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César Calderón  Roberto Duncan  Klaus Schmidt-Hebbel


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Teléfono: (56-2) 6702475; Fax: (56-2) 6702231

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# THE ROLE OF CREDIBILITY IN THE CYCLICAL PROPERTIES OF MACROECONOMIC POLICIES IN EMERGING ECONOMIES

César Calderón
Gerencia de Investigación Económica
Banco Central de Chile

Roberto Duncan
Gerencia de Investigación Económica
Banco Central de Chile

Klaus Schmidt-Hebbel
Gerencia de Investigación Económica
Banco Central de Chile

**Resumen**

Una política de estabilización óptima es contracíclica, es decir, cuando ésta intenta mantener el producto cerca de su nivel potencial. Sin embargo, tradicionalmente se ha argumentado que las economías emergentes no son capaces de adoptar políticas monetarias y fiscales contracíclicas. En este trabajo argumentamos que las propiedades cíclicas de las políticas macroeconómicas dependen fundamentalmente de su grado de credibilidad. Evaluamos esta proposición usando un panel de datos con once economías emergentes y datos de series de tiempo para Chile. La evidencia respalda el hecho que a mayor credibilidad, medida por menores niveles de riesgo país, los países son capaces de aplicar políticas monetarias y fiscales contracíclicas. Contrariamente, los países con políticas menos creíbles (y, por ende, mayores *spreads* de riesgo país) contribuyen a acentuar las fluctuaciones del ciclo económico usando políticas procíclicas. En el caso de Chile encontramos que tanto la política monetaria como la fiscal han sido ampliamente contracíclicas particularmente después de 1993.

**Abstract**

Optimal stabilization policy is counter-cyclical, aiming at keeping output close to its potential. However it has been traditionally argued that emerging economies are unable to adopt counter-cyclical monetary and fiscal policy. Here we argue that the cyclical properties of macroeconomic policies depend critically on policy credibility. We test this proposition by making use of recent panel data for eleven emerging market economies and time-series data for Chile. The evidence supports that countries with higher credibility, as reflected by lower country risk levels, are able to conduct counter-cyclical fiscal and monetary policies. Conversely, countries with less credible policies (and, therefore, with higher country risk spreads) contribute to larger cyclical fluctuations by applying pro-cyclical policies. For Chile we find that both monetary and fiscal policies have been largely counter-cyclical after 1993.

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E-mails: ccaldero@bcentral.cl; rduncan@bcentral.cl.

## 1. Introduction

Optimal macroeconomic policy is counter-cyclical, aiming at keeping output close to its potential. However it is often argued that emerging market economies are unable to adopt counter-cyclical fiscal and monetary policies. Their ability to adopt optimal stabilization policies is severely hampered by factors such as recurring credit constraints in international capital markets (or "sudden stops" *á la* Calvo and Reinhart, 2000), fragile domestic financial systems, high level of foreign-currency denominated liabilities, and other determinants of low credibility in their macroeconomic policies (Lane, 2003).

Hence the mainstream view is that monetary and fiscal policy are dominantly pro-cyclical among emerging economies, especially in Latin America (Hausmann and Stein, 1996; Gavin and Perotti, 1997; Gavin and Hausmann, 1998; Talvi and Végh, 2000; Lane, 2003). Policy pro-cyclicality is a result of emerging-country governments cutting taxes and raising government spending and central banks relaxing monetary policy during booms, while being forced to adopt contractionary policies during recessions due to stringent domestic and external credit constraints imposed during recessions. Pro-cyclical stop-and go policies are intensified when macroeconomic policies are intertemporally inconsistent (a result of weak fiscal and monetary institutions and rules) and when banking systems are weak and exchange-rate regimes are rigid (Calderón and Schmidt-Hebbel, 2003). Pro-cyclicality of macroeconomic policies is more intense in countries with political systems with multiple fiscal veto points and higher output volatility (Stein et al., 1999; Braun, 2001; Talvi and Végh, 2000). Monetary policy weakens when the central bank lacks credibility (Calvo and Reinhart, 2002; Mendoza, 2002).

