**DEPARTMENT OF ECONOMICS**
UNIVERSITY OF STELLENBOSCH

# FISCAL AND MONETARY POLICY AND OUTPUT VOLATILITY IN EMERGING MARKET ECONOMIES

LEON DU TOIT

*Assignment presented in partial fulfilment of the requirements for the degree of Master's of Commerce at the University of Stellenbosch.*

SUPERVISOR: PROF STAN DU PLESSIS

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DECLARATION

I, the undersigned, hereby declare that the work contained in this assignment is my original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Signature……………………

Date:………………………..

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## INTRODUCTION

*In science, as against careerism or pure mathematics, it is better to be approximately correct and scientifically relevant than it is to be precisely correct but humanly irrelevant.*

STEPHEN T. ZILIAK & DEIRDRE N. McCLOSKEY 2008, 246

*Persons who choose to become economists, at the century's end, are those who are attracted by the analytical properties of the models manipulated rather than by the success or failure of such models in offering improved understanding of economic reality...But at the same time, any maintenance of an integrating vision for economics must hold fast to the central scientific content of the discipline...The constraining parameters, at least in large part, are themselves subject to deliberative change, reform and reconstruction.*

JAMES M. BUCHANAN 1997, 9-10

This paper investigates the business cycle dynamics of fiscal and monetary policy in a group of Emerging Market Economies (hence EMEs) and finds evidence supporting the argument that better demand-side policies can improve the stability of an economy. Supply-side factors on the other hand also have an extremely important role to play in the extent of macroeconomic volatility an economy experiences. This quantitative claim about the relative contributions of demand and supply shocks to output volatility throughout the recent history of the respective EMEs is the heart of the investigation. As a consequence of this, most of the content concentrates on defending the validity of this claim and fleshing out the economic implications of how fiscal and monetary policy was conducted in the group of EMEs over the last 28 years. The findings presented here contribute to the empirical business cycle literature and to the analysis of fiscal and monetary policy conduct.

As will be discussed shortly, this research is an extension of recent work on similar empirical and normative stabilisation policy issues in South Africa (Du Plessis, Smit & Sturzenegger, 2007a & 2007b; Du Plessis, 2006). It is the author's opinion that this empirical study can help improve, in the words of business cycle research pioneers Burns and Mitchell (1946: 4), "our understanding of the recurrent fluctuations in economic fortune that modern nations experience". But this research and the potentially improved understanding it can provide, have important practical implications: if the deliberative reforms of existing macroeconomic policy institutions are to make any economic sense, then the reforms must be based on a nuanced understanding of both the inner workings of these institutions, and also their empirical track record. It is to the latter part of this practical economic problem that this paper contributes.

The paper is structured as follows. Section 1 clarifies the research question in the light of recent empirical business cycle research, and contextualises the role of the empirical debate with respect to normative policy issues. It starts by discussing recent work on the issues of output volatility and the cyclicality of fiscal and monetary policy in South Africa. The South African debate is instructive in the EME context because South Africa is itself an EME, and the empirical literature is already quite deep (see, for example, Burger, 2008; Kotze & Du Plessis, 2008; Du Plessis, Smit & Sturzenegger, 2007a & 2007b; Du Plessis & Boshoff, 2007; Du Plessis, 2006). Section 1 shows that other EMEs share similar problems and characteristics providing a base for a natural extension of some of the South African economic literature to a group of EMEs. There is as much disagreement in the broader EME literature as in the South African case if not more, and this section shows exactly which gap this paper will attempt to fill, methodologically and substantively.

There is wide-spread agreement that output volatility in EMEs is higher than in developed countries, and that it matters in terms of economic welfare. Important issues in the literature are the sources of volatility (Burger, 2008), the timing of changes therein (Kotze & Du Plessis, 2008), and the roles of fiscal and monetary policy. Although there is some agreement about the timing and extent of the overall changes in volatility, active research is engaged in getting a clearer picture about the relative roles of supply- and demand-side shocks, and more specifically the contributions of fiscal and monetary policy. All of this empirical work takes place against the backdrop of a much older and still heated debate about the appropriate role of stabilisation policy in a modern nation-state’s economy (see, for example, Friedman, 1968; Modigliani, 1977; Lucas, 1987 & 2003; Plosser, 1989; Taylor, 1997; Mundell, 2000; Prescott, 2004).

One of the claims defended in this paper, and one which makes the papers’ findings a valuable contribution to the literature, is that the empirical method used overcomes many of the shortcoming of other methods, used in attempts to answer similar questions. Section 2 introduces the relevant methodological literature in the context of a practical and theoretically consistent macroeconomic framework of analysis. In order to stay true to the ‘core principles’ of modern macroeconomics (Taylor, 1997), the paper defends the choice of method to the extent that it allows an appropriate macroeconomic investigation of the empirical issue. The literature review in Section 2 is structured around a discussion of how the choice of method is appropriate, because it allows a theoretically-grounded dynamic multivariate analysis of an inherently multi-variable and dynamic phenomenon.

Section 3 presents and discusses the empirical findings of the structural Vector Auto Regression analysis, hence SVAR analysis. The paper uses a SVAR analysis to analyse the extent to which cyclical fiscal and monetary policies have contributed to output volatility – this method was recently used with great success in the South African case by Du Plessis, Smit and Sturzenegger (2007a & 2007b). As mentioned before, the study is limited to a group of EMEs: China (Hong Kong), Israel, Korea (South), Mexico, Peru and Philippines. These countries have experienced much higher output volatility over the past three decades, when compared to developed countries. Considering this, and in view of the ongoing normative discussions about the appropriate role for stabilisation policies, it is important to determine how and to what extent the cyclicality of fiscal and monetary policies has contributed to this high level of output volatility. Would this group of EMEs have been in a different range of volatility had their policies been conducted in a more appropriate manner? How large would the difference be?

Another deep and ongoing debate is the relative importance of supply- and demand-side policies, and the findings of this section contribute to this debate. By conducting a counterfactual policy simulation in the spirit of Du Plessis et al. (2007a) the paper finds, in Section 3, that supply shocks contribute to output volatility to an important extent. But where demand-side policies have been good, they have contributed to up to 13% more stable output, in terms of standard deviation, and where they have been bad, output volatility has increased by up to 18%. Aggregate supply shocks are at least 3 times larger than that of aggregate demand, and up to 38 times larger in some cases. Because these shocks are fundamentally different in nature, it is suggested in section 3 that both play an important but very different role in the extent of output volatility in these EMEs.

Section 4 works out the main implications of the empirical findings, in terms of the existing and ongoing literature, and also for guides to practical macroeconomic policy-making in the spirit of Taylor (1997). Section 3 hints at the difference between aggregate supply and aggregate demand shocks, and explicitly investigates the dynamic interaction between them by way of an empirical model. The model-based counterfactual simulation is useful up to a point, but any nuanced policy analysis must analyse policy in a strategic behavioural setting, incorporating the dynamic effects of expectations. Section 4 sketches the main implications that the empirical findings have for such an analysis. Due to lack of space Section 4 is brief and suggestive, but it remains useful as a basis for further discussion of the results. Technical appendices accompanying the main text are presented after the conclusion in Section 5, while central themes are repeated with different emphasis from section to section.

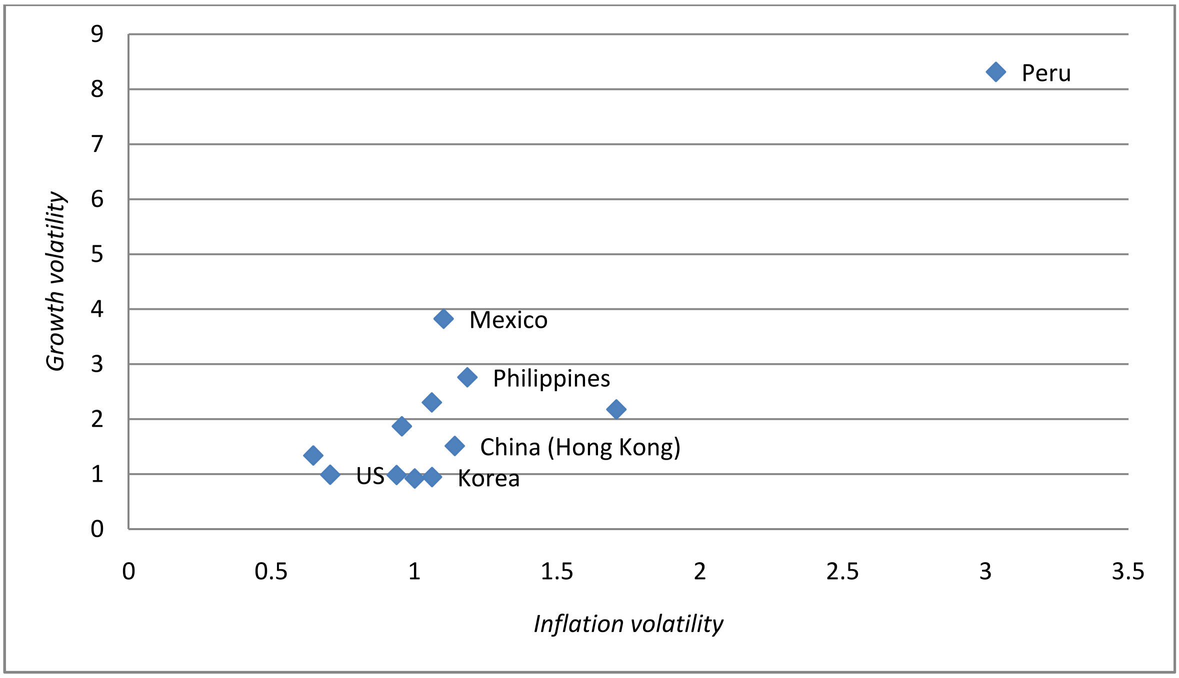
## 1. PROBLEM SETTING

Studying the business cycle dynamics of fiscal and monetary policy in a group of EMEs in an aggregate supply and aggregate demand framework sheds some light on unresolved and important empirical issues. Empirical work on business cycle volatility and the role of policy therein has been conducted in South Africa, with an intense awareness of the negative link between high output volatility and long-term economic growth (Ramey & Ramey, 1995). As argued by Du Plessis, Smit and Sturzenegger (2007a), mistakes at the level of fiscal and monetary policy “cause inflation, distort decisions in the labour and capital markets, and might even precipitate or fail to prevent recessions.” Aghion & Banerjee (2005) show that in a private entrepreneur economy, credit-constraints aggravated by macroeconomic volatility can lead to a sacrifice of long-term productivity. The worry that the demand side policy response would be ‘wrong’ was very real during the heat of the recent credit crunch in the United States, and its spread to other international markets. In short, because volatility matters for economic welfare, it is important that fiscal and monetary policy do not amplify economic fluctuations.

Empirical estimates of the influence of stabilisation policies on the South African business cycle (Burger, 2008; Kotze & Du Plessis, 2008; Du Plessis Smit & Struzenegger, 2007a & 2007b) emphasize the important role of monetary policy in stabilising the post-1994 phases of the business cycle, whereas mildly pro-cyclical fiscal had little destabilising effect (Du Plessis, Smit & Sturzenegger, 2007a). The same literature contextualises the South African case relative to international experiences in output volatility – it is now well established that the data shows a decline on overall output volatility for most developed and developing countries over the last few decades (Romer, 1999; Blanchard & Simon, 2001; Doyle & Faust, 2002; Stock & Watson, 2003a & 2003b; Barrell & Gottschalk, 2004; Gordon, 2005). A similar general consensus has emerged from descriptive business cycle research that output volatility remains higher for EMEs (see, for example, Agenor, McDermott & Prasad, 2000; Rand & Tarp, 2002; Kose, Prasad & Terrones, 2003; Calderon & Fuentes, 2006). It is also quite clear from Du Plessis (2006) that South Africa’s volatility experience is relatively favourable when compared to other EMEs. It is not immediately clear why this is the case, or whether policy could have done anything useful about it, but it is worthwhile to investigate what role policy had to play in determining the experiences among EMEs.

The high and varied volatility among EMEs relative to OECD countries can be represented as shown in Figure 1.1 below – each country is plotted according to their ratio of the standard deviation to the mean of real GDP growth and inflation, as done by Du Plessis et al. (2007a). The higher on each axis, the more loss there is to society. EMEs are clearly more volatile than OECD countries in general.

*Figure 1.1: Volatility in Emerging Markets (1980 to 2008)*




What does this volatility imply for a policy analysis? Economic theory explicitly recognises that the cost of each course of action includes its opportunity cost. In terms of this investigation into output volatility, each policy action followed by the respective EME came at a cost to society. In a narrow sense, it cost society the observed volatility, but the economic cost also includes the volatility that could have realised under a next best policy action, which could be positive or negative depending on the output profile. Because the next best alternative policy action is not observed, the economic cost must be estimated by comparing the actual volatility with that of an alternative history. This paper uses a model of the economy to construct such an alternative history and in this sense quantifies the economic impact that fiscal and monetary policy had over the period in question – by simply comparing output volatility under different policy scenarios. How much would the difference in output volatility have been had policy not destabilised the business cycle in the given country?

It was mentioned above that the literature agrees on the broad decline of volatility among countries, and the narrowing gaps between them. Consequently, most developed countries have moved down the vertical axis in Figure 1.1, while many EMEs have remained on the higher end. Countries that are stuck with high volatility continue to feel the economic consequences of it, and it is important to establish whether a different macroeconomic policy approach can have a meaningful impact of lowering this volatility. The importance of this question is highlighted by recent debates about the effectiveness of stabilisation policy conduct in dampening economic fluctuations(Tanzi, 1997 & 2005).

From a research perspective, it is important that the debate is grounded in appropriate empirical work that can contribute to an understanding of different policy track records. Indeed, much of the inconclusive findings in the empirical EME literature referred to above are about the role of policy in stabilising the business cycle, and along with this, the relative importance of supply and demand-side contributions. The next section defends the empirical method adopted in this paper and explains how this fills many of the methodological gaps in the existing EME literature. On the basis of this, the paper proceeds to answer the question about the contributions of fiscal and monetary policy to output volatility, in the context of a model-based aggregate supply and aggregate demand framework.

## 2. METHODOLOGICAL ISSUES

This section introduces the macroeconomic framework behind the empirical analysis and justifies the choice of method in the context of a literature review. The latter is organised into sections presenting the SVAR methodology in the context of econometric models used for policy analysis, and subsequently, contrasting the model-based approach to other non-model based business cycle methods. It is argued that the SVAR method is suited to the problem at hand because of the relatively large scale of the empirical analysis, spanning over six countries, and also because of the multivariate and jointly determined nature of the business cycle and policy.

Macroeconomic policy analysis provides the framework within which the econometric results are interpreted, and also a guide to choosing an appropriate empirical method from the outset. The role of aggregate supply and aggregate demand in economic fluctuations, an issue at the centre of this analysis, since fiscal and monetary policies are demand-side measures, is an old debate dating back to Ricardo and Malthus, and has been ongoing among Real Business Cycle researchers, Monetarists and Keynesians ever since (Taylor, 1997). In a brilliant reading of the wide-spread literature Taylor identifies 5 core principles of "practical macroeconomics". These principles will help locate the approach taken here in the vast macroeconomic literature and provides a solid theoretical macroeconomic foundation for the present analysis.

The "core principles" are as follows (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. There are, of course, complex arguments supporting these principles and major differences about the nuances behind them, but delving into these are beyond the scope of this paper. This paper 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.

## 2.1 THE SVAR METHODOLOGY

In a survey-based study conducted by Smith and Gregory (1995), they document that the most important difference between the econometric and business-cycle theorist approach to studying business cycles comes from how seriously theory is taken. This in turn, depends on the goals of applied work. The SVAR methodology has much in common with other model-based, business cycle theorist type approaches to studying business cycles: both approaches, even though using different types of models, impose theoretical discipline on traditionally reduced-form characterizations of the macroeconomic data (DeJong & Dave, 2007). The historical development of business cycle methods is closely related to the interaction between theory and measurement, while the specific application is often guided to a method applicable to the goals of the study. It is argued in this section that the SVAR method, with an empirically supported mix of theory and measurement, is suited to the type of policy question posed in the research question. This argument is made in the context of a brief overview of the different business cycle methods and relevant applications.

To begin with, all structural macroeconometric models must deal with the problem of identifying structural parameters. Intuitively speaking, the identification problem is simply that additional assumptions are required to map a specific conception of the structure of the economy into a reduced-form representation of the data, because many different structural models can give rise to the same reduced-form representation (Gottschalk, 2001). This is required because the researcher aims to make statements about the structure of the economy based on the model. Historically, the two main model-based approaches to business cycle studies developed out of systematic critiques of the systems-of-equations approach built on the probabilistic foundations of Haavelmo (1944) and the views of Koopmans (1949).

The main problem was that the macroeconomic models of time were structurally unstable because the reduced form equations relied on suspect assumptions about the exogeneity of variables in the system. To identify the policy effects without altering the structure of the model itself, the Lucas critique (1976) argues, variables that are endogenous with respect to policy regimes must be explicitly modelled. On the other hand, there are only a few powerful a priori restrictions available to impose exogeneity on variables in the system (Sims, 1980) so that it is necessary to break away from the elaborate ‘structure’ of the systems-of-equations. Both responses were aimed at developing structural models that were more suited to sensible policy analysis, but they solve the problem in very different ways.

Models that continue to work on business cycle fluctuations in the tradition of Lucas (1976, 1981 & 1987) and subsequent rational expectations extensions and the earlier real business cycle tradition (Hansen & Sargent, 1980; Kydland & Prescott, 1982 & 1991; Plosser, 1989) like the more recent Dynamic Stochastic General Equilibrium models (see for example Ireland, 2004) have also contributed to the EME business cycle literature. Aguiar & Gopinath (2004) and Neumeyer & Perri (2004) study a group of EMEs using DSGE models, where the data is explained by a structural model built on the optimizing behaviour of representative agents in various sectors of the economy. They find a large difference in the volatility of business cycles of EMEs when compared to developed countries', and argue that supply-side shocks are more important than demand-side shocks in explaining the wild fluctuations.

The other response to the critique of systems-of-equations modelling was lead by the development of the Vector Auto Regression (VAR) following Sims's (1980) critique of identifying restrictions. The structural models that come from this tradition represent a different use of macroeconomic theory to identify the structural model from the reduced-form. Where the DSGE models explicitly derive the endogenous variables from optimizing behaviour, the VAR method drops the attempt to identify exogeneity and model macroeconomic variables as systems of jointly endogenous variables, thereby escaping the use of so-called 'incredible' identifying restrictions. Given the VAR structure, where the time-paths of variables are explained by their own and each other's lagged values, the model faces a new variant of the identification problem.

The first assumption is that innovations in the structural model, written in moving average representation, are orthogonal. The identification happens by imposing a specific structure on the variance-covariance matrix, so that policy variables, when shocked, are able to trace out effects on other variables without taking cross-equation effects with them. According to Bernanke (1986) the shocks are approximately uncorrelated because they do not have common origins, although this does not preclude contemporaneous correlations. The shocks are, therefore, the driving force behind the stochastic dynamics of the variables in the system (Gottschalk, 2001). With the normalised and structured variance-covariance matrix, the system of shocks can be used to trace out the dynamic response of specific variables to any given shock – in this case output responses to policy action.

In the context of the macroeconomic question this paper poses, the restrictions on the variance-covariance matrix must provide a structure to the VAR system that makes the orthogonal shocks interpretable within a sensible macroeconomic framework. Based on a decomposition of output fluctuations into shocks that have permanent and transitory effects respectively (Blanchard & Fisher, 1989; Blanchard & Quah, 1989) it is possible to construct an identification scheme in the variance-covariance matrix that allows an interpretation of the shocks to output that is consistent with the macroeconomic framework for policy analysis proposed by Taylor (1997). Additional so-called long-run restrictions are imposed on the basis of economic theory: aggregate supply shocks have permanent effects while aggregate demand shocks affect output in a transitory way. This scheme proves to be useful in practice. This is done successfully by Du Plessis, Smit and Sturzenegger (2007a & 2007b) who apply a Blanchard-Quah SVAR in the style of Clarida & Gali (1994) and Fackler & McMillin (1998) to the South African case. The technical detail of this method is discussed in depth in the next section where the method is actually applied.

In contrast to model-based analyses, the non-model-based part of the EME business cycle literature, focusing mainly on the characterisation of various cycles and the uncovering of stylised facts based on this, avoids the identification controversies but runs into other methodological difficulties (Du Toit, 2008), the analysis of which is beyond the scope of this paper. The previous section discussed the relevant stylised facts and the unresolved issues associated with these studies, and mentioned that the SVAR analysis overcomes many of the methodological shortcomings of the other univariate methods. Studies adopting the so-called classical cycles method (Du Plessis, 2006; Calderon & Fuentes, 2006; Burns & Mitchell, 1946) differ in the conceptualisation of the business cycle to those using the deviation cycles method (Agenor, McDermott & Prasad, 2000; Rand & Tarp, 2002; Kose, Prasad & Terrones, 2003).

