

Monetary Policy in Emerging Market Economies: What Lessons from the Global Financial Crisis?

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* This paper reflects the views of the author and not necessarily those of the BIS or of central banks participating in the meeting.

Monetary Policy in Emerging Market Economies: What Lessons from the Global Financial Crisis?*

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Abstract

During the recent financial crisis, emerging market economies (EMEs) loosened monetary policy considerably to cushion the effect of the global financial shock, in contrast to previous crises episodes during which they had to tighten monetary policy in order to defend the value of their currencies, contain capital flight, and bolster policy credibility. Our study aims to understand the factors that enabled this shift in the conduct of monetary policy, and to assess whether this marks the beginning of a new era in which EMEs can permanently pursue countercyclical monetary policy as an appropriate and effective stabilization tool, more in line with advanced economies. The results indicate statistically significant linkages between some characteristics of the economies and their ability to conduct countercyclical monetary policy. We find that while stronger macroeconomic fundamentals and reduced vulnerabilities, greater openness to trade and international capital flows, and financial development facilitated the conduct of countercyclical policy, the most important determinants have been the financial reforms achieved over the past decades and the adoption of inflation targeting which is becoming more pervasive among EMEs. As long as EMEs maintain strong economic fundamentals, continue to reform their financial markets, and adopt credible and transparent monetary policy frameworks such as inflation targeting, the conduct of countercyclical policy as an economic stabilization tool will likely be sustainable.

Keywords: Monetary policy, Crises, Macroeconomic stabilization

JEL classifications: E52, E58, E63

*PRELIMINARY.

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1 Introduction

During the financial crisis of 2008-2009, emerging market economies (EMEs) have loosened monetary policy considerably to cushion the effect of the global financial shock, and to foster the recovery of their economies. This is a remarkable departure from previous crisis episodes during which EMEs generally had to raise interest rates in order to defend the value of their currencies, contain capital flight, and bolster the credibility of monetary policy. Our study aims to understand the factors that enabled this shift in the conduct of monetary policy in EMEs, and assess whether this experience marks the beginning of a new era in which policymakers in these economies can now pursue countercyclical monetary policy as an appropriate and effective stabilization tool like their counterparts in the more advanced economies.

An intriguing regularity of macroeconomic policies—both fiscal and monetary—in EMEs is their tendency to be procyclical or, at best, acyclical historically in contrast to those in advanced economies that tend to be countercyclical. This unique feature of monetary and fiscal policy deprived EMEs from important macroeconomic stabilization tools, and might help to explain the higher volatility of output in EMEs compared to the advanced economies’ as documented in Aguiar and Gopinath (2006) and others. One obvious way to reduce output volatility and enhance welfare in EMEs is to understand the factors that had prevented policymakers in EMEs from conducting countercyclical policy, and to devise policies that could help them use fiscal and monetary policy as effective macroeconomic stabilization tools.

Several studies on the subject have analyzed the factors that drive the cyclicity of fiscal policy in EMEs. See for example, Gavin and Perotti (1997), Talvi and Vegh (2004), and others.¹ By contrast, empirical studies on the cyclicity of monetary policy in EMEs are sparse. This sparsity likely owes to the difficulty in finding common monetary policy instruments over time and across countries as these instruments depend importantly on the exchange rate regime. Even with common instruments, characterizing the monetary policy stance is not obvious. In Kaminsky, Reinhart, and Vegh (2004), the authors examined the cyclicity of monetary policy for a broad set of countries covering both emerging market and advanced economies by relying primarily on short-term interest rates. Assuming imperfect substitution between domestic and foreign assets, short-term interest

¹ Including, Braun (2001), Lane, Philip (2003), Gupta et al. (2004), Riascos and Vegh (2003), Kaminsky, Reinhart, and Vegh (2004), etc.

rates can represent common monetary policy instruments under both flexible and predetermined exchange rate regimes. Using these short-term interest rates, they estimate a Taylor rule type policy function for each country and find that, monetary policy is generally countercyclical in advanced economies. By contrast, it tends to be procyclical in emerging market economies. The study did not explore the factors that prevent EMEs from conducting countercyclical monetary policy. These factors were explored in Calderon et al. (2003) for a set of eleven EMEs. They find that the ability of these EMEs to conduct both countercyclical fiscal and monetary policies is determined by the credibility of their policies.

Our study adds to this sparse literature by examining the behavior of monetary policy during economic crises. Economic crises are costly in terms of output and welfare losses. Optimal responses to these crises require countercyclical policies to cushion the effect of the shock and to foster the recovery of economic activity. In EMEs, however, the effect of these shocks are exacerbated inappropriately by procyclical policies, including monetary policy. However, during the 2008-2009 global financial crisis, central banks in EMEs generally loosened monetary policy considerably, like their counterparts in advanced economies, perhaps signaling that monetary policy in these countries is becoming a more effective macroeconomic stabilization tool. To our knowledge, this is the first study to conduct a comprehensive assessment of the factors that determine the cyclicity of monetary policy during crises more generally, and during the 2008-2009 financial crisis in particular.

To this end, we compile a large dataset for 188 advanced and emerging market countries from 1970 through 2009. We identify 1,462 financial and economic crisis years, and examine the behavior of monetary policy during those crises. The results confirm that advanced economies have historically conducted countercyclical monetary policy during crises while EMEs tended to tighten monetary policy. However, the difference in policy response between the two sets of countries has been fading. In the most recent decade, notably during the 2008-2009 crisis, emerging market economies have conducted countercyclical policy like their counterparts in the advanced economies.

Using a Logit regression model, we examine the factors that have facilitated this remarkable shift in monetary policy in EMEs. The results indicate statistically significant linkages between some characteristics of the economies and their ability to conduct countercyclical monetary policy. We find that while stronger macroeconomic fundamentals and reduced vulnerabilities, greater openness to trade and international capital flows, and financial development facilitated the conduct

of countercyclical policy, the most important determinants have been the financial reforms achieved over the past decades and the adoption of inflation targeting which is becoming more pervasive among EMEs. Inflation targeting regimes enhance greater policy transparency and flexibility of monetary policy. EMEs also achieve greater policy credibility by adopting inflation targeting regimes and by achieving greater financial reforms. As long as EMEs maintain strong economic fundamentals, continue to reform their financial markets, and adopt credible and transparent monetary policy frameworks such as inflation targeting, the conduct of countercyclical policy as an economic stabilization tool might be sustainable.

The remainder of the paper is organized as follows: In the next section, we discuss our methodology for identifying crises and the monetary policy stance—two important variables for the analysis. We discuss the determinants of monetary policy stance in section 3. Section 4 describes the econometric strategy and the data. In sections 5 we present the estimation results. In section 6, we discuss some caveats and conduct a number of robustness analyses, and conclude in Section 7.

2 Identification of Crises and Monetary Policy Stance

Two variables that are central to our study are indicators for crises and the monetary policy stance. We follow Frankel and Rose (2006) and define a crisis year as one in which the bilateral U.S. dollar exchange rate depreciated at least 25 percent with the rate of depreciation exceeding the previous year's depreciation by at least 10 percentage points.² In addition, we include periods with negative or zero real Gross Domestic Product (GDP) growth in order to capture episodes of economic stress that necessitate active countercyclical monetary policy, but where exchange rate movements are not substantial. At the outset, we obtain 1,462 crisis years in advanced and emerging market economies between 1970 to 2009. Figure 1 provides a histogram for the distribution of the crises over time. The year 2009 stands out as having the most crises. There were also a higher number of crises in the early 1980s and 1990s. This tabulation is consistent with well-known crises that have affected the global economy, including the global debt crisis of the early 1980s, the Savings and Loans crisis and the Japanese Banking Crisis of the 1990s etc.

Identifying the monetary policy stance is a bit more complicated, primarily due to the lack of a common monetary policy instrument across countries and time. In particular, the policy

²We also explored two alternative definitions provided by Milesi-Ferretti, Gian, and Assaf (2008).

instrument depends on the exchange rate regime. We follow Kaminsky, Reinhart, and Vegh (2004) and use short-term interest rates as the policy instrument. Under flexible exchange rate regimes, short-term interest rates characterize monetary policy since changes in money supply influence these rates. However, under pre-determined exchange rate regimes, short-term rates are valid monetary policy instruments only if we assume imperfect substitution between domestic and foreign assets (Flood and Jeanne (2000); Lahiri and Vegh, 2003). For the choice of short-term rates, we begin with the monetary policy rates, and supplement with the discount rate or the inter-bank rate. When these series are not available, we rely on short-term treasury bill rates, and then money market rates.

