

## **“Good Governance” in Monetary Policy and the Negative Real Effects of Inflation Targeting in Developing Economies**

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### **ABSTRACT**

This paper analyzes the growth effects of inflation targeting regimes in developing countries. In particular, it focuses on the case of three Latin American economies where inflation targeting has been implemented. Our results suggest that monetary policy is procyclical in Brazil and Chile, and countercyclical in Mexico. Also, they suggest that policy has reacted asymmetrically to economic activity in the three countries. Such pattern generates a downward bias in aggregate demand, with negative long-run effects on growth rates. The main economic policy implication of this study is that central banks should consider more seriously the effects of monetary policy on output and employment.

**Keywords:** Monetary policy; inflation targeting; economic growth; Latin America.

### **1 – Introduction**

The idea of governance has been applied in different contexts to explain economic events and to provide guidance to economic policy. “Good governance” – either in terms of the behavior of firms or in terms of government policies – is now recognized in academic circles and among international organizations as an important component of “sound economic fundamentals”.

As it is well-known, the central principles of “good governance” are the notions of transparency and accountability. When the concept is applied to the case of monetary policy, it usually supports the so-called “new consensus”<sup>2</sup> and in particular the adoption of inflation targeting regimes.

There is not a complete agreement on the definition of inflation targeting as a framework for monetary policy in the literature. However, in a general description, it involves the public

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<sup>2</sup> See Taylor (2000). For a criticism, see Lavoie (2002).

announcement of a quantitative inflation target, an institutional commitment to price stability as the primary objective of monetary policy, a high degree of transparency in the decisions of policymakers, and the imposition of accountability on the central bank. This framework has received widespread attention from academic economists and policymakers since it was first adopted by countries like New Zealand, Chile and Canada in the early 1990s, and it has been used as a guideline to policy by a significant number of developed and developing countries in the last ten years.

Controversies and debates around monetary policy regimes are recurring themes in the history of economics. Just like other frameworks, inflation targeting has its supporters and its critics. The main advantages listed by the former group relates to the fact that inflation targeting provides a ‘nominal anchor’ to guide the actions of policymakers and the expectations of the public and, at the same time, allows for some discretion to adjust monetary policy in face of new information and unexpected events. The critics, in turn, claim that inflation targeting may in some circumstances place unnecessary constraints to the action of the central bank, or that the regime focuses excessively on inflation and does not pay sufficient attention to real outcomes. The empirical evidence available so far is not able to resolve the dispute. The performance of inflation targeters seem to be for the most part favorable, but it is also subject to controversy (as I will discuss later in the paper). Indeed, the dispute around the empirical evidence is not surprising, given the limited span of time in which the framework has been implemented.

The use of inflation targeting regimes by emerging market economies is a more recent phenomenon, which has its origins in the late 1990s, and a growing literature has discussed the specific issues surrounding the adoption of the framework in these economies<sup>3</sup>. Some of the main challenges for the conduct of monetary policy in general – and the adoption of inflation targeting in particular – in developing countries are the magnitude of external shocks (such as ‘sudden-stops’ in capital inflows), large exchange rate volatility, and weaknesses in domestic financial sectors.

Despite the large theoretical and empirical literature on inflation targeting in both developed and developing countries, it is clear that very little attention is given to the influence of monetary policy on output growth rates. Although some discussion is made in terms of the short-run effects on the output gap, medium-term and especially long-term considerations are virtually

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<sup>3</sup> Chile is an early inflation targeter among developing countries (starting in 1990), but the Chilean monetary policy framework can not be described as a pure case of inflation targeting during the whole decade. I will address this point later. On the Chilean experience, see Blejer *et al.* (2000, chapter 8) and Schmidt-Hebbel and Werner (2002).

absent. This is hardly surprising, given that the inflation targeting framework is usually associated with the idea of money neutrality in the long run. As Bernanke *et al.* (1999) put it in their widely quoted book on inflation targeting:

“In the long run the only macroeconomic variable that the central bank can affect systematically is the inflation rate. It is unlikely that monetary policy can be used to reduce the unemployment rate *on average* over any substantial period of time.”  
(Bernanke *et al.*, 1999, p. 14)

In other words, inflation targeting can be seen as the latest representative of a tradition that excludes real variables from the set of possible influences of monetary policy. This tradition is ultimately based on the belief that there exists some sort of long-run equilibrium (natural) rate of output or employment that is independent of monetary variables. In this case, even if monetary policy is not neutral with respect to real variables in the short-run, any attempt to systematically explore the short-run tradeoff between inflation and output will lead to higher inflation rates and no permanent gains in terms of output.

This essay intends to consider the prospects for the adoption of inflation targeting regimes in emerging market economies. In particular, it will focus on the case of three Latin American economies where inflation targeting regimes have been implemented, namely Brazil, Chile and Mexico<sup>4</sup>. In Brazil, an inflation targeting mechanism has been operative since mid-1999, after the abandonment of the quasi-fixed exchange rate regime that was the basis of the Real stabilization plan (1994-1999). Chile was one of the pioneers in the adoption of inflation targeting (1990), but this was also accompanied by an exchange rate target until 1999. In Mexico, the adoption of inflation targeting was gradual, and the first steps in this direction were taken in the aftermath of the Tequila Crisis (1994-1995). Since 1999, the inflation target has been the major guide to monetary policy in Mexico.

One of the main issues to be addressed in this study is the procyclical character of monetary policy under inflation targeting, especially in developing countries with liberalized capital accounts and flexible exchange rates. In addition, the paper will also discuss whether (and how) procyclical monetary policies may bring about negative effects on output and employment in the long run. It will be argued that not only monetary policy is procyclical under inflation targeting, but also that it is likely to react in an asymmetric way to fluctuations in economic activity and

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<sup>4</sup> In Latin America, besides Brazil, Chile and Mexico, inflation targeting has also been adopted by Colombia and Peru. However, these cases will not be discussed here.

exchange rates (too ‘tight’ during recessions, not so ‘loose’ during expansions). Such pattern may generate a downward bias in aggregate demand, with negative long-run real effects on output growth.

Two qualifications to this argument are necessary. First, procyclical monetary policy in developing countries does not occur only under inflation targeting regimes. It is also a feature of countries with fixed exchange rates and open capital accounts, and in which monetary policy is mainly conditioned by international capital flows. Second, this paper does not argue that inflation targeting should not have been adopted by any developing country, or that any specific country would be better off by not adopting the regime. It just explores some important (although often neglected) features of the regime in a few countries where inflation targeting was actually implemented.