Apart from this wide methodological difference, there is, however an important similarity: both methods generate a set of univariate series that are correlated to study co-movements and coordination. This yields some insight into policy responses to the business cycle, cyclicality issues and the role of aggregate supply and aggregate demand but cannot quantify the effects of policy relevant to an alternative. For this one needs a model. Also, the jointly determined and multivariate nature of macroeconomic phenomena can lead to difficulties when studied with univariate methods. The SVAR model overcomes this problem.

## 2.2 ADVANTAGES AND JUSTIFICATION

Two strong justifications of the SVAR method are firstly that it is based on sound theory, and secondly that it matches sound economic foundations. This is why the SVAR approach to the business cycle dynamics of fiscal and monetary policy has been applied in the literature with great success (Gali, 1992; Clarida & Gali, 1994; Fackler & McMillin, 1998; Du Plessis, Smit and Sturzenegger, 2007a & 2007b), although the strategy is certainly not without criticism (Gottschalk, 2001). With regard to the sound economic foundations, this section argued that the structural factorization of the variance-covariance matrix is done from the perspective of a sound macroeconomic analysis of the economy, along the lines of Taylor's (1997) core principles. With regard to the first justification, the SVAR method has well articulated econometric foundations dealing with aggregate fluctuations (Slutzky, 1937; Sims, 1980 & 1996; Blanchard & Fischer 1989; Shapiro & Watson, 1988; Blanchard & Quah, 1989). Consequently, the results can be interpreted in a useful framework and used to gauge the role that fiscal and monetary policy has played in EME output volatility. The next section introduces the model in the context of the data, and presents the findings.

## 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, the relevant country history is introduced as the discussion develops, while references act as a guide to a deeper reading. Similarly, for a technical discussion about the econometric model stability, the interested reader can turn to the Data Appendix, read it from start to finish and return to the main text with no loss of continuity. The most important findings about the model stability are mentioned in the data discussion in the main text.

### 3.1 DATA AND BACKGROUND

This subsection looks firstly at the choice of countries and secondly at the choice of variables in the empirical model. So, to return to the empirical issue, Figure 1.1 shows, and many studies mentioned before confirm, that many EMEs have experienced much higher output volatility when compared to developed countries. Based on this different economic experience and the implications it has for investors, Morgan Stanley Capital International (MSCI) has constructed an index of EMEs, measuring equity market performance. These countries are: Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Israel, Jordan, Korea, Malaysia, Mexico, Morocco, Pakistan, Peru, 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 from 1980 onwards. This leaves a group of six EMEs: China (Hong Kong), Israel, Korea, Mexico, Peru and Philippines. These countries share similar characteristics and output volatility that is higher than found in developed countries. In view of this empirical regularity and the literature, it makes sense to ask what role policies have played in generating or counteracting this output volatility. Of course, the empirical model ignores much of the heterogeneity found in each country, and it is important to interpret model-based findings in the context of other off-model information. The SVAR method simply takes the aggregate economic data as given, and looks into the dynamic quantitative relations among the various series in the system. In this paper the model is used to analyse the role that policy played in these countries' business cycles, which means that the most important off-model information to consider is that which clarifies the actual policy conduct in these countries. A full analysis of this is beyond the scope of the paper, and would constitute another research question altogether, but a brief consideration of the most important aspects, and a discussion of how these relate to the empirical model follow below.

This paper analyses the effects of policy on output volatility with the recognition that policy conduct in modern open economies is the outcome of complex institutional choices, especially for EMEs. Indeed, choosing appropriate monetary policy in the world of international capital mobility for an EME with an immature financial market is not straightforward. Two broad approaches both highlight the important connection between country characteristics on the one hand, and the exchange rate and monetary policy regimes on the other (Bordo, 2003). More generally, a country can choose an institutional arrangement that determines its international monetary integration either by seeking insulation against real or nominal shocks, in the "trilemma" tradition, or by seeking different sources of credibility for a nominal anchor for monetary policy (Bordo, 2003). A more stylised choice, as prescribed by the so-called bipolar view, is a trade-off between fixed and floating exchange rates – in this view, fixed rates precludes independent monetary policy, but provides other stability benefits, while the latter gives scope for independent monetary policy but with additional risks.

The combination of looking at the sources of shocks and the need for a nominal anchor is especially relevant in view of the currency and financial crisis history of the group of EMEs, and when considering their still emergent fiscal and monetary policy reforms. It is insightful to mention some historical developments in this regard. 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 a 1994 devaluation, 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).

In most cases discussed above, the crisis in question has revealed glaring institutional weaknesses on both the fiscal and monetary side. It seems that active reform was implemented with the recognition that it is difficult for an EME to successfully attain both commitment and flexibility – a theme that will be discussed more fully in section 4. EMEs have experienced severe problems in managing their monetary systems with intermediate exchange rate regimes, meaning that throughout the sample period of this empirical study, monetary policy has seen some real problems and subsequent attempts at reform. Historically successful exchange rate regimes, in terms of their ability to mitigate volatility, have been those with adequate institutional support (Bordo, 2003). This section's discussion supports this conclusion by showing that monetary and fiscal policy which is consistent with a-cyclical or counter-cyclical conduct can have a substantial effect on lowering output volatility. In view of the historical interaction between the policy institution and the broader economic environment, section 4 argues that this conduct must be institutionally supported.

As mentioned before, the SVAR model analyses the business cycle dynamics of fiscal and monetary policy by collecting aggregate data into a small system, and by imposing restrictions on the interactions between the variables in the system on the basis of macroeconomic theory. In doing this, the SVAR model allows the researcher to ask a quantitative question about policy, taking the country history as given. In this case, the analysis aims at determining how much fiscal and monetary policy affected output volatility in the group of EMEs. When the implications of the findings are discussed, it is important to remember the institutional history associated with the aggregate data – that is, the actual data was generated by specific policy conduct. This is also the source of concern: where this conduct has aggravated the cyclical fluctuations in aggregate output, the policy has added unnecessarily to volatility, at a loss to society. Since a smooth business cycle is preferred in terms of welfare, pro-cyclical fiscal and monetary policy is economically inefficient. If the findings show that cyclical policy conduct has a quantitatively important impact on output volatility, a case can be made for more appropriate policy conduct.

To get these results, the paper uses a model similar to that used by Du Plessis, Smit and Sturzenegger (2007a & 2007b) to study the South African case. The previous section discussed the macroeconomic framework underpinning the model, and this section will discuss the econometric counterpart of that. It will show how to achieve the model identification of aggregate supply and aggregate demand fluctuations, with identified policy shocks, as the sources of fluctuations in output. This is done by the use of long-run restrictions on policy and output dynamics. For output, the model uses quarterly real GDP in first difference – this makes up supply-side shocks. Aggregate demand shocks are further decomposed into monetary and fiscal policy shocks, for which the model uses a proxy of the real interest rate in the former case, and government expenditure as a proportion of GDP in the latter (for more detail see Data 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, 2007a).

As mentioned in Blanchard and Quah (1989), the identification requires a "cautious interpretation" because the extent to which it is correct is an empirical issue. 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 of fiscal policy (Du Plessis et al., 2007a). There is also doubt about the stationarity of the series, while this and the afore-mentioned is properly investigated by looking at model stability. The results in the Data Appendix confirm that the SVAR models are stable in the sense that their roots lie within the unit circle, while it also present findings which support the empirical identification of the models.

### 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 (2007a & 2007b), 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),

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

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),

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

Because the structural model is unobservable, we estimate the reduced form model in (3.2). When estimating (3.2) the structural moving average 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

$$u_t = C_0 \varepsilon_t. \tag{3.3}$$

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):

$$\Sigma = E(u_t u_t^T). \tag{3.4}$$

Because the reduced form VAR in (3.2) is under-identified, it is impossible to recover $C_0$ and $\varepsilon_t$ 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 $\varepsilon_t$ and the system dynamics $C_i$.

### 3.2.2 IDENTIFICATION

The additional restrictions define the shocks in the system and, as Blanchard and Quah (1989) argue, are open to straightforward economic interpretation. Whereas Blanchard and Quah (1989) use these long-run restriction in a bivariate system with output and unemployment, Clarida and Gali (1994) use similar long run restrictions to study fluctuations in the real exchange rate, in a three-variable system. Du Plessis, Smit and Sturzenegger (2007a & 2007b) follow Clarida and Gali (1994) in adopting the Blanchard-Quah long-run restrictions, along with three other cross-equation restrictions which identify the system. Du Plessis et al. (2007a & 2007b) use the long-run restrictions in the SVAR model to decompose the fluctuations of output into aggregate supply and aggregate demand shocks. To study the cyclicality of fiscal and monetary policy, the demand shock is further decomposed into two sub-components which correspond to the respective policy shocks. This paper extends the SVAR analysis of Du Plessis et al, (2007a & 2007b) to the group of EMEs. 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 can be 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 $R(1) \equiv R_0 + R_1 + R_2 \ldots = C(1)C_0^{-1}$, 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 $\Sigma$ 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.

## 3.3 INNOVATION ACCOUNTING

This section provides support for the identification scheme discussed in the previous section and analyses the monetary and fiscal policy responses to the business cycle, and the relative importance of the given response. Before presenting the actual findings, it is helpful to clarify the exact nature of innovation accounting, impulse response analysis and variance decomposition, to avoid any confusion about the meaning of the results and conclusions. This section follows the explanation found in Enders (2004: 264 – 280), and discusses technical detail in so far as it clarifies the actual results.

### 3.3.1 IMPULSE RESPONSE ANALYSIS

The vector moving average representation of the structural model (3.1) allows us to trace out the time paths of the shocks on variables in the form of an impulse response function (hence IRF). In the notation introduced above, the IRF is made up of the effects of the impact multipliers $C_i$ via the structural shocks $\varepsilon_t$ - 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,

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

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. 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 be zero in the long-run, as well as the effect of monetary policy of 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 correspond to our prior 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 $\varepsilon_t$. In the context of the SVAR, the identifying restrictions, that is our knowledge about the structure of the economy that we use to impose consistency in the model, allow us to identify the exact sources of the shocks. This imposition was done by our zero restrictions on the impact multipliers in the variance-covariance matrix, shown explicitly in (3.8).

Given the model, the assumptions and our identifying restrictions, we can use the IRF analysis to gauge the various policy responses in terms of their cyclicality. This is the standard interpretation scheme used throughout the business cycle literature, and it is useful because these policy responses and the extent of their cyclicality matter for the volatility of the output cycle, and eventually the extent of volatility in the economy – this brings the analysis back to the loss-function. We can determine what kind of policy-rule the actual policy behaviour mimicked over the sample period, and use the evidence on the impact of this behaviour on volatility as support for an argument that a different type of rule-like behaviour would produce superior results. To further investigate the relative importance of the policy shocks in terms of the fluctuations in output, we use the second strategy of innovation accounting, namely variance decomposition.

### 3.3.2 VARIANCE DECOMPOSITION

The vector moving average representation makes it explicit that the fluctuations in the variables are the result of various shocks, and we can 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, and the results will contribute to our understanding of the importance of the various policy responses to business cycle fluctuations, by showing the relative importance of the policy shocks in explaining the variation of the forecast errors of the output series.

For any *n*-period ahead forecast, the forecast error is given by,

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

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

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

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. This procedure can be done for each series in the model, at various forecast horizons. Once again, this decomposition expresses the variation in the forecast error of the series as the sum of the proportional variation due to the different shocks. In this application we can gauge the relative importance of monetary and fiscal policy in contributing to variation in output. It is the identification restrictions imposed on the variance-covariance matrix that allows for the identification of the policy shocks in the variance decomposition itself. When the decomposition is done for a specific data set, we can get closer to answering some important questions about policy conduct: do the policy responses matter at all in terms of the loss function? Is there room for improvement in policy conduct?

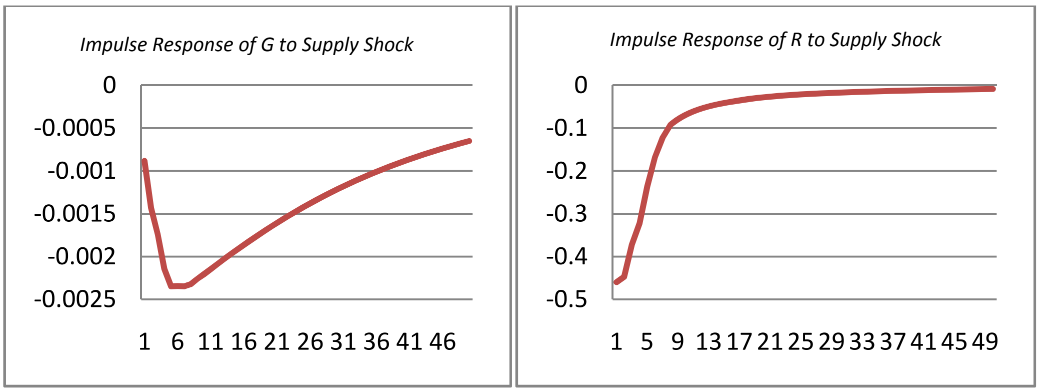
### 3.3.3 RESULTS

The first important finding is that the accumulated impulse responses of GDP to the aggregate supply and demand shocks are theory consistent for all EMEs in the sample, in the sense that aggregate supply shocks have permanent effects on GDP, while aggregate demand shocks have transitory effects on GDP. These results are presented graphically in Appendix B1. This can be seen from the shape of the IRFs, and gives empirical support to the economic identification of the aggregate supply and demand shocks. The rest of this section investigates country-by-country, the cyclicality of policy, policy coordination, and the transmission of policy to output. Identifying the historical business cycle dynamics of fiscal and monetary policy is the basis for a discussion about the extent to which these policies have been stabilising or destabilising, and provides a useful base for discussion about possible policy reform. All SVARs are estimated with four lags.

*CHINA*

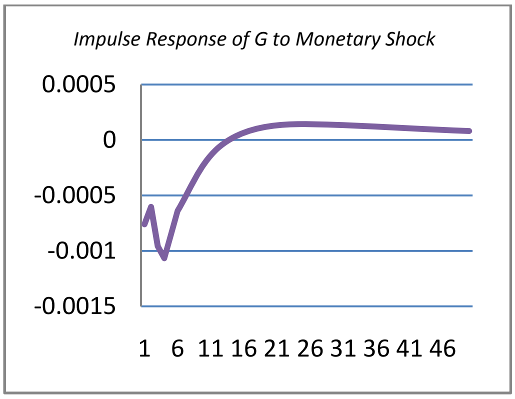
All of the IRFs studied are responses to positive shocks. If the IRF of government expenditure to a supply shock is negative, then it shows a counter-cyclical policy response – that is, when the economy is in an upswing, government expenditure decreases. This is the case for China, over the sample period from 1980 to 2008, as is seen in Panel 3.1 below. When the IRF of the real interest rate, on the other hand, is negative in response to a positive supply shock, it shows pro-cyclical monetary policy – when the interest rate decreases in a upswing, output is temporarily increased due to the expansionary monetary policy. From the figure below, it is clear that China's monetary policy has been pro-cyclical over the sample period, and to a much larger extent than the counter-cyclical fiscal policy.

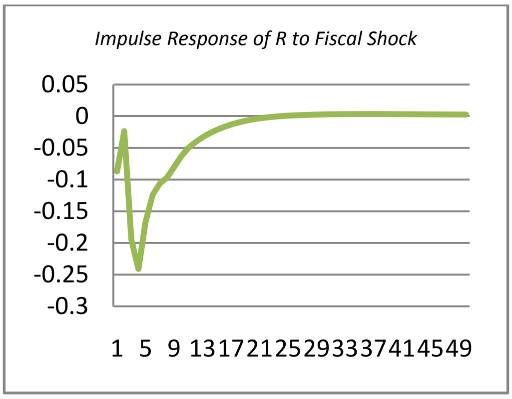
*Panel 3.1: The Cyclicality of Policies in China*



Panel 3.2 shows that both fiscal and monetary policy, are accommodative with respect to the other. The IRF of government expenditure shows a counter-cyclical response to a positive real interest rate shock, while the pro-cyclicality of monetary policy in response to expansionary fiscal policy shows that the same holds for monetary policy. As seen in the previous panel, the fiscal response is relatively small compared to the monetary response, and is probably not of great practical importance.

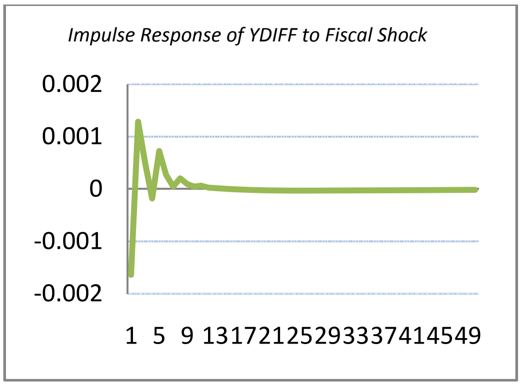
*Panel 3.2: Policy Coordination in China*

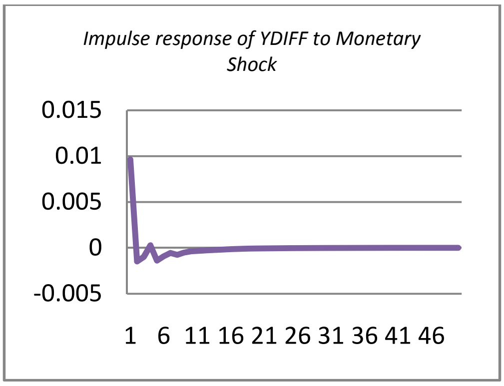



Although the next section will explore the quantitative importance of the stabilisation policies more fully using historical decomposition, the relative sizes of the IRFs are also informative.

*Panel 3.3: Policy Transmission in China*




The IRFs showing the response of GDP to fiscal and monetary shocks, shown above in Panel 3.3, confirm that monetary policy indeed has a larger effect on output in the short-run. The same observation is supported by the variance decomposition of GDP shown in Table 3.1 below, which shows that the monetary shock explains substantially more variation in GDP than fiscal shocks, which are zero for all practical purposes.

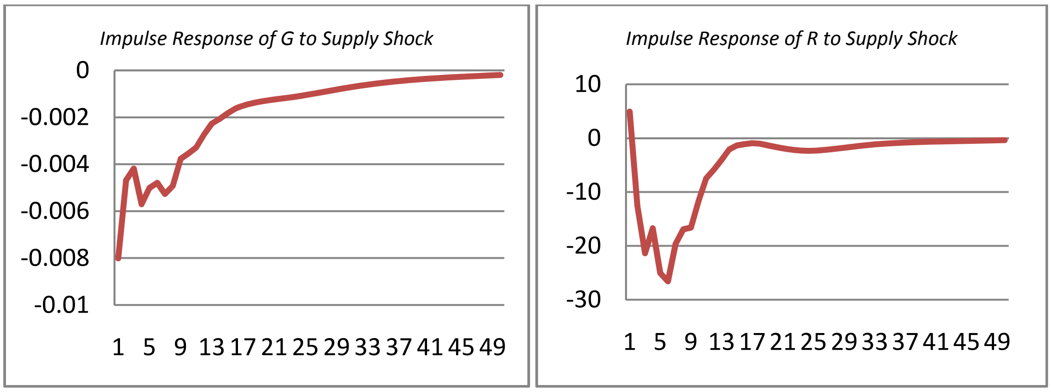
*Table 3.1: Variance Decomposition of GDP for China*

| Period | S.E. | Supply | Fiscal | Monetary |
|---|---|---|---|---|
| 1 | 0.0179 | 70.3339 | 0.8366 | 28.8295 |
| 2 | 0.0186 | 71.2326 | 1.2569 | 27.5106 |
| 3 | 0.0187 | 71.1257 | 1.3175 | 27.5568 |
| 4 | 0.0189 | 71.7860 | 1.2952 | 26.9188 |
| 5 | 0.0190 | 71.3126 | 1.4319 | 27.2555 |
| 6 | 0.0190 | 71.1308 | 1.4483 | 27.4210 |
| 7 | 0.0190 | 71.0932 | 1.4462 | 27.4606 |
| 8 | 0.0190 | 70.9714 | 1.4548 | 27.5738 |
| 9 | 0.0190 | 70.9162 | 1.4558 | 27.6280 |
| 10 | 0.0190 | 70.8946 | 1.4554 | 27.6501 |

*ISRAEL*

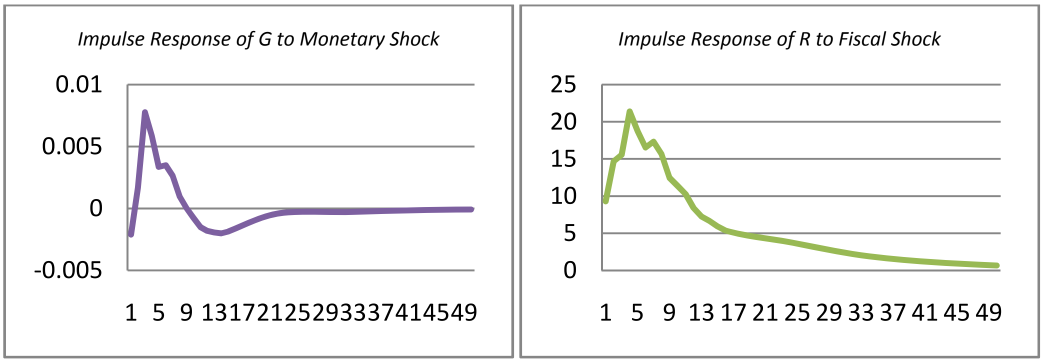
As the IRFs in Panel 3.4 show, fiscal policy has been counter-cyclical, while monetary policy has been pro-cyclical, and to a much larger extent, even when compared to China. This is probably due to the financial crisis Israel experienced in 1983, and this event might distort our views of 'normal' stabilisation policy in Israel. As there is concern for the stability of the results, and since it makes sense to look at stabilisation policy behaviour after the crisis, the innovation accounting is done for the sample 1980 to 2008 and for a post-crisis sample from 1986 to 2008. The latter results are presented after those for the whole sample.