There is growing evidence that macroeconomic policies are counter-cyclical in industrial countries. While this seems obvious in the case of monetary policies adopted by the U.S. Federal Reserve, the European Central Bank, and the Bank of Japan, among other OECD central banks, it is less obvious in the case of fiscal policy. However recent papers stress the counter-cyclical role of fiscal policies in Europe (Melitz, 2000) and report that the degree of counter-cyclicality has been strengthened even after the signing of the Maastricht Treaty and the Stability and Growth Pact by European Union members (Galí and Perotti, 2002).

Hence macroeconomic policies should play a stabilizing role in those emerging market economies where institutions are stronger and economic fundamentals are better — like in industrial economies. For example, Chile and Malaysia adopted expansionary policies during 2001-2003 period, a period of cyclical weakness in these economies.

We argue that it is important to control for policy credibility when assessing emerging country differences in the cyclical stance of their macroeconomic policies. The main goal of this paper is to test this proposition by using the country risk spread on sovereign debt (a proxy of the lack of policy credibility) as a principal determinant of the cyclicality of fiscal and monetary policies in emerging countries. We expect that a country with low credibility – reflected in by higher country risk spreads – will adopt pro-cyclical policies. The lack of strong institutions, good economic fundamentals, and robust policy rules prevent the latter countries from applying contractionary policies during booms and expansionary policies during recessions. On the other hand, emerging countries with higher levels of credibility may be able to pursue counter-cyclical macroeconomic policies.

We test our hypothesis on two different samples based on very recent data. The first is a panel data set for eleven emerging countries with annual data for 1996-2002. The second is an annual time-series sample for Chile covering 1991-2003. The reason for complementing the international panel estimation with time-series data for an individual country is that Chile has been able to progressively strengthen its fundamentals and policy credibility during the last dozen years, changing its policy stance from pro-cyclical to counter-cyclical during the 1990s.

Our empirical results confirm that countries exhibiting higher credibility levels are able to conduct counter-cyclical macroeconomic policies, while pro-cyclical policies are observed when credibility is weak. This result holds for both the international panel data set and for Chile. Our findings are robust to different measures of the output gap, fiscal and monetary policy variables, and proxies of country risk.

The paper is organized as follows. In the following section we discuss a simple analytical setup and the empirical strategy applied to assess the relationship between the cyclical stance of macroeconomic policies and their credibility. We report the panel data evidence for the set of emerging economies in section 3. In Section 4, we present a detailed empirical evaluation for Chile. Section 5 concludes briefly.

## 2. Empirical Methodology

We start by introducing the model and the empirical strategy to test for the cyclicality of fiscal and monetary policies in the panel sample of emerging economies. Then we discuss the setup and estimation strategy for the Chile sample.

### 2.1. Panel Data Analysis for Eleven Emerging Economies

We estimate a regression equation for a panel data sample of eleven countries for annual data covering 1996-2002. Our sample of emerging economies, restricted to eleven countries due to data availability on country-risk spreads, comprises Argentina, Brazil, Chile, Colombia, Ecuador, Malaysia, Peru, the Philippines, Thailand, and Venezuela.

We will estimate the following equations for the cyclical stance of monetary and fiscal policy:[1]

$$\left(r-\bar{r}\right)_{i,t} = \theta_0 + \theta_1 (y-\bar{y})_{i,t} + \theta_2 (y-\bar{y})_{i,t}\,\rho_{i,t} + w_{i,t} \tag{1}$$

$$\left(f-\bar{f}\right)_{i,t} = \gamma_0 + \gamma_1 (y-\bar{y})_{i,t} + \gamma_2 (y-\bar{y})_{i,t}\,\rho_{i,t} + z_{i,t} \tag{2}$$

where subindexes *i* and *t* denote the country and the time period, respectively; $\left(r-\bar{r}\right)$ is the deviation of the real interest rate from its long-run level[2] – approximated by the sample mean; $(y-\bar{y})$ is the output gap (or business cycle measure), defined as the deviation of real GDP from its long-run trend. In addition, $\rho$ is the country risk spread on sovereign debt, which proxies for the degree of credibility of macroeconomic policies; and *w* and *z* are stochastic disturbances.

To test our hypothesis, we include an interaction term between the business cycle and the proxy of country risk in both equations for the cyclical policy stance. At low levels of country risk (or high policy credibility) we anticipate fiscal and monetary policy to be counter-cyclical and hence expect coefficients $\theta_1$ and $\gamma_1$ to be positive. At high levels of country risk (or low credibility) we anticipate macroeconomic policies to be pro-cyclical.