The remainder of this paper is organized as follows. Next section will review the main features of the inflation targeting framework and the rationale behind its adoption. In the following sections, I will focus on the case of emerging market economies, and discuss the additional problems and challenges faced by these economies with respect to macroeconomic policies. Afterwards, the procyclical and asymmetrical nature of monetary policy will be analyzed, and the possible long-run effects on output and employment will be considered. Finally, a specification for testing whether monetary policy has been procyclical and asymmetrical in Brazil, Chile and Mexico under inflation targeting will be outlined, and some results will be presented.

## **2 – The inflation targeting framework**

As mentioned before, there is not a complete agreement on the definition of inflation targeting as a framework for monetary policy in the literature. Mishkin and Schmidt-Hebbel (2001, p.3), for instance, provide the following definition: “Full-fledged inflation targeting is based on five pillars: absence of other nominal anchors, an institutional commitment to price stability, absence of fiscal dominance, policy instrument independence, and policy transparency and accountability.”

In practice, it is fair to say that the design and implementation details of inflation targeting regimes vary widely across countries. Central banks have adopted different target price indexes, target horizons, escape clauses and mechanisms of communication, evaluation and

accountability. Besides, inflation targeting regimes are accompanied by different arrangements for fiscal and exchange rate policies<sup>5</sup>.

The theoretical rationale behind the adoption of inflation targeting in many countries rests on three elements (Bernanke *et al*, 1999). First, as mentioned before, the idea of money neutrality in the long run. In this case, even if monetary policy is not neutral with respect to real variables in the short-run, any attempt to systematically explore the short-run tradeoff between inflation and output will lead to higher inflation rates and no permanent gains in terms of output.

The second element in support of inflation targeting is the idea that the maintenance of low and stable rates of inflation is an important precondition for achieving other macroeconomic objectives, such as high rates of growth in the long run. In this case, the main arguments are: (i) inflation is harmful to economic efficiency because it can distort the production, investment and consumption decisions of economic agents as they are unable to distinguish between changes in the general price level and changes in relative prices; (ii) the effort to insulate agents from the effects of inflation has its own costs, “including costs of attention and calculation as well as the cost of resources devoted to (for example) the development of alternative financial instruments.” (Bernanke *et al.*, 1999, p. 17). It is worth noting that this element is more controversial than the previous one (long-run money neutrality). In fact, there is empirical evidence suggesting that the negative effects are only important at very high levels of inflation, and are negligible at annual rates below 8% or so (Sarel, 1996)<sup>6</sup>.

The third argument, and perhaps the most important one according to Bernanke *et al.* (1999), is that inflation targeting provides a nominal anchor to monetary policy. As a target rate of inflation communicates to the public the price level the central bank is aiming to achieve in the future, it provides a guide for expectations of financial markets and the general public, and a reference point to evaluate *a posteriori* whether the central bank has been able to accomplish the goals of monetary policy. This argument is thus related to two of the main aspects of inflation targeting regimes, namely transparency and accountability.

For one reason or another, inflation targeting frameworks in different forms have been adopted by several developed and developing countries in the past years. Truman (2003) lists the

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<sup>5</sup> It is true, however, that the first condition outlined above by Mishkin and Schmidt-Hebbel (2001), rules out fixed exchange rate regimes, currency boards, or other arrangements in which the exchange rate is seen as the main anchor to expectations and inflation.

<sup>6</sup> See also Stanners (1993) for empirical evidence that suggests no correlation between inflation and growth rates.

following countries as inflation targeters: Australia, Brazil, Canada, Chile, Colombia, Czech Republic, Finland, Hungary, Iceland, Israel, Korea, Mexico, New Zealand, Norway, Peru, Philippines, Poland, South Africa, Spain, Sweden, Thailand, and UK<sup>7</sup>.

After more than a decade of inflation targeting in the world, there is now an extensive empirical literature that evaluates how successful it has been. This question is not straightforward since, as it is recognized by many authors in this literature, there are a few methodological points that require attention and suggest that we should consider any inferences with caution. Some of the issues are the controversy surrounding the definition of inflation targeting and the choice of the sample, potential selection bias, possible equivalence of some aspects of inflation targeting and other monetary regimes, and simultaneous causation of inflation-targeting adoption and the performance of the economy<sup>8</sup>.

### **3 – Inflation targeting in developing countries**

A growing number of developing countries have adopted the inflation targeting framework, particularly since the late 1990s. This group includes Brazil, Chile, Colombia, Czech Republic, Hungary, Israel, Mexico, Peru, Philippines, Poland, South Africa, South Korea, and Thailand. The specific details and the circumstances that led to the adoption of the framework vary from country to country. In some cases, the inflation targeting regime was implemented gradually, with the sequential introduction of the mechanisms that formally characterize the framework. In others, it was introduced rapidly, as a response to financial or currency crises that caused the abandonment of previous monetary arrangements and led to the search for new “nominal anchors” for monetary policy<sup>9</sup>.

The empirical evidence concerning the performance of such countries under inflation targeting is limited, given the fact that in most of them the adoption of the framework is very recent. However, there is at this point a relatively large literature that discusses specific problems and challenges related to the design and implementation of inflation targeting mechanisms in emerging market economies. Mishkin (2004) provides a useful summary of the main

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<sup>7</sup> Some authors (e.g. Ball and Sheridan, 2003) also include Switzerland in the group of inflation targeters. Note also that Finland and Spain joined the Euro in the late 1990s and, therefore, have their monetary policy subordinated to the European Central Bank (that does not formally adopt the framework).

<sup>8</sup> A comprehensive review of the empirical literature on the performance of inflation targeters in the developed world is beyond the scope of this paper. See, for instance, Bernanke et al. (1999), Mishkin and Schmidt-Hebbel (2001), Neumann and Von Hagen (2002), Ball and Sheridan (2003).

<sup>9</sup> Among the three countries that will be discussed in this study, Chile and Mexico appear to belong in the first group, whereas Brazil fits better in the second group. I will return to this point later.

institutional aspects of developing countries that should be considered in the formulation and execution of inflation targeting policies. These are the following: (i) weak fiscal and financial institutions; (ii) low credibility of monetary institutions; (iii) currency substitution and liability dollarization; and (iv) greater vulnerability to external shocks (in particular, “sudden stops” of capital inflows)<sup>10</sup>.