*Panel 3.4: The Cyclicality of Policies in Israel*

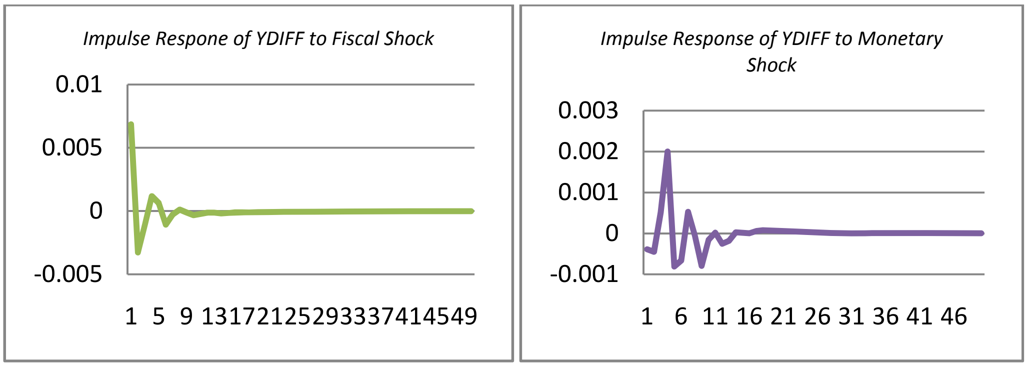



Continuing with the policy analysis for the whole sample, Panel 3.5 below shows that both fiscal and monetary policy has been counteractive – fiscal policy is expansionary in response to contractionary monetary policy, where the monetary response has been much larger, and the fiscal response is of little practical importance.

*Panel 3.5: Policy Coordination in Israel*




*Panel 3.6: Policy Transmission in Israel*



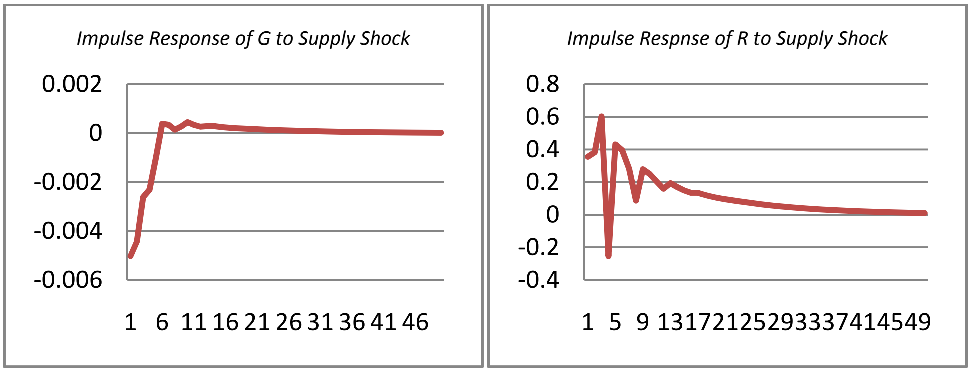

Panel 3.6 suggests that neither fiscal nor monetary policy has very large effects on output at all, and the variance decomposition in Table 3.2 confirms that the variation in GDP is largely due to output shocks.

*Table 3.2: Variance Decomposition of GDP for Israel*

| Period | S.E. | Supply | Fiscal | Monetary |
|---|---|---|---|---|
| 1 | 0.0223 | 90.5041 | 9.4654 | 0.0305 |
| 2 | 0.0237 | 89.6597 | 10.2774 | 0.0630 |
| 3 | 0.0238 | 89.5343 | 10.3571 | 0.1086 |
| 4 | 0.0240 | 88.7055 | 10.4914 | 0.8031 |
| 5 | 0.0242 | 88.7480 | 10.3524 | 0.8997 |
| 6 | 0.0243 | 88.5778 | 10.4554 | 0.9668 |
| 7 | 0.0243 | 88.5257 | 10.4612 | 1.0130 |
| 8 | 0.0243 | 88.5251 | 10.4616 | 1.0133 |
| 9 | 0.0243 | 88.4378 | 10.4442 | 1.1180 |
| 10 | 0.0243 | 88.4182 | 10.4598 | 1.1220 |

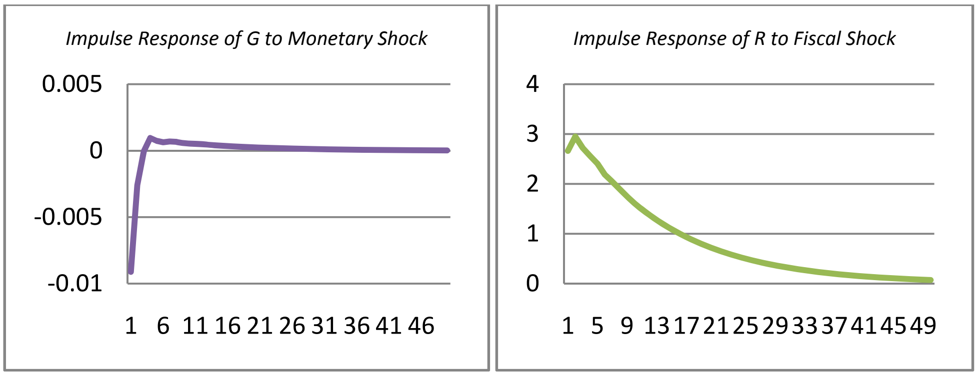
Surprisingly, the IRFs on Panel 3.7 the post-crisis sample shows monetary policy to be counter-cyclical, although quite erratic, while fiscal policy is still counter-cyclical and relatively small in magnitude.

*Panel 3.7: The Cyclicality of Policies in Israel (post '86)*




Fiscal policy is accommodating, but for a very short-lived period, while monetary policy is counteractive – Panel 3.8 shows that expansionary fiscal shocks trigger contractionary or counter-cyclical monetary policy responses that are quite large compared to the miniscule fiscal responses, but still smaller than the monetary responses observed over the sample period as a whole.

*Panel 3.8: Policy Coordination in Israel (post '86)*




It seems as if monetary policy in the post-crisis period was a bit erratic, but did not have large or long-lasting effects on output. This observation is mirrored in Panel 3.9 and Table 3.3, where we see that neither fiscal nor monetary policy played a quantitatively important role in the fluctuations in output during the post-crisis period. These results are, however, preliminary since the historical decomposition is more suited to answering these questions of relative quantitative importance of shocks over the sample period.

*Panel 3.9 Policy Transmission in Israel (post '86)*

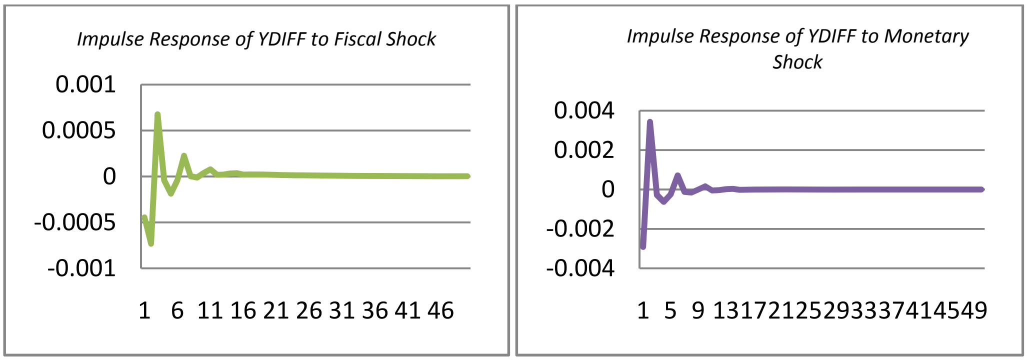


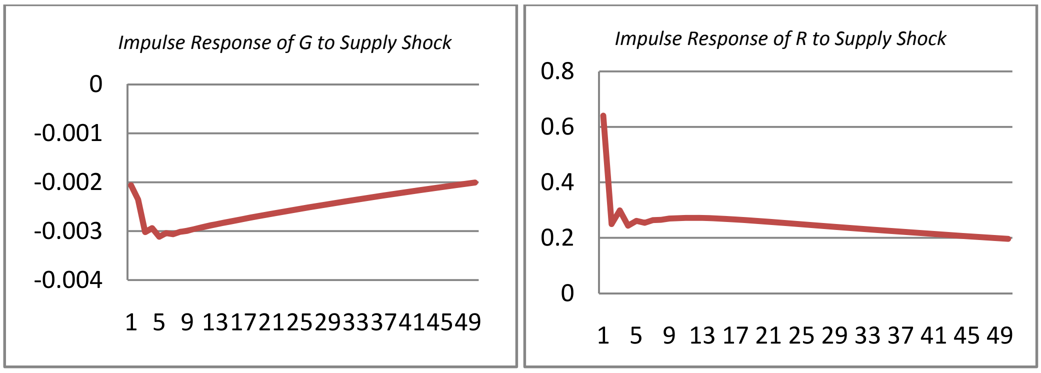

*Table 3.3: Variance Decomposition of GDP for Israel (post '86)*

| Period | S.E. | Supply | Fiscal | Monetary |
|---|---|---|---|---|
| 1 | 0.021 | 98.106 | 0.043 | 1.851 |
| 2 | 0.022 | 95.835 | 0.146 | 4.019 |
| 3 | 0.023 | 95.787 | 0.233 | 3.980 |
| 4 | 0.023 | 95.716 | 0.233 | 4.050 |
| 5 | 0.023 | 95.838 | 0.232 | 3.930 |
| 6 | 0.023 | 95.778 | 0.231 | 3.991 |
| 7 | 0.023 | 95.769 | 0.240 | 3.991 |
| 8 | 0.023 | 95.766 | 0.240 | 3.995 |
| 9 | 0.023 | 95.770 | 0.240 | 3.990 |
| 10 | 0.023 | 95.768 | 0.240 | 3.992 |

*KOREA*

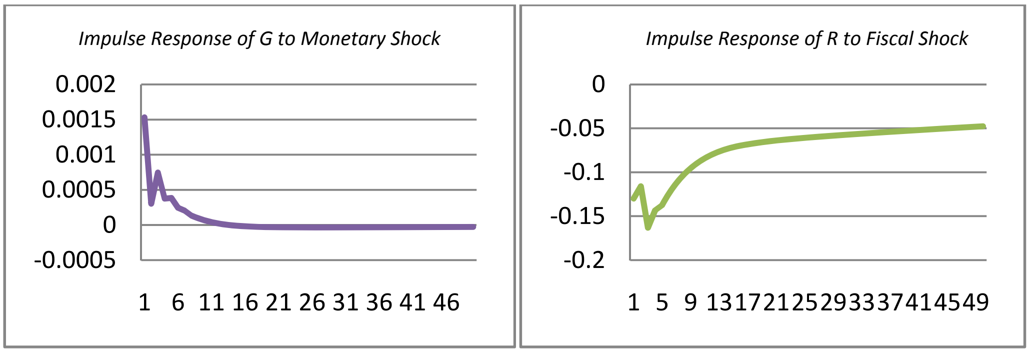
Both fiscal and monetary policy has been counter-cyclical in Korea, as shown by the IRFs in Panel 3.10 below. As before, monetary policy seems much more responsive in terms of the size of the IRF.

*Panel 3.10: The Cyclicality of Policies in Korea*

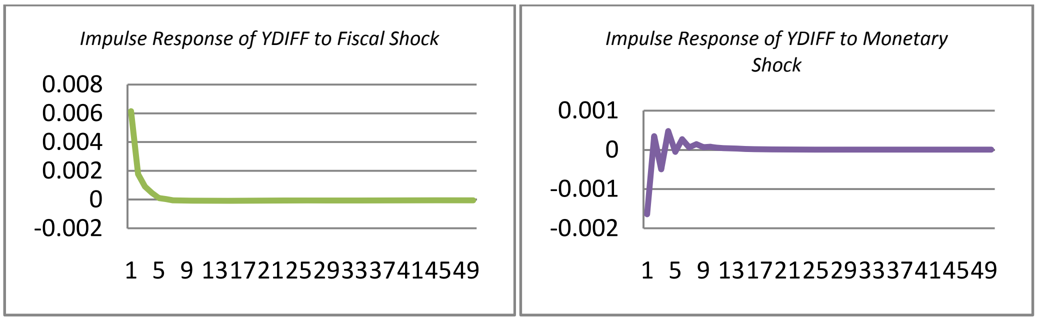


Fiscal policy has been counteractive while monetary policy has been accommodating, but even with accommodating monetary policy, fiscal policy seems to have little effect on output at all. This can be seen in Panels 3.11 and 3.12 and in Table 3.4 below.

*Panel 3.11: Policy Coordination in Korea*




*Panel 3.12: Policy Transmission in Korea*




Stabilisation policy in Korea seems to have little destabilising or stabilising effect on the Korean business cycle, a suspicion that will be more closely analysed in the historical decomposition section.

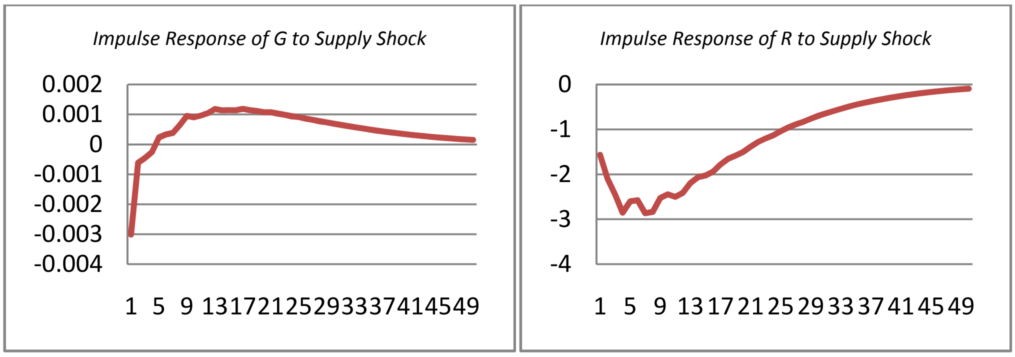
*Table 3.4: Variance Decomposition of GDP for Korea*

| Period | S.E. | Supply | Fiscal | Monetary |
|---|---|---|---|---|
| 1 | 0.015 | 82.553 | 16.282 | 1.165 |
| 2 | 0.015 | 81.425 | 17.377 | 1.199 |
| 3 | 0.016 | 82.044 | 16.726 | 1.230 |
| 4 | 0.016 | 81.910 | 16.771 | 1.319 |
| 5 | 0.016 | 82.005 | 16.683 | 1.313 |
| 6 | 0.016 | 81.988 | 16.671 | 1.341 |
| 7 | 0.016 | 82.007 | 16.652 | 1.341 |
| 8 | 0.016 | 82.007 | 16.645 | 1.348 |
| 9 | 0.016 | 82.014 | 16.637 | 1.349 |
| 10 | 0.016 | 82.017 | 16.632 | 1.351 |

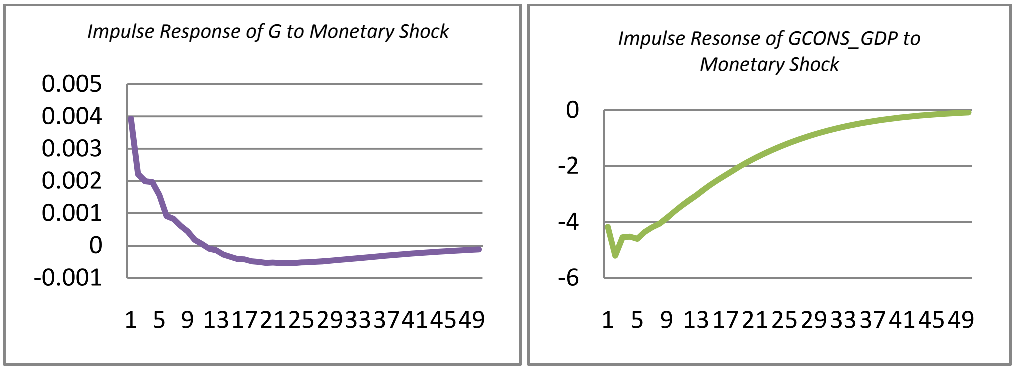
*MEXICO*

Fiscal policy is initially counter-cyclical and then pro-cyclical, but again the response is so small that fiscal policy can be considered a-cyclical for all practical purposes, at least in terms of the government expenditure proxy used here. Monetary policy is pro-cyclical and again much larger in response to the business cycle than fiscal policy. Fiscal policy is counteractive but the response is very small while monetary policy is accommodating with a larger response. These observations are evident in the IRFs shown in Panels 3.13 and 3.14 below.

*Panel 3.13: The Cyclicality of Policies in Mexico*

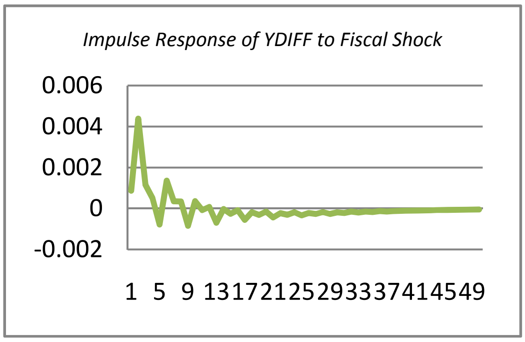



*Panel 3.14: Policy Coordination in Mexico*




While fiscal policy does not have large cyclical responses or large cyclical effects on GDP, as is clear from the small magnitude of the IRF in Panel 3.15 below, it seems that monetary policy has some role to play in the cyclical behaviour of GDP in Mexico – the latter can be seen from the IRF in Panel 3.15 and the relatively large share of Shock3 in the variance decomposition of GDP shown in Table 3.5 below. This issue will be investigated more fully in the historical decomposition.

*Panel 3.15: Policy Transmission in Mexico*



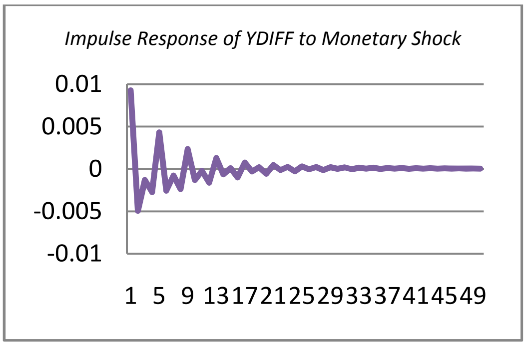



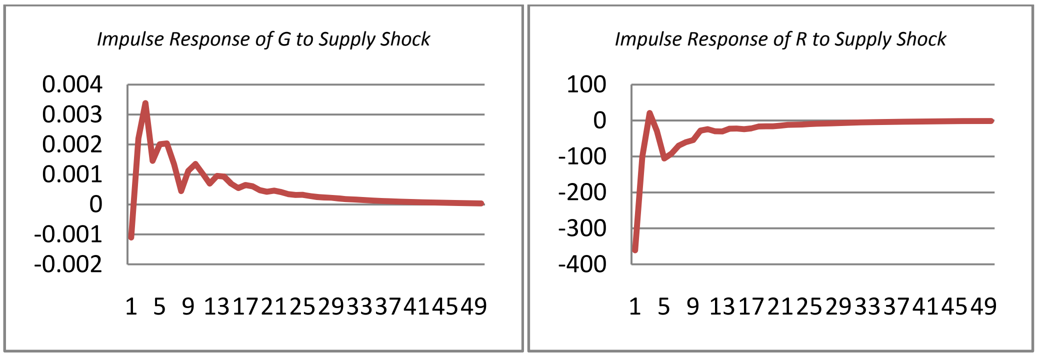

*Table 3.5: Variance Decomposition of GDP for Mexico*

| Period | S.E. | Supply | Fiscal | Monetary |
|---|---|---|---|---|
| 1 | 0.020 | 77.829 | 0.192 | 21.978 |
| 2 | 0.021 | 70.214 | 4.561 | 25.225 |
| 3 | 0.021 | 69.914 | 4.802 | 25.284 |
| 4 | 0.021 | 69.087 | 4.718 | 26.194 |
| 5 | 0.024 | 71.338 | 3.962 | 24.700 |
| 6 | 0.024 | 70.316 | 4.221 | 25.463 |
| 7 | 0.024 | 70.243 | 4.234 | 25.523 |
| 8 | 0.024 | 69.862 | 4.166 | 25.972 |
| 9 | 0.025 | 70.211 | 4.095 | 25.694 |
| 10 | 0.025 | 70.008 | 4.102 | 25.890 |

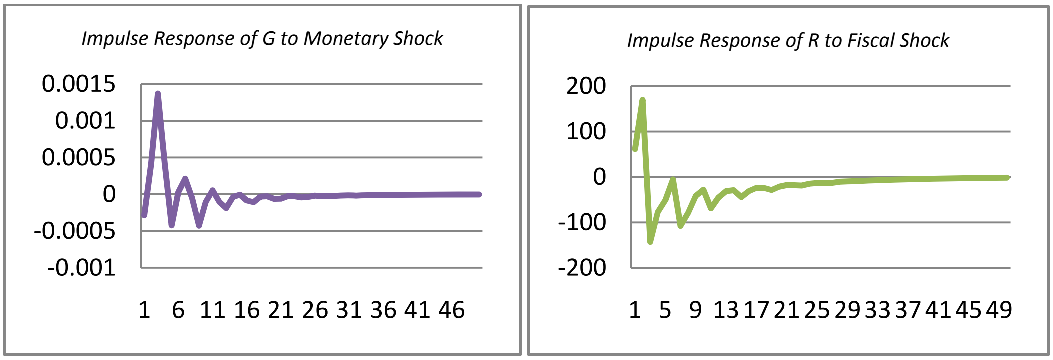
*PERU*

When a country has experienced lengthy periods of hyperinflation and aggregate instability to the extent that Peru had during the 1980s, innovation accounting results remain merely suggestive. As mentioned before, this suggestive information provides a helpful guide to further investigation, making it far from futile. Based on an SVAR estimated over the whole sample period, the IRFs in Panel 3.16 suggests that fiscal policy has been mildly pro-cyclical, although the response is so small that it is practically a-cyclical. Monetary policy has been very pro-cyclical, which is consistent with the prolonged hyperinflationary period of the 1980s. During the whole sample, both fiscal and monetary policy has been counter-active with respect to each other, showing a lack of policy coordination, as is clear from Panel 3.17. Both policies seem to have a negligible impact on output, while monetary policy has a larger effect, as suggested by the IRFs in Panel 3.18.