In addition to short-term interest rates, we also use growth of central bank's domestic credit to proxy for monetary policy. Under flexible exchange rate regimes, central bank domestic credit growth affects the monetary base and short-term rates. Under pre-determined exchange rate regimes and perfect substitution between domestic and foreign assets, growth in central bank credit will be offset by an opposite effect in foreign exchange reserves. However, if domestic and foreign assets are imperfect substitutes, an increase in central bank credit will have some effect on the monetary base and short-term interest rates.

Even with good measures of the monetary policy instrument, characterizing the monetary policy stance is not obvious. For the purpose of this study, we define countercyclical policy as a movement in the direction of loosening monetary policy in periods of economic stress. We define a binary indicator variable for countercyclical monetary policy based on whether short-term interest rates decline in the year of the crisis relative to the previous year or when the central bank's domestic credit growth exceeds that of both the previous year and the average rate of the three years that preceded the crisis. In the instance where no monetary policy rates are available and we rely on other short-term rates, we are mindful that these rates can change independently of the true monetary policy rate. For example, risk premia tend to increase during crises, causing some short-term rates to rise even if policy rates have been lowered. However, in periods of crises, we posit that a decline in short-term rates likely indicates lower monetary policy rates. Using these monetary policy instruments, we obtain the policy stance for 980 crisis years–127 for the advanced economies, and 853 for emerging market economies.

Figure 2 presents the frequency of the use of countercyclical monetary policy during crises by country groupings over time. It highlights the contrast between the advanced and emerging

market economies. While the advanced economies have traditionally conducted countercyclical monetary policy during crises, it is only in the latter periods that a higher number of EMEs began to lower policy rates during crises. During crises in the 1970s, EMEs lowered rates in only about 30 percent of the crises. This fraction has increased steadily and, in the most recent decade, EMEs loosened monetary policy in 70 percent of the crises. During the 2008-2009 global crisis, the fraction rose even higher to over 80 percent. This remarkable development begs the following questions: What explains EMEs' increasing ability to conduct countercyclical policy? Is this a transitory phenomenon or is monetary policy in these countries evolving to become a more effective macroeconomic stabilization tool? The quest for answers to these questions is the motivation for our study.

3 Determinants of Monetary Policy in Emerging Market Economies During Crises

During economic crises the common policy prescription is to loosen monetary policy in order to support domestic economic activity. This prescription is theoretically motivated by the Keynesian models and illustrated in practice by the Taylor rule type of approach to monetary policy. In this setting, looser monetary policy is necessary to help close the negative output gap and restore full employment. The consequent increase in domestic liquidity tempers the effect of the contraction in external credit that usually occurs during EMEs' crises. Advanced economies have generally followed this practice. In emerging market economies, however, other factors have prevented the conduct of countercyclical policy as authorities in these countries have been more concerned about containing capital flight, defending their exchange rates, and bolstering the credibility of policy. Consistent with this observation, a study by Calderon et al. (2003) on the cyclicity of monetary policy in some EMEs, finds that credibility of policy was the determining factor. As pointed out by Lane, Philip (2003), when the monetary authority lacks credibility, a temporary loosening of monetary policy is perceived as heralding a persistent switch to a loose money regime with negative impacts on confidence and an increase in risk premium demanded by foreign investors.³

We include in our study a number of variables that capture the strength of institutions and the credibility of policy. Among these, we consider the exchange rate regime and monetary

³See also Caballero (2002), Calvo and Reinhart (2002) and Mendoza (2002).

policy framework, particularly the presence of an inflation targeting regime. We also include variables on financial reforms, that is, the extent to which authorities have allowed market forces to determine outcomes in credit and financial markets. Financial development is also an important consideration. A higher level of financial market development enables a more efficient transmission of monetary policy actions to domestic economic activity and, hence, increases the incentives to conduct countercyclical monetary policy. Moreover development of domestic financial markets have traditionally promoted more borrowing on domestic markets and in local currencies. A higher share of local currency debt reduces the risks of capital flight which, in turn, should facilitate the conduct of countercyclical policy. In addition, it helps to reduce risks of currency and maturity mismatches.

Devereux and Lane (2003) finds that countries with a greater dependence on foreign currency debt are more likely to tailor policy to minimize exchange rate volatility with the creditor country. Besides restricting monetary policy, dependence on external debt and debt with shorter maturities has affected the perceived solvency of EMEs during crises. With this consideration in mind, we include variables on external debt and its maturity structure, and variables on the country's finances such as foreign exchange reserves and central government debt.

We also consider other macroeconomic fundamentals such as current account balances and inflation. A low inflation environment facilitates the loosening of monetary policy, consistent with the prescriptions from a Taylor rule policy reaction function. Inflation could also capture the independence of the central bank and, hence, credibility of monetary policy. Several studies document that central banks in lower-inflation countries are relatively more independent (see for example, Alesina and Summers (1993)); and central bank independence improves the efficiency of monetary policy (Mishkin (2010)). Yakhin (2008) finds that under financial integration, the optimal monetary policy is countercyclical, but procyclical under autarky. These results suggest an important role for openness. Therefore, we include a measure of financial openness, and also trade openness

In sum, the variables we explore can be classified into four categories: Macroeconomic fundamentals and vulnerabilities, openness, monetary policy and exchange rate framework, and financial development and reforms. These variables are obviously not independent of each other and the categories are likely not disjoint. In the analyses that follow, we explore the statistical link between the conduct of monetary policy and these variables in both univariate and multivariate econometric frameworks.

4 Econometric Specification and Data Description

We estimate the following Logit model with the indicator variable for countercyclical monetary policy as the dependent variable.

$$\text{Pr ob}(CCMP = 1)_{i,\tau-1} = \Phi \left(\beta' X_{i,\tau-1} \right) \quad (1)$$

Where $\Phi \left(\beta' X_{i,j} \right) = \frac{e^{\beta' X_{i,\tau-1}}}{1 + e^{\beta' X_{i,\tau-1}}}$; $X_{i,\tau-1}$ represents a set of explanatory variables that capture a country's ability to conduct countercyclical monetary policy during crises and are measured in the year before the crisis ($\tau - 1$) for each crisis country i .

Macroeconomic Fundamentals and Vulnerability: $FXR2GDP$ and $CAB2GDP$ are the foreign exchange reserves and current account balance as percent of GDP, respectively. $CGD2GDP$ is the central government debt as percent of GDP. INF is the annual change of the consumer price index. $STDT2EXTDT$ and $STDT2FXR$ represent short-term external debt as percent of total external debt and foreign exchange reserves, respectively.

Openness: $OPENTRADE$ and $OPENFIN$ capture the degree of trade and financial openness, respectively. Trade openness is the the sum of imports and exports as percent of GDP. For financial openness, we use the Chinn-Ito index of capital account openness initially introduced in Chinn and Ito (2006), and subsequently updated by the authors through 2008. The index is based on the tabulation of binary dummy variables that capture restrictions on cross-border financial transactions as reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). It varies from -1.8 to 2.5, with higher numbers indicating greater degrees of financial openness.⁴

Exchange Rate Regime and Policy Credibility: IT is an indicator variable for whether the country's central bank is an inflation targeter in a given year. $EXCHREG$ captures the rigidity of the exchange rate regime based on the classification in the IMF's Exchange Arrangements and Exchange Restrictions. For a particular year, each country is assigned a number between 1 and 5, with higher numbers indicating greater flexibility of the exchange rate regime.

