

NBER WORKING PAPER SERIES

OVERCOMING THE FEAR OF FREE FALLING:
MONETARY POLICY GRADUATION IN EMERGING MARKETS

Carlos A. Vegh
Guillermo Vuletin

Working Paper 18175
<http://www.nber.org/papers/w18175>

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
June 2012

This paper was prepared for a conference on "The role of Central Banks in financial stability: How has it changed?" organized by the Federal Reserve Bank of Chicago on November 10-11, 2011. We are grateful to Pablo Federico, Agustin Roitman, and conference participants for helpful comments and suggestions. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

NBER working papers are circulated for discussion and comment purposes. They have not been peer-reviewed or been subject to the review by the NBER Board of Directors that accompanies official NBER publications.

© 2012 by Carlos A. Vegh and Guillermo Vuletin. All rights reserved. Short sections of text, not to exceed two paragraphs, may be quoted without explicit permission provided that full credit, including © notice, is given to the source.

Overcoming the Fear of Free Falling: Monetary Policy Graduation in Emerging Markets
Carlos A. Vegh and Guillermo Vuletin
NBER Working Paper No. 18175
June 2012
JEL No. E52,F41

ABSTRACT

Developing countries have typically pursued procyclical macroeconomic policies, which tend to amplify the underlying business cycle (the “when-it-rains-it-pours” phenomenon). There is, however, evidence to suggest that about a third of developing countries have shifted from procyclical to countercyclical fiscal policy over the last decade. We show that the same is true of monetary policy: around 35 percent of developing countries have become countercyclical over the last decade. We provide evidence that links procyclical monetary policy in developing countries to what we refer as the “fear of free falling;” that is, the need to raise interest rates in bad times to defend the domestic currency.

Carlos A. Vegh
Department of Economics
Tydings Hall, Office 4118G
University of Maryland
College Park, MD 20742-7211
and NBER
vegh@econ.bsos.umd.edu

Guillermo Vuletin
Colby College
Department of Economics
Diamond, 3rd floor
5230 Mayflower Hill
Waterville, ME 04901-8852
gvuletin@colby.edu

Introduction

As is well-documented by now, developing countries have traditionally pursued procyclical fiscal policy.² In other words, governments have tended to follow expansionary fiscal policy during booms and contractionary fiscal policy in recessions, thus exacerbating the underlying business cycle (the so-called “when it rains, it pours” phenomenon).

Figure 1 illustrates procyclical fiscal policy on the spending side, by plotting the cyclical components of government spending and real GDP for 94 countries during the period 1960 to 2009.³ Black bars denote industrial countries while light bars indicate developing countries. The visual impression is quite striking: while an overwhelming majority of light bars lie on the right side of the picture, indicating a positive correlation or procyclical government spending in developing countries, a majority of black bars lie on the left side, indicating a negative correlation or countercyclical government spending in industrial countries.⁴ Explanations for this puzzling behavior of fiscal policy in developing countries range from imperfect access to international capital markets (Gavin and Perotti, 1997; Riascos and Vegh, 2003) to political pressures for additional spending in good times (Talvi and Vegh, 2005; Alesina and Tabellini, 1990; Iltezki 2011).

Over the last decade, however, many emerging countries have managed to escape the fiscal procyclicality trap and actually become countercyclical (see Frankel, Vegh, and Vuletin, 2011).

To illustrate this “graduation” phenomenon, Figure 2 repeats Figure 1 for the period 1960-1999,

² See Kaminsky, Reinhart, and Vegh (2004) and the references therein.

³ Real government expenditure is defined as central government expenditure and net lending deflated by the GDP deflator.

⁴ The same is true on the taxation side. As shown in Vegh and Vuletin (2012), tax rate policy tends to be procyclical in developing countries and acyclical in industrial countries.

while Figure 3 focuses on the decade 2000-2009. While Figure 2 essentially conveys the same message as Figure 1, Figure 3 shows an obvious shift of light bars from the right side of the picture to the left. In fact, about a third of developing countries have graduated. Frankel, Vegh, and Vuletin (2011) trace this dramatic shift in policy to improvements in institutional quality, which are reflected in better fiscal institutions and policy rules that require the fiscal authority to meet a certain target for the cyclically-adjusted primary balance (Frankel 2011). This ensures that countries will save in good times and hence be able to dissave in bad times.

While a great deal of attention has been paid to the cyclical properties of fiscal policy, relatively little attention has been devoted to monetary policy. In particular, there has been no attempt, as far as we know, to examine whether the graduation phenomenon alluded to above is also present for monetary policy. Our aim in this paper is thus to (i) document the extent of monetary policy procyclicality in developing countries relative to industrial countries and (ii) assess how many countries have graduated, if any, over the last decade. In fact, we will show that 40 percent of developing countries in our sample have, on average, pursued procyclical monetary policy over the last 50 years. In sharp contrast, every single industrial country has followed countercyclical monetary policy over the same period. Over the last decade, however, around 35 percent of developing countries have graduated.

We trace this graduation from monetary policy procyclicality to the fact that many emerging markets have overcome what we call the “fear of free falling.” In the past – and this is still true, of course, of many developing countries – the depreciation of the domestic currency during bad times (typically characterized by large capital outflows) would force policymakers to raise

interest rates to defend the currency. The fear was (is) that a rapidly depreciating currency would plunge the economy into a deeper crisis by encouraging further capital outflows and leading to widespread bankruptcy of firms indebted in dollar terms. The need to raise interest rates to defend the currency would preclude the possibility of using monetary policy to spur the economy, as in industrial countries. As many emerging markets have matured – by undertaking market-friendly reforms and pursuing sounder macroeconomic management – this fear of free falling has subsided, or disappear altogether, thus allowing policymakers to free policy rates for countercyclical purposes.

The paper proceeds as follows. We first document the shift in the cyclical behavior of monetary policy over the last decade in the developing world. We then show empirically how this graduation process is tightly linked to developing countries overcoming the fear of free falling. Final thoughts close the paper.

Graduating class

This section documents the shift in the cyclical behavior of monetary policy over the last decade in the developing world. To set the stage, Figure 4 plots the cyclical component of short-term interest rates and real GDP for 68 countries for the period 1960-2009.⁵ As can be seen, every single dark bar lies on the left side of the figure, indicating that all industrial countries have pursued, on average, countercyclical monetary policy (i.e., higher interest rates in good times). In contrast, 40 percent of light bars (developing countries) lie on the right side,

⁵ We take short-term interest rates as a proxy for the stance of monetary policy. In some cases, we have data for overnight interbank interest rates, such as the Federal Funds rate in the United States. In most cases, however, we rely on discount rates due to their longer availability. Conceptually, any standard open economy model with imperfect asset substitution would allow monetary authorities to use the interest rate as a policy instrument (see, for instance, Calvo and Vegh, 1995, and Flood and Jeanne, 2005)

indicating procyclical monetary policy (i.e., lower interest rates in good times). In fact, the average correlation for developing countries is 0.05 percent, compared to 0.41 for industrial countries.

How is monetary policy cyclical related to fiscal policy cyclical? Not surprisingly, Figure 5 shows that fiscal and monetary policy cyclical are strongly related. All countries pursuing procyclical monetary policy (i.e., $\text{Corr}(\text{cycle } i, \text{cycle } \text{RGDP}) < 0$) have also followed procyclical fiscal policy (i.e., $\text{Corr}(\text{cycle } \text{RG}, \text{cycle } \text{RGDP}) > 0$). Moreover, countries that tend to be more countercyclical in monetary policy are also less procyclical when it comes to fiscal policy. Given the close relation between the cyclical of monetary and fiscal policy – and based on the findings in Frankel, Vegh, Vuletin (2011) regarding fiscal policy graduation – we would expect many developing countries to have also graduated from monetary policy procyclical.