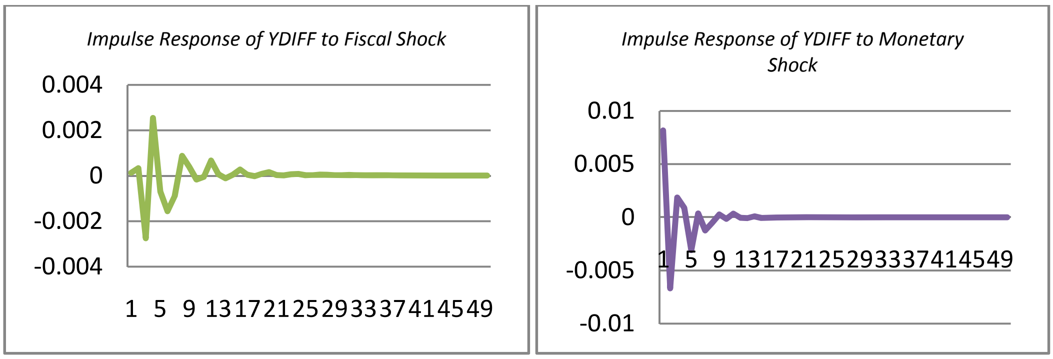
*Panel 3.16: The Cyclicality of Policies in Peru*




*Panel 3.17: Policy Coordination in Peru*

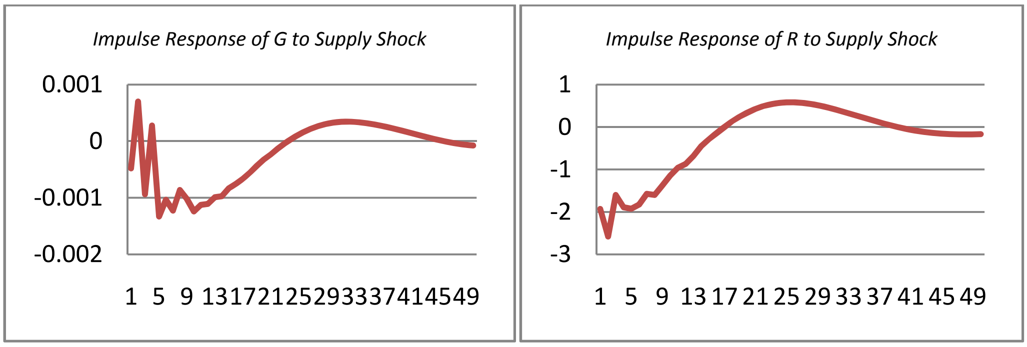



*Panel 3.18: Policy Transmission in Peru*

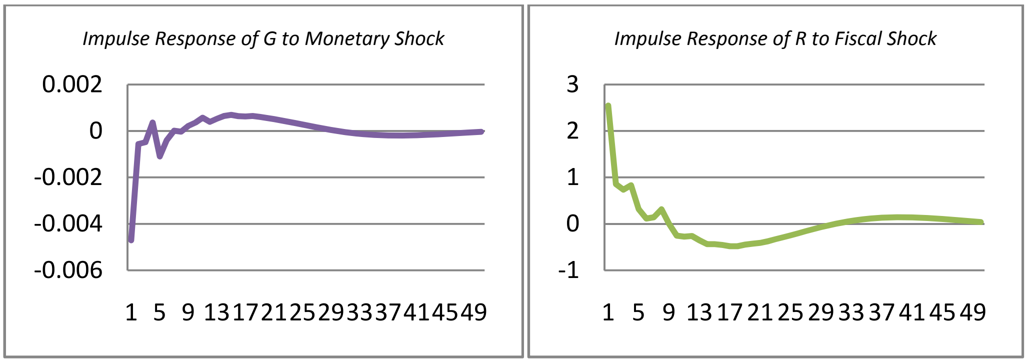



It is possible that conducting the analysis over the whole sample period will introduce some instability into the findings, considering the dramatic turnaround in aggregate economic activity after the hyperinflationary period. To get an indication of the robustness of the innovation accounting presented above, the SVAR is estimated for the sample period after 1995. Panel 3.19 shows fiscal policy to be mostly a-cyclical, with a very small anti-cyclical response, while monetary policy remains pro-cyclical although the response is much less drastic as before.

*Panel 3.19: The Cyclicality of Policies in Peru (post '95)*

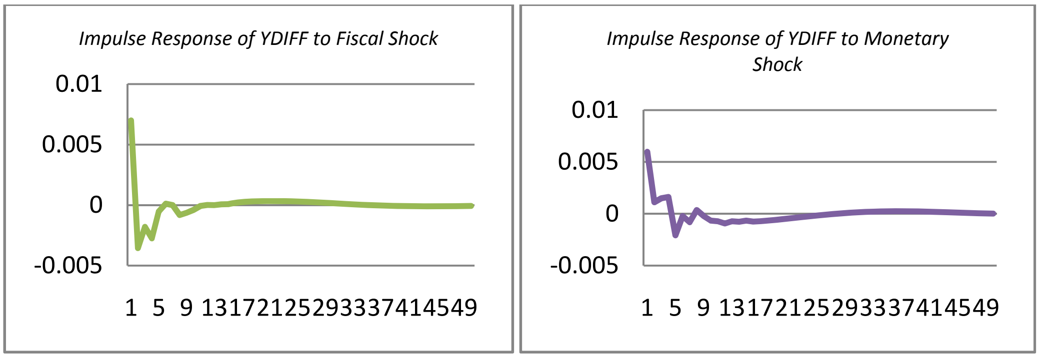



*Panel 3.20: Policy Coordination in Peru (post '95)*




The transmission of policy action to output seems ambiguous and very small, based on inspection of the IRFs in Panel 3.21.

*Panel 3.21: Policy Transmission in Peru (post '95)*




Another way to check policy transmission to output, keeping within the innovation accounting exercise, is to examine the variance decomposition of GDP. Table 3.6 shows that monetary policy indeed has a much larger effect on output variation, while fiscal policy is virtually ambiguous – a finding that will later be confirmed by the historical decomposition and counterfactual analysis.

*Table 3.6 Variance Decomposition of GDP for Peru*

| Period | S.E. | Supply | Fiscal | Monetary |
|---|---|---|---|---|
| 1 | 0.026 | 90.143 | 0.002 | 9.854 |
| 2 | 0.033 | 89.777 | 0.011 | 10.211 |
| 3 | 0.033 | 88.974 | 0.693 | 10.333 |
| 4 | 0.034 | 88.645 | 1.239 | 10.116 |
| 5 | 0.034 | 88.037 | 1.253 | 10.710 |
| 6 | 0.034 | 87.874 | 1.455 | 10.671 |
| 7 | 0.034 | 87.702 | 1.520 | 10.778 |
| 8 | 0.034 | 87.627 | 1.583 | 10.789 |
| 9 | 0.034 | 87.619 | 1.595 | 10.786 |
| 10 | 0.034 | 87.624 | 1.596 | 10.780 |

Variance decomposition based on the post 1995 SVAR suggests that policy played an important role in the variation of GDP, where fiscal policy is much more important than before.

*Table 3.7: Variance Decomposition of GDP for Peru (post 95)*

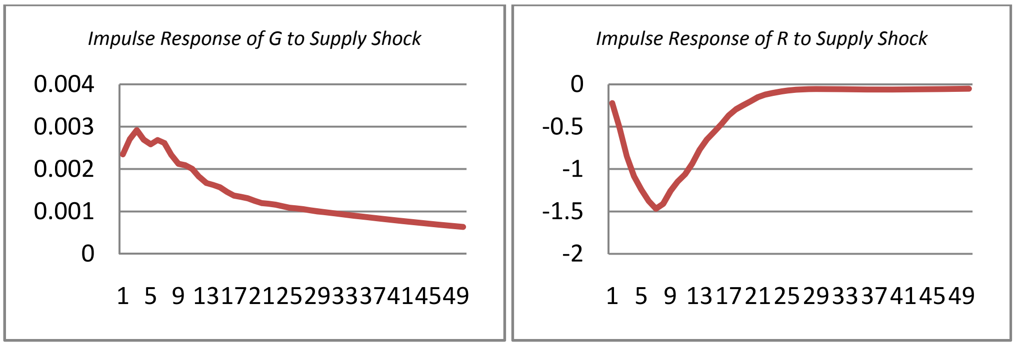
| Period | S.E. | Supply | Fiscal | Monetary |
|---|---|---|---|---|
| 1 | 0.014 | 59.080 | 23.655 | 17.265 |
| 2 | 0.015 | 55.367 | 27.902 | 16.731 |
| 3 | 0.015 | 54.425 | 28.413 | 17.162 |
| 4 | 0.015 | 52.110 | 30.376 | 17.515 |
| 5 | 0.016 | 51.249 | 29.830 | 18.921 |
| 6 | 0.016 | 52.065 | 29.321 | 18.614 |
| 7 | 0.016 | 52.146 | 29.104 | 18.750 |
| 8 | 0.016 | 52.973 | 28.676 | 18.351 |
| 9 | 0.016 | 53.174 | 28.600 | 18.225 |
| 10 | 0.016 | 53.301 | 28.444 | 18.255 |

The historical decomposition will further investigate the varying roles of fiscal and monetary policy in terms of their impact on output volatility.  The innovation accounting suggests that anti-cyclical fiscal policy could have played a stabilising role, while pro-cyclical monetary policy might have added substantially to output volatility.

*PHILIPPINES*

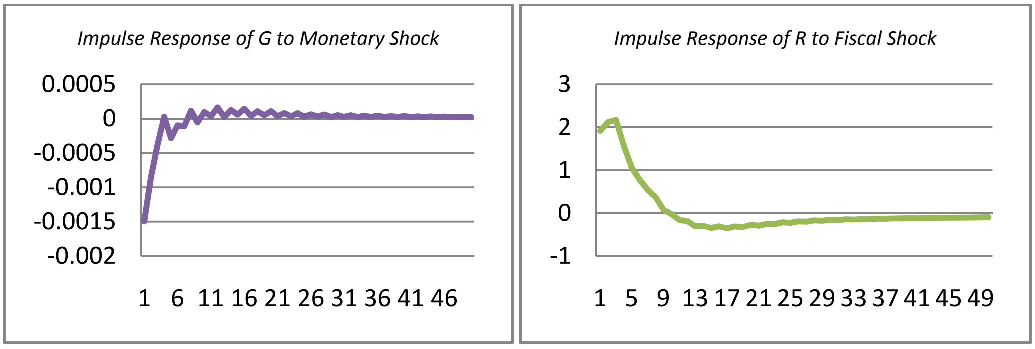
Both fiscal and monetary policies have been pro-cyclical, although the small magnitude of fiscal policy is more likely to render it a-cyclical, as is clear from the IRFs in Panel 3.22.

*Panel 3.22: The Cyclicality of Policies in Philippines*




Panel 3.23 shows that fiscal policy has been mildly accommodating, thereby aggravating the effects of pro-cyclical monetary policy, while monetary policy has been counteractive.

*Panel 3.23: Policy Coordination in Philippines*




The IRFs in Panel 3.24 suggest that the response of GDP to fiscal and monetary shocks is relatively small, while the variance decomposition in Table 3.8 shows that these demand-side shocks still play a role in explaining the variance of GDP.

*Panel 3.24: Policy Transmission in Philippines*

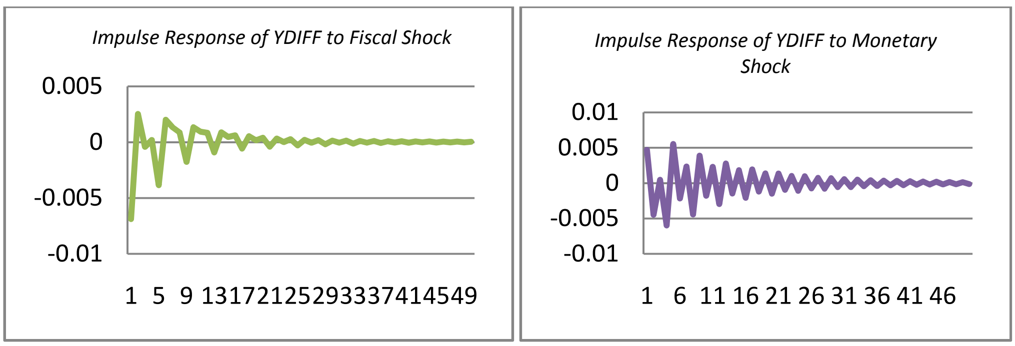
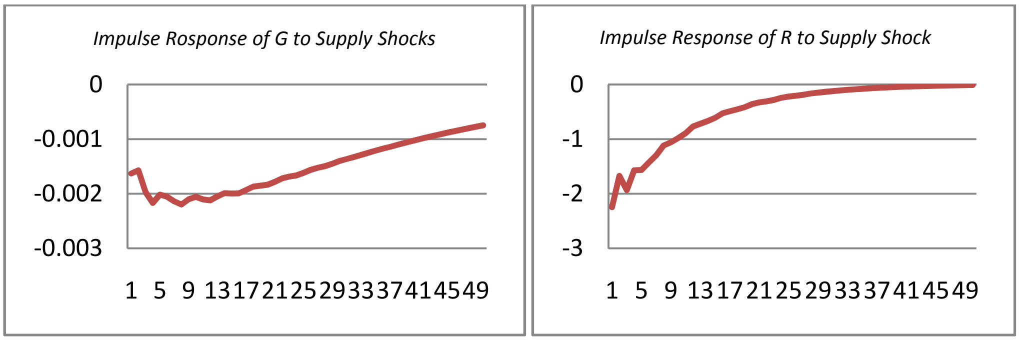


*Table 3.8: Variance Decomposition of GDP for Philippines*

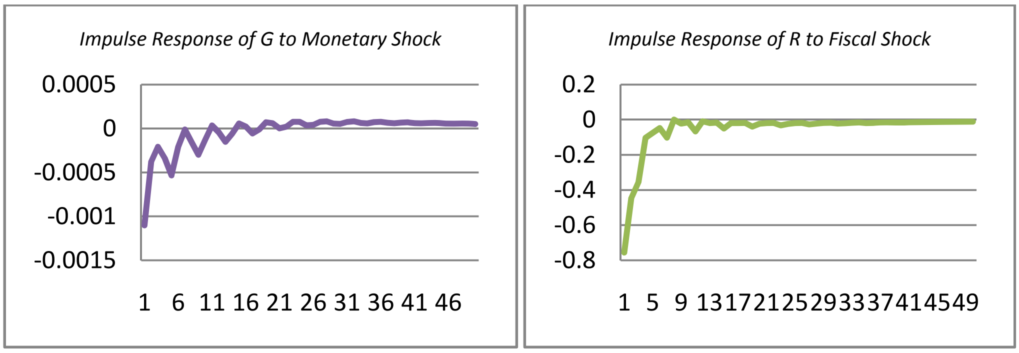
| Period | S.E. | Supply | Fiscal | Monetary |
|---|---|---|---|---|
| 1 | 0.016 | 72.138 | 19.035 | 8.827 |
| 2 | 0.017 | 66.124 | 19.033 | 14.843 |
| 3 | 0.017 | 66.254 | 18.943 | 14.804 |
| 4 | 0.018 | 60.664 | 16.107 | 23.230 |
| 5 | 0.021 | 58.356 | 16.179 | 25.465 |
| 6 | 0.021 | 57.410 | 16.698 | 25.892 |
| 7 | 0.021 | 56.558 | 16.790 | 26.652 |
| 8 | 0.022 | 54.486 | 16.084 | 29.431 |
| 9 | 0.022 | 53.616 | 15.731 | 30.653 |
| 10 | 0.022 | 53.121 | 15.920 | 30.959 |

As in the Peruvian case, there is some concern about the robustness of the results due to wild interest rate and output behaviour in the early 1980s, surrounding the debt-crisis in the Philippines (for more details about the data see the Data Appendix). To check robustness and to compare pre- and post-crisis policy behaviour the SVAR is estimated over the sample period after 1985, yielding a new set of IRFs. As seen in Panel 3.25 the IRFs show that while fiscal policy is now anti- or a-cyclical, monetary policy is still pro-cyclical. It is expected that fiscal policy would be more affected by the debt crisis and this seems to show in the IRF analysis. Both fiscal and monetary policies are accommodating, as shown in Panel 3.26. The change in coordination comes from the change in the cyclical behaviour of fiscal policy.

*Panel 3.25: The Cyclicality of Policies in Philippines (post '86)*



*Panel 3.26: Policy Coordination in Philippines*




The transmission of fiscal policy is less important than monetary policy since Panel 3.27 shows that the response of GDP to a monetary shock generates a lot of variation over quite a long period. The variance decomposition in Table 3.9 shows that monetary shocks play a large role in the variance of GDP, suggesting that monetary policy might have been a destabilising factor in the post-crisis era in Philippines.

*Panel 3.27: Policy Transmission in Philippines*

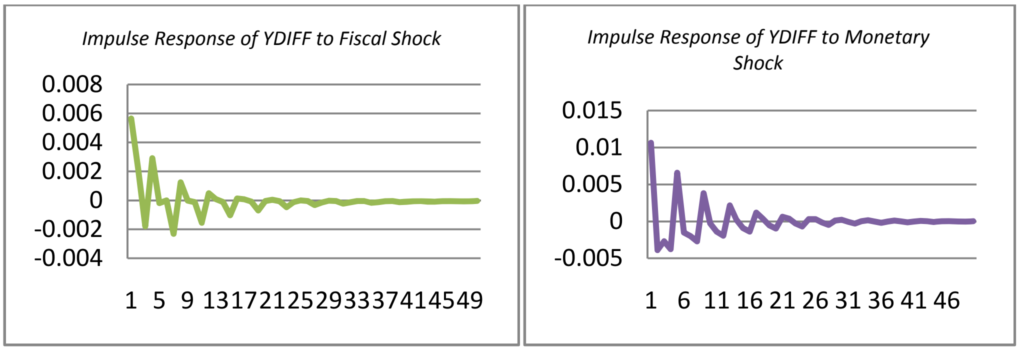



*Table 3.9: Variance Decomposition of GDP for Philippines (post '86)*

| Period | S.E. | Supply | Fiscal | Monetary |
|---|---|---|---|---|
| 1 | 0.01 | 5.15 | 20.95 | 73.89 |
| 2 | 0.01 | 5.07 | 21.07 | 73.86 |
| 3 | 0.01 | 8.20 | 20.84 | 70.96 |
| 4 | 0.02 | 13.43 | 21.11 | 65.46 |
| 5 | 0.02 | 11.49 | 17.74 | 70.77 |
| 6 | 0.02 | 11.41 | 17.58 | 71.01 |
| 7 | 0.02 | 11.31 | 18.84 | 69.85 |
| 8 | 0.02 | 13.31 | 18.29 | 68.40 |
| 9 | 0.02 | 12.85 | 17.43 | 69.73 |
| 10 | 0.02 | 12.86 | 17.42 | 69.72 |

*SUMMARY*

The innovation accounting has provided empirical support for the SVAR identification, and the consequent economic interpretation of the aggregate supply and demand shocks. This section has also presented results about the business cycle dynamics of fiscal and monetary policy in the group of EMEs, all of which can be summarised concisely in Table 3.10 below. A striking regularity is that the extent of the cyclical response of fiscal policy seems very small, but that in China, Mexico, Peru and Philippines it still explains a large proportion of the variance of GDP. This suggests that fiscal policy, where anti-cyclical smoothes the output cycle, where a-cyclical has an ambiguous effect, and where pro-cyclical aggravates the volatility of the output cycle. Fiscal policy in Israel and Korea seems to be relatively unimportant with respect to the volatility of the output cycle. These results confirm the findings of Du Plessis (2006: 21 – 22) that monetary policy is a much more effective stabilisation or destabilisation tool.