Financial Development and Financial Reforms: $FINDEV$ measures financial development based on data for bank deposit, financial system deposits, deposit banks' assets, and credit extended by banks and total credit to the domestic economy. We then divide these variables by GDP and

⁴See http://web.pdx.edu/~ito/Readme_kaopen2008.pdf for details.

conduct a principal component analysis to obtain a single index. The resulting factor (index) is highly correlated (0.92 or higher) with the variables, and explains about 93 percent of the variability of these variables. *FINREF* measures financial reforms. It is an index constructed by Abiad et al. (2008) based on factors such as the extent of directed credit, level of reserve requirements, prevalence of credit controls and credit ceilings, interest rate controls, entry barriers, capital account restrictions, state ownership in banking sector, and prudential regulations and supervision of the banking sector. The index provides a number ranging from 0 to 21, with higher values indicating greater degrees of financial reform. See Abiad et al. (2008) for details. In this study, we use the normalized (between 0 and 1) version of the index, also provided by the authors and impute the values for 2006 and 2007. The reforms index has a high auto-correlation with a coefficient of 0.99. We use an *AR*(1) process to impute the missing values.⁵ Tables 1 presents summary statistics for the variables described above for the 1970-2009 sample and the 2008-2009 sub-sample.

5 Estimation and Results

To facilitate interpretation of our regression results, we transform all the continuous variables into categorical variables: top quartile, mid-quartiles, and bottom quartile.⁶ Using the transformed variables, we estimate the Logit model in equation (1) for the emerging market economies. We begin with the 2008-2009 crisis, and later expand the analysis to the 1970-2009 sample.

5.1 The 2008-2009 Financial Crisis

In this section, we analyze monetary policy during the 2008-2009 global crisis. As shown in Figure 2, over 80 percent of EMEs were able to raise policy rates at the height of the crisis between the third quarter of 2008 and the end of the first quarter of 2009. Nonetheless some of them were not. In the analysis that follows we assess the factors that enabled some, but not all, countries to lower monetary policy rates. The econometric model is as specified in equation (1) with some minor modifications.

$$\Pr ob(CCMP_i = 1) = \Phi \left(\beta' X_{i2007} \right) \quad (2)$$

⁵More specifically, our imputation model was $FINREF_{it} = 0.99 * FINREF_{it-1} + \varepsilon_{it}$.

⁶In addition, the transformation allows us to explore nonlinearities and to be less concerned about the effect of outliers.

First a country is considered to have conducted countercyclical monetary policy during the crisis if the cumulative change in monetary policy rates between the third quarter of 2008 and the end of the first quarter in 2009 is negative. $CCMP_i$ is the indicator variable for whether country i has, on net, loosened monetary policy between the third quarter of 2008 and the end of the first quarter in 2009. Second, we fix $\tau - 1$ to 2007, so that X_{i2007} represents the same set of independent variables used in the previous analysis, but measured in 2007 only— the year prior to the crisis.

Figures 3 through 5 plot the median or mean values of some key variables through 2007 for the set of countries that lowered policy rate (the bold line) and the set of those that did not (the thin line). Several of these key variables highlight the difference between the two sets of countries. Those that loosened monetary policy had better macroeconomic fundamentals and lower vulnerabilities: inflation was lower at the eve of the crisis; current account balances were in large surplus while those of countries that couldn't lower rates were in deficit; reserves as percent of GDP were higher, and central government debt as percent of GDP was lower. Also, compared to countries that could not lower rates, those that did had external debt with slightly longer maturities, and lower short-term debt as percent of reserves. They were also more open to trade and international capital flows, had relatively more flexible exchange rate regimes, and were more likely to be inflation targeters. Finally, countries that lowered monetary policy had more developed financial markets and had made more progress on financial reforms.

5.1.1 Univariate Analysis

The regression results for the univariate analysis, that is, each regression has only one explanatory variable are shown in Table 2. Columns 2, 3, and 4 show the logit coefficients, p-values, and odds ratios, respectively.

Macroeconomic Fundamentals and Vulnerability: These results suggest that strong macroeconomic fundamentals and reduced vulnerability in the pre-crisis year increased the chances of conducting countercyclical monetary policy. A country with pre-crisis inflation in top quartile of the distribution has smaller odds of reducing rates during the crisis. Similarly, countries with the lowest government debt and highest current account surplus (in the top quartiles) were, respectively, about two-and-half and three-and-half times more likely to conduct countercyclical policy. The coefficients for the share of short-term external debt, foreign exchange reserves as percent of GDP, and short-term debt as percent of foreign exchange reserves are not statistically significant.

Openness: The next set of results indicate an important role for openness in a country’s ability to conduct countercyclical monetary policy. Countries with highly open capital accounts (top quartile of the distribution) were 3 times more likely to loosen monetary policy during the 2008-2009 crisis. Similarly, those most open to trade at the eve of the crisis were two-and-half times more likely to loosen monetary policy.

Exchange Rate Regime and Policy Credibility: The coefficient for the exchange rate regime has the expected sign. Countries with the most flexible form of exchange rate regime are more likely to loosen monetary policy, but the coefficient is not statistically significant. The result for inflation targeting, which also proxies for transparency and credibility of the central bank, are very strong. A country with inflation targeting regime was about seven-and-half more likely to conduct countercyclical monetary policy than a country without one.

Financial Development and Financial Reforms: The result for financial reform is also very strong. It suggest that a country that had achieved the highest level of financial reforms was four-and-half times more likely to loosen monetary policy. For financial development, the positive coefficient has the expected sign, though it is not statistically significant.

We suspect that these variables are not necessarily independent of each other. In the next analysis, we estimate the effect of these various factors in a multivariate econometric framework.

5.1.2 Multivariate Analysis

Tables 3 presents the odds ratios obtained from the multivariate regression using equation (2). We estimate the model with OxMetrics, a statistical software package that explores various combinations of regressors to maximize the fit of the model. At the outset, it suggested 5 alternative models—Columns (1) through (5). Overall, the results are consistent with those of the univariate analysis. Countries with the lowest level of government debt at the eve of the crisis were about two-and-half times more likely to loosen monetary policy. Those that were most open, particularly to capital flows, had greater odds of conducting countercyclical monetary policy. Inflation targeting is the most important determinant of a country’s ability to conduct countercyclical policy. The result is strong and consistently robust across various specifications. Due to lack of data, we were unable to assess the effect of financial reforms on the conduct of monetary policy during the recent crisis.

In sum, the analysis above provide evidence of links between emerging market economies’ abil-

ity to conduct countercyclical policy during the crisis and some pre-crisis characteristics of their economies such level of government debt, degree of openness and, importantly, inflation targeting monetary policy framework.

5.2 Beyond the 2008-2009 Crisis

In this section, we repeat the analysis using a large sample spanning 1970 through 2009 in order to assess the generality of the results from the previous section.

5.2.1 Univariate Analysis

Table 4 presents the regression results for the univariate model. They are generally similar to those in Table 2.

Macroeconomic Fundamentals and Vulnerability: Strong macroeconomic fundamentals and reduced vulnerability increase the chances of conducting countercyclical monetary policy. A country with pre-crisis inflation in bottom quartile of the distribution, is 62 percent more likely to reduce rates during the crisis. Similarly, countries with the largest amount of foreign exchange reserves (in the top quartile) are about two-and-half times more likely to conduct countercyclical policy. Those with the highest levels of short-term external debt to foreign exchange reserves ratio are less likely to conduct countercyclical policy during crises. The coefficients on the share of short-term external debt, current account surpluses, and government debt are not statistically significant.

Openness: The next set of results examine the role of openness. Overall they suggest an important role for openness in a country's ability to conduct countercyclical monetary policy. Countries with highly open capital accounts (top quartile of the distribution) are 45 percent more likely to loosen monetary policy during crises. Similarly, those most closed to trade reduces their chances of loosening monetary policy by nearly 30 percent.

Exchange Rate Regime and Policy Credibility: The coefficient for the exchange rate regime has the expected sign. Countries with the most flexible form of exchange rate regime are more likely to loosen monetary policy, but the coefficient is not statistically significant. Again, the results for inflation targeting, which also proxies for transparency and credibility of the central bank, are the strongest. They suggest that a country with inflation targeting is nearly seven times more likely to conduct countercyclical monetary policy than a country without an inflation targeting regime.

Financial Development and Financial Reforms: Both financial development and reforms en-

hance the ability to conduct countercyclical monetary policy. Countries that have achieved the highest level of financial reforms are more than twice as likely to loosen monetary policy, and those with the most developed financial system are 50 percent more likely to loosen monetary policy.