To a greater or lesser extent, such characteristics can explain some stylized facts about the behavior of some macroeconomic indicators in emerging market economies after the adoption of inflation targeting. Fraga, Goldfajn and Minella (2003) compare developed and developing inflation targeters with respect to the volatility of inflation, exchange rates, GDP growth and interest rates, as well as average rates of inflation and GDP growth. Their findings suggest that emerging market economies show higher volatility in all the variables considered, and these results are explained by a combination of fragile institutions and higher vulnerability to external shocks. It is interesting to note that the variability of interest rates is the variable that presents greater difference between developed and developing countries (the average of standard deviation is more than four times higher in the second group of countries). As I will argue in the next section, this result is related to the procyclical character of monetary policy under inflation targeting in emerging market economies.

#### **4 – Inflation targeting and procyclical monetary policy**

It is widely recognized that macroeconomic policies in developing countries tend to operate in a procyclical way, and are strongly influenced by international capital flows (Ffrench-Davis, 2003; Ocampo, 2003a). The recent experience of emerging market economies and the financial and currency crises in the 1990s suggest that capital account cycles decisively affect domestic policies and are subject to high levels of volatility and contagion. Moreover, the rapid process of financial liberalization during the last decade seems to have increased the vulnerability of these economies to swings in international capital markets<sup>11</sup>.

Concerning monetary policy, it can be shown that a procyclical pattern may emerge in developing countries with liberalized capital accounts under different exchange rate

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<sup>10</sup> On the effects of volatile capital flows in developing countries, see Ffrench-Davis (2003) and Ocampo (2003a, 2003b). On inflation targeting in emerging market economies, see also Blejer et al (2000), Caballero and Krishnamurthy (2003), and Truman (2003).

<sup>11</sup> Caballero and Krishnamurthy (2003) acknowledge the effects of ‘sudden stops’ in capital flows in emerging economies. In order to minimize the procyclical character of monetary policy, they propose two alternatives, namely, a state-contingent inflation targeting regime and a target that overweighs non-tradable inflation.

arrangements. In case of fixed exchange rates, the explanation is straightforward, since monetary policy is passive to capital flows (according to basic open economy macroeconomic theory). Net inflows lead to expansionary monetary policy while net outflows lead to monetary contractions<sup>12</sup>.

The case of flexible exchange rates is more interesting for the purposes of this study, since it has been adopted by many developing countries in Latin America and elsewhere and is more commonly associated to the inflation targeting framework. In this paper, I will make a case that inflation targeting contributes to the procyclical character of monetary policy in emerging market economies with liberalized capital accounts and flexible exchange rates. Most importantly, I want to argue that procyclical monetary policies are not only caused by large external shocks or crises, but they are a feature of the regime even under “normal” times and do not depend on the occurrence of significant capital inflows or outflows<sup>13</sup>.

So, the question to be addressed is: if monetary policy is procyclical under inflation targeting, what mechanisms can explain such behavior? First of all, the fact that country risk perception tends to increase when economic activity slows down. For instance, consider an emerging market economy in which fiscal revenues depend highly on value added taxes or other forms of taxation that are sensitive to economic activity. When the economy faces a recession or simply slows down, fiscal revenues tend to decline and it is likely that government expenses do not fall in the same proportion or with the same speed (e.g. due to “rigidities” in certain types of expenses or to political constraints). Therefore, it is clear that fiscal surplus tend to be reduced (or fiscal deficit tends to be amplified) and this may lead to an increase in country risk premium, given the lower capacity of the country to repay external debt. As the recent experience of emerging markets with flexible exchange rates has shown, an increase in country risk premium may lead to a change in the portfolio of private investors and, consequently, to the depreciation of the domestic currency. Depreciation, in turn, impacts the expectations of inflation in the next periods, due to increase in the price of tradable goods<sup>14</sup>. Under inflation targeting, the central bank would react to the rise in inflation expectations by tightening the monetary policy (i.e.

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<sup>12</sup> The case of “fear of floating” (Calvo and Reinhard, 2002), in which countries that are considered to have a flexible exchange rate regime do not allow their currencies to fluctuate freely, can also explain procyclical monetary policies.

<sup>13</sup> But see also Calderon and Schmidt-Hebbel (2003), who argue that the ability to pursue countercyclical policies depends on the country-risk premium, i.e., countries with low risk-premium would be able to do it, while the ones with high risk-premium would not.

<sup>14</sup> For many countries, this impact occurs especially through the increase in prices of capital goods and intermediate goods (such as oil), since it affects the production costs of many sectors of the economy.



increasing interest rates), which would amplify the decline in economic activity by reducing private spending and also affecting public spending (since higher interest rates imply higher interest payments on existing public debt and the necessity to generate a higher primary surplus)<sup>15</sup>.

In principle, the same mechanism would operate in periods of economic expansion: higher fiscal revenues leading to decrease in country risk premium and consequent appreciation of the domestic currency. I would argue, however, that monetary policy does not operate in a symmetrical way under these circumstances. In other words, the central bank under inflation targeting would in general react more strongly to exchange rate depreciations than to exchange rate appreciations. The reason for this behavior is the weight of inflation stabilization in the central bank's reaction function: when the domestic currency is depreciating, prompt reaction is needed if the inflationary effects of depreciation are to be offset; when the currency is appreciating, the deflationary effects are not counterbalanced with the same intensity, since they may help the central bank to achieve the target for inflation, especially in periods of disinflation or after the economy has suffered negative supply shocks. In sum, this asymmetric reaction is likely to occur in developing countries under inflation targeting and flexible exchange rates, and may generate a downward bias to aggregate demand which brings about negative long-run effects on output and employment.

It is interesting to note that inflation targeting *per se* – i.e. the formal mechanism of announcing a target for inflation to guide expectations, the search for increasing transparency by the publication of inflation reports, and so on – is not the main problem. In principle, such framework is also consistent with directing monetary policy toward real objectives like output and employment. As many supporters (e.g. Bernanke *et al*, 1999) have emphasized, inflation targeting do not imply a rigid monetary policy rule, and provides enough flexibility for the central bank to respond in various directions to changes in the environment. However, the problem is that in practice central banks under inflation targeting tend to place an increased focus on inflation and tend to be less concerned with output fluctuations. As Benjamin Friedman (2002, p. 7) puts it:

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<sup>15</sup> There is a limiting case in which the reaction of the central bank can lead the system to divergent behavior. This happens when the effect of the rise in interest rates on government debt leads to the perception that the debt trajectory is unsustainable and that the government will not be able to honor its payments. In this case, we would observe capital flight, further currency depreciation, leading to further increases in interest rates and so on. This is the classic example of “fiscal dominance”, and will not be explored here (see Blanchard, 2004, for an analysis of fiscal dominance in the Brazilian economy).