[1] The deviation of actual inflation from its target is omitted from the monetary policy equation (1) because the sample includes several countries without an inflation-targeting framework.
[2] Throughout this paper, we will consider indexed interest rates and real interest rates to be analogous.

In the latter case, the interaction (third) term in each equation should dominate the second term in equations (1) and (2) and therefore we expect $\theta_2$ and $\gamma_2$ to be negative. More details on the construction of the data series and their sources are provided in appendix A.

Our empirical method is generalized least squares applied to fixed-effects panel estimation, in order to account for the presence of autocorrelation and/or heteroskedasticity and unobservable country-specific effects.

### 2.2. Time-Series Analysis for Chile

We estimate the monetary and fiscal policy functions for Chile for the period ranging from the first quarter of 1991 to the first quarter of 2003, the full period of Chile's inflation-targeting experience. Therefore we specify a generalized Taylor rule for the monetary policy rule, adding the lagged dependent variable and the inflation deviation from target to the output gap and the interaction term between output gap and country risk spreads (the two latter as in equations (1) and (2) above):[3]

$$\left(r-\bar{r}\right)_t = \alpha_0 + \alpha_1\left(r-\bar{r}\right)_{t-1} + \alpha_2\left(\pi-\pi^M\right)_t + \alpha_3\left(y-\bar{y}\right)_t + \alpha_4\left(y-\bar{y}\right)_t \rho_t + u_t \qquad (3)$$

where $\left(r-\bar{r}\right)$ is the deviation of the real interest rate from its long-run level;[4] $\pi$ is actual inflation, $\pi^M$ is the inflation target, $(y-\bar{y})$ is the seasonally-adjusted deviation of real GDP from its trend,[5] and $u$ is a stochastic error.[6] Like in equations (1) and (2), we expect $\alpha_3$ to be positive[7] (reflecting a counter-cyclical policy) and $\alpha_4$ to be negative, thus indicating that countries with low country risk are able to pursue counter-cyclical policies. Regarding our

[3] This specification generalizes standard Taylor rules estimated previously for Chile and other countries – see Taylor (1993, 1995, 2002), Corbo (2002), Cabrera and Lagos (2002), and Schmidt-Hebbel and Tapia (2002), among others.

[4] In addition, we perform a sensitivity analysis where the long-run interest rate is the trend component of the interest rate obtained using the Hodrick-Prescott (1997) and band-pass filters (Baxter and King, 1999).

[5] Our results are robust to the use of different filters, including Hodrick-Prescott, Baxter-King, and quadratic trend.

[6] We omitted from the monetary policy rule (i) the expected rate of inflation, because of lack of an adequate empirical measure for the complete sample period, and (ii) changes in the exchange rate because Chile used an exchange rate band during most of the 1990s but the band limits were found to be not binding (Morandé and Tapia, 2002).

[7] A negative coefficient would reflect a pro-cyclical monetary policy.

control variables, we expect the coefficient of the lagged dependent variable, $\alpha_1$, to be between 0 and 1, and the coefficient $\alpha_2$ to be positive. The details on the construction of the series and their sources are reported in appendix B.

The specification for the fiscal policy function is the following:

$$\left(f-\bar{f}\right)_t = \beta_0 + \beta_1\left(f-\bar{f}\right)_{t-1} + \beta_2\left(y-\bar{y}\right)_t + \beta_3\left(y-\bar{y}\right)_t \rho_t + v_t \qquad (4)$$

where $\left(f-\bar{f}\right)$ is the deviation of the fiscal balance as a percentage of GDP from its long-run level,[8] and *v* is the residual term. Again, we include an interaction term between country risk and the output gap to test whether lower credibility – as reflected by higher country risk spreads – constrains Chile's ability to apply counter-cyclical fiscal policy. Hence we expect coefficient $\beta_2$ to be positive and $\beta_3$ to be negative.

We use the generalized method of moments (GMM) technique to estimate equations (3) and (4) in order to consider possible endogeneity of regressors.[9] For comparison we also report some OLS estimation results.