In sum, these results suggest strong linkages between a country’s ability to conduct monetary policy and its macroeconomic fundamentals and vulnerability, its degree of openness, the exchange rate regime and the credibility of the central bank’s policy, as well as the degree of financial development and reforms. Judging by the size of the coefficients, inflation targeting appears to be the most important determinant of the ability to conduct countercyclical monetary policy, followed by high level of financial reforms, large amounts of foreign exchange reserves and low inflation.

5.2.2 Multivariate Analysis

Tables 5 presents the odds ratios obtained from the multivariate regression using equation (1). We estimate the model with OxMetrics. It explored 450 models (combinations of regressors), and selected the 12 comparable alternative models reported in columns (1) through (12) of the table.

Macroeconomic Fundamentals and Vulnerability: As found previously, stronger macroeconomic fundamentals and low vulnerability enhances the odds of countercyclical monetary policy. Countries with the lowest pre-crisis rate of inflation are more than twice as likely to lower interest rates during crises. These results would be consistent with the prediction from a Taylor rule reaction function. Indeed, in a low inflation environment, monetary authorities can loosen monetary policy to stimulate economic activity without concerns of fueling inflation. We find evidence that higher foreign exchange reserves as percent of GDP enhances the odds of conducting countercyclical monetary policy. Having foreign exchange reserves to cover the external short-term debt is a robust indicator of a country’s ability to conduct countercyclical monetary policy. Countries in the lowest quartile of the short-term debt to foreign exchange reserves distribution are roughly twice as likely to conduct countercyclical monetary policy, and the effect appears to be monotonic. The extent to which a country can cover its short-term debt is indeed an important indicator of its solvency in crises periods when the rollover of debt or issuance of new debt becomes difficult.

Openness: In one of the specification, we find evidence that financial openness increases the likelihood of countercyclical monetary policy. Countries most open to trade are 50 percent more likely to loosen monetary policy during a crisis. The coefficients for trade openness has the expected sign, but it is not statistically significant.

Exchange Rate Regime and Policy Credibility: The coefficient for the exchange rate regime is statistically insignificant. By contrast, as documented previously, inflation targeting remains the most robust predictor of a country’s ability to conduct countercyclical monetary policy. Inflation targeters are 6 to 11 times more likely than non-targeters to loosen monetary policy during a crisis, and this effect is consistently robust across the various alternative models.

Financial Development and Financial Reforms: The coefficient for financial reforms is robust across a number of alternative specifications. Countries with the highest level of financial reforms are roughly three-times more likely to conduct countercyclical monetary policy. The results for financial development are not significant in a number of cases, but were significant, they are counter-intuitive.

6 Caveats and Robustness Analysis

In this section, we conduct some robustness analysis to assess the importance of some of the assumptions we have made and discuss some obvious caveats.

We assumed, as in Kaminsky, Reinhart, and Vegh (2004), that under imperfect substitution between foreign and domestic assets, short-term interest rates are good monetary policy instruments under predetermined exchange rate regimes. To assess whether this assumption drives our results, we conduct a robustness analysis that restricts the sample to non-pegged exchange rate regimes. The second test restricts the measurement of monetary policy to policy rates and discount rates, the two most reliable measures. The third robustness test remove from the sample, instances when policy was acyclical, that is, we observed no changes in the interest rates between the pre-crisis and crisis years. The results for these robustness analyses are presented in Table 6 column (1), (2), and (3). respectively. Our main results highlighting the importance of financial reforms and inflation targeting regimes are preserved.

One caveat is whether nominal interest rates (instead of real interest rates) are the appropriate measure of monetary policy stance. Our inability to measure inflation expectations data or construct good proxy variables prevent us from conducting this robustness analysis. Given that the study is more concerned with the direction of monetary policy from the standpoint of the central bank and not with the actual stance supports the use of nominal interest rates.

Another caveat is pertains to the other non-conventional monetary policy instruments that

EMEs tend to use. In advanced economies with well-functioning financial markets, the main monetary policy instrument consists of Open Market Operations and, to a lesser extent, adjustments to the discount rate and reserve requirement ratios. In EMEs, where financial markets are underdeveloped, policy has also relied historically on other non-conventional instruments such as reserve requirements, credit ceilings, moral suasion, etc. Although this study does not take into account all the measures of monetary policy, we believe that if data were available, changes in these instruments would be consistent with the changes in short-term rates. For example, it is not likely that the central bank will lower short-term interest rates and at the same time raise reserve requirements or lower the credit ceilings.

The consistency between the analysis over the 1970-2009 sample and the 2008-2009 sub-sample provides further assurances that our main results are robust to a number of the caveats mentioned earlier. In the 2008-2009 sub-sample, we have better measures of the monetary policy rates and, hence, rely less on other short-term interest rates as proxies for policy rates. Moreover, fewer countries had pegged exchange rate regimes suggesting the assumption imperfect substitution domestic and foreign assets is not as necessary. Finally, the 2008-2009 sub-sample allows us to control for the nature of the crisis and rely on cross-country variations to identify the determinants of countercyclical policy.

7 Concluding Remarks

During the recent global financial crisis, a large number of EMEs loosened monetary policy to cushion the effect of the global financial crisis. This was a remarkable departure from previous crisis episodes during which they had to tighten monetary policy. In this study we explored the factors that enabled this shift in policy stance, and find statistically significant linkages between some characteristics of the economies and their ability to conduct countercyclical monetary policy.

The results indicate that while stronger macroeconomic fundamentals and reduced vulnerabilities, greater openness to trade and financial flows, and financial development facilitated the conduct of countercyclical policy during crises, the most important determinants have been the financial reforms achieved over the past decades and the adoption of inflation targeting which is becoming more pervasive framework among EMEs. Inflation targeting regimes enhance transparency and flexibility of monetary policy. By adopting inflation targeting and by implementing financial

reforms, EMEs also achieve policy credibility.

Indeed, one of the main impediments to EMEs' ability to conduct countercyclical monetary policy is lack of credibility. When credibility is fragile, an attempt by the central bank to loosen monetary policy is perceived as signaling a permanent switch to a loose money regime with negative impacts on confidence and increased risk premia demanded by foreign investors. The adoption of inflation targeting helps to dispel these perceptions as it fosters confidence in monetary policy and anchors inflation expectations. Moreover, inflation targeting has been accompanied by reduced emphasis on exchange rate management, thereby, allowing monetary policy to be flexibly geared toward the stabilization of the domestic economy.

We interpret these results to suggest that as long as EMEs maintain strong economic fundamentals, continue to reform their financial markets, and adopt flexible and transparent monetary policy frameworks such as inflation targeting, the conduct of countercyclical policy as an economic stabilization tool will likely be sustainable. The increasing popularity of inflation targeting among EMEs is particularly encouraging in this regard. We are not aware of a country that has adopted inflation targeting and abandoned it out of dissatisfaction, and there appears to be some degree of irreversibility in financial reforms, suggesting that the conduct of countercyclical policy could be sustainable. The increasing ability EMEs to use monetary policy as a macroeconomic stabilization tool might help to explain the observed greater resilience of these economies to shocks emanating from the advanced economies despite greater degree of integration between the two sets of countries.

8 Appendix: Variables and Data Sources

<i>INTEREST RATES</i>	International Financial Statistics (IFS), Haver Analytics
<i>CENTRAL BANK CREDIT</i>	IFS
<i>INF</i>	IFS, World Development Indicators database (WDI)
<i>FXR2GDP</i>	IFS, WDI
<i>MATEXTDT</i>	WDI
<i>CAB2GDP</i>	WDI
<i>CGD2GDP</i>	WDI and IMF Historical Public Debt database
<i>STDT2EXTDT</i>	IFS, Global Development Finance database
<i>STDT2FXR</i>	Global Development Finance database, IFS
<i>OPENTRADE</i>	WDI
<i>OPENFIN</i>	Chinn-Ito Index database
<i>IT</i>	National sources
<i>EXCHREG</i>	Ilzetzki, Reinhart and Rogoff (2008) database
<i>FINREF</i>	Abiad et. al (2010) Financial Reforms database
<i>FINDEV</i>	Constructed by authors using following WDI and IFS data: bank deposit, financial system deposit, deposit bank assets, private credit, and bank credit variables as percent of GDP credit data are obtained from WDI; bank data are obtained from IFS.