“Notwithstanding the compatibility in principle of inflation targeting as a conceptual framework for implementing a monetary policy in which real outcomes matter as well as inflation, an observer who has paid attention to the last quarter century of debate about monetary policy is entitled to suspect that a powerful motivation for adopting this framework, at least in some quarters, is the hope that if explicit discussion of central bank’s policy is carried out entirely in terms of an optimal inflation trajectory, concerns for real outcomes may somehow atrophy or even disappear from consideration altogether.”

In fact, most of the discussion about monetary policy under inflation targeting is devoid of any explicit reference to real outcomes, except for the recognition that increase in interest rates may cause a decline in aggregate demand *in the short run*, and this is one of the channels through which monetary policy may affect inflation. Mishkin (2002) provides a theoretical rationale for central bank behavior under inflation targeting and argues that “too much focus” on output fluctuations in discussion of monetary policy is likely to produce worse outcomes for output and inflation. This argument is based on two elements: (i) monetary policy that responds actively to output fluctuations tend to be suboptimal, since it is hard to measure output gap, and its theoretical concept is controversial; (ii) “language which stresses output goals can make a central bank’s communication strategy less effective and can thereby weaken monetary policy credibility.” (Mishkin, 2002, p. 1)

There is also empirical evidence that shows that central banks have become more focused on inflation after adoption of inflation targeting. Cecchetti and Ehrmann (1999) compare central bank behavior in 23 developed and developing countries, and find that inflation targeters exhibit increasing aversion to inflation variability and decreasing aversion to output variability. Moreover, they show that inflation targeting countries were able to reduce inflation volatility at the expense of an increase in output variability. Minella *et al.* (2003) estimate a reaction function for the central bank of Brazil, and show that the monetary authority has strongly reacted to inflation expectations. At the same time, it is interesting to note that the coefficient on output gap is not statistically significant in most of the specifications.

In summary, it is clear that inflation targeting regimes imply a strong emphasis on inflation stabilization, with low concerns for real effects on output and employment. As discussed earlier in this section, such central bank behavior may generate a procyclical and asymmetrical pattern on monetary policy and deepen economic contractions, especially in emerging market

economies with liberalized capital accounts. This problem is minimized in a framework that assumes away long-term real effects of monetary policy and, more generally, of aggregate demand fluctuations. However, as I will argue in the next section, there are good theoretical and empirical reasons to question this assumption.

## **5 – Monetary policy, aggregate demand, and long-term real effects**

As mentioned before, the inflation targeting framework rests on a number of theoretical and empirical foundations. In particular, it depends on the assumption that long-term equilibrium of real variables is independent of nominal magnitudes, and that there is a given equilibrium trajectory to which the economy returns in the long run. In this case, the NAIRU “is unaffected by the time path of the economy and (...) the rate of growth of the economy is in effect predetermined (or at least set on the supply side of the economy without influence from the demand side).” (Arestis and Sawyer, 2002, p.2) Moreover, it is implied that no long-run tradeoff between inflation and unemployment exists, what leads to the well-known argument that there is nothing central banks can do about real variables in the long run.

This section will question the assumption of a unique and stable natural rate of unemployment and briefly present theoretical and empirical evidence that aggregate demand, in general, and monetary policy, in particular, may have long-term effects on economic activity. In other words, this section wants to argue that the quasi-consensus among academic economists and central bankers about the ineffectiveness of monetary policy in the long run does not entirely reflect the theoretical knowledge and the empirical evidence on the issue. Therefore, this study espouses the concern expressed by Benjamin Friedman (2002, p. 4): “the evidence for the natural rate model has never been as strong as the prevailing consensus within the economics profession (not to mention the case for inflation targeting) has let on.”

We start by pointing out to the concept of hysteresis<sup>16</sup>. In general, hysteresis in labor markets relates to the idea that the long-term equilibrium unemployment rate depends on the history of the actual unemployment rate. There are several reasons why this may happen, including the effects of unemployment on workers’ skills and overall productivity, and the distinction between insiders and outsiders in the process of wage setting (Blanchard and Summers, 1987). Hysteresis brings in path-dependence, and therefore opens room for aggregate demand fluctuations to affect the long-term path of the economy.

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<sup>16</sup> The literature of hysteresis in economics is large and will not be reviewed here. References can be found in Blanchard and Summers (1987) and Cross (1995).

Another possible way to explore aggregate demand effects on growth is to consider the existence of increasing returns to scale. In particular, Kaldorian models of growth assume increasing returns in manufacture and explain economic growth by a mechanism of mutual and cumulative causation between output growth and labor productivity (as described by the so-called Verdoorn's Law). Besides, the idea of increasing returns in macroeconomics is usually associated with the existence of multiple equilibria. In this case, as shown by Hahn and Solow (1995), macroeconomic policy can have permanent effects by affecting the equilibrium toward which the economy will eventually converge.

Dutt and Ros (2003) present a broad review of models in which aggregate demand contractions have long-term effects on output. Firstly, they analyze models in which the trend-reverting tendencies of the economy are weakened by some sort of path dependence, which change the long-run position of the economy itself. This includes the effects of hysteresis in labor markets, the existence of multiple equilibria associated with increasing returns to scale, and the effects of currency overvaluation in open economies with balance of payment constraints.

The second group of models presented by Dutt and Ros (2003) explore situations in which automatic adjustment tendencies are absent or offset, even if "frictions" or "rigidities" are removed from the economy. The reasons for non-convergence relate to: (i) regressive income redistribution due to changes in money and prices, and consequent effects on the propensity to consume; (ii) negative effects of deflation on investment, due to increase in the real value of firms' debts; (iii) changes in expectations due to falling prices and wages, which can paralyze consumption or investment decisions in case of pervasive uncertainty; (iv) liquidity trap, which prevents further reduction in the interest rate, and therefore prevents recovery of investments; and (v) endogeneity of money.