To address the issue of monetary policy graduation, we divide the 1960-2009 sample used in Figure 4 into two sub-samples: 1960-1999 and 2000-2009. Figure 6 replicates Figure 4 for the period 1960-1999 and conveys essentially the same message. Figure 7, on the other hand, focuses on the period 2000-2009. Once again, the visual image conveyed by Figure 7 is striking when compared to Figure 6. Specifically, the number of light bars on the left-side of the picture (i.e., positive correlations) has greatly increased. Around 77 percent of developing countries (36 out of 47) now show countercyclical monetary policy, up from 49 percent (23 out of 47) in Figure 6. Moreover, the average correlation between the cyclical components of short-term interest rates and real GDP in developing countries has increased from -0.02 for the period 1960-

1999 (indicating acyclical monetary policy on average) to 0.28 since the year 2000 (indicating countercyclical monetary policy).

To illustrate the issue of monetary graduation more broadly, Figure 8 presents a scatter plot with the 1960-1999 correlation on the horizontal axis and the 2000-2009 correlation on the vertical axis. By dividing the scatter plot into four quadrants along the zero axes, we can classify countries into four categories:

1. **Established graduates** (top-right): These are countries that have always been countercyclical. Not surprisingly, all industrial countries belong to this category. About 38 percent of developing countries (18 out of 47) also fall into this category, including Colombia and Korea.
2. **Still in school** (bottom-left): These are countries that have continued to behave procyclically over the last decade. These are all, of course, developing countries, including Costa Rica, Gambia, and Uruguay. Interestingly, this category represents a fairly small set of all developing countries (about 13 percent, or 6 out of 47).
3. **Back to school** (bottom-right): These are countries that were countercyclical during the 1960-1999 period and turned procyclical over the last decade. This small group of countries includes Brazil, China, and Morocco. It is worth noting that, taken together, the “back to school” and “still in school” categories represent less than 25 percent of all developing countries (11 out of 47).
4. **Recent graduates** (top-left): These are countries that used to be procyclical and became countercyclical over the last decade. They are all developing countries (18 out of 47) and include Chile and Mexico.)

In sum, the evidence suggests that more than a third of the developing world (18 out of 47 countries) has recently "graduated" from monetary policy procyclicality. As a result, about 77 percent (36 out of 47) of developing countries have followed countercyclical monetary policy over the last decade.

Graduation and "fear of free falling."

What explains the ability of some developing countries to escape the procyclical monetary policy trap? While there is no doubt that many factors come into play, we believe that a critical channel is the following. In emerging economies, recessions are often associated with capital outflows (and, in fact, are sometimes caused by sudden reversals of capital inflows, the so-called "sudden stops" phenomenon; see Calvo, 1998). This capital outflow triggers a steep depreciation of the domestic currency, which forces the Central Bank to raise interest rates to defend the currency.⁶ We refer to this monetary policy reaction as "fear of free falling" (**FFF**) and we measure it by computing the correlation between the cyclical component of the short-term interest rate and the rate of depreciation of the exchange rate.⁷ Specifically, a positive correlation indicates that the short-term policy rate increases when the domestic currency is depreciating, indicating the

⁶ The need to defend the domestic currency in bad times is best exemplified by IMF advice during the 1997 Asian crisis. To quote Stanley Fischer (at the time, the First Deputy Managing Director), "[i]n weighing [the question of whether programs were too tough], it is important to recall that when they approached the IMF, the reserves of Thailand and Korea were perilously low, and the Indonesian rupiah was excessively depreciated. Thus, the first order of business was, and still is, to restore confidence in the currency. To achieve this, countries have to make it more attractive to hold domestic currency, which, in turn, requires increasing interest rates temporarily, even if higher interest costs complicate the situation of weak banks and corporations. This is a key lesson of the tequila crisis in Latin America 1994-95, as well as from the more recent experience of Brazil, the Czech Republic, Hong Kong and Russia, all of which have fended off attacks on their currencies in recent months with a timely and forceful tightening of interest rates along with other supporting policy measures. Once confidence is restored, interest rates can return to more normal levels."

⁷ We borrow the expression "free falling," of course, from Reinhart and Rogoff 's (2004) well-known exchange rate regime classification.

presence of FFF.⁸ On the contrary, a zero correlation (or no FFF) suggests that the monetary authority does not systematically respond to exchange rate movements. While a standard Taylor rule would call for a lower interest rate during recessions, the presence of FFF forces policymakers to raise interest rates to defend the currency.⁹ Indeed, Figure 9 shows that monetary policy is procyclical for high levels of FFF and becomes more countercyclical as FFF diminishes.

As we might expect, FFF is closely related to other common criteria used to ascertain the soundness of government policy, such as institutional quality. We construct an index of institutional quality (IQ) by calculating the average of four normalized variables from the International Country Risk Guide dataset:

- Investment profile: Factors affecting investment risk that are not covered by other political, economic, and financial risk components. The risk rating assigned is the sum of three subcomponents: contract viability/expropriation, profits repatriation, and payment delays.
- Corruption: Measures corruption within the political system.
- Law and order: Assesses the strength and impartiality of the legal system and the popular observance of the law.
- Bureaucratic quality: Assesses the ability and expertise to govern without drastic changes in policy or interruptions in government services.

⁸ Of course, if interest parity held in practice, our measure of FFF would be meaningless because it would always be positive by construction (assuming variations in international interest rates are not significant). But, empirically, it is well-known that interest parity does not hold, particularly in the short run (see, among others, Mishkin, 1984; Frankel, 1991; Chinn and Guy Meredith, 2004; Akram, Rime and Sarno, 2008; and Burnside, Eichenbaum, Kleshchelski, and Rebelo, 2010). In addition, for more than 90 percent of the countries, we use the discount rate, rather than a short-term or market interest rate.

⁹ See Hnatkovska, Lahiri, and Vegh (2008) for a formal model of interest rate defense of the domestic currency in small open economies.

The IQ index ranges from 0 (lowest institutional quality) to 1 (highest institutional quality). Figure 10 shows that higher (lower) IQ is associated with lower (higher) FFF. Moreover, Figure 11 shows that in developing countries FFF diminishes over time as countercyclicality of monetary policies increases.

Although it is tempting to think of capital flight and FFF as chronic scourges in developing countries, they can change over time. Figure 12 provides some examples of the within-country relation between FFF and cyclicity of monetary policy by plotting, for three different countries, the 20 or 15 year rolling window associated correlations. Panel A shows the case of the United Kingdom, an "established graduate". FFF levels have been consistently around zero and monetary policy has always been countercyclical. At the other extreme, Panel B shows the case of Uruguay, a "still in school" country. FFF levels have ranged between 0.4 and 0.9 and monetary policy has been consistently procyclical. Panel C shows the case of Chile, a "recent graduate". Remarkably, the FFF decreased from values close to 0.9 in the early 1980s to about zero in the late 2000s. In line with our arguments, monetary policy shifted from being strongly procyclical - with values close to Uruguay's - to countercyclical.

Graduation and "fear of free falling." Regression analysis

This section uses panel data regressions to exploit the within-country variability as opposed to the cross section analysis underlying Figure 9. First, we estimate expanded Taylor rules for developing countries (Corbo, 2000; Moron and Winkelried, 2005):

$$i_{it}^c = \alpha + \beta \cdot y_{it}^c + \delta \cdot \pi_{it}^c + \lambda \cdot e_{it}^c + \eta_i + \mu_{it}, \quad (1)$$

where i_{it}^c , y_{it}^c , π_{it}^c , and e_{it}^c are the cyclical components of the short-term interest rate, real GDP, inflation, and exchange rate depreciation, respectively. In addition, we will interact FFF with the output cycle to evaluate whether the FFF alters the way in which monetary policy responds to business cycle fluctuations.¹⁰ Specifically, we estimate:

$$i_{it}^c = \alpha + \beta \cdot y_{it}^c + \delta \cdot \pi_{it}^c + \lambda \cdot e_{it}^c + \gamma \cdot (FFF_{it} \times y_{it}^c) + \phi \cdot FFF_{it} + \eta_i + \mu_{it}. \quad (2)$$

In line with our findings from Figure 9, we expect γ to be negative. This would confirm that interest rates respond more countercyclically as FFF diminishes.