This paper's findings about the cyclicality of monetary policy corresponds to those of Du Plessis (2006) for Israel and Korea, but differs with respect to Mexico, Peru and Philippines, and provides new information about China. This paper finds evidence of pro-cyclical monetary policy in China, Mexico, Peru Philippines, and to some extent in Israel during their crisis years. Variance decompositions confirm that output responds to pro-cyclical monetary policy, whereas in China, Peru and Philippines accommodating fiscal policy aggravates the effects of pro-cyclical monetary policy. This kind of policy behaviour can add to the volatility of the output cycle, and be a source of loss to society.

*Table 3.10: Summary of Policy Behaviour in EMEs*

| | **Cyclicality** | | **Coordination** | | **Variance Decomposition** | |
|---|---|---|---|---|---|---|
| **Country** | **Fiscal** | **Monetary** | **Fiscal** | **Monetary** | **Fiscal** | **Monetary** |
| China | *anti/a* | *pro* | *accomm* | *accomm* | *0.80%* | *28%* |
| Israel | *anti/a* | *pro* | *counter* | *counter* | *9.40%* | *0.03%* |
| Israel (post '86) | *anti/a* | *anti* | *accomm* | *counter* | *0.04%* | *1.80%* |
| Korea | *anti/a* | *anti* | *counter* | *accomm* | *16.20%* | *1.16%* |
| Mexico | *a* | *pro* | *counter* | *accomm* | *4.50%* | *25%* |
| Peru | *pro/a* | *pro* | *counter* | *counter* | *1%* | *10%* |
| Peru (post '95) | *anti/a* | *pro* | *accomm* | *counter* | *30%* | *17%* |
| Philippines | *pro/a* | *pro* | *accomm* | *counter* | *16%* | *20%* |
| Philippines (post'86) | *anti/a* | *pro* | *accomm* | *accomm* | *18%* | *70%* |

The results of this section are informative about the policy behaviour in the group of EMEs over the sample period, but cannot identify variation in policy behaviour over the sample period itself.  The innovation accounting exercise is, as we have seen with simple sample changes, dependent on the data over the whole period.  All of these EMEs have experienced periods of financial crisis, in which stabilisation policy can hardly be considered to be 'normal'.  It is important to investigate to what extent the volatility caused by the crises affect the overall volatility of output, and how policy behaviour has responded to the crises.  In this regard the innovation accounting is merely suggestive and provides a good starting point for further investigation in the next section.

Also, just because the policy response to the business cycle fluctuations in output is small, as was the case with fiscal policy in most cases studied in this section, does not mean that the policy does not have any influence on the volatility of output at all.  The same obviously holds for monetary policy.  The results from the innovation accounting hinted at this when the size of the impulse response function was small, but the variance decomposition revealed that the policy shocks have some explanatory power with respect to the variation in GDP.  Of course, the size of the influence of any given policy on the volatility of GDP only makes sense once it is compared to the volatility of GDP under a 'relevant' alternative policy scenario.

This is the usual economic method of counterfactual analysis, and is intimately connected to the basic approach of opportunity cost analysis.  The opportunity cost of one policy is the outcome that you could have had under an alternative policy.  The extent to which a given policy history has contributed to the volatility of GDP only has economic meaning once it is related to the volatility of GDP that would have realised in the absence of that policy, and hence under an alternative policy.  The next section, using historical decomposition in the tradition of Fackler and MacMillin (1998) and an approach to counterfactual policy analysis used recently by Du Plessis, Smit and Sturzenegger (2007a), attempts to quantify the importance of the stabilisation policy behaviour for the group of EMEs in terms of the contribution of these policies to the volatility of output.  The historical decomposition also allows investigation into policy responses to the crises, a study of the time-paths of policy behaviour and provides further support for the model identification.

## 3.4 HISTORICAL DECOMPOSITION

The moving average representation of the structural model (3.1) and the reduced-form model (3.2) allow us to view the fluctuations in the system variables as being the result of different shocks. In the econometric approach, the SVAR is specified so that these shocks have a clear economic interpretation – fluctuations in output are decomposed into aggregate supply and aggregate demand shocks, where the aggregate demand shocks are further decomposed into monetary and fiscal policy shocks. The SVAR allowed us to study policy conduct in terms of policy reactions to business cycle dynamics and, to some extent, policy transmission to the business cycle itself. At the beginning of the empirical analysis we looked at the different levels of macroeconomic volatility among the group of EMEs, as part of the loss-function based approach. Using the structural factorization of the VAR, we can continue with the loss-function based analysis and determine to what extent monetary and fiscal policy shocks have made the business cycle more volatile.

Historical decomposition allows us to decompose the historical data, each variable in the system, into the sum of the accumulated shocks and a base projection. Whereas the role of the shocks is quite clear, the precise meaning of the base projection is somewhat vague. It can best be understood as a type of in-sample forecast – because the shocks are mutually orthogonal, and innovations with respect to the inertial evolution of the given series, projecting from a given date ahead does not allow us to use the information contained in the shocks themselves. The decomposition splits the series into random shocks and inertial evolution. From this we construct a new aggregate supply and demand series, which gives us a new measure of the business cycle – this is used to study the effect of monetary and fiscal policy on the business cycle, in a counterfactual type setting.

To see this from another perspective, following Fackler and MacMillin (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 $\varepsilon_t$ are structural shocks, the latter forming the basis of the moving average representation in (3.1). Now the 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 $\pi_i$, 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),

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

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,

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

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

$$= \sum_{s=0}^{\infty} D_s \varepsilon_t. \tag{3.20}$$

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

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

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

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

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 $t$. The algebraic reasoning corresponds to the intuitive explanation where the data is said to be decomposed into random shocks and inertial evolution.

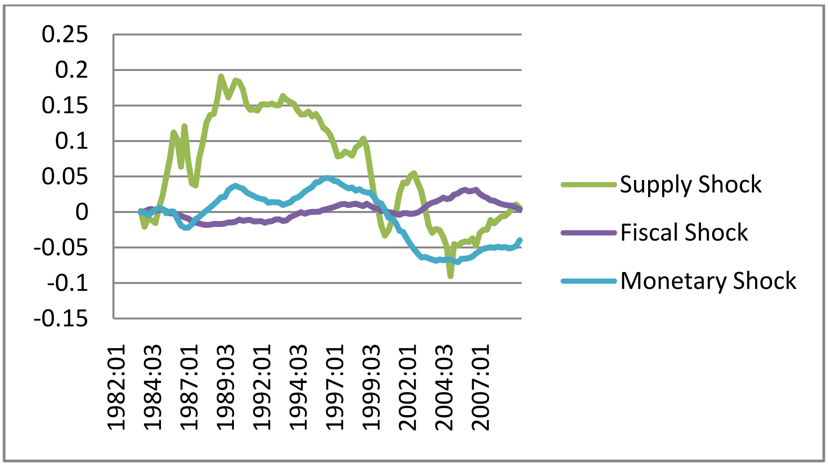
### 3.4.1 RESULTS

This section analyses the evolution of stabilisation policy over time, the response of policies to financial crises, attempts to quantify the importance of the policy behaviour in terms of its contribution to output volatility, and provides additional empirical support for the model identification. To further investigate the extent and nature of policy cyclicality, and to move beyond the suggestive conclusions drawn from innovation accounting, this section uses the historical decomposition to study the time paths of the mutually orthogonal structural shocks to GDP in each country. These shocks correspond to the accumulated response of GDP to aggregate supply and fiscal and monetary policy shocks.

*CHINA*

Figure 3.28 shows the cumulative mutually orthogonal shocks to GDP for China – this decomposition of GDP into the evolution of the three structural shocks corresponds to the first term in (3.21).

*Figure 3.28: Accumulated Response of GDP to Aggregate Shocks in China*




As argued by Du Plessis, Smit and Sturzenegger (2007a), the cyclicality of policy cannot be determined by looking only at the co-movements of the policy shocks with the evolution of GDP, as was done in the innovation accounting exercise. Because aggregate demand shocks have temporary effects on real GDP, policy actions will be correlated with the business cycle. To avoid the possible bias due to GDP being influenced by its own effect, the cyclicality of policy can be investigated by studying the correlations between the demand and supply shocks given by the historical decomposition. Doing this for China over different sample periods yields the results shown in Table 3.11.

*Table 3.11: Correlations: Accumulated Demand and Supply Shocks in China*

| Period | Fiscal Shock | Monetary Shock | Intra-policy |
|---|---|---|---|
| 1980q1-2008q1 | -0.76 | 0.77 | -0.57 |
| 1980q1-1990q1 | -0.77 | 0.67 | -0.36 |
| 1990q1-2000q1 | -0.44 | 0.44 | 0.45 |
| 2000q1-2008q1 | -0.88 | 0.66 | -0.59 |

While confirming the direction of the policy responses found by innovation accounting, the correlations in Table 3.10 show that fiscal policy has been anti-cyclical over the whole period, most probably due to the fact that it has a currency board with no independent monetary policy. It has, however been less pro-cyclical during the 1990s, and most pronounced after 2000. Monetary policy follows this trend of varying intensity closely, but has been pro-cyclical. The pro-cyclicality of monetary policy is a concern in that it could aggravate cyclical fluctuations. Fiscal and monetary policy responses have been mostly negatively correlated with the exception of the 1990s. Due to the complicated time-varying relationship between policy responses, aggregate demand and supply shocks, and the business cycle, it is not entirely clear how the cyclical behaviour of policy has influenced the volatility of output. By simply looking at the size of the fluctuations in supply shocks and demand shocks in Figure 3.28 we would expect demand shocks not to have as big influence as supply shocks. The 1998 Asian crisis is visible in the negative supply shock. It is nonetheless important to investigate how large the influence is in terms of the historical transmission of policy. The model lends itself to a counterfactual-type policy simulation that will help quantify the extent of policy influence on output volatility in a consistent way.

The counterfactual analysis proceeds by setting the policy shocks equal to zero over the sample period, and comparing the standard deviation of output under the different policy scenarios – where policy effects are eliminated, and where they are present. This method is also employed by Du Plessis, Smit and Sturzenegger (2007a) and follows the recommendations of Fackler and MacMillin (1998). The counterfactual yields a new output series by asking what it would have looked like had policy conduct been consistent with mostly a-cyclical behaviour. The sense in which the effect of policy on output volatility is quantified is now clear, and the limitations will be discussed at the end of the section.

Table 3.12 shows the results for China: comparing the standard deviation of output under the scenario where there are no monetary policy shocks versus where they are included confirms that the pro-cyclical monetary policy, over booms and busts, has added 4.5% to the standard deviation of output. Together, given their counteractive nature, the policy shocks have added about 7% to the standard deviation of output. Du Plessis et al. (2007a: 22) find a mere change of 0.5% in the standard deviation of output due to the elimination of shocks in South Africa. This means that stabilisation policy in China has had a relatively large influence on the volatility of output.

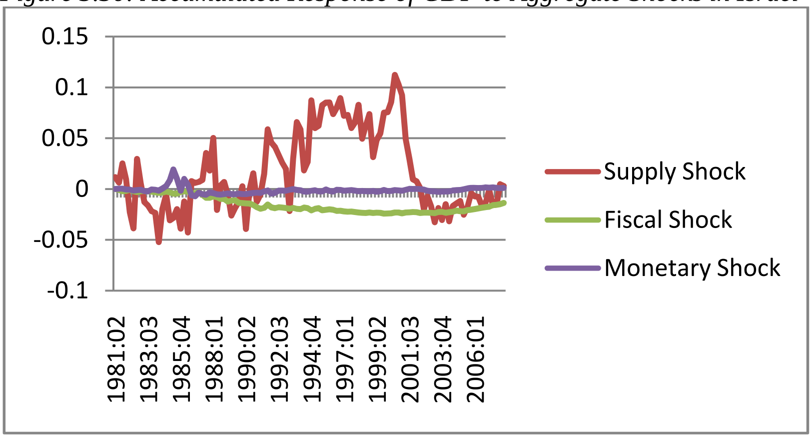
*Table 3.12: China Counterfactual Policy Outcomes*

| | Actual | No shocks | No fiscal shocks | No monetary shocks |
|---|---|---|---|---|
| Std Dev | 0.384 | 0.359 | 0.341 | 0.368 |
| % change | | 6.90% | 12.60% | 4.40% |

*ISRAEL*

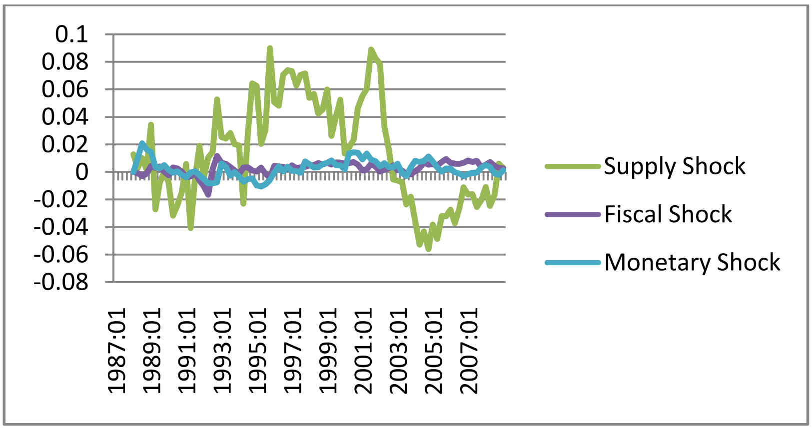
A similar analysis for Israel reveals the ability of the historical decomposition to assign the variation of GDP to aggregate components that have a straight-forward economic interpretation. Figure 3.29 shows the evolution of aggregate supply and demand shocks, with the variation in policy shocks being dwarfed by supply shocks – the large negative supply shock during the second Palestinian Intifada from 2000 until 2002. In the previous section the IRF analysis and sample selection procedure showed that the major pro-cyclical monetary policy event happened during the Israeli financial crisis in the early 1980s. Casual inspection of the accumulated monetary shock in Figure 3.29 confirms the dominance of the monetary reaction during the crisis compared to the 'normal' policy making afterwards.

*Figure 3.30: Accumulated Response of GDP to Aggregate Shocks in Israel*



Excluding the crisis from the sample allows a much more clear identification of the subsequent policy behaviour, as is clear in Figure 3.30 below. Compared to the fluctuations in the supply shocks, policy shocks still seem quite small.

*Figure 3.30: Accumulated Response of GDP to Aggregate Shocks in Israel (post '86)*




Studying the correlations between the accumulated shocks to GDP reveals the cyclicality of policy over the time period. IRF analysis suggested that fiscal policy has been mostly anti-cyclical or a-cyclical over the entire period, and the results in Table 3.13 confirm this to some extent. Fiscal shocks have responded pro-cyclical and anti-cyclical, but the correlation is small most of the time. Monetary policy has been pro-cyclical although the post-crisis sample suggests that during the period of 'normal' policy making it has been quite weak.

*Table 3.13: Correlations: Accumulated Demand and Supply Shocks in Israel*

| Period | Fiscal Shock | Monetary Shock | Intra-policy |
|---|---|---|---|
| *Whole Sample* | | | |
| 1980q1-2008q1 | 0.13 | 0.23 | 0.23 |
| 1980q1-1990q1 | -0.18 | 0.77 | -0.12 |
| 1990q1-2000q1 | 0.54 | 0.47 | 0.49 |
| 2000q1-2008q1 | -0.28 | 0.45 | -0.19 |
| *Post '86* | | | |
| 1986q1-2008q1 | -0.01 | 0.03 | 0.23 |
| 1986q1-1995q1 | 0.13 | -0.23 | 0.10 |
| 1995q1-2008q1 | -0.16 | 0.20 | 0.01 |

Counterfactual analysis and the magnitudes in Tables 3.14, calculated in the same way as in the Chinese case, suggests that stabilisation policy in Israel has had small to no effect on the volatility of output.

*Table 3.14: Israel Counterfactual Policy Outcomes*

| *Policy change over the whole sample* | | | | |
|---|---|---|---|---|
| | Actual | No shocks | No fiscal shocks | No monetary shocks |
| *GDP in levels* | | | | |
| Std Dev | 0.342 | 0.339 | 0.339 | 0.332 |
| % change | | 0.86% | 0.85% | 2.93% |
| | | | | |
| *Policy change after 1986 (from SVAR estimated of the whole sample period)* | | | | |
| | Actual | No shocks | No fiscal shocks | No monetary shocks |
| *GDP in levels* | | | | |
| Std Dev | 0.342 | 0.339 | 0.340 | 0.332 |
| % change | | 0.77% | 0.66% | 3.03% |

When the historical decomposition is done based on the SVAR estimated for the sample period after the crisis, the magnitudes in Table 3.15 suggest a somewhat larger role for stabilisation policy in adding to the volatility of output (about 5%), although it is smaller than the Chinese case.

*Table 3.15: Israel Counterfactual Policy Outcomes*

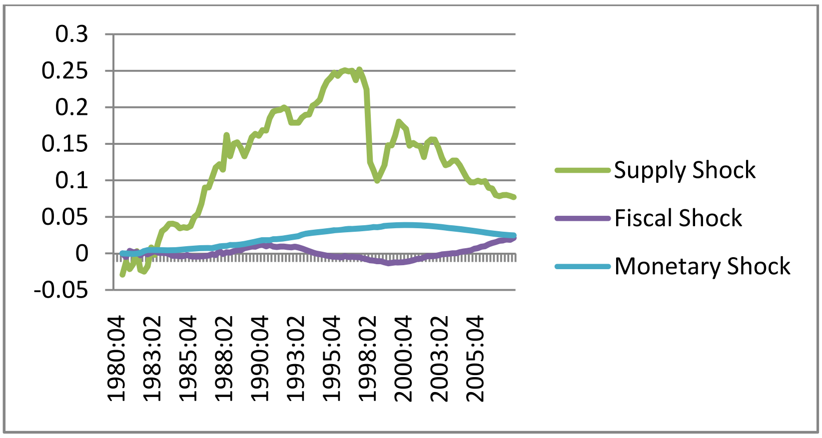
| *Policy change after 1986 (from SVAR estimated over only that period)* | | | | |
|---|---|---|---|---|
| | Actual | No shocks | No fiscal shocks | No monetary shocks |
| *GDP in levels* | | | | |
| Std Dev | 0.275 | 0.259 | 0.260 | 0.261 |
| % change | | 6.30% | 6.10% | 5.50% |

A striking observation is the size of the negative supply shock suffered by Israel around 2001, coinciding with the September 11$^{th}$ terrorist attacks, and the Turkish and Argentinean financial crises. These crisis-related fluctuations form an important part of the explanation of policy behaviour and output volatility.

*KOREA*

The results obtained from innovation counting suggested that Korean demand-side policies have been counter-cyclical over the sample period. Figure 3.31 shows the accumulated response of GDP to the aggregate shocks and policy conduct seems very smooth based on visual inspection.

*Figure 3.31: Accumulated Response of GDP to Aggregate Shocks in Korea*




Also clear from visual inspection is the massive negative supply shock around 1997, when the Asian financial crisis started. Even though stabilisation policy seems very smooth over the entire period, the relatively wild supply shocks influence the conclusions about cyclicality of policy to quite a large extent. Studying the correlations between demand and supply shocks show how the negative supply shock dominated the results about monetary policy found in the innovation accounting exercise.

*Table 3.16: Correlations: Accumulated Demand and Supply Shocks in Korea*

| Period | Fiscal Shock | Monetary Shock | Intra-policy |
|---|---|---|---|
| 1980q1-2008q1 | -0.11 | 0.65 | -0.25 |
| 1980q1-1990q1 | 0.47 | 0.93 | 0.54 |
| 1990q1-2000q1 | 0.09 | -0.02 | -0.98 |
| 2000q1-2008q1 | -0.95 | 0.95 | -0.99 |

It turns out that monetary policy has been pro-cyclical over the rest of the period, while during the crisis, due to the large negative supply shock, monetary policy was counter-cyclical. The more nuanced results on monetary policy correspond to the results found by Du Plessis (2006), whereas those based on innovation accounting were opposed. Fiscal policy conduct has been mixed over the period. Given the large supply shock and the smooth evolution of policy shocks it is doubtful that the pro-cyclical policy conduct has destabilised output to any meaningful extent.