FXR2GDP: Foreign exchange reserves to GDP ratio; *CAB2GDP*: Current account balance to GDP ratio;
CGD2GDP: Central government debt to GDP ratio; *STDT2EXTDT*: Short-term debt to total debt ratio;
STDT2FXR: Short-term debt to foreign exchange reserves ratio; *EXTDT2EXP*: External debt to GDP ratio;
OPENTRADE: Trade volume to GDP ratio; *MATEXTDT*: Maturity in year of newly issues external debt;
OPENFIN: Index for openness of the capital account; *IT*: Binary indicator for inflation targeting;
EXCHREG: Exchange rate regime; *FINREF*: Index for financial reforms; *FINDEV*: Index for financial development.

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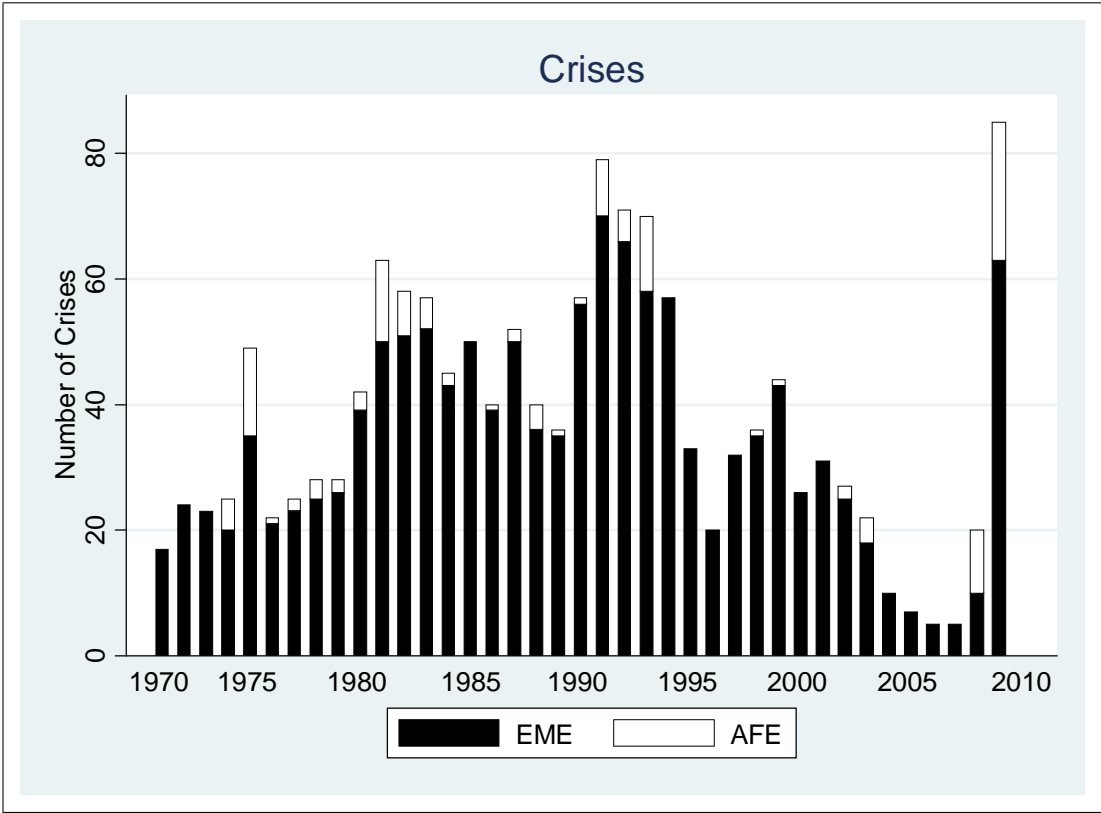


Figure 1: Frequency of Financial and Economic Crises: 1970-2009.

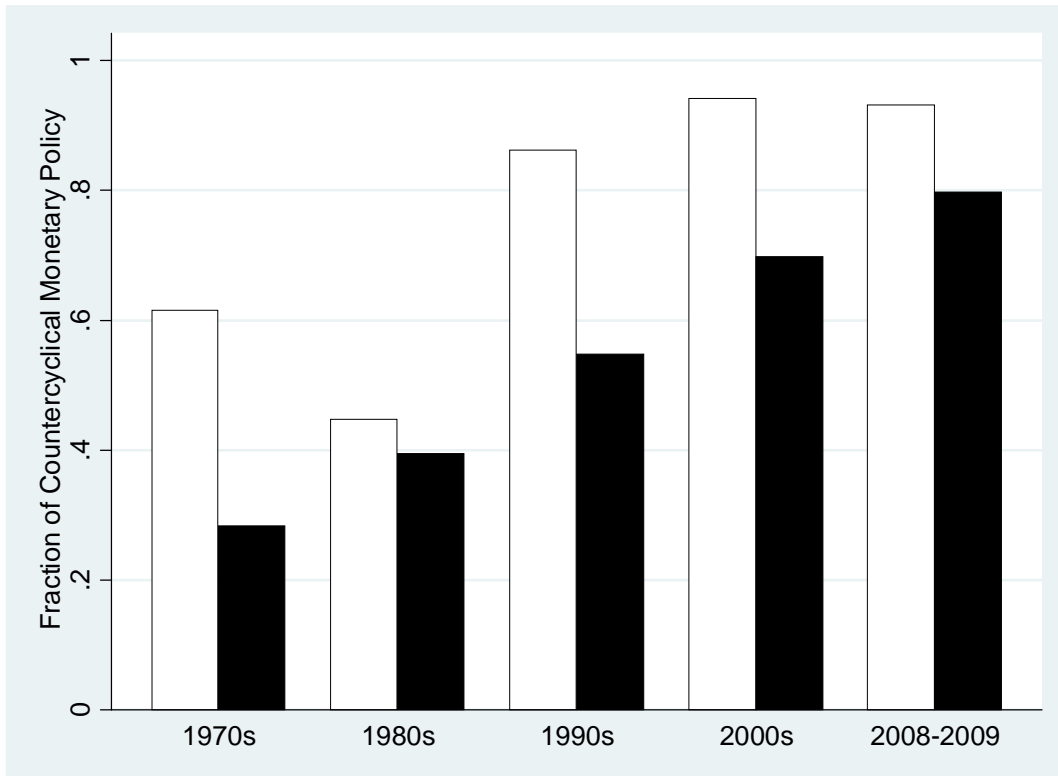


Figure 2: Fraction of Crises during which Advanced and Emerging Market Economies Conducted Countercyclical Monetary Policy.