Table 1 shows all panel country-fixed-effects regressions. Columns 1, 2, and 3 estimate the effect of each regressor in regression (1) one-at-a-time. Panel A shows the results for all countries in the sample, which support Taylor rules implications. In particular, Column 1 shows that, during good (bad) times interest rate increases (decreases), indicating that monetary policy is countercyclical. Columns 2 and 3 support the notion that the interest rate is positively related to inflation and depreciation shocks.

In line with our earlier correlation-based analysis, monetary policy is countercyclical in industrial economies (Panel B, column 1) and seems to be acyclical in developing countries (Panel C, column 1). These results continue to hold when we include macroeconomic determinants of interest rate policy two-at-a-time or all together (Columns 4 to 7).

¹⁰ FFF is constructed using the 10-year rolling window correlation between the cyclical component of the short-term interest rate and the rate of depreciation of the exchange rate.

Columns 8 to 10 estimate different versions of regression (2); column 8 excludes e_{it}^c , column 9 leaves π_{it}^c off, and column 10 includes all regressors. In all cases, the interaction term γ has a negative sign, as expected. However, it is not statistically significant for industrial countries; supporting the idea that FFF is not an important issue in those cases. In sharp contrast, FFF appears to be critical for developing countries. First, the interaction term between FFF and real GDP cycle is negative, which gives empirical support to the arguments laid out in the previous section. Second, including FFF makes it possible to recover the Taylor rule prediction between monetary policy and business cycle. Indeed, as shown in Panel C, columns 8, 9, and 10, once FFF is included, the coefficient on RGDP cycle becomes positive.

We thus conclude from the empirical analysis that, when FFF is not an issue, monetary policy is countercyclical because the traditional monetary policy reaction dominates. However, as FFF increases, policymakers' concerns regarding sharp depreciations during recessions become more relevant. Eventually, for high levels of FFF, this new suggested channel dominates the traditional one and monetary policy becomes procyclical.

Conclusions

We have documented the fact that, over the last decade, more than a third of developing countries have graduated from monetary policy procyclicality and become countercyclical. We have argued that a critical factor in achieving this important policy shift has been overcoming the fear of free falling; that is, the need to defend a rapidly depreciating currency in bad times. This frees the policy rate for countercyclical purposes.

References

- Akram, Q. Farooq, Dagfinn Rime, and Lucio Sarno, 2008, "Arbitrage in the foreign exchange market: Turning on the microscope," *Journal of International Economics*, Vol. 76, pp. 237-253.
- Alesina, Alberto and Guido Tabellini, 1990, "A positive theory of fiscal deficits and government debt," *Review of Economic Studies*, Vol. 57, pp. 403-414.
- Burnside, Craig, Martin Eichenbaum, Isaac Kleshchelski, and Sergio Rebelo, 2010, "Carry trade and momentum in currency markets," (mimeo, Duke University and Northwestern University).
- Calvo, Guillermo A., and Carlos A. Vegh, 1995, "Fighting inflation with high interest rates: The small open economy case under flexible prices," *Journal of Money, Credit and Banking*, Vol. 27, pp. 49-66.
- Corbo, Vittorio, 2000, "Monetary policy in Latin America," Central Bank of Chile Working Paper No. 78.
- Flood, Robert and Olivier Jeanne, 2005, "An interest rate defense of a fixed exchange rate?" *Journal of International Economics*, Vol. 66, pp. 471-484.
- Frankel, Jeffrey, 1991, "Quantifying international capital mobility in the 1980s," in *National Saving and Economic Performance*, University of Chicago Press.
- Frankel, Jeffrey, 2011, "A solution to fiscal procyclicality: The structural budget institutions pioneered by Chile," forthcoming, *Fiscal Policy and Macroeconomic Performance*, edited by Luis Felipe Céspedes and Jordi Galí (Central Bank of Chile). NBER Working Paper No. 16945.
- Frankel, Jeffrey A., Carlos A. Vegh, and Guillermo Vuletin, 2011, "On graduation from fiscal procyclicality," NBER Working Paper No. 17619.
- Fischer, Stanley (1998), "The IMF and the Asian crisis," <http://www.imf.org/external/np/speeches/1998/032098.HTM>
- Gavin, Michael, and Roberto Perotti, 1997, "Fiscal policy in Latin America," NBER Macroeconomics Annual, Vol. 12, pp. 11-61.
- Hnatkovska, Viktoria, Amartya Lahiri, and Carlos Vegh, 2008, "Interest rates and the exchange rate: A non-monotonic tale," NBER Working Paper No. 13925.
- Ilzetzki, Ethan, 2011, "Rent-seeking distortions and fiscal procyclicality," *Journal of Development Economics*, Vol. 96, pp. 30-46.
- Kaminsky, Graciela, Carmen M. Reinhart, and Carlos A. Vegh, 2004, "When it rains, it pours: Procyclical capital flows and macroeconomic policies," NBER Macroeconomics Annual, Vol. 19, pp. 11-82.
- Chinn, Menzie and Guy Meredith, 2004, "Monetary policy and long-horizon uncovered interest parity," *IMF Staff Papers*, Vol. 51, pp. 409-430.
- Mishkin, Frederic, 1984, "Are real interest rates equal across countries? An empirical investigation of international parity conditions," *Journal of Finance*, Vol. 39, pp.1345- 1357.

Moron, Eduardo and Diego Winkelried, 2005, "Monetary policy rules for financially vulnerable economies," *Journal of Development Economics*, Vol. 76, pp. 23-51.

Riascos, Alvaro and Carlos A. Vegh, 2003, "Procyclical government spending in developing countries: The role of capital market imperfections." (mimeo, UCLA and Banco Republica, Colombia).

Vegh, Carlos A., and Guillermo Vuletin, 2012, "How is tax policy conducted over the business cycle?," NBER Working Paper No. 17753.

Talvi, Ernesto, and Carlos A. Vegh, 2005, "Tax base variability and procyclicality of fiscal policy," *Journal of Development Economics*, Vol. 78, No. 1, pp. 156-190.

Reinhart, Carmen M. and Kenneth Rogoff, 2004, "The modern history of exchange rate arrangements: A reinterpretation," *Quarterly Journal of Economics*, Vol. 119, pp. 1-48.

Appendix 1. Definition of variables and sources

Gross Domestic Product

World Economic Outlook (WEO-IMF) and International Financial Statistics (IFS-IMF) were the main data sources. Series NGDP (gross domestic product, current prices) for WEO and 99B for IFS-IMF. For Azerbaijan, Bahrain, Kuwait, Libya, Qatar, and United Arab Emirates data were provided by Middle East Department at the IMF. Data period covers 1960-2009.

GDP deflator

World Economic Outlook (WEO-IMF) and International Financial Statistics (IFS-IMF) were the main data sources. Series NGDP_D (gross domestic product deflator) for WEO-IMF and 99BIP for IFS-IMF. For Azerbaijan, Bahrain, Kuwait, Libya, Qatar, and United Arab Emirates data were provided by Middle East Department at the IMF. Data period covers 1960-2009.

Consumer price index

World Economic Outlook (WEO-IMF) and International Financial Statistics (IFS-IMF) were the main data sources. Series PCPI (consumer price index) for WEO-IMF and 64 for IFS-IMF. For Azerbaijan and Kuwait data were taken from Global Financial Data (GFD). Data period covers 1960-2009.