*Table 3.17: Korea Counterfactual Policy Outcomes*

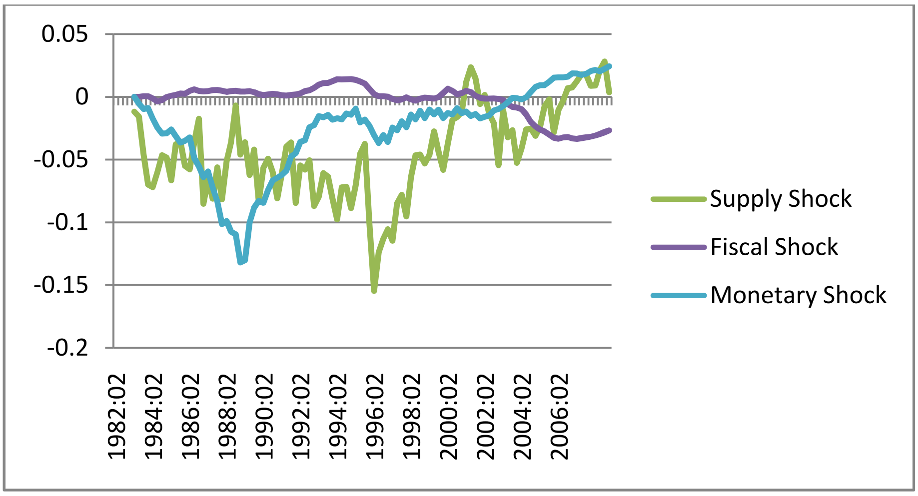
| *Policy change over the whole sample* | | | | |
|---|---|---|---|---|
| | Actual | No shocks | No fiscal shocks | No monetary shocks |
| *GDP in levels* | | | | |
| Std Dev | 0.534 | 0.510 | 0.521 | 0.510 |
| % change | | 4.89% | 2.53% | 4.74% |
| | | | | |
| *Policy change after 1998 (from SVAR estimated of the whole sample period)* | | | | |
| | Actual | No shocks | No fiscal shocks | No monetary shocks |
| *GDP in levels* | | | | |
| Std Dev | 0.534 | 0.509 | 0.521 | 0.511 |
| % change | | 4.95% | 2.63% | 4.69% |

Table 3.17 shows the results from the counterfactual simulation, and suggests that the combined destabilising influence of the policy shocks is in the 5%, while output's response to monetary policy is about 2% larger than fiscal policy.  The results show that demand shocks are quantitatively unimportant when compared to supply shocks in explaining the volatility of output in Korea.  It seems then, that the historical evolution of supply shocks have been the major source of volatility in the Korean business cycle and that stabilisation policy has done well not to destabilise the cycle that much.

*MEXICO*

While fiscal policy seems to share a kind of smoothness with the Korean fiscal policy, the same cannot be said of monetary policy, as can be seen from Figure 3.32 below.

*Figure 3.32: Accumulated Response of GDP to Aggregate Shocks in Mexico*




The innovation accounting suggested mostly a-cyclical fiscal policy and pro-cyclical monetary policy over the sample period. These results hold when the correlations presented in Table 3.18 are examined. The anti-cyclical stimulus in fiscal policy comes from the post 2000 period, while monetary policy was a-cyclical during the 1980s during a large business cycle expansion.

*Table 3.18: Correlations: Accumulated Demand and Supply Shocks in Mexico*

| Period | Fiscal Shock | Monetary Shock | Intra-policy |
|---|---|---|---|
| 1980q1-2008q1 | -0.59 | 0.39 | -0.57 |
| 1980q1-1990q1 | -0.01 | 0.06 | -0.65 |
| 1990q1-2000q1 | -0.08 | 0.56 | 0.22 |
| 2000q1-2008q1 | -0.58 | 0.59 | -0.95 |

The supply shocks capture the effects of the financial crises in 1982 and 1994, and much of the large pro-cyclical fluctuations in monetary policy are bunched in these crisis periods. In this setup it is useful to ask two counterfactual questions: what would the volatility of output have been had policy evolved differently throughout the crises and over the whole period? And what would it have been, had policy been different after the second crisis in 1994? By asking these questions we can quantify the extent to which stabilisation policy has contributed or detracted from output volatility, although given the pro-cyclical nature of monetary policy it is not expected to have contributed to more stability. Table 3.19 summarises the results of the model-based counterfactual simulation.

*Table 3.19: Mexico Counterfactual Policy Outcomes*

| *Policy change over the whole sample* | | | | |
|---|---|---|---|---|
| | Actual | No shocks | No fiscal shocks | No monetary shocks |
| *GDP in levels* | | | | |
| Std Dev | 0.213 | 0.196 | 0.221 | 0.187 |
| % change | | 8.42% | -3.78% | 13.84% |
| | | | | |
| *Policy change after 1994 (from SVAR estimated of the whole sample period)* | | | | |
| | Actual | No shocks | No fiscal shocks | No monetary shocks |
| *GDP in levels* | | | | |
| Std Dev | 0.213 | 0.217 | 0.220 | 0.209 |
| % change | | -1.89% | -3.22% | 1.77% |

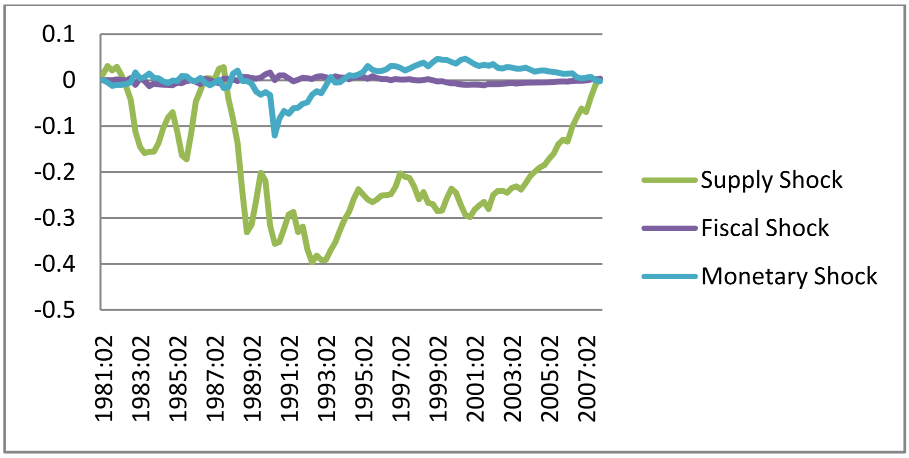
If there were no monetary shocks over the whole period, if the pro-cyclical monetary policy did not happen, output would have been about 13 % more stable, whereas fiscal policy had an overall stabilising effect. No shocks whatsoever would have produced an output profile with a standard deviation 9% smaller – this is quite large. However, based on the post 1994 results it seems that fiscal policy played a small stabilising role, while monetary policy was mildly destabilising. It does seem like the Mexican monetary policy left enough room for improvement, but once again it is the supply shocks that dominate the volatility in output.

*PERU*

The innovation accounting results on Peru suggested that fiscal policy was relatively pro-cyclical during the 1980s, whereas it became anti-cyclical after 1994. The results also showed that monetary policy was mostly pro-cyclical, but less so during the post 1995 period. It seems that policies on the demand-side had become more stable after the hyperinflationary period of the 19802 and early 1990s, but also that monetary policy could have had a substantially destabilising effect on output. To investigate this further and more fully, the analysis turns to the historical decomposition of the data, presented graphically in Figure 3.33 below. On visual inspection, the supply shock is much more stable after 1995, while the large negative monetary policy shock at the end of the 1980s does not repeat itself. These intuitive observations are quantitatively supported by the fact that the standard deviation of the supply shocks is 0.07 in the post 1995 period, compared to the 0.14 in the previous period

– a 100% decrease in the average size of the deviations in supply shocks. While fiscal shocks have a roughly constant and small standard deviation of 0.005 over the whole period, monetary shocks are also 75% smaller in the post 1995 period – from 0.027 to 0.011. This suggests that the stabilisation of the economy had its origins from both the supply- and the demand-side, but that the supply-side stabilisation is much larger. Be that as it may, it is still important to find out to what extent better demand-side policy could have made a difference, had it been conducted in a more appropriate cyclical way.

*Figure 3.33: Accumulated Response of GDP to Aggregate Shocks in Peru*




Given the observations about the size of the shocks and the suggestive results from the innovation accounting, the historical decomposition reveals a much more nuanced, but consistent picture about the cyclicality of policy. Table 3.20 shows that fiscal policy has been mildly counter-cyclical on the whole, while monetary policy has been both strongly pro- and anti-cyclical over the whole period, the latter finding about monetary policy corresponding to that of Du Plessis (2006).

*Table 3.20: Correlations: Accumulated Demand and Supply Shocks in Peru*

| Period | Fiscal Shock | Monetary Shock | Intra-policy |
|---|---|---|---|
| 1980q1-2008q1 | -0.24 | 0.07 | -0.48 |
| 1980q1-1994q4 | -0.52 | 0.46 | -0.39 |
| 1995q1-2008q1 | 0.26 | -0.86 | -0.44 |

We can use the historical decomposition in a similar way as before to get an estimate of the impact that demand-side policy had on output volatility – by comparing the actual volatility of output, with the model-based alternatives, each corresponding to a different policy scenario. Table 3.21 presents the counterfactual scenarios below.

*Table 3.21: Peru Counterfactual Policy Outcomes*

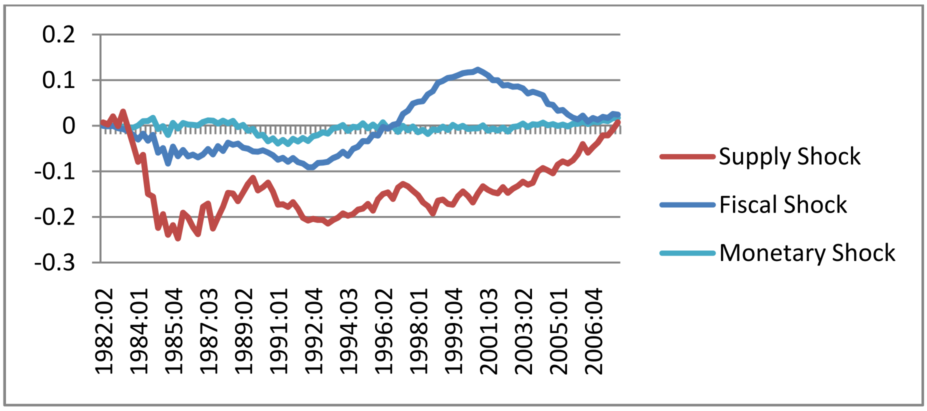
| *Policy change over the whole sample* | | | | |
|---|---|---|---|---|
| | Actual | No shocks | No fiscal shocks | No monetary shocks |
| *GDP in levels* | | | | |
| Std Dev | 0.214 | 0.200 | 0.216 | 0.198 |
| % change | | 6.60% | -0.98% | 7.70% |
| | | | | |
| *Policy change after 1995 (from SVAR estimated of the whole sample period)* | | | | |
| | Actual | No shocks | No fiscal shocks | No monetary shocks |
| *GDP in levels* | | | | |
| Std Dev | 0.214 | 0.208 | 0.215 | 0.207 |
| % change | | 2.73% | -0.66% | 3.39% |

Eliminating demand-side policy shocks altogether, over the whole period, would have yielded an output profile that was 6.6% more stable, in terms of standard deviations – this added stability would have come from the elimination of the destabilising monetary policy, while fiscal policy seems too small to matter much. In the light of the stabilisation from the supply-side subsequent to the hyperinflationary period it makes sense to ask how different policy behaviour would have affected output volatility had it been different after 1995, but unchanged before 1995. The results in Table 3.21 show that, similar to the scenario over the whole period, fiscal policy is unimportant while monetary policy had a destabilising effect of output, up to 3.4% of standard deviations. Even though this is bad in terms of welfare, it is an improvement when compared to the hyperinflationary period – monetary policy has been less destabilising after 1995, but better cyclical policy could have had a 3% improvement.

*PHILIPPINES*

In the innovation accounting section, it became clear that the debt crisis of the early 1980s had a big influence on the interpretation of the cyclicality of fiscal policy over the sample period. More specifically, the observed pro-cyclicality in the IRF comes mainly from the behaviour of fiscal policy during the debt crisis period, whereas fiscal policy is mildly counter-cyclical afterwards. Monetary policy, on the other hand, seems to be pro-cyclical. Once again, the historical decomposition provides a more nuanced picture of stabilisation policy. The large negative supply shocks associated with the debt crisis are evident in Figure 3.35.

*Figure 3.35: Accumulated Response of GDP to Aggregate Shocks in Philippines*




Just as the innovation accounting suggested, fiscal policy was pro-cyclical during the 1980s, while it was anti-cyclical afterwards. Monetary policy was anti-cyclical before 2000 and pro-cyclical afterwards, although it seems to have been a-cyclical on the whole, as suggested by Du Plessis (2006).

*Table 3.22: Correlations: Accumulated Demand and Supply Shocks in Philippines*

| Period | Fiscal Shock | Monetary Shock | Intra-policy |
|---|---|---|---|
| 1980q1-2008q1 | -0.62 | 0.08 | 0.08 |
| 1980q1-1990q1 | 0.89 | -0.15 | -0.23 |
| 1990q1-2000q1 | -0.95 | -0.47 | 0.35 |
| 2000q1-2008q1 | -0.98 | 0.84 | -0.80 |

It turns out that if the policy shocks were eliminated altogether, output would have been more stable with a standard deviation smaller 18%, as shown in Table 3.23 below. Eliminating one set of policy shocks is not so easy to interpret, since the remaining policy, which could have been both accommodating and counter-active in turn, is then left unchecked, and exerts more of an influence on output. But on the whole, eliminating either of the policy shocks over the whole sample would have produced a more stable output profile, with fiscal policy having a stronger effect. Fiscal reform after the 1980s debt crisis resulted in anti-cyclical policy, but the large pro-cyclicality during the 80s still dominates the overall effect of fiscal policy on output. Monetary policy seems to have played a much smaller role in contributing to output volatility. Stabilisation policy in the Philippines has therefore contributed to the volatility of output, and an alternative policy regime could have done better in terms of stabilisation.

*Table 3.23: Philippines Counterfactual Policy Outcomes*

| *Policy change over the whole sample* | | | | |
|---|---|---|---|---|
| | Actual | No shocks | No fiscal shocks | No monetary shocks |
| *GDP in levels* | | | | |
| Std Dev | 0.253 | 0.214 | 0.217 | 0.249 |
| % change | | 18% | 16.41% | 1.26% |

*SUMMARY*

The major research question discussed in this paper is the extent to which stabilisation policies in EMEs have contributed to their observed macroeconomic volatility, along the dimension of output volatility. Once the cyclical conduct of policy has been identified it only acquires meaning in terms of the loss function if we can quantify the extent of destabilisation or destabilisation – this has been the main aim of this section.

China's fiscal policy has been mostly anti-cyclical but pro-cyclical policy has added volatility to output in the range of 7% of standard deviation. This means that better cyclical stabilisation policy could have made a difference to economic volatility in China. In Israel, on the other hand, had there been no policy shocks over the whole sample period, would have had little stability to gain – about 1% of standard deviation in output. This is due to the ambiguous cyclical nature of stabilisation policy, and the large influence of the 1983 financial crisis. Looking only at the post-crisis sample, stabilisation policy added up to 5% standard deviation to output. It seems that better cyclical policy in the post-crisis period could have made a difference, although the volatility seems to be dominated from the supply-side. In Korea, mixed cyclical behaviour over the sample period result in a more or less of a-cyclical contribution to output. Counterfactual analysis suggests that eliminating the shocks altogether would have increased stability by about 5%, in terms of the standard deviation of output. Mexico experienced pro-cyclical monetary policy which, over the whole sample range, added about 8% to output volatility, whereas a post 1994 policy actually added to output stability.

In Peru, better cyclical policy over the whole period would have produced an output profile with 7% less standard deviation, where the room for improvement is primarily in monetary policy. Even though demand-side policies contributed to more output volatility, evidence suggests that policies have been improving over time. Supply-side shocks nevertheless dominate the fluctuations in output due to demand-side shocks. The Philippine economy had pro-cyclical fiscal and monetary policy at times, with accommodating policy behaviour from both sides. Eliminating these potentially destabilising fluctuations altogether would have gained output stability up to 18% of the standard deviation of output, with most of the destabilisation originating in the crisis-led fiscal policy behaviour or the 1980s.

The results suggest that when cyclical fiscal and monetary policy has been bad, it was sometimes pretty bad – adding up to 18% volatility to output in terms of standard deviations. In some cases, however, the impact was small. In most cases, monetary policy has had a larger influence than fiscal policy, according to the innovation accounting and the historical decomposition. This section analysed the demand-side policy behaviour in the context of its relation to the supply-side of the economy, and made an attempt to contextualise the fluctuations of the demand-side in terms of those of the supply-side. By doing this, it becomes clear that, to the extent that the demand-side policies respond to the cyclical fluctuations of the supply-side, the main origin of output volatility in these EMEs is the supply-side of the economy – Table 3.25 confirms this.

*Table 3.24: Standard Deviation of Aggregate Series*

| **Country** | **AS** | **AD** | **Factor** |
|---|---|---|---|
| China | 0.36 | 0.03 | 11.21 |
| Israel | 0.34 | 0.01 | 36.89 |
| Israel (post '86) | 0.26 | 0.01 | 31.29 |
| Korea | 0.51 | 0.01 | 38.46 |
| Mexico | 0.2 | 0.03 | 6.74 |
| Peru | 0.2 | 0.02 | 10 |
| Philippines | 0.21 | 0.06 | 3.35 |
| Philippines (post '86) | 0.33 | 0.09 | 3.51 |
| South Africa | 0.33 | 0.02 | 14.8 |
| United States | 0.25 | 0.01 | 26.02 |

EMEs are in a different range of economic volatility because they are structurally different, experience financial crises more often and more deeply, and in many cases fiscal and monetary policies do not respond to output fluctuations in the correct way. When this is the case, the influence on volatility can be quite large in some cases, but is mostly negligible. Put differently, negative supply shocks are usually so big in EMEs that an incorrect demand-side policy response cannot do too much to make it worse, while a correct policy response cannot do too much to make it better either. This has been demonstrated by the empirical analysis. Just to be clear, this is not an argument that stabilisation policy does not matter, but rather an argument for the establishment of appropriate institutions on both the supply and demand side of the economy.

Apart from providing a consistent set of answers to the initial research question, this section provided additional empirical support for the model identification: the accumulated response of GDP to supply shocks identify the major crisis events in the countries very accurately. Given the support for the model, the empirical results about the contribution of stabilisation policies to output volatility can only take the policy analysis that far. It can demonstrate that demand-side policies have had some impact on the economic stability of EMEs and that future stabilisation policy should remain conservative in trying to stabilise output. But the empirical analysis has taken the historical data as given, while future policy behaviour is not given, nor is the correct policy conduct obvious from the results presented in this section. The institutional arrangement must be tailored to the specific economy. It is the aim of the next section to explore the implications of the empirical findings for the existing empirical literature, and for policy conduct. And in doing this the paper has to leave the confines of the model and adopt a different type of argument.

*The point here is ontological: Even though macroeconomics cannot be reduced to microeconomics as the program of microfoundations suggests, the elements of macroeconomics could not exist without the substrate of microeconomic individuals.*

KENNETH D. HOOVER 2001, 124

## 4. IMPLICATIONS

Section 3 provides evidence in support of the argument that appropriate cyclical policy can contribute to a more stable output profile. The policy histories of the group of EMEs explains to a large extent why they are placed higher up on the vertical axis of the loss function presented in section 1. In most cases, monetary policy has contributed to a more volatile output profile in the group of EMEs. Indeed, the short historical background showed that the large supply shocks originated from the sometimes awkward monetary integration of the EMEs with the international market. Recent history has seen monetary reforms in all of these countries which aim to contribute to macroeconomic stability, and the analysis suggests that this is sensible. But having independent monetary policy means having an exchange rate regime that allows a nominal anchor apart from the exchange rate itself. And the crisis history suggests that for the mix of monetary policy flexibility and credibility to be effective, it must be supported by sound institutions. On the fiscal side, policy has been mostly a-cyclical, or had little effect when compared to monetary policy, except in cases where fiscal expenditures were drastic.

The results in section 3 and Table 3.25 show that the response of output to supply shocks is much larger than the response to demand shocks, in some cases up to a factor of 38 times larger, in some only 3 times larger. The variation in this magnitude is important, suggesting that both shocks can contribute to more stable output, but also that demand-side policies have a smaller role to play. The long-run restrictions, as supported by the macroeconomic framework and the empirical models, require supply shocks to have permanent effects on output while demand shocks are merely transitory, but this does not mean that permanent effects do not affect output volatility.

The current internationally coordinated response to the global financial crises illustrates this close relationship between the institutional nature of the economy, the cyclical fluctuations in output, and attempts to dampen these fluctuations from the demand-side – indeed, the aggregates used in the empirical model cannot exist without the substrate of microeconomic individuals. There seems to be a recognition that discretionary fiscal and monetary responses to crisis-related output fluctuations has a limit, and that the appropriate long term response, is to reform institutions so as to restore confidence (Gunnion, 2008). Of course, demand-side policy is in a much better position to respond within its limits if its conduct is organised by an appropriate macroeconomic framework. This has been the case for the EMEs in this study as well, where appropriate cyclical policy conduct would have produced a much more stable output profile, even given the crises they experienced.