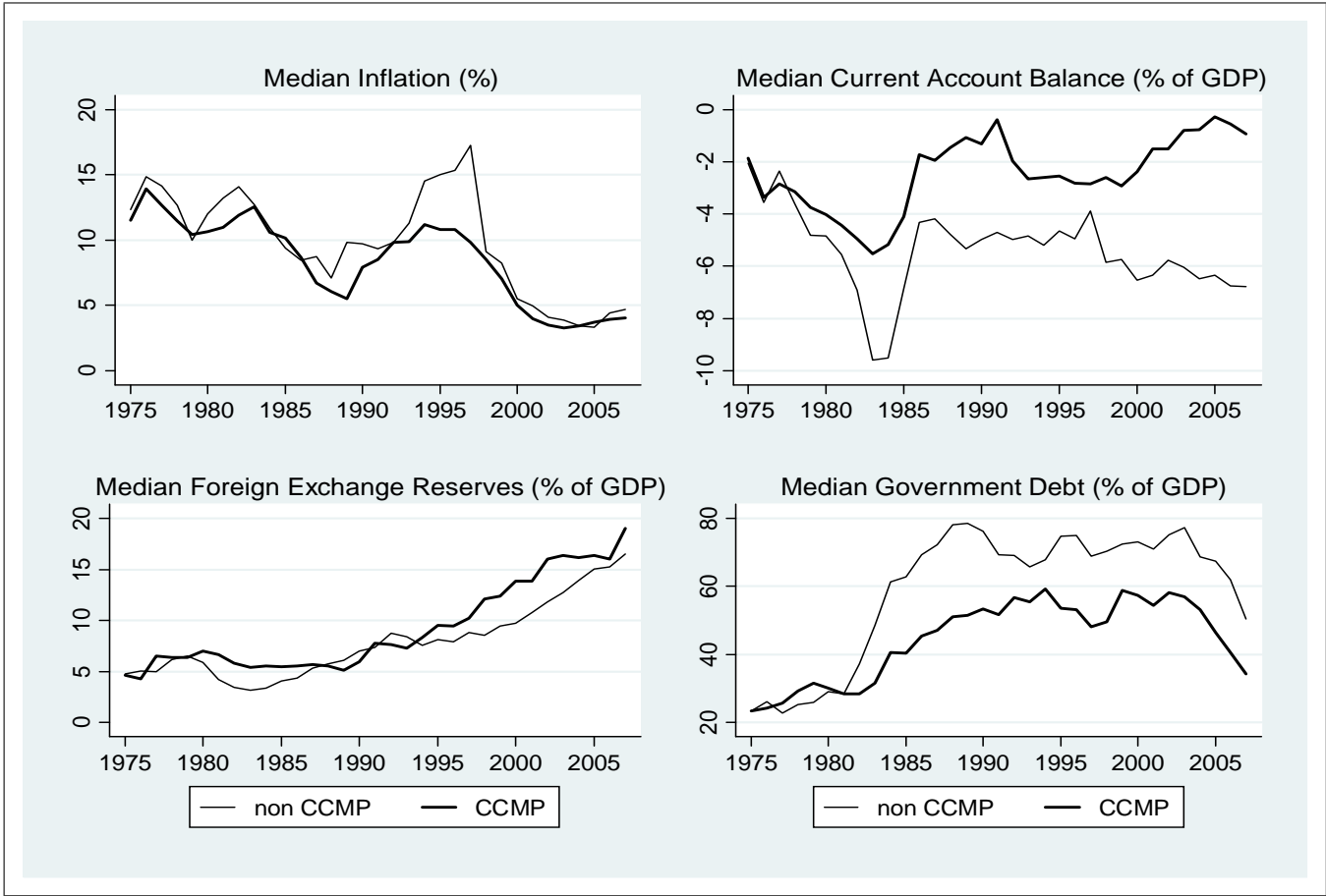


Figure 3: Timeline of Macroeconomic Variables by Monetary Policy Behavior during the 2008-2009 Crisis

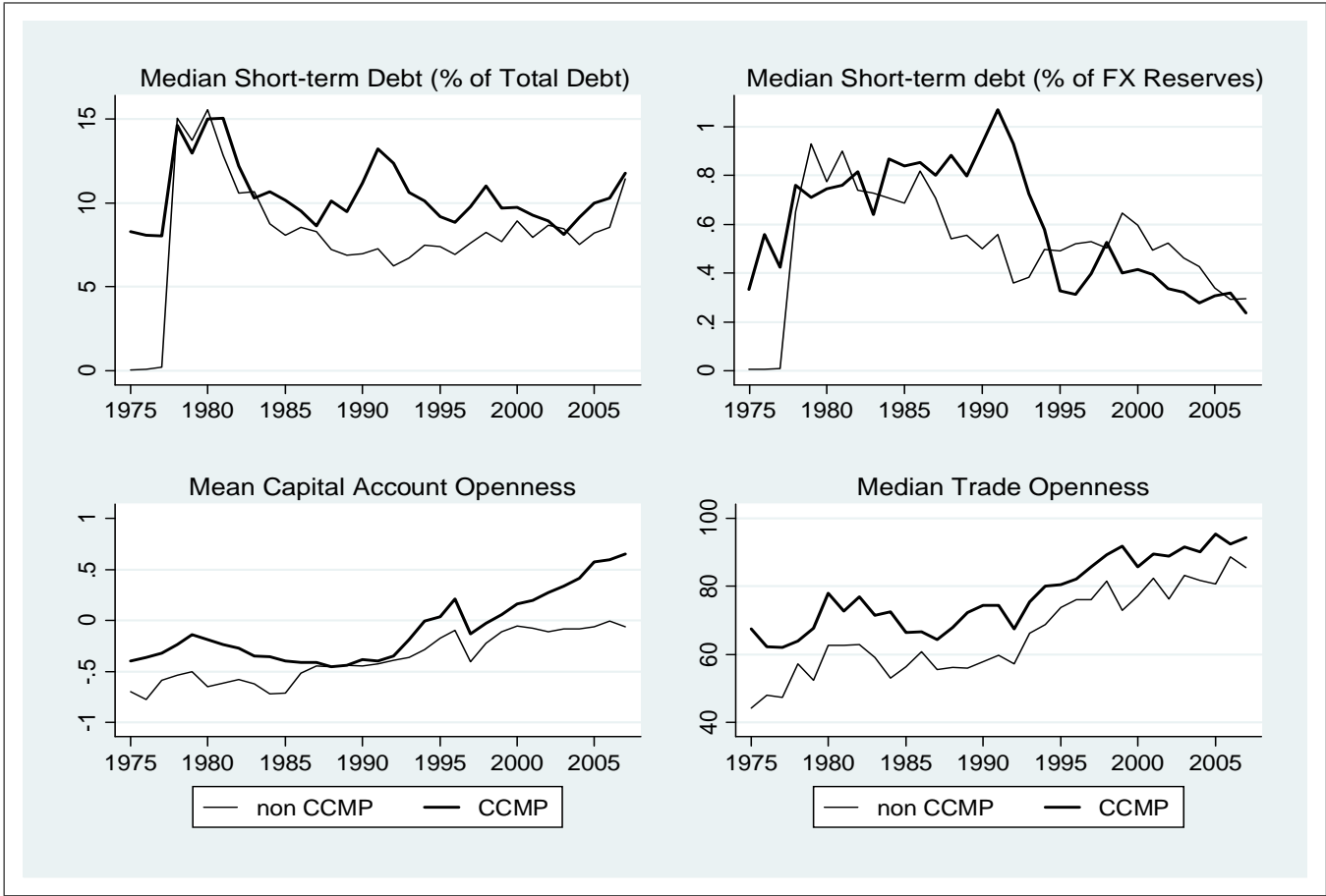


Figure 4: Timeline of Macroeconomic Variables by Monetary Policy Behavior during the 2008-2009 Crisis