Lavoie (2002) focuses more directly on monetary policy, and uses a simple monetary model (that he calls "new consensus model") in which the central bank sets the interest rate according to a Taylor rule. Lavoie (2002) changes one of the equations of the model by introducing path-dependence and allowing aggregate demand to have an impact on the actual growth rates in the long run. His justification for this procedure is very much in line with the arguments presented in this section:

"Fast growth rates of demand imply fast growth rates of output; the latter encourages learning by doing but also a fast pace of capital accumulation, which on its own drives up the rate of technical progress; faster growth rates also encourage potential workers to

enter the workforce, and they also encourage foreign workers to immigrate to the area where growth proceeds at a faster pace. The two main components of the natural rate of growth, the growth rate of the labor force and the rate of technical progress, are thus positively linked to the rate of growth of demand.” (Lavoie, 2002, p. 13-4)

Using this amended model, Lavoie (2002) analyzes central banking behavior under inflation targeting. He shows that a temporary increase in interest rates (in response to deviations of inflation from the target) induces a permanent decline in the natural rate of growth and, therefore, that restrictive monetary policies have negative long-run effects on economic performance.

The critique to the assumption of a unique and stable natural rate of unemployment (and the associated idea of money neutrality) can also find support in empirical evidence<sup>17</sup>. Ball (1997) analyzes the behavior of unemployment in Europe during the 1980s, and argues that the NAIRU has increased in most of the region during that decade. Moreover, he finds that countries which had longer disinflation periods and larger drops in inflation rates presented higher increases in structural unemployment. Ball (1997) concludes that the increase in the NAIRU is associated with tight monetary policies adopted to reduce inflation rates.

Leon-Ledesma and Thirlwall (2002) pursue a similar investigation by focusing on the endogeneity of the natural rate of growth. They estimate the sensitivity of the *natural* rate of growth to the *actual* rate of growth for 15 OECD countries over the period 1961-1995. Their findings support the idea that the natural rate is endogenous to the actual rate of growth and, therefore, that aggregate demand may influence the performance of the economy in the long-run.

Ahmed and Rogers (2000) examine the effects of inflation on output, consumption and investment using long-term US data (1889-1995). Their results suggest that a permanent unanticipated rise in inflation has a positive long-run effect on the three variables and is associated with an increase in the share of investment in GDP.

Ball and Croushore (2003) focus on the effects of monetary policy, and analyze the effects of changes in the US federal funds rate on output and inflation during the period 1968-1995. They found that monetary policy has strong effects on *real* output, but that these effects are not so

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<sup>17</sup> Akerlof (2002) reviews empirical evidence on the natural rate of unemployment. He rejects the vertical long-run Phillips curve and asserts: “Econometric evidence further suggests that the natural rate theory rests on shifty sand rather than bedrock.” (Akerlof, 2002, p. 420)

strong on *expected* output. Ball and Croushore (2003) explain this result with a simple macroeconomic model with sticky prices, and show that monetary policy has real effects if agents systematically underestimate the effects of policy on aggregate demand.

## **6 – Inflation targeting and procyclical monetary policy: an empirical estimation**

This paper intends to test whether monetary policy has presented a procyclical and asymmetrical behavior in emerging economies that adopted the inflation targeting framework. In particular, it focuses on three of the Latin American economies where the framework was adopted: Brazil, Chile and Mexico.

There is a growing literature (although not yet very extensive) that analyzes the experience of inflation targeting in Latin America. The focus is usually on the behavior of inflation, the influence on expectations, and the possible credibility gains associated with the strategy.

To the best of my knowledge, only a few studies provide empirical estimates on the procyclical character of monetary policy in Latin America. Calderon and Schmidt-Hebbel (2003) analyze a panel of eleven emerging market economies over the period 1996-2002 (annual data). Their findings suggest that the cyclical character of monetary policy depend on country risk premium: policy is procyclical when country risk is high and countercyclical when it is low.

Costa e Silva (2004) provides a test for procyclical monetary and fiscal policy in Argentina, Brazil, Chile and Mexico using annual data for the period 1970-2000. The focus of his study is the influence of capital flows on macroeconomic policy and the feedback effect of policy on capital flows, and no particular attention is given to inflation targeting. Costa e Silva (2004) finds that monetary policy has been procyclical in three of the four countries analyzed, and that it has been correlated to the fluctuations of international capital flows.

In this study, I analyze the procyclical and asymmetrical character of monetary policy under inflation targeting by estimating the relation between economic activity and interest rates. In other words, I want to evaluate how monetary policy has responded to fluctuations in output, especially in the downturn of the cycle. Since it is also expected that interest rates affect economic activity, this study will use a Vector Autoregression (VAR) model, in order to allow for these feedback effects. In structural form, the model can be written as:

$$i_t = A_1 + \sum_{j=0}^n \alpha_{1j} \Delta y_{t-j} + \sum_{j=1}^n \alpha_{2j} i_{t-j} + B_1 X_t + \varepsilon_{1t} \quad (1)$$

$$\Delta y_t = A_2 + \sum_{j=1}^n \beta_{1j} \Delta y_{t-j} + \sum_{j=1}^n \beta_{2j} i_{t-j} + B_2 X_t + \varepsilon_{2t} \quad (2)$$

Where  $i$  represents short term real interest rates (deflated by consumer price indexes),  $y$  corresponds to the level of output, and  $X$  are the control variables, namely, changes in oil prices (to capture supply shocks) and in US interest rates (to capture changes in international liquidity)<sup>18</sup>. In this case, a negative sign for the parameters  $\alpha_{1j}$  would suggest that monetary policy follows a procyclical pattern, that is, the central bank tightens monetary policy in periods of declining economic activity.