In order to test for robustness of our results, we perform alternative estimations using:

(a) Two alternative measures of the monetary policy rate: nominal and indexed to the country's CPI-based indexation measure.[10]

(b) Four alternative measures of the output gap, using de-trending techniques based on the filters of Hodrick-Prescott, Baxter-King, and quadratic trend, and the cyclical component of GDP computed by Contreras and García (2002a).

(c) Three alternative measures of the long-run level for the monetary policy rate ( Hodrick-Prescott, Baxter-King, and the estimations from Contreras and García, 2002b).

(d) Two alternative measures of the long-run component of the fiscal balance using the Hodrick-Prescott and Baxter-King filters.

[8] Positive (negative) values for the fiscal balance indicate a surplus (deficit). The long-run trend is expressed as the sample mean. However, we also performed a sensitivity analysis where we changed the long-run trend of the fiscal balance using Hodrick-Prescott and band-pass trend components.

[9] We use a constant and lags of the dependent variable and the regressors as instruments.

[10] The indexation measure is the *Unidad de Fomento*, a daily unit of account indexed to the lagged CPI that is widely used as an indexation mechanism for commercial and financial transactions in Chile.

(e) Two alternative measures of country risk using sovereign bond spreads (with information projected for some years using the *II* rating) and the country risk rating published by *Institutional Investor*.

(f) External variables (like the terms of trade and the U.S. business cycle) are used as additional instrumental variables.

## 3. International Evidence

In this section we estimate equations (1) and (2) for eleven emerging market economies, eight Latin American and three Asian economies. Figures 1a and 1b depict the levels of country risk premiums for the sample under study. Table 1 presents the estimates for the full sample (see first and third columns) and for a restricted sample that excludes Argentina and Ecuador (second and fourth columns), because of the large spreads shown by the two latter countries in recent years.

The results confirm significant relations between macroeconomic policies and the business cycle (output gap) and its interaction with the country-risk spread. All coefficients show expected signs and are statistically significant at the 5% level. Both monetary and fiscal policies are significantly counter-cyclical in emerging economies with low to moderate risk spreads. In countries with higher spreads, both policies are significantly biased toward a more pro-cyclical position.

The results allow to calculate the level of country risk premium that is associated to a neutral policy stance, i.e., a threshold level at which policy is neither counter nor pro-cyclical. Above (below) the threshold value of country risk premium, monetary or fiscal policies turn pro-cyclical (counter-cyclical). The threshold level is obtained simply by dividing the output gap coefficient by the negative of the interaction term coefficient, a result of setting the partial derivative of the policy rule to the output gap to zero. In the case of monetary policy equation (1), the country-risk threshold spread $\rho^*$ is the following:[11]

$$\frac{\partial(r-\bar{r})_t}{\partial(y-\bar{y})_t} = \theta_3 + \theta_4 \rho^* = 0 \quad \Rightarrow \quad \rho^* = -\frac{\theta_3}{\theta_4} \tag{5}$$

[11] Analogous threshold levels can be obtained for equations (2) – (4).

It is straightforward to infer the cyclical position of monetary policy, dependent on the observed level of the country risk spread $\rho$, from the latter expression:

$$\begin{aligned} &if \quad \rho < -\frac{\theta_3}{\theta_4} \quad \Rightarrow \quad \frac{\partial(r-\bar{r})_t}{\partial(y-\bar{y})_t} = \theta_3 + \theta_4\rho > 0 \quad \Rightarrow \quad the\ policy\ is\ countercyclical \\ &if \quad \rho > -\frac{\theta_3}{\theta_4} \quad \Rightarrow \quad \frac{\partial(r-\bar{r})_t}{\partial(y-\bar{y})_t} = \theta_3 + \theta_4\rho < 0 \quad \Rightarrow \quad the\ policy\ is\ procyclical \end{aligned} \tag{6}$$

Hence the degree of cyclicality of economic policy depends on the coefficient of the output gap ($\theta_3$), the coefficient of the interaction between the output gap and the country risk ($\theta_4$), and the country risk spread ($\rho$). The inequalities in (6) simply reflect that the likelihood of conducting counter-cyclical macroeconomic policies becomes higher at low country-risk levels.