And yet, given forceful analytical and empirical evidence about the advantages of appropriate cyclical fiscal and monetary policy, the EMEs have had a difficult time in reaching this lofty goal. Analytical arguments about the high loss associated with time inconsistent and ad hoc monetary policy (Blanchard & Fischer, 1989; Romer, 2001) argue in favour of institutional support for the pursuit of long-term price stability, while Woodford (2003) convincingly argues that this automatically implies the pursuit of output stability. That rules are preferable to discretion can be seen in the context of the strategic nature of real world policy making, where clear and predictable policy behaviour can lower the extent of uncertainty in the economy and serve as a useful anchor for expectations (Reid, 2008). The recognition that policy dynamics arise from both structural lags and expectational sources (Blanchard & Fischer, 1989) highlights the importance of appropriate institutional design, while the findings of this paper suggests that there is a real economic gain to following the appropriate rule-like policy behaviour.

As with monetary policy, discretionary fiscal policy is often associated with a loss of economic welfare (Taylor, 2000; Fatas & Mihov, 2003; Du Plessis & Boshoff, 2007). The short historical contextualisation given in the previous section suggests that policy reform is moving in the right direction in the EMEs, but it is unclear whether these reforms are credible. Even where fiscal and monetary rules have been institutionalised, recent analysis (see for example Kopits, 2001; Wyplosz, 2005; Du Plessis, 2005; Alesina and Tabellini, 2006) suggests that the problem of designing an incentive structure for appropriate cyclical fiscal and monetary policy requires a solution that takes the political dimensions of the problem into account. Just like the discussion about the international monetary integration of the EMEs emphasised the importance of mature financial institutions, so public choice style analysis of domestic economic institutions also suggests that fiscal and monetary authorities need explicit and depoliticized rules. Only then can the mechanisms of accountability and credibility lead to policy conduct that is consistent with counter- or a-cyclical behaviour on the demand-side, and institutions that avoid large crises on the supply-side.

This short analysis suggests that in addition to the gains of appropriate cyclical policy estimated by the aggregate model-based analysis, there are behavioural aspects of the economy which lead to more a more stable macro economy when fiscal and monetary policy act in rule-like ways and respond systematically to the business cycle. The attainment of these gains, however, is premised on the existence of sound institutions. The empirical analysis is, therefore, perfectly consistent with the findings of the literature on policy rules.

# CONCLUSION

This paper has done three things: firstly, it identified an empirical regularity which posed an interesting policy question in the context of the existing business cycle literature for Emerging Market Economies; secondly, it conducted an empirical study to answer the specific policy question; and lastly, it discussed the results and the implications thereof for existing stabilisation policy literatures. The two literatures that are particularly relevant are the empirical business cycle literature and the literature on policy conduct. The major contributions of the findings are: it fills a gap in the existing empirical literature and contributes to important policy discussions.

The paper found evidence that demand-side fiscal and monetary policy, where it has been pro-cyclical in the group of EMEs, has contributed to a more volatile output profile, and that this has come at a loss to societal welfare. The SVAR methodology used to identify the direction of the policy response is particularly suited to the multivariate and jointly determined nature of business cycles and cyclical policy. The model served as a tool to quantify the magnitude of the impact of these policies by conducting a small counterfactual simulation. The historical decomposition used to do this also generated additional support for the empirical validity of the model and hence the findings, while the innovation accounting provided theory consistent answers. Another important finding in the context of the policy inquiry is that the response of output to supply shocks is always larger than the response to demand shocks.

This observation, coupled with the historical background of the EMEs led to a brief discussion of policy conduct in the strategic macroeconomic setting. The main findings of this paper support institutional arguments for the adoption of policy rules by demonstrating the benefits associated with appropriate rule-like cyclical policy. Demand-side fiscal and monetary policies can make a difference to the extent of the output volatility in EMEs, but not without meaningful institutional reform. Further research can fruitfully look into the gains of richer empirical models based on single-county studies that look into the possible structural breaks and give a more full analysis of policy institutions.

APPENDICES

# A. DATA APPENDIX

## A1. VARIABLES IN THE ECONOMETRIC MODEL

*Table A1.1: Variables in the SVAR*

| Variable | Description |
|---|---|
| $\Delta y_t$ | First difference of log real GDP |
| $g_t$ | Ratio of government expenditure to GDP |
| $r_t$ | Real interest rate* |

*

The real interest rate is calculated by subtracting inflation from the nominal interest rate, either firstly from quarterly data, in which case the frequency is already correct for the model specification, or secondly from monthly data. In the case of the latter, this paper follows the method of Du Plessis, Smit and Sturzenegger (2007a), which is as the three month average, or within-quarterly formula.

Letting $r_t^q$ denote the quarterly real interest rate for time *t*, $i_t^m$ denote the monthly nominal interest rate for time *t*, and $CPI_t^m$ denote the monthly consumer price index at time *t*, then the within-quarterly formula is given by:

$$r_t^q = Avg(i_{t-1}^m, i_t^m, i_{t+1}^m) - \left\{[\ln\left(\frac{CPI_t^m + CPI_{t+1}^m}{2}\right) - \ln\left(\frac{CPI_t^m + CPI_{t-1}^m}{2}\right)]^{12} - 1\right\}. \qquad \text{(A1.1)}$$

## A2. SPECIFIC SERIES FOR VARIABLES

*Table A2.1: 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

## A3. STABILITY OF THE VAR

A brief discussion of the necessary and sufficient conditions for stability of the VAR system will help tie down the exact meaning of stability, and avoid possible confusion. For simplicity, and following Enders (2004: 384 – 385), we consider a first-order VAR version of the model presented in (1), using the same notation and system dimensions as before,

$$X_t = A_0 + A_1 X_{t-1} + \varepsilon_t. \qquad \text{(A3.1)}$$

To check the stability we examine the homogenous equation $X_t = A_1 X_{t-1}$ using the method of undetermined coefficients, with arbitrary constant $c_i$ to propose a solution of the form

$$X_{it} = c_i \lambda^t. \qquad \text{(A3.2)}$$

For (A3.2) to be a non-trivial solution of the $n$ equations (A3.1), the determinant of the system with $X_{it} = c_i \lambda^t$ and $X_{it-1} = c_i \lambda^{t-1}$ must equal zero:

$$\begin{vmatrix} (a_{11}-\lambda) & a_{12} & a_{13} \\ a_{21} & (a_{22}-\lambda) & a_{23} \\ a_{31} & a_{32} & (a_{33}-\lambda) \end{vmatrix} = 0. \qquad \text{(A3.3)}$$

Generally, the determinants of (A3.3) will be an *n*th order polynomial that is satisfied by the $n$ values of $\lambda$. Because each root is a solution to the homogenous equation, the following linear combination of the homogenous solutions is itself a homogenous solution:

$$X_{it} = d_1\lambda_1^t + d_2\lambda_2^t + \cdots + d_n\lambda_n^t. \tag{A3.4}$$

Since each equation will have the same roots, the necessary and sufficient condition for stability of the VAR is that all the characteristic roots lie within the unit circle. An equivalent condition holds for higher order systems. This is the condition that is tested for each VAR estimated for the given EME. A visual representation of the typical stability test is given in figure A3.1 below, while the results are for each country are summarised in table A3.1.

*Figure A3.1: Characteristic Roots and the Unit Circle*

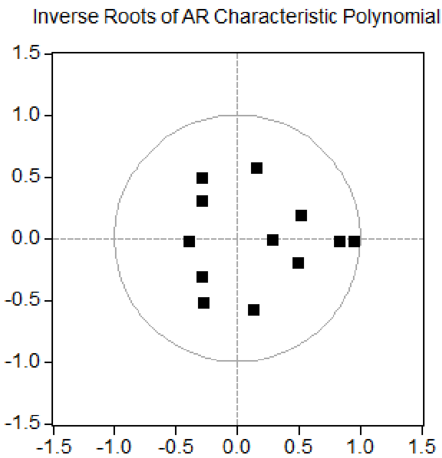



*Table A3.1: Stability Check*

| Country | Roots inside the unit circle |
|---|---|
| China (HK) | Yes |
| Israel | Yes |
| Korea | Yes |
| Mexico | Yes |
| Peru | Yes |
| Philippines | Yes |

Based on the eigenvalue tests, there is no great concern about the stability of the VARs.

## A4. UNIT ROOT TESTS AND VISUAL INSPECTION OF THE DATA

To understand the intent of unit root tests and their limited application, this section presents the basic framework for unit root testing, motivates the choice of test procedure, and presents the results along with a discussion of their implication for the study. At best, unit root testing leaves the researcher with a pinch of salt in taking the model to be final 100% accurate and stable, and helps in choosing the sample range more carefully. Testing whether a series has a unit root usually involves some variant of the following general test procedure, originally due to Dickey and Fuller (1979), where the test is constructed to allow for serially correlated errors (Davidson & MacKinnon, 2004: 613 - 623). If the error term $u_t$ in the test regression follows a stationary ARMA($p$,$q$) process, then because every ARMA process can be represented as an AR(∞) process, the test regression with an appropriately chosen number of lags, used to construct the test statistic for the null hypothesis that $y_t$ has a unit root is

$$\Delta y_t = X_t\gamma + \beta' y_{t-1} + \sum_{j=1}^{p} \delta_j \, \Delta y_{t-j} + e_t. \tag{A4.1}$$

In (A4.1) $X_t$ is just a row of deterministic regressors and the terms $\Delta y_{t-p}$ are added to account for the ARMA errors. Because $\beta' = (\beta - 1)(1 - \rho_1)$ the null hypothesis is simply that $\beta = 1$, versus the alternative that $\beta < 1$. To test this null hypothesis the Augmented-Dickey-Fuller statistic constructs an ordinary *t* statistic for the coefficient $\beta'$. But even if we knew how many lags to include the asymptotic distribution of the ADF tests will lead to severe over-rejection of the null hypothesis. Also, the finite sample distributions of the ADF tests are not the same as the asymptotic distributions, so that we know even less about the true size of the test. ADF tests suffer from severe size and power problems.

Ng and Perron (2001) and Perron and Ng (1996) develop a new set of tests, constructed in a similar spirit, but dealing with both size and power problems caused by the unknown ARMA error process, and the subsequent problem of choosing the ‘appropriate’ number of lags. These tests use Modified Information Criteria (MIC) with a penalty factor for choosing lags that is sample dependent (Ng & Perron, 2001: 1519). The set of so-called M-tests, also used recently by Boshoff (2007), is used to test for the presence of unit roots in the series used in the VARs. The critical values for the limiting distributions of the M-test statistics were determined by numerical simulation by Ng and Perron (2001). Statistically speaking, using these tests will help us use all available information to test the null hypothesis while controlling type I and type II error probabilities as best as we can. The answers generated by these tests, along with the stability tests presented in the previous section, will support the empirical study by providing evidence against model instability.

But two important issues cannot be settled by referring to a statistical test in this case. Firstly, it is open to question how relevant asymptotic tests are in finite sample settings, and secondly what the relevant loss function is to evaluate the test outcomes against. The relevance of the empirical findings of this model-based enquiry does not hinge solely on the power and size of the unit root tests employed in this section, although these tests form part of the defence of the strength of the overall argument about policy conduct. These statistical tests are constructed to help the inquirer control the probability of making a wrong judgement about the properties of the series, but this is only relevant to the extent that there are any real consequences to being wrong. Therefore, these tests are done with the loss function of society on mind – the case for such an approach to testing is cogently and forcefully argued by Ziliak and McCloskey (2008).

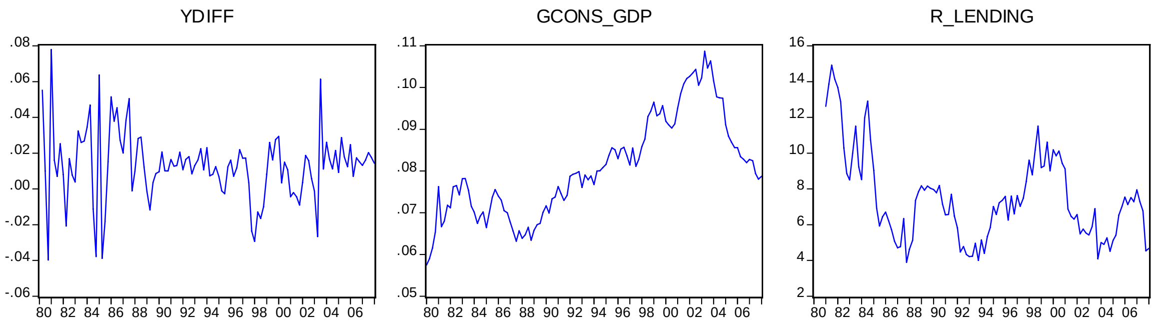
The results, all testing the null that the series has a unit root, follow in the tables below.

*Table A4.1: Unit Root tests for China, 1981q1 2008q1*

| YDIFF | | | | | |
|---|---|---|---|---|---|
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -0.2796 | -0.25962 | 0.92855 | 45.8404 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| GCONS_GDP | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -0.94147 | -0.6133 | 0.65143 | 22.1881 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| R_LENDING | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -2.83084 | -1.0084 | 0.35622 | 8.17068 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |

*MZa* and *MZt* are interpreted as usual, where a statistic with a value exceeding the critical value leads to a rejection of the null, while *MSB* is bounded from zero (Ng & Perron, 1996) and hence the null is rejected when the statistic is smaller than the critical value. *MPT* corresponds to the Dickey-Fuller GLS or Feasible Point Optimal (ERS) and is interpreted in the same way as *MSB.* There is some concern about the stationarity of YDIFF, GCONS_GDP and R_LENDING since it only rejects the null for relatively large sized tests – larger than 10%. For YDIFF and GCONS_GDP *MSB* does not seem too far off, while for R_LENDING we can reject the null based on *MZt*, *MSB*, *MZT* for levels close to 10%. Although a picture is not a proof, it sometimes helps to simple look at the data. The series tested for unit roots above are presented in figure A4.1 below. On inspection the series do not seem to exhibit serious regime shifts or structural breaks. Two points to bear in mind: Firstly, because a variable like GCONS_GDP is unlikely to drift away from its stable value forever (Du Plessis, Smit & Sturzenegger, 2007b: 24), the unit root tests on these series can be interpreted less strictly. Secondly, both visual inspection and unit root testing are confined to the sample, where we actually conceptualise the time series to be a realisation of some unobserved stochastic process – given enough observations from this stochastic process it might well exhibit strict stationarity.

*Table A4.1 China: VAR Series*




But even the Ng-Perron tests have relatively low power when the root is close to unity and when the critical value is small. The argument throughout this section is that when we cannot reject the null at 10%, but rather a higher level of say 20% or 30%, that this is enough precision to support an argument against model instability, especially when stability tests in the previous section demonstrate model stability. The tests do not yield definitive results, but provide caution for interpreting the model results as being 100% correct. Where this caution seems large it is, however, necessary to reconsider the dimensions of the model.

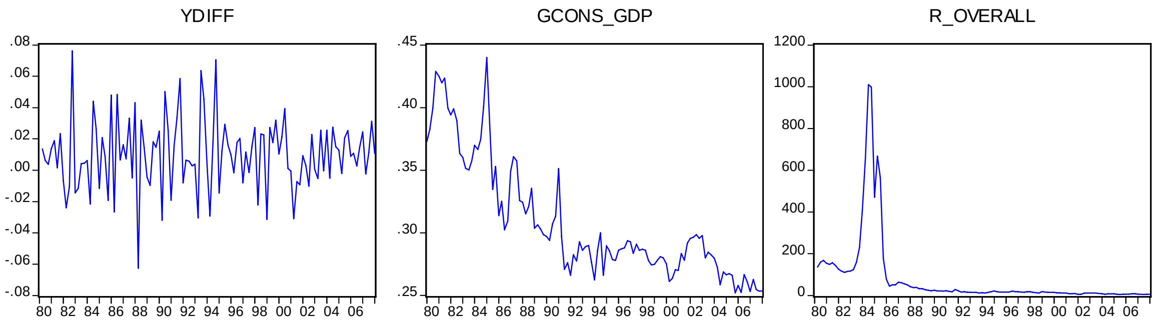
Table A4.2.1 displays the test results for Israel over the whole sample period.

*Table A4.2.1: Unit Root Tests Israel, 1980q1 to 2008q1*

| YDIFF | | | | | |
|---|---|---|---|---|---|
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -13.6529 | -2.61247 | 0.19135 | 1.79559 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| GCONS_GDP | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -2.6078 | -0.94559 | 0.3626 | 8.6228 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| R_OVERALL | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -10.8088 | -2.30516 | 0.21327 | 2.34498 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |

For YDIFF we reject the null at 10% based on *MZa*, *MZt*, *MSB* and *MPT*. For GCONS_GDP we can only reject for lower levels of confidence than 10% for all four tests, while for R_OVERALL we reject the null at 10% based on *MZa*, *MZt*, *MSB* and *MPT*.

*Figure A4.2: Israel: VAR Series*




Visual inspection of the series in Table A4.2 shows a reasonable pattern in YDIFF and GCONS_GDP, although GCONS_GDP is clearly trended, while there is a massive spike in 1985 in the R_OVERALL series. This might lead one not to reject the null, and we can see if the sample period selection influences the unit root tests by repeating the exercise for a sample period starting after the real interest rate spike. These results are presented in Table A4.2.2 below.

*Table A4.2.2: Unit Root Tests for Israel, 1986q1 to 2008q1*

| YDIFF | | | | | |
|---|---|---|---|---|---|
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -0.33309 | -0.30795 | 0.92452 | 44.8625 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| GCONS_GDP | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -6.73004 | -1.65059 | 0.24526 | 4.26495 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| R_OVERALL | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | 0.25898 | 0.24599 | 0.94985 | 54.3643 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |

While changing the sample period slightly improves the results on GCONS_GDP for all the tests, it changes the characteristics of the other series, and throws away valuable information. Based on the argument that GCONS_GDP is bounded to its mean, the stability tests presented in Table A3.1, and these test results the SVAR will be estimated over the whole sample period.

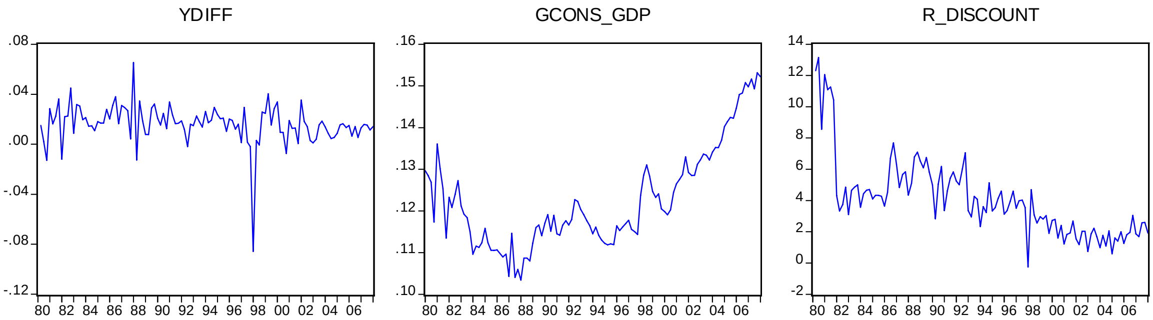
Turning to the Korean data, we can reject the null at 10% for YDIFF for all four tests, while the null is rejected for GCONS_GDP for higher probabilities of committing a type I error. The same holds for R_DISCOUNT, where MSB is the most powerful rejection.

*Table A4.3: Unit Root tests for Korea, 1980q1 2008q1*

| YDIFF | | | | | |
|---|---|---|---|---|---|
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -33.277 | -4.07887 | 0.12257 | 0.73675 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| GCONS_GDP | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -3.16048 | -1.01725 | 0.32186 | 7.47104 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| R_DISCOUNT | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -0.00798 | -0.00621 | 0.77851 | 36.5686 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |

Based on the stability tests, unit root tests, and visual inspection (Table A4.3), the Korean SVAR will be estimated for the whole sample period.

*Table A4.3: Korea: VAR Series*

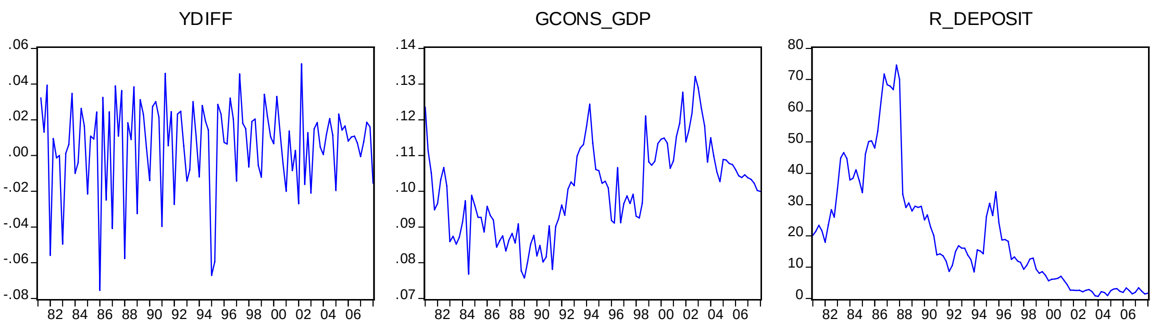



The results for the Mexican data are given in the table and figure below. The null is rejected for YDIFF, GCONS_GDP, and R_DEPOSIT at probabilities of committing a type I error slightly higher than 10%. The SVAR will be estimated for the whole sample period.