Short-term interest rate

Global financial data was the main data source. For the following countries, the short-term interest rate used is the discount window interest rate: Algeria, Argentina, Austria, Bangladesh, Barbados, Belgium, Bolivia, Botswana, Brazil, Bulgaria, Canada, Chile, China, Colombia, Costa Rica, Cyprus, Czech Rep., Denmark, Egypt, Fiji, Finland, France, Gambia, Germany, Ghana, Greece, India, Ireland, Israel, Italy, Japan, Jordan, Kenya, Korea, Kuwait, Malaysia, Mauritius, Mexico, Morocco, Nepal, Netherlands, Nigeria, Norway, Pakistan, Paraguay, Peru, Philippines, Portugal, Rwanda, South Africa, Spain, Sri Lanka, Swaziland, Switzerland, Tanzania, Trinidad and Tobago, Tunisia, Turkey, Uganda, United States, Uruguay, Venezuela, and Zambia. For Australia we used the Australia Reserve Bank overnight cash rate. For New Zealand we used the New Zealand Reserve Bank official cash rate. For Sweden we used the Sweden Riksbank repo rate. For Thailand we used the discount window as well as the repo rate. For the United Kingdom we used the Bank of England base lending rate. Data period covers 1960-2009.

Official exchange rate

World Economic Outlook (WEO-IMF) was the main data source. Series ENDA (exchange rate, national currency per U.S. Dollar). For the United States we use the Dollar per Euro exchange rate. Data period covers 1960-2009.

Institutional quality

International Country Risk Guide (ICRG) was the source of data. Institutional quality is a normalized index that ranges between 0 (lowest institutional quality) and 1 (highest institutional quality). The index was calculated by the authors as the average of four components: investment profile, corruption, law and order, bureaucracy quality. Data period covers 1984-2008.

Appendix 2. Countries in the sample

TABLE 1A

Countries in the tax sample

Industrial countries (21)	Developing countries (47)	
Australia	Algeria	Kuwait
Austria	Argentina	Malaysia
Belgium	Bangladesh	Mauritius
Canada	Barbados	Mexico
Denmark	Bolivia	Morocco
Finland	Botswana	Nepal
France	Brazil	Nigeria
Germany	Bulgaria	Pakistan
Greece	Chile	Paraguay
Ireland	China	Peru
Italy	Colombia	Philippines
Japan	Costa Rica	Rwanda
Netherlands	Cyprus	South Africa
New Zealand	Czech Rep.	Sri Lanka
Norway	Egypt	Swaziland
Portugal	Fiji	Tanzania
Spain	Gambia	Thailand
Sweden	Ghana	Trinidad and Tobago
Switzerland	India	Tunisia
United Kingdom	Israel	Turkey
United States	Jordan	Uganda
	Kenya	Uruguay
	Korea	Venezuela
		Zambia

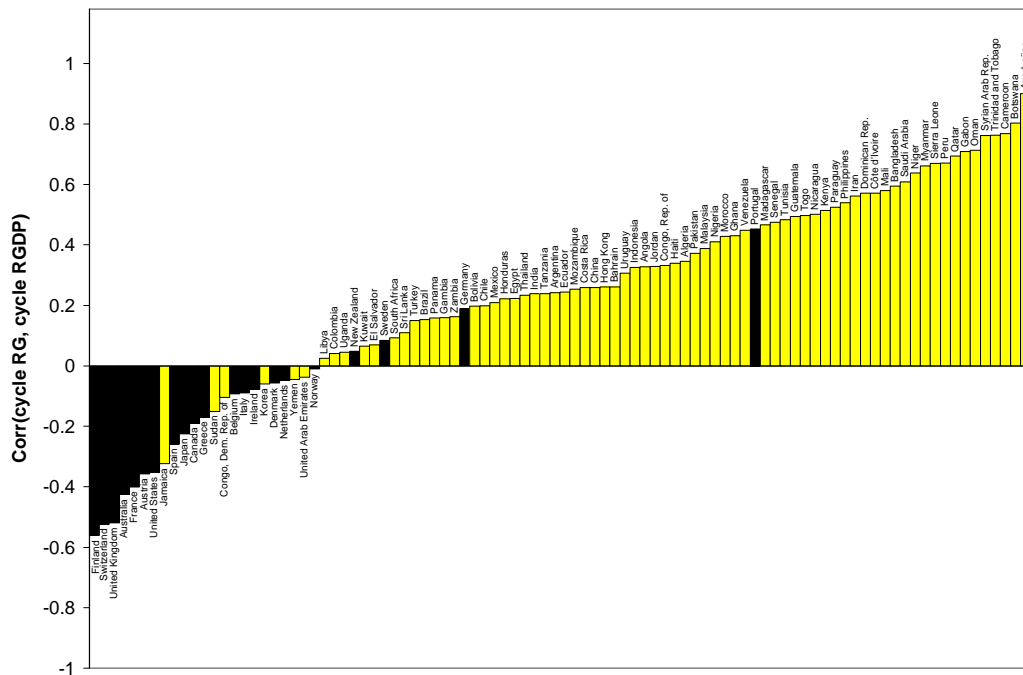
Notes: Total number of countries is 68.

Appendix 3. Data on cyclicity of monetary policy, fear of free falling, and institutional quality

Country	Graduating class	Country correlation between the cyclical components of the central bank interest rate and real GDP			Fear of free falling	Institutional quality
		Average 1960-2009	Average 1960-1999	Average 2000-2009	Average 1960-2009	Average 1984-2008
Algeria	SS	-0.08	-0.07	-0.13	0.35	0.46
Argentina	EG	0.23	0.05	0.61	-0.05	0.54
Bangladesh	EG	0.09	0.01	0.55	0.22	0.31
Bolivia	RG	0.10	-0.08	0.62	0.04	0.38
Botswana	RG	0.01	-0.18	0.86	0.11	0.66
Brazil	BS	0.11	0.14	-0.09	0.45	0.54
Bulgaria	EG	-0.05	0.04	0.29	-0.07	0.61
Chile	RG	-0.25	-0.46	0.81	0.56	0.66
China	BS	0.14	0.28	-0.41	0.07	0.56
Colombia	EG	0.53	0.42	0.77	-0.14	0.46
Costa Rica	SS	-0.20	-0.16	-0.43	-0.01	0.61
Cyprus	EG	0.03	0.02	0.30	-0.11	0.76
Czech Rep.	EG	0.52	0.29	0.74	-0.04	0.74
Egypt	RG	-0.01	-0.08	0.39	0.32	0.48
Fiji	BS	0.02	0.07	-0.43	0.04	
Gambia	SS	-0.25	-0.32	-0.37	0.23	0.54
Ghana	EG	0.14	0.14	0.35	0.27	0.47
India	RG	-0.24	-0.31	0.53	0.07	0.57
Israel	RG	-0.14	-0.23	0.00	0.54	0.72
Jordan	RG	0.02	-0.18	0.64	0.16	0.56
Kenya	RG	-0.11	-0.12	0.01	0.81	0.52
Korea	EG	0.28	0.24	0.59	-0.03	0.65
Kuwait	RG	0.05	-0.17	0.58	0.17	0.57
Malaysia	EG	0.40	0.37	0.52	0.16	0.63
Mauritius	RG	-0.07	-0.12	0.01	0.11	
Mexico	RG	-0.18	-0.43	0.59	0.56	0.54
Morocco	BS	0.16	0.21	-0.24	0.36	0.58
Nepal	EG	0.13	0.13	0.17	0.11	
Nigeria	SS	-0.02	-0.01	-0.15	0.24	0.34
Pakistan	EG	0.29	0.22	0.44	0.05	0.42
Paraguay	EG	0.11	0.23	0.14	-0.03	0.38
Peru	EG	0.13	0.11	0.62	0.11	0.43
Philippines	EG	0.13	0.04	0.57	0.51	0.44
Rwanda	SS	-0.02	-0.01	-0.30	0.30	
South Africa	EG	0.36	0.28	0.75	0.21	0.62
Sri Lanka	EG	0.30	0.02	0.79	0.49	0.48
Swaziland	BS	0.13	0.18	-0.70	0.23	
Tanzania	RG	-0.03	-0.11	0.52	0.15	0.47
Thailand	EG	0.13	0.02	0.43	0.10	0.58
Trinidad and Tobago	RG	0.07	-0.23	0.40	-0.01	0.58
Tunisia	RG	-0.05	-0.09	0.24	-0.16	0.55
Turkey	RG	-0.12	-0.26	0.15	0.55	0.54
Uganda	RG	0.01	-0.04	0.28	0.17	0.42
Uruguay	SS	-0.29	-0.57	-0.36	0.37	0.50
Venezuela	RG	-0.19	-0.36	0.28	0.65	0.44
Zambia	EG	0.09	0.09	0.66	0.39	0.43