On the other hand, by separating periods of expansion and contraction, I intend to assess the asymmetrical character of monetary policy, and verify whether the monetary authorities in Brazil, Chile and Mexico have responded in a different way in the various phases of the business cycle. This task will be accomplished by creating two dummy variables: (i) GOOD, which takes the value 1 in periods when GDP is above a linear trend, and 0 otherwise, and (ii) BAD, which is symmetrical to GOOD. By multiplying the dummy variables to the rates of growth in the three economies, I create two separate series describing “good times” and “bad times”, and then proceed to estimate whether or not monetary policy has responded differently to booms and recessions. In this case, the resulting equations are:

$$i_t = A_1 + \sum_{j=0}^n \alpha_{1j} \Delta y_{GOOD_{t-j}} + \sum_{j=0}^n \alpha_{2j} \Delta y_{BAD_{t-j}} + \sum_{j=1}^n \alpha_{3j} i_{t-j} + B_1 X_t + \varepsilon_{1t} \quad (3)$$

$$\Delta y_{GOOD_t} = A_2 + \sum_{j=0}^n \beta_{1j} \Delta y_{GOOD_{t-j}} + \sum_{j=0}^n \beta_{2j} \Delta y_{BAD_{t-j}} + \sum_{j=1}^n \beta_{3j} i_{t-j} + B_2 X_t + \varepsilon_{2t} \quad (4)$$

$$\Delta y_{BAD_t} = A_3 + \sum_{j=0}^n \delta_{1j} \Delta y_{GOOD_{t-j}} + \sum_{j=0}^n \delta_{2j} \Delta y_{BAD_{t-j}} + \sum_{j=1}^n \delta_{3j} i_{t-j} + B_3 X_t + \varepsilon_{3t} \quad (5)$$

I have estimated the outlined model for the period when inflation targeting has been fully implemented in these economies (1999-2005), using monthly data. The proxies used for GDP

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<sup>18</sup> I have estimated the model with both control variables, with only one of them, and with none. In general, I used lagged values of the variables to allow for a delayed response of monetary authorities to external shocks. Due to space constraints, not all the results will be provided here, but can be made available upon request.

are: (i) for Brazil: Industrial Production Index, from IBGE; (ii) for Chile: Monthly Economic Activity Index, from Chilean Central Bank; (iii) for Mexico: Global Economic Activity Index, from INEGI. In the three cases, the series with seasonal adjustment were used. The data source for the rates of interest is the Central Banks of the three countries.

Before proceeding to the estimation, I checked for stationarity of the series using Augmented Dickey-Fuller (ADF) test, and the null of unit roots was rejected at 10% for all series. In addition, the choice of lags for the endogenous and variables in the VAR was based on the Schwarz Information Criterion, which tends to be “conservative” in terms of lag lengths. SIC was also used for the choice of lags of control variables.

For the most part, the estimation provides support for the arguments presented here. In the case of Brazil, the negative coefficients on GDP growth in equation (1) suggest that monetary policy has been procyclical under inflation targeting. The results regarding the asymmetric behavior of monetary policy are also in line with what was expected. Policy has been procyclical in good and bad times, but the central bank reaction tends to be stronger in bad times: “too tight during contractions, not so loose during expansions” (see tables 1.1 and 1.2, and the impulse response functions provided in the appendix).

The results for Chile also conform to what was expected: monetary policy has had a procyclical character in the period 1999-2005, and has also reacted in an asymmetric way to the business cycle. The estimations suggest it has been countercyclical in good times and procyclical in bad times. As argued before, such behavior would bring about a negative bias in aggregate demand. These results are robust to all different specifications analyzed here (see tables 2.1 and 2.2, and appendix).

The Mexican case confirms only in part the results found for Brazil and Chile. The estimated coefficients in equation (1) suggest that monetary policy has been countercyclical to changes in GDP. When periods of expansions and contractions are discriminated, we found results which are similar to ones in the case of Chile: positive coefficients on the variable  $\Delta y.GOOD$ , which indicates that policy has been countercyclical in “good times”, and negative coefficients on the variable  $\Delta y.BAD$ , suggesting a procyclical behavior in “bad times”. However, the reaction of the central bank appears to be stronger (in absolute value) in periods of prosperity than it is in periods of recessions, and this may explain the overall countercyclical character of monetary policy. In other words, the behavior in good times seem to “dominate” the one in bad times (see tables 3.1, 3.2, and appendix).



**Table 1.1 – Testing for procyclical monetary policy (BRAZIL 1999-2005)**  
**VAR regression output (controls: changes in oil prices and in US interest rates)**

	RIR (1)	RIR (2)	RIR (3)
RIR(-1)	0.7132 ( 35.0636)	0.7108 (35.2276)	0.8915 (25.1841)
DGDP(-1)	<b>-0.1520 P*</b> <b>(-2.3355)</b>	<b>-0.1459 P*</b> <b>(-2.25470)</b>	<b>-0.1089 P</b> <b>(-0.78139)</b>
C	2.9908 (12.4857)	2.9900 (12.4894)	1.0899 (2.29614)
D_OIL(-1)	-0.0063 (-0.50028)	-0.0029 (-0.24378)	-
D_OIL(-2)	-0.0266 (-2.15834)	-0.0235 (-1.97780)	-
D(US_INTEREST)	0.4767 (0.95941)	-	-
R-squared	0.9539	0.9533	0.8981

Notes: P stands for procyclical; C for countercyclical; \* indicates significance at 10% (at least); t-statistics are in parentheses.

**Table 1.2– Testing for asymmetrical monetary policy (BRAZIL 1999-2005)**  
**VAR regression output (controls: changes in oil prices and in US interest rates)**

	RIR (1)	RIR (2)	RIR (3)
RIR(-1)	0.7175 ( 35.1660)	0.7138 (35.2287)	0.8919 (24.8457)
DGDP_GOOD(-1)	<b>-0.0651 P</b> <b>(-0.7368)</b>	<b>-0.0729 P</b> <b>(-0.8235)</b>	<b>-0.0963 P</b> <b>(-0.4721)</b>
DGDP_BAD(-1)	<b>-0.2440 P*</b> <b>(-2.6845)</b>	<b>-0.2201 P*</b> <b>(-2.4683)</b>	<b>-0.1200 P</b> <b>(-0.6284)</b>
C	2.9378 (12.2159)	2.9461 (12.2058)	1.0837 (2.2419)
D_OIL(-1)	-0.0082 (-0.6492)	-0.0036 (-0.2996)	-
D_OIL(-2)	-0.0274 (-2.2438)	-0.0234 (-1.9781)	-
D(US_INTEREST)	0.6250 (1.2411)	-	-
R-squared	0.9553	0.9543	0.8980

**Table 2.1 – Testing for procyclical monetary policy (CHILE 1999-2005)**  
**VAR regression output (controls: changes in oil prices and in US interest rates)**

	RIR (1)	RIR (2)	RIR (3)
RIR(-1)	0.9120 (20.2103)	0.9132 (20.2975)	0.8934 (20.1444)
DGDP(-1)	<b>-0.0868 P</b> <b>(-1.1683)</b>	<b>-0.0947 P</b> <b>(-1.28935)</b>	<b>-0.0768 P</b> <b>(-1.02503)</b>
C	0.1116 (1.3237)	0.1221 (1.47088)	0.1038 (1.23120)
D_OIL(-1)	-0.0144 (-1.9855)	-0.0160 (-2.28576)	-
D(US_INTEREST)	-0.2338 (-0.7978)	-	-
R-squared	0.8569	0.8556	0.8504

Notes: P stands for procyclical; C for countercyclical; \* indicates significance at 10% (at least); t-statistics are in parentheses.