*Table A4.4: Unit Root Tests for Mexico, 1981q1 2008q1*

| YDIFF | | | | | |
|---|---|---|---|---|---|
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | 0.00494 | 0.00386 | 0.78245 | 36.9759 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| GCONS_GDP | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -3.81396 | -1.3266 | 0.34783 | 6.46327 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| R_DEPOSIT | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -3.56997 | -1.2582 | 0.35244 | 6.87105 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |

*Figure A4.4: Mexico: VAR Series*

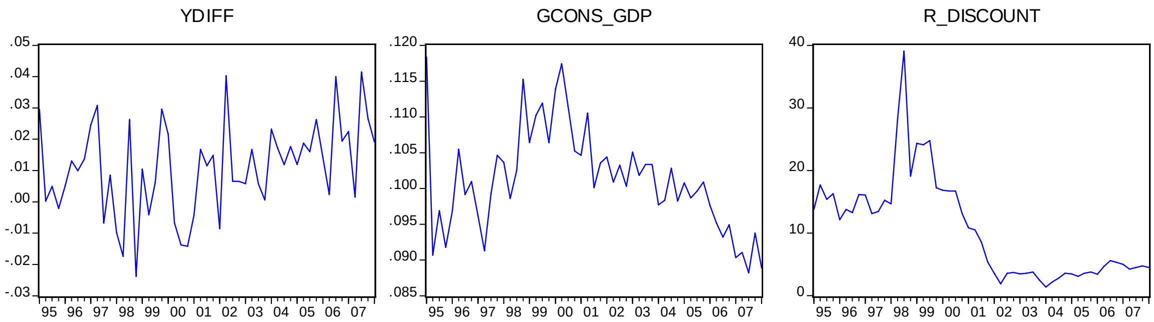


In the Peruvian case, based on the test outcomes in table A4.5.1 below, where for YDIFF the null is rejected almost at the 10% level. The results for GCONS_GDP seem acceptable while R_DISCOUNT rejects the null confidently.

*Table A4.5: Unit Root Tests for Peru, 1981q1 2008q1*

| | | | | | |
|---|---|---|---|---|---|
| YDIFF | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -3.94089 | -1.40359 | 0.35616 | 6.21701 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| GCONS_GDP | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -2.30625 | -1.02993 | 0.44658 | 10.3281 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| R_DISCOUNT | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -14.1087 | -2.65571 | 0.18823 | 1.73767 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |

*Figure A4.5: Peru: VAR Series*




If the volatility of the output series is a source of instability in the SVAR, it is possible to estimate it for only the period after the dramatic hyper-inflation in 1994. Consequently, we observe, on the basis of the results in Table A4.5.1, that YDIFF is stable, while the effects of changing the sample period on GCONS_GDP and R_DISCOUNT is ambiguous.

*Table A4.5.1: Unit Root Tests for Peru, 1995q1 2008q1*

| YDIFF | | | | | |
|---|---|---|---|---|---|
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -7.7461 | -1.96789 | 0.25405 | 3.1633 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| GCONS_GDP | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | 0.56745 | 0.33427 | 0.58907 | 26.5756 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| R_DISCOUNT | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -2.65146 | -1.07519 | 0.40551 | 8.93655 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |

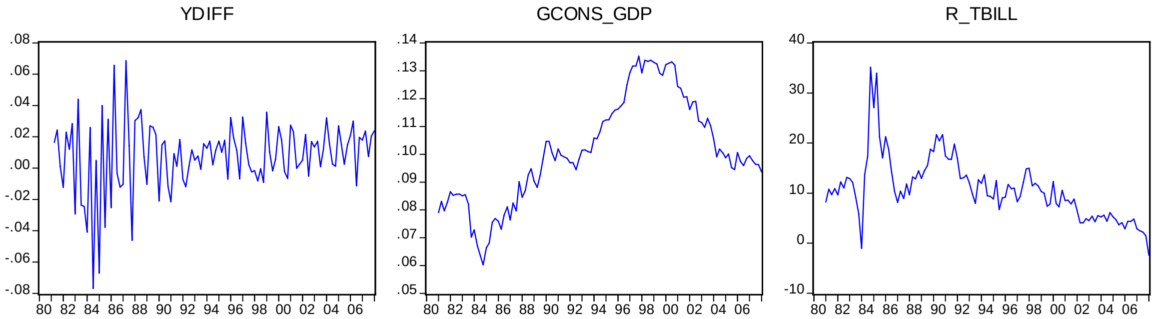
Lastly, looking at the results for Philippines, presented in Table A4.6.1 below, we can reject the null at reasonable levels for YDIFF and GCONS_GDP, although not at 10%, while the null is rejected for R_TBILL at 10%.

*Table A4.6.1: Unit Root Tests for Philippines, 1981q1 to 2008q1*

| YDIFF | | | | | |
|---|---|---|---|---|---|
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -2.96366 | -1.19969 | 0.4048 | 8.22855 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| GCONS_GDP | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -1.18222 | -0.75522 | 0.63881 | 20.2395 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| R_TBILL | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -10.1527 | -2.10871 | 0.2077 | 2.97414 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |

Visual inspection of Figure A4.6 reveals some change in the pattern of YDIFF in the late 1980s, with a spike in real interest rates accompanying the change.

*Figure A4.6: Philippines: VAR Series*




If the sample period is changed there is, however, almost no gain in stability.

*Table A4.6.2: Unit Root Tests for Philippines, 1988q1 to 2008q1*

| | | | | | |
|---|---|---|---|---|---|
| YDIFF | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -1.16302 | -0.76176 | 0.65499 | 21.036 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| GCONS_GDP | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -0.92482 | -0.67971 | 0.73496 | 26.4742 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |
| R_TBILL | | | | | |
| Test | Level | MZa | MZt | MSB | MPT |
| Ng-Perron test statistics | | -1.77026 | -0.5906 | 0.33362 | 9.64304 |
| Asymptotic critical values | 10% | -5.7 | -1.62 | 0.275 | 4.45 |

This section has presented various unit root tests in order to explicitly discuss the stability of the models discussed in the main text, and used as the basis for the empirical investigation. The findings are considered in conjunction with those in the previous section and further empirical support for the model identification. Information is excluded from the sample only if it is deemed to present a substantial risk to the stability, and eventually, reliability of the empirical results. This data appendix, as a whole, provides any reader with the necessary basis to challenge the author on any given model choice and maintained statistical assumption.

## A5. BASIC RATS CODE

```
calendar 1980 1 4                        ‘sample and frequency
allocate 2008:1                          ‘end of sample
open data “c:\documents\...\filename.xls”        ‘whatever path is relevant
data(format=xls, org=columns) / variable1 variable2 variable3
table
        ‘this calls the relevant data

system(model=modelname)
variables variable1 variable2 variable3
lags 1 to 4                ‘could be 1 to 2, or 1 to 8, etc. depending on the researcher’s choice
deterministic constant
end(system)
estimate(resids=residsname)
        ‘this estimates the reduced-from VAR

compute bqfactor=%bqfactor(%sigma,%varlagsums)
errors(model=modelname,decomp=bqfactor) * 30
        ‘this estimates the structural factorisation according to the Blanchard-Quah scheme

history(model=modelname,add,results=history) * %sigma
        ‘this calculates the historical decomposition of the data
```

For more details see *RATS User’s Guide*.

# B. RESULTS APPENDIX 1

## B1. THEORY CONSISTENT IMPULSE RESPONSE FUNCTIONS

As in the text, Shock1 is the supply shock, while Shock2 and Shock3 are Fiscal and Monetary shocks.

*Figure B1: Theory Consistent IRFs for China*

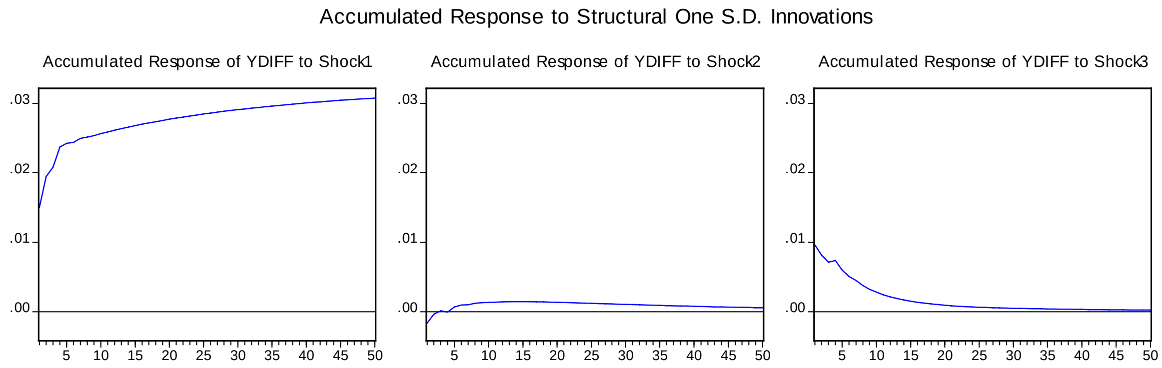



*Figure B2: Theory Consistent IRFs for Israel*

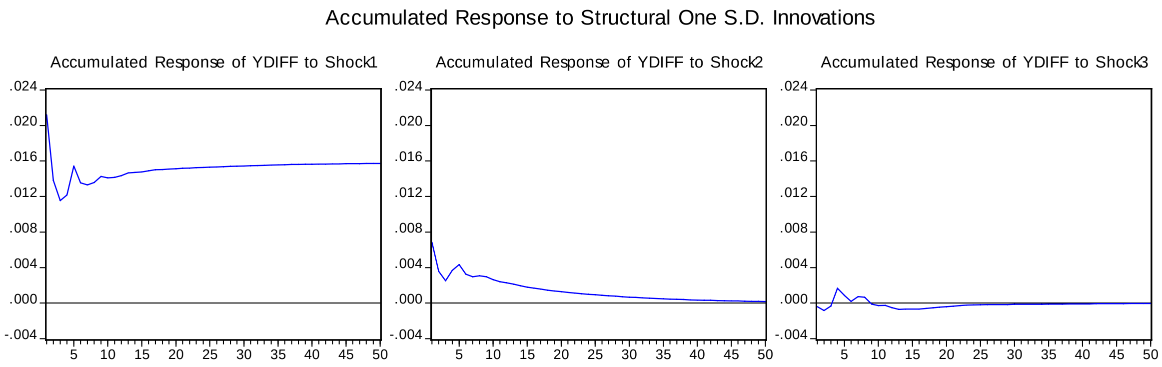



*Figure B2.1: Theory Consistent IRFs for Israel (post '86)*

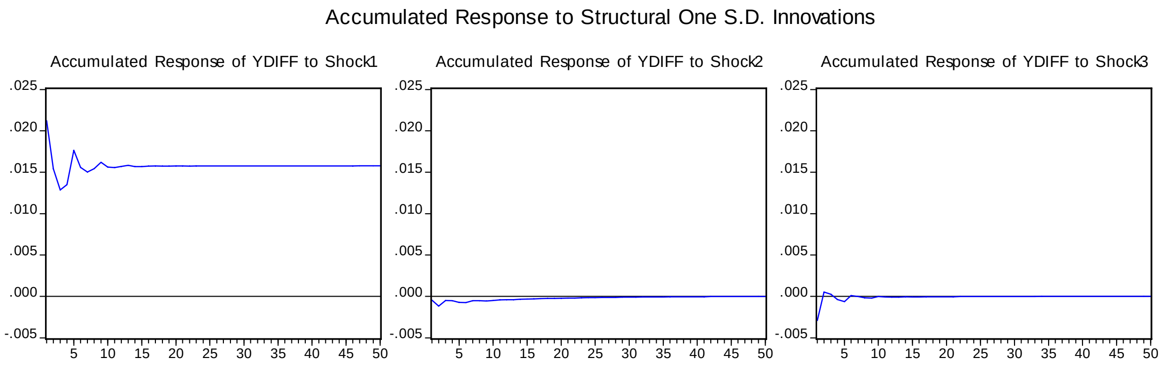


*Figure B3: Theory Consistent IRFs for Korea*

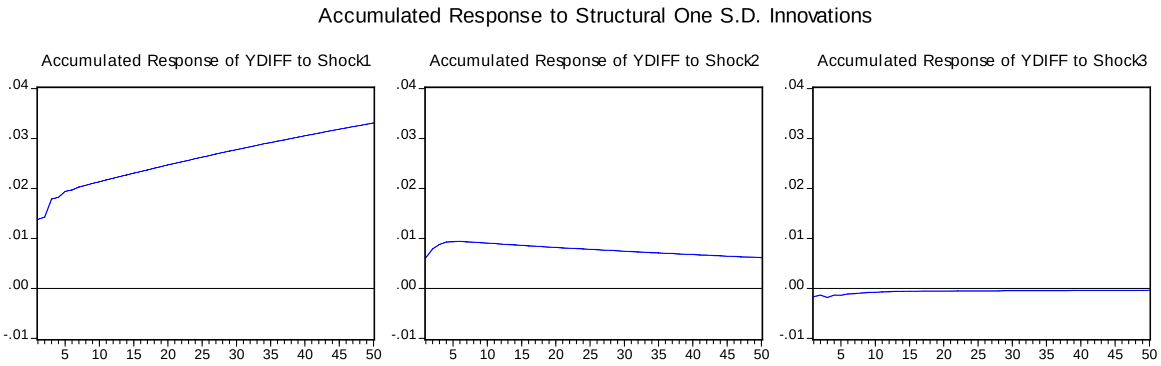



*Figure B4: Theory Consistent IRFs for Mexico*

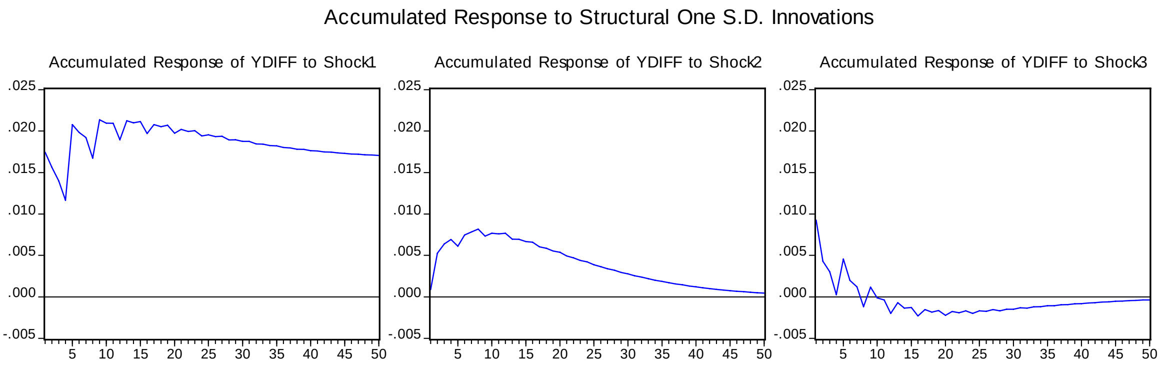



*Figure B5.1: Theory Consistent IRFs for Peru*

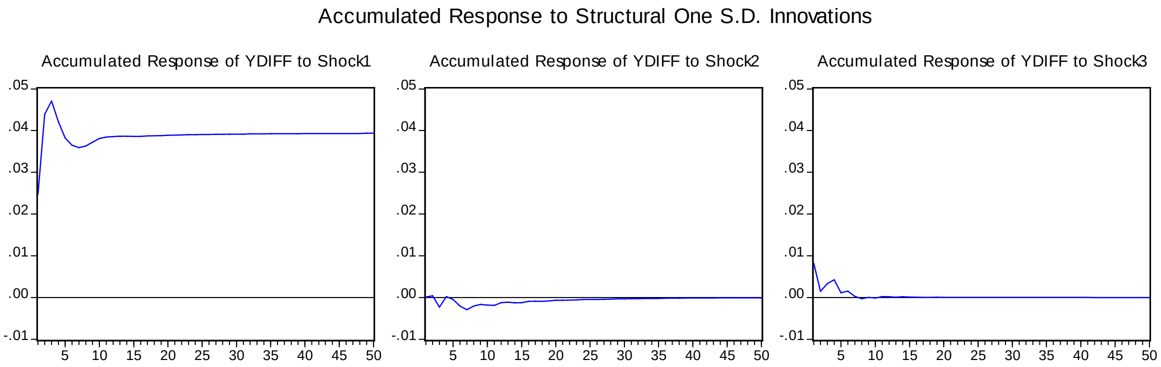


*Figure B5.2: Theory Consistent IRFs for Peru (post '95)*

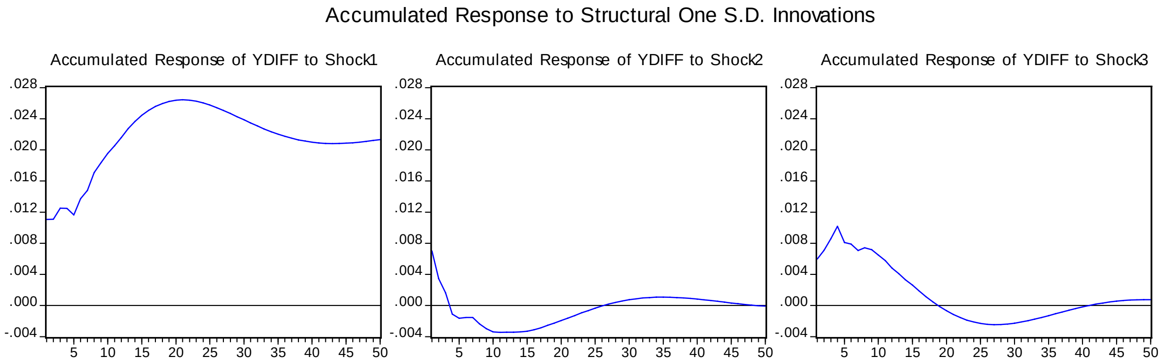



*Figure B6.1: Theory Consistent IRFs for Philippines*

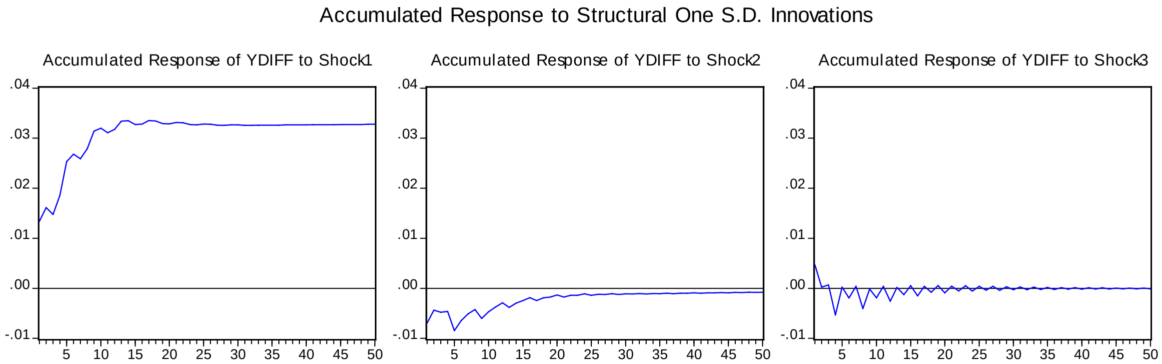
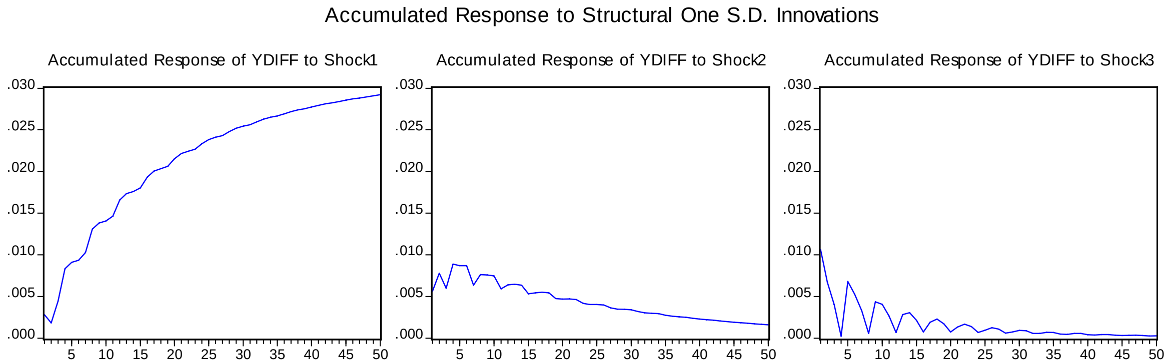



*Figure B6.2: Theory Consistent IRFs for Philippines (post '86)*



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