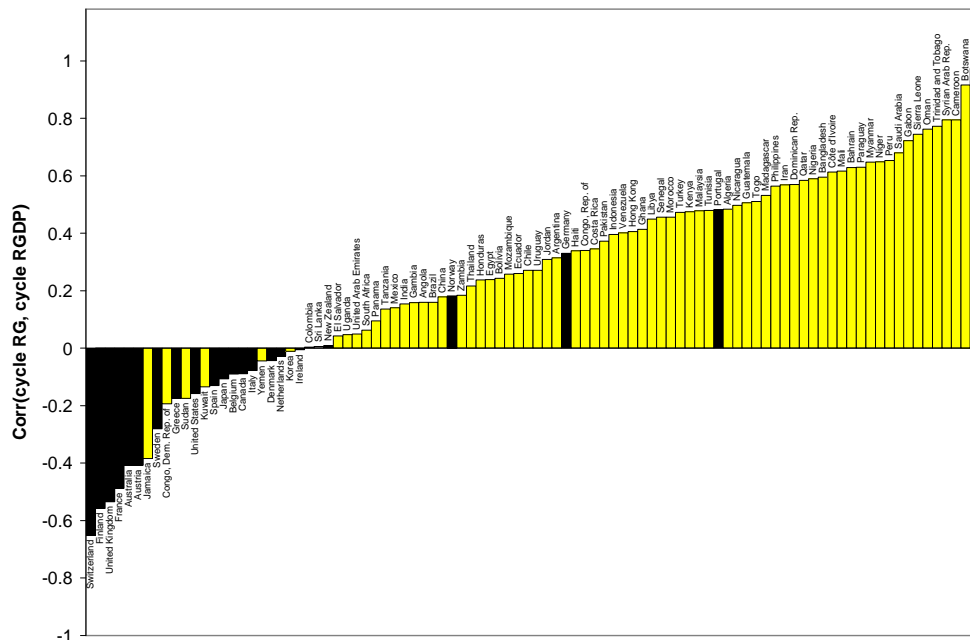
Notes: The abbreviations EG, SS, RG, and BS stand for established graduate, still in school, recent graduate, and back to school graduating classes, respectively.

Figure 1. Country correlations between the cyclical components of the real government spending and real GDP. 1960-2009



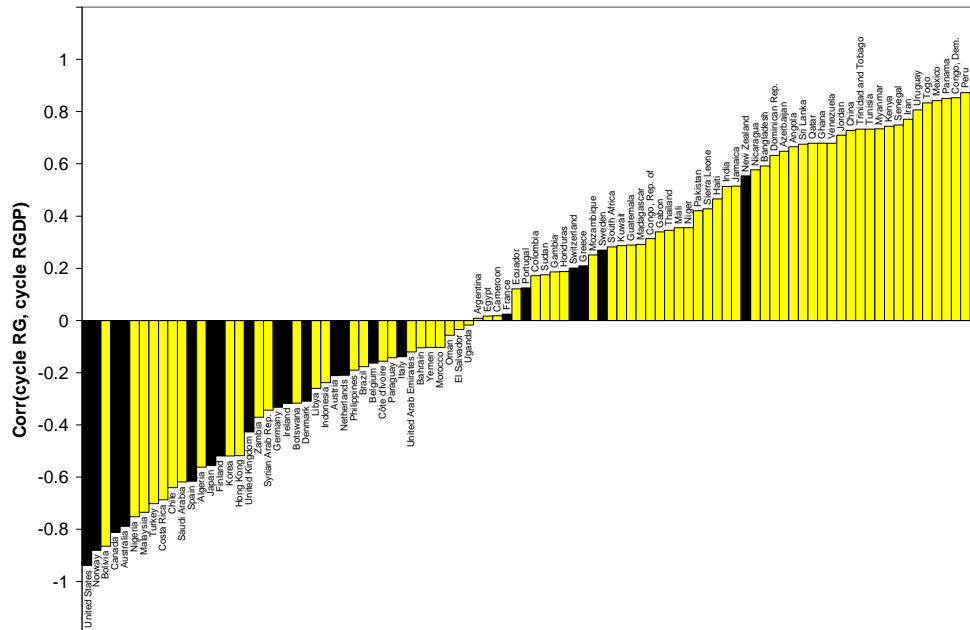
Notes: Dark bars are industrial countries and light ones are developing countries. The cyclical components have been estimated using the Hodrick-Prescott filter. A positive (negative) correlation indicates procyclical (countercyclical) fiscal policy. Source: Frankel, Vegh, and Vuletin (2011).

Figure 2. Country correlations between the cyclical components of the real government spending and real GDP. 1960-1999



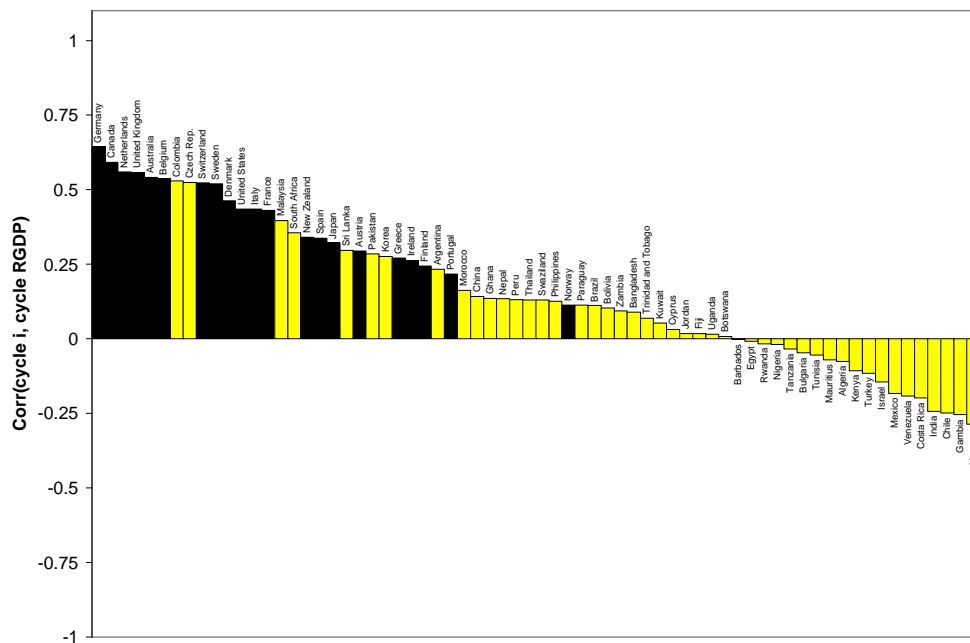
Notes: Dark bars are industrial countries and light ones are developing countries. The cyclical components have been estimated using the Hodrick-Prescott filter. A positive (negative) correlation indicates procyclical (countercyclical) fiscal policy. Source: Frankel, Vegh, and Vuletin (2011).

