: Philippines IRFs



The results below present Ng & Perron (1996, 2001) unit root tests. MZa and MZt are interpreted like usual test statistics (a test statistic larger than the critical value rejects the null hypothesis), whereas for MSB and MPT a value less than the critical value rejects the null hypothesis.

Table A2: China Unit Root Tests

		MZa	MZt	MSB	MPT
Null Hypothesis: YDIFF has a unit root					
Ng-Perron test statistics		0.08952	0.06725	0.75124	35.2915
Asymptotic critical values:*	*1%*	*-13.8*	*-2.58*	*0.174*	*1.78*
	10%	*-5.7*	*-1.62*	*0.275*	*4.45*
Null Hypothesis: GCONSGDP has a unit root					
Ng-Perron test statistics		-2.70819	-1.11601	0.41208	8.87742
Asymptotic critical values:*	*1%*	*-13.8*	*-2.58*	*0.174*	*1.78*
	10%	*-5.7*	*-1.62*	*0.275*	*4.45*
Null Hypothesis: RLENDING has a unit root					
Ng-Perron test statistics		-6.17712	-1.66353	0.26931	4.27503
Asymptotic critical values:*	*1%*	*-13.8*	*-2.58*	*0.174*	*1.78*
	10%	*-5.7*	*-1.62*	*0.275*	*4.45*

Table A3: Israel Unit Root Tests

		MZa	MZt	MSB	MPT
Null Hypothesis: YDIFF has a unit root					
Ng-Perron test statistics		0.21463	0.18678	0.87023	46.3002
Asymptotic critical values:*	*1%*	*-13.8*	*-2.58*	*0.174*	*1.78*
	10%	*-5.7*	*-1.62*	*0.275*	*4.45*
Null Hypothesis: GCONSGDP has a unit root					
Ng-Perron test statistics		-0.76178	-0.39392	0.51711	17.2138
Asymptotic critical values:*	*1%*	*-13.8*	*-2.58*	*0.174*	*1.78*
	10%	*-5.7*	*-1.62*	*0.275*	*4.45*
Null Hypothesis: RDISCOUNT has a unit root					
Ng-Perron test statistics		*-21.0283*	*-3.24208*	*0.15418*	*1.16679*
Asymptotic critical values:*	*1%*	*-13.8*	*-2.58*	*0.174*	*1.78*
	10%	-5.7	-1.62	0.275	4.45

Table A4: Korea Unit Root Tests

		MZa	MZt	MSB	MPT
Null Hypothesis: YDIFF has a unit root					
Ng-Perron test statistics		*0.52456*	*1.33718*	*2.54913*	*372.764*
Asymptotic critical values:*	*1%*	*-13.8*	*-2.58*	*0.174*	*1.78*
	10%	-5.7	-1.62	0.275	4.45
Null Hypothesis: GCONSGDP has a unit root					
Ng-Perron test statistics		-1.00537	-0.33468	0.33289	10.8342
Asymptotic critical values:*	*1%*	*-13.8*	*-2.58*	*0.174*	*1.78*
	10%	*-5.7*	*-1.62*	*0.275*	*4.45*
Null Hypothesis: RDISCOUNT has a unit root					
Ng-Perron test statistics		-4.24995	-1.36985	0.32232	5.90382
Asymptotic critical values:*	*1%*	*-13.8*	*-2.58*	*0.174*	*1.78*
	10%	*-5.7*	*-1.62*	*0.275*	*4.45*

Table A5: Mexico Unit Root Tests

		MZa	MZt	MSB	MPT
Null Hypothesis: YDIFF has a unit root					
Ng-Perron test statistics		-0.40356	-0.29732	0.73674	30.4934
Asymptotic critical values:*	*1%*	*-13.8*	*-2.58*	*0.174*	*1.78*
	10%	*-5.7*	*-1.62*	*0.275*	*4.45*
Null Hypothesis: GCONSGDP has a unit root					
Ng-Perron test statistics		-3.74731	-1.3013	0.34726	6.5764
Asymptotic critical values:*	*1%*	*-13.8*	*-2.58*	*0.174*	*1.78*
	10%	*-5.7*	*-1.62*	*0.275*	*4.45*
Null Hypothesis: RDEPOSIT has a unit root					
Ng-Perron test statistics		-11.826	-2.43144	0.2056	2.07263
Asymptotic critical values:*	*1%*	*-13.8*	*-2.58*	*0.174*	*1.78*
	10%	*-5.7*	*-1.62*	*0.275*	*4.45*

Table A6: Peru Unit Root Tests

		MZa	MZt	MSB	MPT
Null Hypothesis: YDIFF1 has a unit root					
Ng-Perron test statistics		-8.20876	-2.00325	0.24404	3.0727
Asymptotic critical values*:	1%	-13.8	-2.58	0.174	1.78
	10%	-5.7	-1.62	0.275	4.45
Null Hypothesis: GCONSGDP has a unit root					
Ng-Perron test statistics		-2.5975	-1.10632	0.42592	9.2887
Asymptotic critical values*:	1%	-13.8	-2.58	0.174	1.78
	10%	-5.7	-1.62	0.275	4.45
Null Hypothesis: RDISCOUNT has a unit root					
Ng-Perron test statistics		-11.1958	-2.36564	0.2113	2.18973
Asymptotic critical values*:	1%	-13.8	-2.58	0.174	1.78
	10%	-5.7	-1.62	0.275	4.45

Table A7: Philippines Unit Root Tests

		MZa	MZt	MSB	MPT
Null Hypothesis: YDIFF2 has a unit root					
Ng-Perron test statistics		-9.15939	-2.13741	0.23336	2.68525
Asymptotic critical values*:	1%	-13.8	-2.58	0.174	1.78
	10%	-5.7	-1.62	0.275	4.45
Null Hypothesis: GCONSGDP has a unit root					
Ng-Perron test statistics		-1.55239	-0.87284	0.56226	15.6187
Asymptotic critical values*:	1%	-13.8	-2.58	0.174	1.78
	10%	-5.7	-1.62	0.275	4.45
Null Hypothesis: RDEPOSIT has a unit root					
Ng-Perron test statistics		-12.8518	-2.50571	0.19497	2.02165
Asymptotic critical values*:	1%	-13.8	-2.58	0.174	1.78
	10%	-5.7	-1.62	0.275	4.45

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