**Table 2.2– Testing for asymmetrical monetary policy (CHILE 1999-2005)**  
**VAR regression output (controls: changes in oil prices and in US interest rates)**

	RIR (1)	RIR (2)	RIR (3)
RIR(-1)	0.9148 ( 20.3262)	0.9159 (20.3939)	0.8954 (20.1696)
DGDP_GOOD(-1)	<b>0.0270 C</b> <b>(0.2292)</b>	<b>0.0137 C</b> <b>(0.1174)</b>	<b>0.0169 C</b> <b>(0.1409)</b>
DGDP_BAD(-1)	<b>-0.1482 P*</b> <b>(-1.6656)</b>	<b>-0.1542 P*</b> <b>(-1.7417)</b>	<b>-0.1275 P</b> <b>(-1.4104)</b>
C	0.0928 (1.0875)	0.1050 (1.2504)	0.0883 (1.0304)
D_OIL(-1)	-0.0149 (-2.0579)	-0.0166 (-2.3733)	-
D(US_INTEREST)	-0.2552 (-0.8729)	-	-
R-squared	0.8601	0.8585	0.8525

**Table 3.1 – Testing for procyclical monetary policy (MEXICO 1999-2005)**  
**VAR regression output (controls: changes in oil prices and in US interest rates)**

	RIR (1)	RIR (2)	RIR (3)
RIR(-1)	0.9261 ( 17.7921)	0.9122 (18.0814)	0.8245 (17.2164)
DGDP(-1)	<b>0.1256 C</b> <b>(0.8063)</b>	<b>0.1583 C</b> <b>(1.0355)</b>	<b>0.1095 C</b> <b>(0.6633)</b>
C	0.2986 (1.2300)	0.3126 (1.2881)	0.6062 (2.5088)
D_OIL(-1)	-0.0102 (-0.6892)	-0.0067 (-0.4660)	-
D_OIL(-2)	0.0028 (0.1855)	0.0069 (0.4786)	-
D(US_INTEREST)	0.6979 (1.0691)	-	-
R-squared	0.8320	0.8291	0.8046

Notes: P stands for procyclical; C for countercyclical; \* indicates significance at 10% (at least); t-statistics are in parentheses.

**Table 3.2– Testing for asymmetrical monetary policy (MEXICO 1999-2005)**  
**VAR regression output (controls: changes in oil prices and in US interest rates)**

	RIR (1)	RIR (2)	RIR (3)
RIR(-1)	0.9171 (17.4519)	0.9040 (17.8346)	0.8162 (16.8762)
DGDP_GOOD(-1)	<b>0.2544 C</b> <b>(1.3217)</b>	<b>0.2942 C</b> <b>(1.5668)</b>	<b>0.2461 C</b> <b>(1.2028)</b>
DGDP_BAD(-1)	<b>-0.0910 P</b> <b>(-0.3698)</b>	<b>-0.0803 P</b> <b>(-0.3269)</b>	<b>-0.1247 P</b> <b>(-0.4699)</b>
C	0.3303 (1.3545)	0.3453 (1.4201)	0.6430 (2.6417)
D_OIL(-1)	-0.0084 (-0.5646)	-0.0052 (-0.35778)	-
D_OIL(-2)	0.0036 (0.2441)	0.0073 (0.5128)	-
D(US_INTEREST)	0.6234 (0.9522)	-	-
R-squared	0.8352	0.8330	0.8080

Overall, the results presented here suggest that inflation targeting regimes in Brazil, Chile and Mexico may bring about a negative bias in aggregate demand, given the asymmetrical reaction of central banks to the business cycle. However, as I will argue in the conclusion, further research on the relation between interest rates, exchange rates, and GDP growth is needed in order to better elucidate this question. The work of Galindo and Ros (2005) presents a promising avenue for research by estimating the asymmetric response of monetary policy to exchange rate movements in Mexico. The authors show that the inflation targeting framework has contributed to the appreciation of the real exchange rate, and this has had contractionary effects on output in the long run<sup>19</sup>.

## **7 – Conclusions**

This paper has discussed the potential long-term growth effects of inflation targeting regimes, an aspect usually neglected in the literature. The main question under consideration here is whether or not monetary policy reacts in a procyclical and asymmetrical way to economic activity in developing countries. The paper suggests that such behavior is likely to produce a downward bias in aggregate demand, and bring about negative effects on growth rates in the long run.

An empirical model has been estimated to evaluate monetary policy in Brazil, Chile and Mexico during the period 1999-2005. The results suggest: (i) that monetary policy has been procyclical in Brazil and Chile, and countercyclical in Mexico; and (ii) that it has reacted asymmetrically to GDP growth rates in Brazil, Chile and Mexico, in different ways: while the first case is better described by the expression “too tight during contractions, not so loose during expansions”, the other ones can be described as “procyclical in booms, countercyclical in recessions”. In all cases, it can be argued that monetary policy under inflation targeting has been detrimental to aggregate demand.

The results described here partly confirm the findings of Costa e Silva (2004) who used annual data during the period 1970-2000 to find a procyclical monetary policy in Brazil and countercyclical policy in Mexico. On the other hand, they do not conform to the results of Calderon and Schmidt-Hebbel (2003), who found a correlation between country risk premium and the response of monetary policy to GDP growth.

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<sup>19</sup> See also Ball and Reyes (2004), for an empirical estimation of the relations between exchange rates, interest rates, international reserves, and inflation in Mexico.

I conclude this paper by making a few comments about further avenues for empirical research that would help to clarify some of the issues not resolved here. First, the sample can be expanded to include other developing countries in Latin America and elsewhere which adopted the inflation targeting framework. Second, the procedure suggested by the work of Galindo and Ros (2005), who found that inflation targeting contributes to the appreciation of the real exchange rate in Mexico, could be applied to the other countries studied here.