Figure 3. Country correlations between the cyclical components of the real government spending and real GDP. 2000-2009



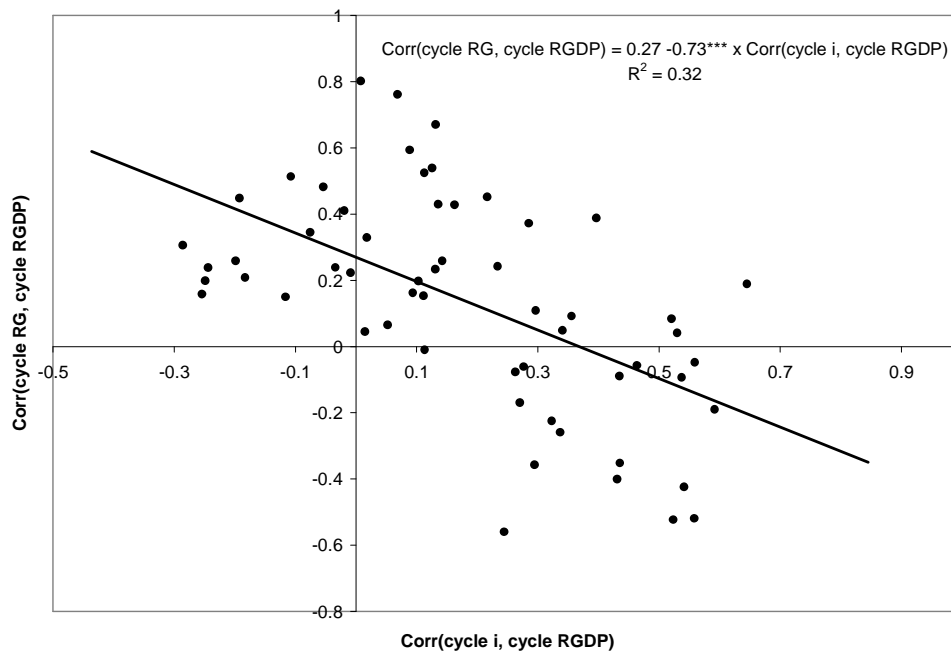
Notes: Dark bars are industrial countries and light ones are developing countries. The cyclical components have been estimated using the Hodrick-Prescott filter. A positive (negative) correlation indicates procyclical (countercyclical) fiscal policy. Source: Frankel, Vegh, and Vuletin (2011).

Figure 4. Country correlations between the cyclical components of short-term interest rate and real GDP. 1960-2009



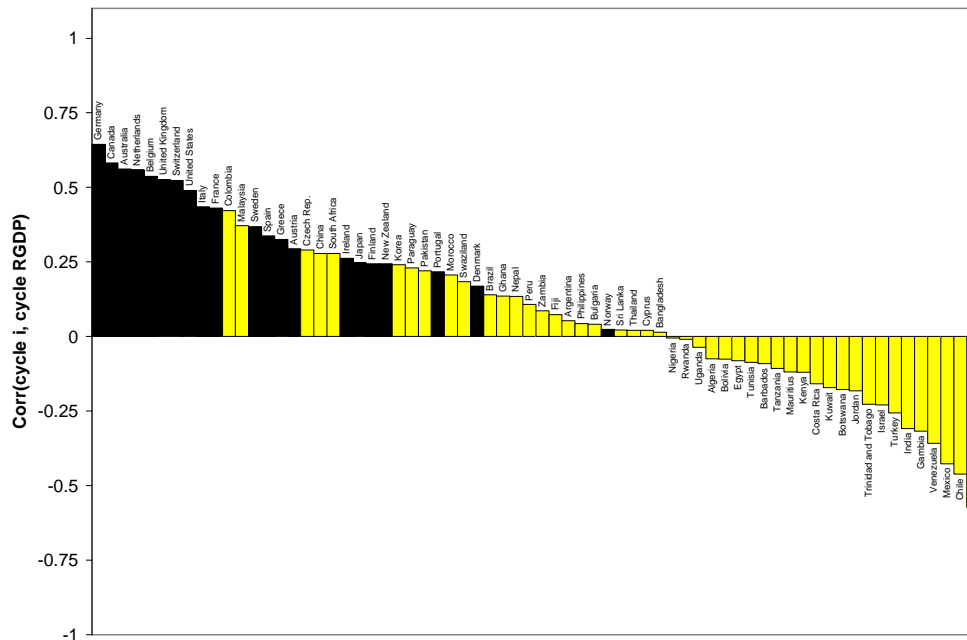
Notes: Dark bars are industrial countries and light ones are developing countries. The cyclical components have been estimated using the Hodrick-Prescott filter. A positive (negative) correlation indicates countercyclical (procyclical) monetary policy. Sample of 68 industrial and developing countries. Source: World Economic Outlook (IMF), International Financial Statistics (IMF), and Global Financial Data.

Figure 5. Cyclicity of fiscal policy vs. cyclicity of monetary policy. 1960-2009



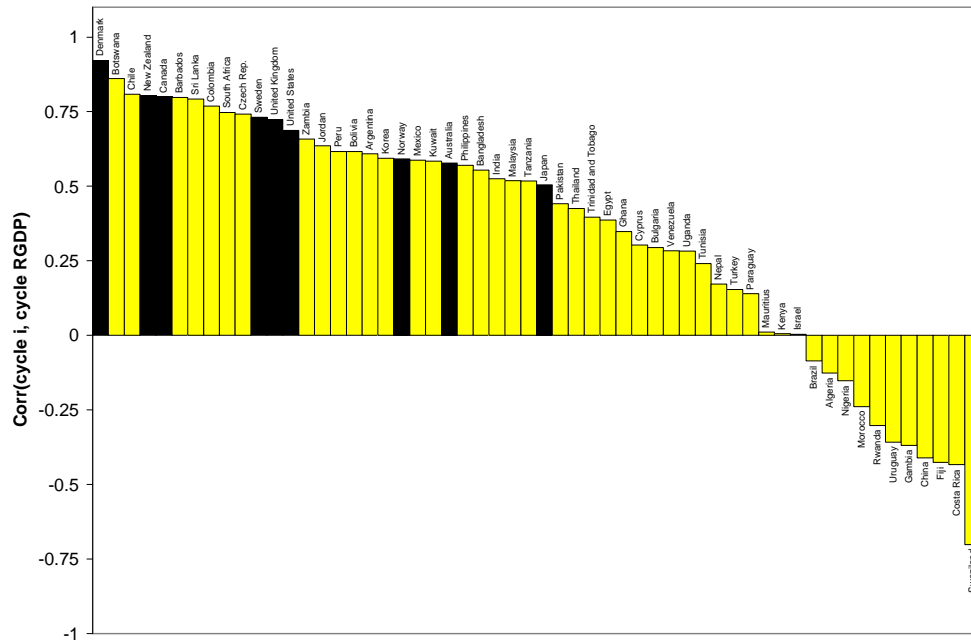
Notes: Corr(cycle RG, cycle RGDP) measures country correlations between the cyclical components of the real government spending and real GDP; source: Frankel, Vegh, and Vuletin (2011). Corr(cycle i, cycle RGDP) measures country correlations between the cyclical components of short-term interest rate and real GDP. A positive (negative) Corr(cycle RG, cycle RGDP) indicates procyclical (countercyclical) fiscal policy. A positive (negative) Corr(cycle i, cycle RGDP) indicates countercyclical (procyclical) monetary policy. Source: World Economic Outlook (IMF), International Financial Statistics (IMF), and Global Financial Data.

Figure 6. Country correlations between the cyclical components of short-term interest rate and real GDP. 1960-1999