Using the full sample of countries, monetary policy turns pro-cyclical at threshold spreads ($\rho$*) of 2811 basis points (bp), while fiscal policy turns pro-cyclical above 4797 bp (see table 1). Excluding the two countries with the highest country spreads (Argentina and Ecuador), the results from the restricted sample show that monetary and fiscal policies turn procyclical at much lower country risk levels: 822 bp and 574 bp, respectively. Countries that exhibited risk spreads above the threshold levels during 2002 were Brazil and Venezuela in the full sample, and Brazil, Colombia, Peru, and Venezuela, in the restricted sample.

## 4. Evidence for Chile

Figures 2 and 3 show the time pattern of (indexed) monetary policy rate deviations and the fiscal balance from their respective long-run values and the output gap during 1991-1993 in Chile.[12] The latter figures summarize the degree of cyclicality of both macroeconomic policies during thee past 12 years. Monetary policy became counter-cyclical particularly in the mid-nineties, while fiscal policy did some time before, except for exceptional periods in the early nineties.

[12] Long-term values were proxied by the relevant sample mean for the same period. Sensitivity exercises were performed assuming stochastic means obtained by using filters, yielding similar results.

Figure 4 depicts the deviations of inflation from the Central Bank's inflation targets (started in January 1991) and the output gap since 1991. In this case, the link between both variables becomes more evident since 1999, a period of low growth and subsequent recovery.

### 4.1. Monetary Policy

The empirical results for the extended Taylor rule are reported in table 2a (for the nominal policy rate, NPR) and table 2b (for the UF-indexed policy rate, UF-PR). The output gap and its interaction with the country spread are statistically significant (at conventional significance levels of 5% or 10%) in most cases. The coefficients reflect expected signs of all coefficients of the latter variables in both tables.

In order to assess the robustness of our results, we also conduct estimations for each policy rate (NPR and UF-PR) using OLS and GMM, with similar results. The *t*-tests (and also the *F*-tests in the case of OLS) confirm the statistical significance of the estimated parameters. Similarly, the Hansen over-identification tests (*J* tests) confirm that the specification is valid at conventional levels of significance.

However we obtain a low statistical significance for the coefficients of the inflation deviation form its target, although they exhibit expected sign in most cases. Our results differ from previous studies for other countries (e.g. for the U.S., see Taylor, 1993) and for Chile (Corbo, 2002; Cabrera and Lagos, 2002) that report positive coefficients for the ibnflation deviation – as we obtain in most cases – that are also statistically significant. Other than our inclusion of the interaction term, the main difference between the preceding studies on Chile and ours lies in the estimation period. The preceding studies generally start in 1986 and end in 1999.

As reported in tables 2a and 2b, column 2, the threshold country risk levels that imply a neutral monetary policy are in the range of 251 to 259 bp. Hence, considering the positive sign of the output gap coefficient and observed country risk spreads, monetary policy has been largely counter-cyclical in Chile. The exception was when country spreads exceeded the aforementioned values, which was largely before 1993.

In order to test for robustness of our results, we perform alternative estimations considering (i) different computations of the business cycle (tables 2a and 2b, rows 4-7),

(ii) different measures of the long-run level for the monetary policy rate (table 2a, last two columns, and table 2b, last three columns), and (iii) different instruments, like the terms of trade and the U.S. output gap (tables 2a and 2b, column 6). Results are virtually invariant (the range for the threshold level is estimated at 222-286 bp[13]) and, consequently, the main conclusions are supported.

We conduct a final sensitivity exercise by using the *II* rating as a proxy for the degree of economic policy credibility. Equations (3) and (4) are now reformulated as:

$$\left(r-\bar{r}\right)_t = \alpha_0 + \alpha_1\left(r-\bar{r}\right)_{t-1} + \alpha_2\left(\pi-\pi^M\right)_t + \alpha_3\left(y-\bar{y}\right)_t + \alpha_4\left(y-\bar{y}\right)_t Rating_t^{II} + u_t \qquad (7)$$

$$\left(f-\bar{f}\right)_t = \beta_0 + \beta_1\left(f-\bar{f}\right)_{t-1} + \beta_2\left(y-\bar{y}\right)_t + \beta_2\left(y-\bar{y}\right)_t Rating_t^{II} + v_t \qquad (8)$$

The difference with equations (3) and (4) refers to interpretation and expected signs. As the *Rating* variable implies higher credibility, we now expect coefficients $\alpha_1$ and $\beta_1$ in the two latter equations to be negative, and $\alpha_2$ and $\beta_2$ to be positive, to be consistent with the null hypothesis.