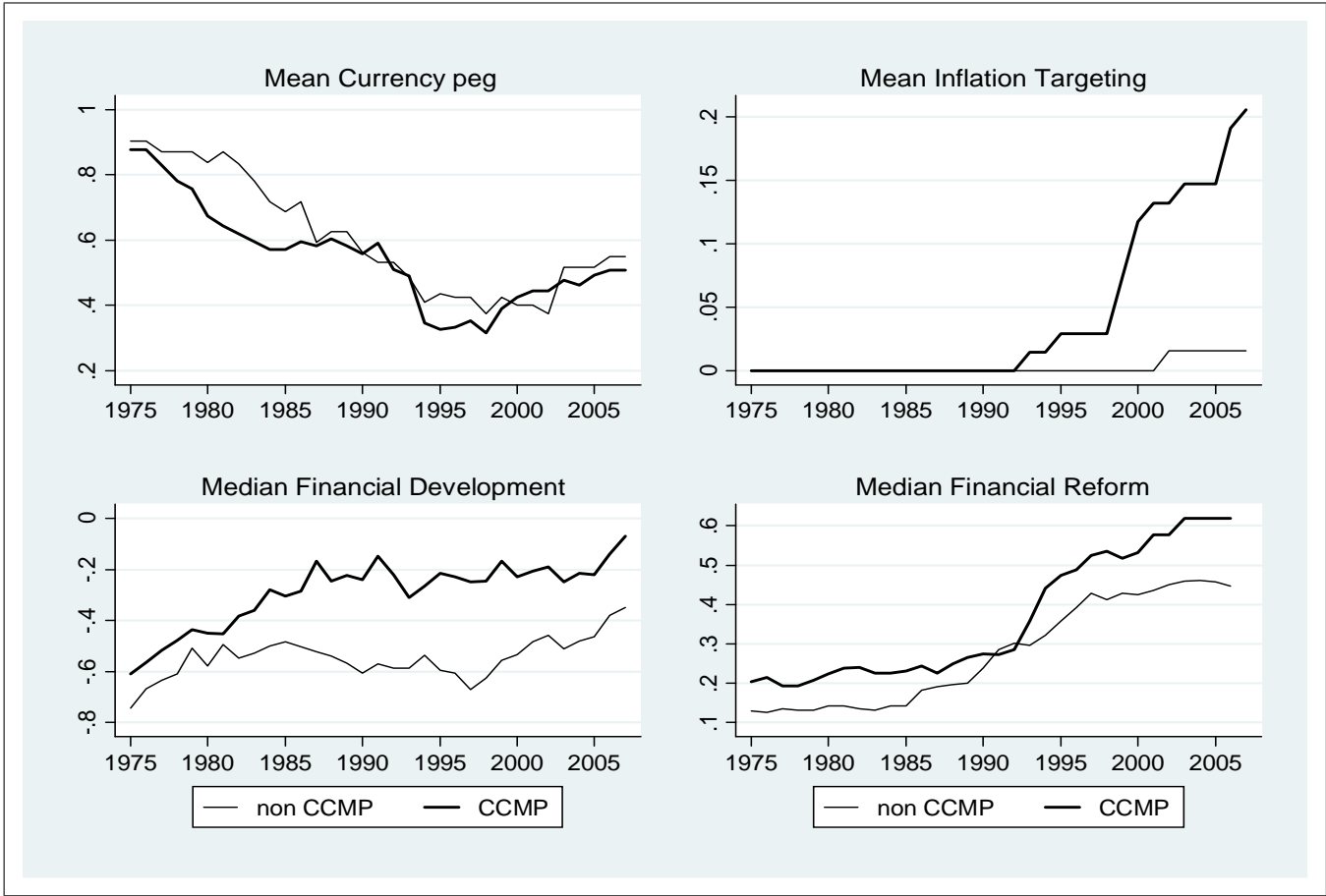


Figure 5: Timeline of Macroeconomic Variables by Monetary Policy Behavior during the 2008-2009 Crisis

Table 1: DESCRIPTIVE STATISTICS OF VARIABLES

Variable	Sample: 2008-2009				Sample: 1970-2009			
	Median	Mean	St. Dev.	Nobs	Median	Mean	St. Dev.	Nobs
<i>INF</i>	5.51	60.42	679.64	160	11.14	129.63	663.81	1,177
<i>FXR2GDP</i>	18.19	22.70	17.64	150	5.09	8.31	10.32	1021
<i>CAB2GDP</i>	-4.40	-3.09	13.62	137	-4.11	-4.93	10.10	862
<i>CGD2GDP</i>	37.90	48.44	46.26	154	51.68	71.08	78.83	925
<i>STDT2EXTDT</i>	12.30	15.61	14.83	127	9.78	13.36	14.11	953
<i>STDT2FXR</i>	0.22	0.72	2.52	121	0.75	16.25	111.65	866
<i>OPENTRADE</i>	89.93	99.35	53.67	150	65.50	73.81	42.11	1,117
<i>OPENFIN</i>	-0.087	0.29	1.62	155	-1.13	-0.39	1.40	1,043
<i>IT</i>	0	0.097	0.30	164	0	0.012	0.11	1,339
<i>EXCHREG</i>	2	1.85	0.95	141	2	2.65	1.66	971
<i>FINREF</i>	0.73	0.74	0.14	68	0.31	0.36	0.27	446
<i>FINDEV</i>	-0.15	0.16	1.03	141	-0.50	-0.32	0.67	841

All variables are measured in pre-crisis year. *INF*: Inflation. *FXR2GDP*: Foreign exchange reserves to GDP ratio. *CAB2GDP*: Current account balance to GDP ratio. *CGD2GDP*: Central government debt to GDP ratio. *STDT2EXTDT*: Short-term debt to total external debt ratio. *STDT2FXR*: Short-term debt to foreign exchange reserves ratio. *OPENTRADE*: Trade volume to GDP ratio. *OPENFIN*: Index for openness of the capital account. *IT*: Binary indicator for inflation targeting. *EXCHREG*: Exchange rate regime (1=most rigid, 5=most flexible). *FINREF*: Index for financial reforms up to the crisis (0=lowest level of financial reforms, 1=highest level of financial reforms). *FINDEV*: Index for financial development. Higher number indicate greater financial development. Source: Various data sources (see Appendix) authors' calculations.

Table 2: LOGIT ESTIMATES OF COUNTERCYCLICAL MONETARY POLICY FUNCTION
Variable

Variable	Coef.	P-Value	Odds-ratio	Nobs
<i>MACROECONOMIC FUNDAMENTALS AND VULNERABILITY</i>				
<i>INF- HIGH</i>	-0.824	0.063	0.439	130
<i>CGD2GDP - LOW</i>	0.817	0.056	2.26	126
<i>CAB2GDP - HIGH</i>	1.241	0.006	3.46	118
<i>FXR2GDP - HIGH</i>	0.636	0.120	1.89	126
<i>STDT2EXTDT - LOW</i>	-0.510	0.307	0.60	102
<i>STDT2FXR- HIGH</i>	-.327	0.486	0.72	102
<i>OPENNESS</i>				
<i>OPENFIN - HIGH</i>	1.109	0.013	3.03	126
<i>OPENTRADE - HIGH</i>	0.896	0.042	2.45	122
<i>MONETARY, EXCHANGE ARRANGEMENT, AND CREDIBILITY</i>				
<i>EXCHREG - FLOAT</i>	.605	0.305	1.83	129
<i>IT</i>	2.025	0.010	7.58	132
<i>FINANCIAL DEVELOPMENT AND REFORMS</i>				
<i>FINREF - HIGH</i>	1.49	0.035	4.46	62
<i>FINDEV - HIGH</i>	0.566	0.165	1.76	122

Indicator for counter-cyclical monetary policy (CCMP) is the dependent variable. All independent variables are measured in pre-crisis year: INF: Inflation. FXR2GDP: Foreign exchange reserves to GDP ratio. CAB2GDP: Current account balance to GDP ratio. CGD2GDP: Central government debt to GDP ratio. STDT2EXTDT: Short-term debt to total external debt ratio. STDT2FXR: Short-term debt to foreign exchange reserves ratio. OPENTRADE: Trade volume to GDP ratio. OPENFIN: Index for openness of the capital account. IT: Binary indicator for inflation targeting. EXCHREG: Exchange rate regime (1=most rigid, 5=most flexible). FINREF: Index for financial reforms up to the crisis (0=lowest level of financial reforms, 1=highest level of financial reforms). FINDEV: Index for financial development. Higher number indicate greater financial development. "LOW": Bottom quartile; "MID": Middle quartiles; "HIGH": Top quartile.

Table 3: ODDS RATIOS FROM LOGIT ESTIMATES OF COUNTERCYCLICAL MONETARY POLICY FUNCTION

Variable	(1)	(2)	(3)	(4)	(5)
<i>CGD2GDP - LOW</i>	2.67**	2.58*		2.54*	2.57*
<i>OPENFIN - LOW</i>	2.27	1.85	2.19	1.85	1.96
<i>OPENFIN - HIGH</i>	3.35**	3.17*	4.03**	3.24*	3.38**
<i>OPENTRADE - LOW</i>	0.25**		0.28*		0.21*
<i>OPENTRADE - MID</i>	0.49		0.57		0.50
<i>OPENTRADE - HIGH</i>		2.40		2.54*	
<i>IT</i>	37.01***	27.93***	29.14***	27.51***	42.08***
<i>FINDEV - LOW</i>				0.80	
<i>FINDEV - MID</i>		1.19			
<i>FINDEV - HIGH</i>		1.39			1.09
<i>FINREF - HIGH</i>					
<i>N</i>	118	113	118	113	113

Indicator for counter-cyclical monetary policy (CCMP) is the dependent variable. All independent variables are measured in pre-crisis year. INF: Inflation. FXR2GDP: Foreign exchange reserves to GDP ratio. CAB2GDP: Current account balance to GDP ratio. CGD2GDP: Central government debt to GDP ratio. STD2EXTDT: Short-term debt to total external debt ratio. STD2FXR: Short-term debt to foreign exchange reserves ratio. OPENTRADE: Trade volume to GDP ratio. OPENFIN: Index for openness of the capital account. IT: Binary indicator for inflation targeting. EXCHREG: Exchange rate regime (1=most rigid, 5=most flexible). FINREF: Index for financial reforms up to the crisis (0=lowest level of financial reforms, 1=highest level of financial reforms). FINDEV: Index for financial development. Higher number indicate greater financial development. "LOW": Bottom quartile; "MID": Middle quartiles; "HIGH": Top quartile.