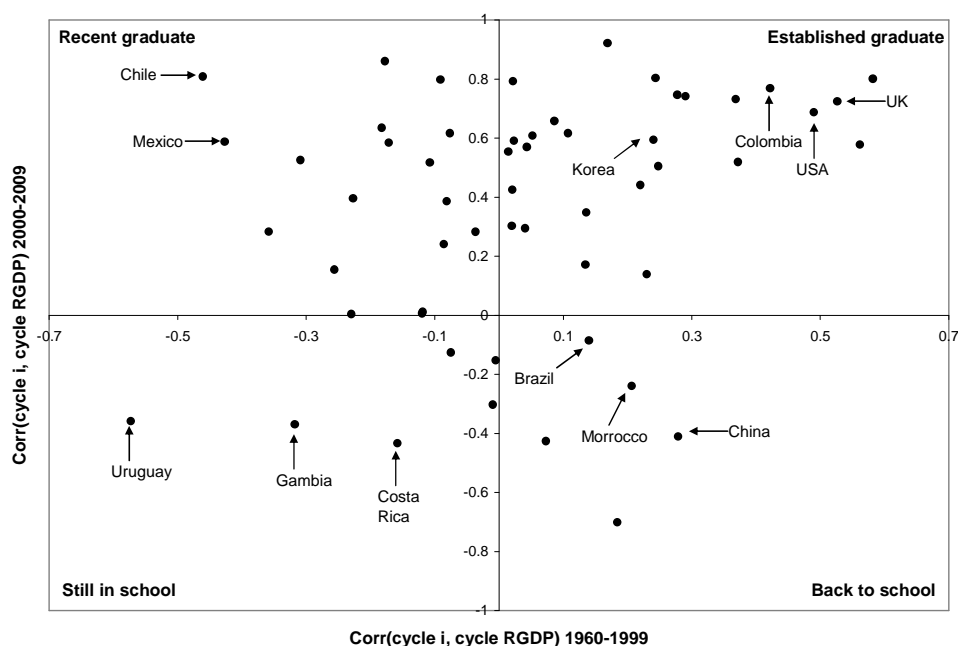
Notes: Dark bars are industrial countries and light ones are developing countries. The cyclical components have been estimated using the Hodrick-Prescott filter. A positive (negative) correlation indicates countercyclical (procyclical) monetary policy. Sample of 68 industrial and developing countries. Source: World Economic Outlook (IMF), International Financial Statistics (IMF), and Global Financial Data.

Figure 7. Country correlations between the cyclical components of short-term interest rate and real GDP. 2000-2009



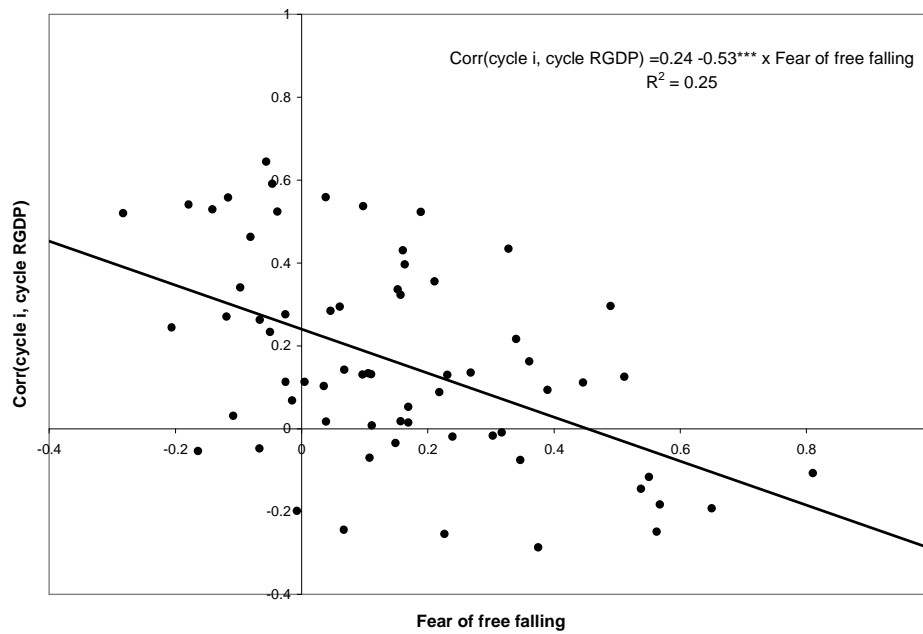
Notes: Dark bars are industrial countries and light ones are developing countries. The cyclical components have been estimated using the Hodrick-Prescott filter. A positive (negative) correlation indicates countercyclical (procyclical) monetary policy. Sample of 56 industrial and developing countries. Source: World Economic Outlook (IMF), International Financial Statistics (IMF), and Global Financial Data.

Figure 8. Country correlations between the cyclical components of short-term interest rate and real GDP. 1960-1999 vs. 2000-2009



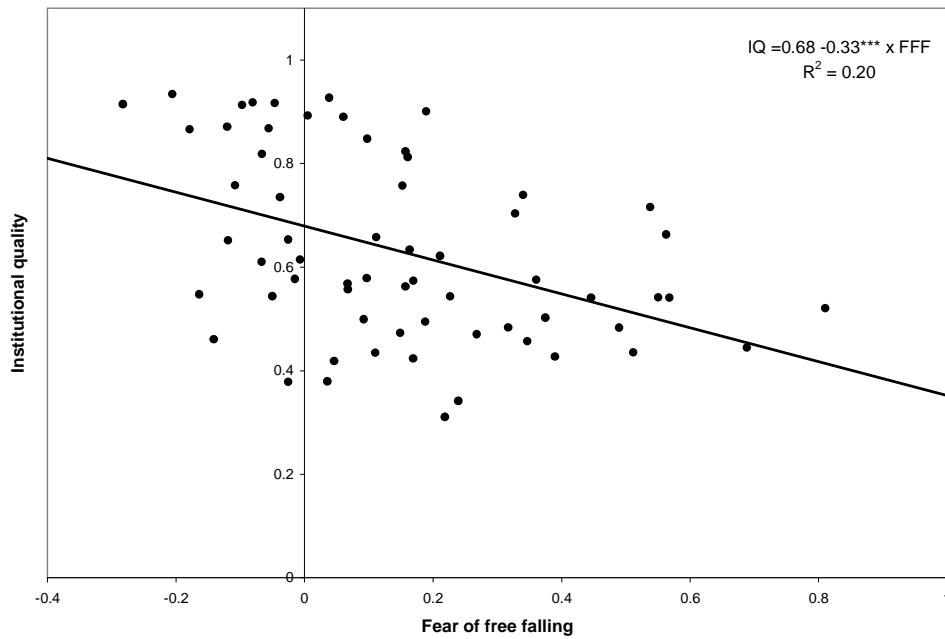
Notes: The cyclical components have been estimated using the Hodrick-Prescott filter. A positive (negative) correlation indicates countercyclical (procyclical) monetary policy. See Appendix 2 for correlation values for each country. Sample of 56 industrial and developing countries. Established graduates: Argentina, Australia, Bangladesh, Bulgaria, Canada, Colombia, Cyprus, Czech Rep., Denmark, Ghana, Japan, Korea, Malaysia, Nepal, New Zealand, Norway, Pakistan, Paraguay, Peru, Philippines, South Africa, Sri Lanka, Sweden, Thailand, United Kingdom, United States, and Zambia. Still in school: Algeria, Costa Rica, Gambia, Nigeria, Rwanda, and Uruguay. Back to school: Brazil, China, Fiji, Morocco, and Swaziland. Recent graduates: Barbados, Bolivia, Botswana, Chile, Egypt, India, Israel, Jordan, Kenya, Kuwait, Mauritius, Tanzania, Trinidad and Tobago, Tunisia, Turkey, Uganda, and Venezuela. Sample of 56 industrial and developing countries. Source: World Economic Outlook (IMF), International Financial Statistics (IMF), and Global Financial Data.

Figure 9. Country correlations between the cyclical components of short-term interest rate and real GDP vs. fear of free falling. 1960-2009



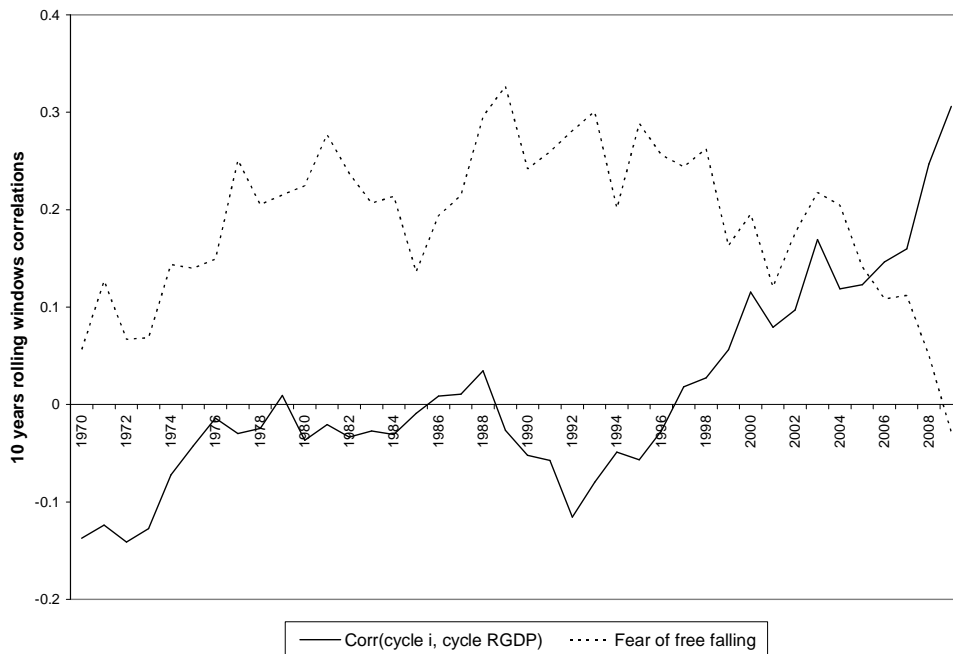
Notes: Sample of 66 industrial and developing countries. Source: World Economic Outlook (IMF), International Financial Statistics (IMF), and Global Financial Data.