Another concluding comment relates to the theme of aggregate demand and growth. It seems that the empirical analysis made in this paper does not provide a response to whether long-run output growth is demand-driven or not. The idea that aggregate demand can influence growth in the long run is assumed *a priori*, and the paper explores the consequence of this assumption when monetary policy is guided by inflation targeting procedures. In this case, the main contribution of this study is to point out to potential negative real effects of inflation targeting that are usually neglected in the literature, simply because of the *assumption* that aggregate demand fluctuations are irrelevant to long-term outcomes.

Finally, if it is true that monetary policy is procyclical and asymmetric under inflation targeting, and if it is accepted that demand changes can have long-lasting effects, the main economic policy implication of this study is that central banks should consider more seriously the real effects of monetary policy. In particular, the analysis would imply that the trade-off central bankers face is not only between inflation and short-run output losses, but between inflation and long-lasting growth effects.

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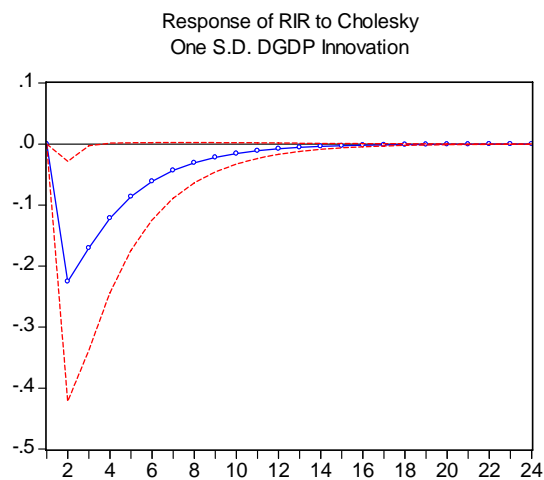
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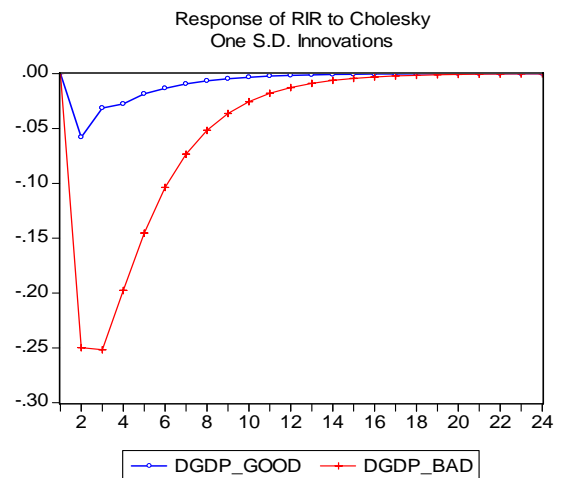
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## APPENDIX: IMPULSE RESPONSE FUNCTIONS

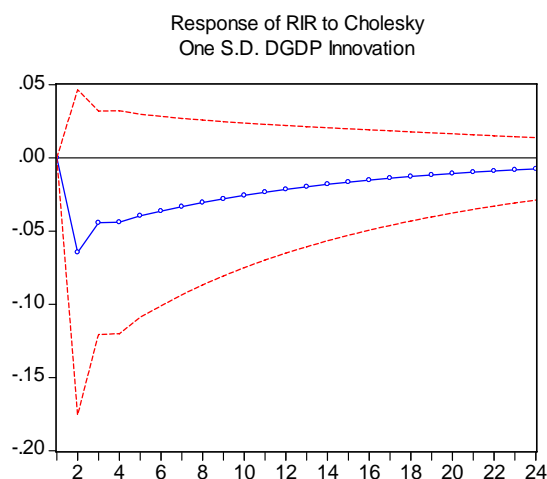
### 1.1 – Testing for procyclical monetary policy: BRAZIL 1999-2005 (model 1)



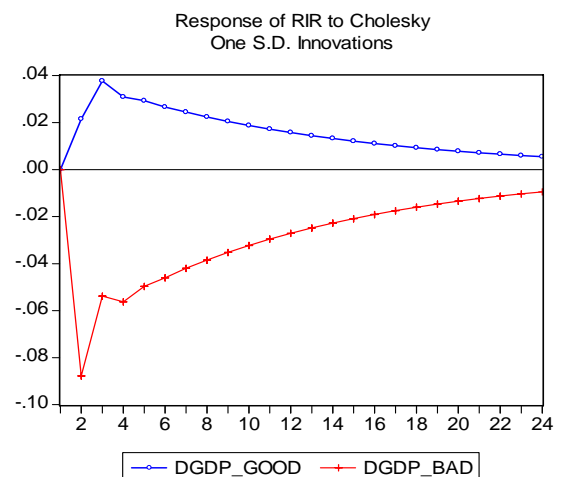
### 1.2 – Testing for asymmetrical monetary policy: BRAZIL 1999-2005 (model 1)



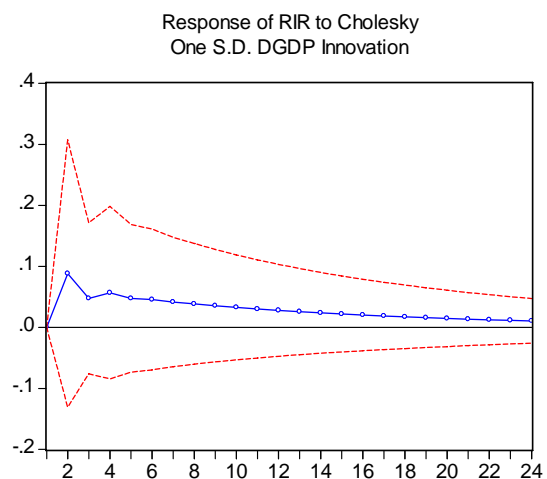
### 2.1 – Testing for procyclical monetary policy: CHILE 1999-2005 (model 1)



### 2.2 – Testing for asymmetrical monetary policy: CHILE 1999-2005 (model 1)



### 3.1 – Testing for procyclical monetary policy: MEXICO 1999-2005 (model 1)



### 3.2 – Testing for asymmetrical monetary policy: MEXICO 1999-2005 (model 1)