Table 4: LOGIT ESTIMATES OF COUNTERCYCLICAL MONETARY POLICY FUNCTION
Variable

Variable	Coef.	P-Value	Odds-ratio	Nobs
<i>MACROECONOMIC FUNDAMENTALS AND VULNERABILITY</i>				
<i>INF - LOW</i>	0.481	0.003	1.62	846
<i>CAB2GDP - HIGH</i>	0.135	0.449	1.14	682
<i>CGD2GDP - LOW</i>	-0.169	0.304	0.84	782
<i>FXR2GDP - HIGH</i>	0.925	0.000	2.52	818
<i>STDT2EXTDT - LOW</i>	-0.130	0.483	0.88	722
<i>STDT2FXR - HIGH</i>	-0.392	0.028	0.68	704
<i>OPENNESS</i>				
<i>OPENFIN - HIGH</i>	.373	0.011	1.45	790
<i>OPENTRADE - LOW</i>	-.325	0.047	0.722	814
<i>MONETARY, EXCHANGE ARRANGEMENT, AND CREDIBILITY</i>				
<i>EXCHREG - FLOAT</i>	0.189	0.346	1.208	701
<i>IT</i>	1.921	0.012	6.826	872
<i>FINANCIAL DEVELOPMENT AND REFORMS</i>				
<i>FINREF - HIGH</i>	0.791	0.000	2.205	789
<i>FINDEV - HIGH</i>	0.406	0.020	1.501	710

Indicator for counter-cyclical monetary policy (CCMP) is the dependent variable. All independent variables are measured in pre-crisis year. INF: Inflation. FXR2GDP: Foreign exchange reserves to GDP ratio. CAB2GDP: Current account balance to GDP ratio. CGD2GDP: Central government debt to GDP ratio. STDT2EXTDT: Short-term debt to total external debt ratio. STDT2FXR: Short-term debt to foreign exchange reserves ratio. OPENTRADE: Trade volume to GDP ratio. OPENFIN: Index for openness of the capital account. IT: Binary indicator for inflation targeting. EXCHREG: Exchange rate regime (1=most rigid, 5=most flexible). FINREF: Index for financial reforms up to the crisis (0=lowest level of financial reforms, 1=highest level of financial reforms). FINDEV: Index for financial development. Higher number indicate greater financial development. "LOW": Bottom quartile; "MID": Middle quartiles; "HIGH": Top quartile.

Table 5: ODDS RATIOS FROM LOGIT ESTIMATES OF COUNTERCYCLICAL MONETARY POLICY FUNCTION
Variable

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<i>INF - LOW</i>	2.29***	2.30***	2.33***	2.34***	2.10***	2.36***	1.97*	2.06*	2.14*	2.01*	1.79	2.15*
<i>CAB2GDP - HIGH</i>	0.98	1.08	0.98	1.01		1.01	1.22	1.20	1.13	1.19		1.19
<i>CGD2GDP - HIGH</i>	0.94	0.86	0.90	0.85	1.02	0.91	0.60	0.60	0.57	0.57	0.66	0.60
<i>FXR2GDP - HIGH</i>		1.90**						1.62				
<i>STDT2EXTDT - LOW</i>		1.03						0.93				
<i>STDT2FXR - LOW</i>	1.84**			1.83**	1.25		2.12*			2.18*	1.72	
<i>STDT2FXR - MID</i>			.60*						0.49			
<i>STDT2FXR - HIGH</i>			.42**			.60**			0.43			0.74
<i>OPENFIN - MID</i>		0.91	0.86	0.87	0.72	0.83		1.12	1.27	1.18	1.12	1.10
<i>OPENFIN - HIGH</i>	1.53*						1.16					
<i>OPENTRADE - HIGH</i>	1.28	1.17	1.20	1.41	1.32	1.42	1.17	0.98	1.13	1.22	1.04	1.09
<i>IT</i>	11.00**	8.62*	8.48**	10.79**	10.09**	9.49**	6.27*	5.39	5.72*	6.12*	5.65*	5.63*
<i>EXCHREG - HIGH</i>	0.94	0.94	0.94	0.90	0.92	1.00	1.17	1.18	1.15	1.16	1.26	1.22
<i>FINDEV - LOW</i>	1.60*	1.64*		1.56*	1.41	1.49	0.93	1.01		0.94	0.93	0.97
<i>FINDEV - MID</i>			.68*						0.78			
<i>FINREF - HIGH</i>							2.93***	2.79***	2.98***	3.12***	3.71***	3.02***
<i>N</i>	404	403	404	404	467	404	241	241	241	241	258	241

Indicator for counter-cyclical monetary policy (CCMP) is the dependent variable. All independent variables are measured in pre-crisis year.
INF: Inflation. *FXR2GDP*: Foreign exchange reserves to GDP ratio. *CAB2GDP*: Current account balance to GDP ratio. *CGD2GDP*: Central government debt to GDP ratio. *STDT2EXTDT*: Short-term debt to total external debt ratio. *STDT2FXR*: Short-term debt to foreign exchange reserves ratio. *OPENTRADE*: Trade volume to GDP ratio. *OPENFIN*: Index for openness of the capital account. *IT*: Binary indicator for inflation targeting. *EXCHREG*: Exchange rate regime (1=most rigid, 5=most flexible). *FINREF*: Index for financial reforms up to the crisis (0=lowest level of financial reforms, 1=highest level of financial reforms). *FINDEV*: Index for financial development. Higher number indicate greater financial development. "LOW": Bottom quartile; "MID": Middle quartiles; "HIGH": Top quartile.

Table 6: ODDS RATIOS FROM LOGIT ESTIMATES OF COUNTERCYCLICAL MONETARY POLICY FUNCTION

Variable	(1)	(2)	(3)
<i>INF</i> - LOW	0.71	1.29	1.59*
<i>INF</i> - MID			
<i>FXR2GDP</i> - HIGH	2.33*	1.96**	1.73*
<i>CGD2GDP</i> - LOW	1.51	1.35	0.83
<i>CGD2GDP</i> - MID			
<i>CGD2GDP</i> - HIGH			
<i>STDT2FXR</i> - LOW	2.76*	0.71	1.41
<i>STDT2FXR</i> - MID			
<i>OPENTRADE</i> - LOW			
<i>OPENFIN</i> - MID			
<i>OPENFIN</i> - HIGH	0.94	0.93	
<i>IT</i>	11.03*	9.44**	8.74*
<i>FINREF</i> - MID			
<i>FINREF</i> - HIGH	2.68*	5.93***	1.89*
<i>FINDEV</i> - LOW	2.45**	2.37***	1.88**
<i>FINDEV</i> - MID			
<i>FLOAT</i>		0.75	0.55*
<i>N</i>	179	381	402

Indicator for counter-cyclical monetary policy (CCMP) is the dependent variable. All independent variables are measured in pre-crisis year: INF: Inflation. FXR2GDP: Foreign exchange reserves to GDP ratio. CAB2GDP: Current account balance to GDP ratio. CGD2GDP: Central government debt to GDP ratio. STDT2EXTDT: Short-term debt to total external debt ratio. STDT2FXR: Short-term debt to foreign exchange reserves ratio. OPENTRADE: Trade volume to GDP ratio. OPENFIN: Index for openness of the capital account. IT: Binary indicator for inflation targeting. EXCHREG: Exchange rate regime (1=most rigid, 5=most flexible). FINREF: Index for financial reforms up to the crisis (0=lowest level of financial reforms, 1=highest level of financial reforms). FINDEV: Index for financial development. Higher number indicate greater financial development. "LOW": Bottom quartile; "MID": Middle quartiles; "HIGH": Top quartile. Column (1) restricts the sample to non-pegged exchange rate regimes. Column (2) restricts the definition of short-term interest rates to policy rates only. Column (3) remove countries with "acyclical" policy.