Figure 10. Fear of free falling (1960-2009) vs. institutional quality (1984-2008)



Notes: Sample of 64 industrial and developing countries. Source: World Economic Outlook (IMF) and International Country Risk Guide (ICRG)

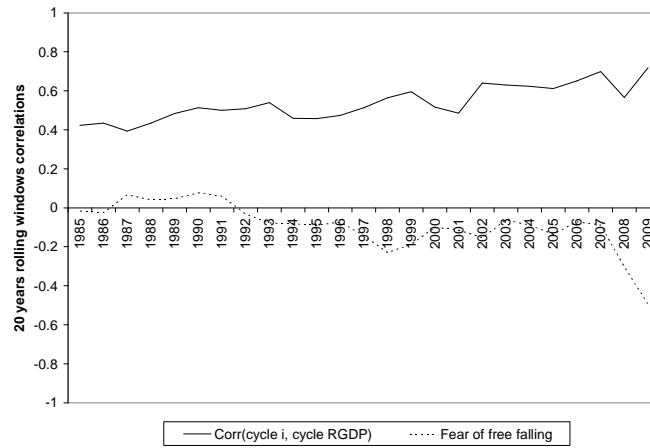
Figure 11. Average country correlations between the cyclical components of short-term interest rate and real GDP vs. fear of free falling. Developing countries.



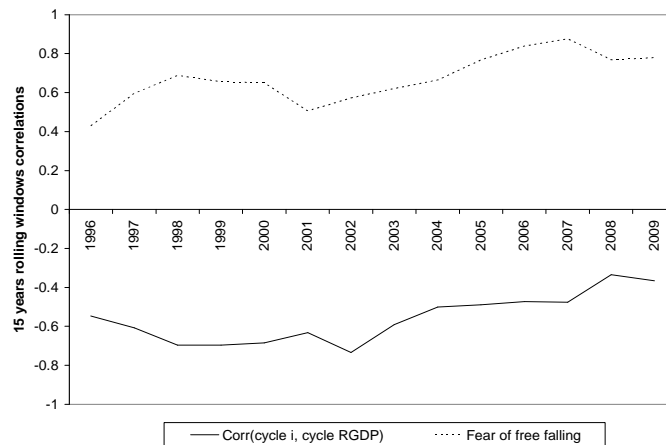
Notes: Sample of 47 developing countries. Source: World Economic Outlook (IMF), International Financial Statistics (IMF), and Global Financial Data.

Figure 12. Graduation examples. Country correlations between the cyclical components of short-term interest rate and real GDP vs. fear of free falling.

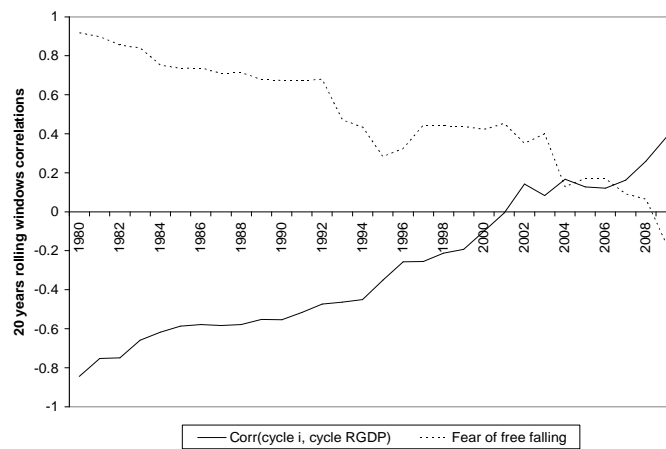
Panel A. United Kingdom (established graduate)



Panel B. Uruguay (still in school)



Panel C. Chile (recent graduate)



Source: World Economic Outlook (IMF), International Financial Statistics (IMF), and Global Financial Data.

TABLE 1

Panel regressions. Dependent variable is the cyclical component of short-term interest rate

Panel A. All countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
RGDP cycle	0.48*** [2.8]			0.47*** [2.7]	0.49*** [2.8]		0.47*** [2.7]	1.63*** [5.6]	1.63*** [5.5]	1.66*** [5.6]
Inflation cycle		0.04*** [6.4]		0.04*** [6.3]		0.04*** [6.2]	0.04*** [6.1]	0.04*** [5.2]		0.04*** [5.0]
Exchange rate depreciation cycle			0.41** [2.3]		0.42** [2.4]	0.29* [1.7]	0.30* [1.7]		0.42** [2.2]	0.33* [1.8]
RGDP cycle * Fear of free falling								-3.01*** [-4.0]	-3.02*** [-4.0]	-3.05*** [-4.1]
Number of observations	2732	2718	2769	2681	2705	2702	2669	2037	2037	2037
Number of countries	68	68	68	68	68	68	68	67	67	67

Panel B. Industrial countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
RGDP cycle	5.38*** [12.3]			5.37*** [12.0]	5.67*** [12.8]		5.59*** [12.4]	5.73*** [11.1]	6.01*** [11.7]	5.92*** [11.4]
Inflation cycle		0.03*** [2.9]		0.01 [1.6]		0.03*** [2.9]	0.01 [1.5]	0.01 [1.2]		0.01 [1.2]
Exchange rate depreciation cycle			12.20 [1.5]		25.51*** [3.3]	12.55 [1.5]	25.80*** [3.3]		26.60*** [3.1]	26.37*** [3.1]
RGDP cycle * Fear of free falling								-1.76 [-1.3]	-2.06 [-1.5]	-2.12 [-1.5]
Number of observations	874	878	893	858	856	871	851	705	705	705
Number of countries	21	21	21	21	21	21	21	21	21	21

Panel C. Developing countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
RGDP cycle	0.13 [0.6]			0.13 [0.7]	0.14 [0.7]		0.14 [0.7]	0.95*** [2.6]	0.89** [2.4]	0.98*** [2.7]
Inflation cycle		0.05*** [5.6]		0.05*** [5.5]		0.04*** [5.4]	0.04*** [5.3]	0.04*** [4.4]		0.04*** [4.2]
Exchange rate depreciation cycle			0.40** [2.1]		0.41** [2.1]	0.28 [1.4]	0.28 [1.4]		0.39* [1.9]	0.29 [1.4]
RGDP cycle * Fear of free falling								-2.26** [-2.4]	-2.22** [-2.4]	-2.30** [-2.5]
Number of observations	1858	1840	1876	1823	1849	1831	1818	1332	1332	1332
Number of countries	47	47	47	47	47	47	47	46	46	46

Notes: Estimations are performed using country-fixed-effects. t-statistics are in square brackets. Constant and Fear of free falling terms are not reported. *, ** and *** indicate statistically significant at the 10%, 5% and 1% levels, respectively. Fear of free falling is constructed using the 10-year rolling window correlation between the percentage change in short-term interest rate and exchange rate depreciation.