The results in tables 2a and 2b, row 9, for monetary policy, show that the output gap and interaction term coefficients are significant and exhibit expected signs. We proceed analogously to the calculation of threshold country risk spreads by calculating now threshold levels for *II Ratings*. They fall in a narrow range of 47-48 points.

**4.2. Fiscal Policy**

The empirical results for the fiscal policy rule are reported in table 3. As in the case of monetary policy, the hypothesis of a dominantly counter-cyclical fiscal policy during the last 12 years in Chile cannot be rejected at conventional significance levels. We also report threshold country risk levels for fiscal policy. The threshold country risk level reported in Table 3, column 2, is 229 bp., somewhat lower than the comparable range obtained for the neutral monetary policy stance.

Here we also perform sensitivity exercises using alternative measures for the output gap (table 3, rows 3-6), the trend values of the fiscal balance and their deviations (table 3,

[13] This range is based on the results obtained from GMM estimations.

last two columns), and instrumental variables (table 3, column 6). Estimated parameter values are statistically significant and exhibit expected signs. The threshold country risk levels are in the 223-259 bp range [14], which is within the comparable range estimated for the neutral monetary policy stance. The final sensitivity exercise, reported in table 3, row 8, shows that our fundamental hypothesis is confirmed when the *II* rating is used as a measure of credibility.

## 5. Concluding Remarks

We have evaluated the ability of emerging countries to pursue countercyclical policies, conditioned by the degree of credibility of their macroeconomic policies, measured by country risk indicators. The economic literature has shown that countries with low credibility (and weak institutions) are unable to sustain the monetary and fiscal policy stance they have previously announced (Persson, 2002). In this paper we have tested the proposition that countries with higher policy credibility are able to apply counter-cyclical policies.

Our empirical evidence supports the proposition that macroeconomic policies in emerging economies can be counter-cyclical. Our results, for both cross-country panel data and a time series for Chile, support the hypothesis that fiscal and monetary authorities in countries with low to moderate country risk – reflecting better fundamentals, stronger institutions, and more stable policy rules – can afford and are able to of pursue counter-cyclical policies. On the contrary, countries that exhibit moderate to high levels of country risk premiums will be forced to conduct pro-cyclical macroeconomic policies.

Our panel data evidence for 11 emerging economies shows that the coefficients of interest exhibit the expected signs and are statistically significant. In the restricted country sample – which excludes the two countries with the highest country risk spreads – the results are qualitatively similar although the estimated threshold levels for the country-risk spreads are lower. For the latter sample we find that monetary and fiscal policies are counter-cyclical when country-risk premiums fall below values in the 600-800 basis point range.

[14] As above, this range is based on the results obtained from GMM estimations.

The time series evidence for Chile shows that monetary and fiscal policies have been largely counter-cyclical – in particular after 1993, when country risk spreads fell below the 200-300 basis point range. These results are robust to alternative measures of the dependent variable in the monetary policy rule, different de-trending techniques to estimate the output gap, different measures of long-run monetary policy rates and long-run fiscal balances, different sets of instrumental variables, and different measures of country risk.

## Appendix A

## Country Panel: Data, Sources, and Definitions [/a]

| Variable | Description | Sources | Availability/Sample |
|---|---|---|---|
| Interest Rates | Nominal Lending or Policy Interest Rate ($i$)[/b] | JP Morgan, Central Banks | Full sample. |
| Domestic Inflation | Consumer Price Index growth ($\pi$) | JP Morgan, Central Banks | Full sample. |
| Output | Real GDP Index, base year: 1996=100, ($y$) | JP Morgan, Central Banks | Full sample. |
| Fiscal Balance | Nominal Fiscal Balance as a percentage of nominal GDP in domestic currency ($f$) | JP Morgan, Central Banks | Full sample, except Argentina 1996, and Venezuela 2003 |
| Country Risk | EMBI+ stripped spread over U.S. Treasuries Basis points, average ($\rho$) | JP Morgan | Full sample, except: Chile 1996-98, Colombia 1996-98, Malaysia 1996, Peru 1996, and Thailand 1996. |
| **Definitions** | | | |
| Real Interest Rate Deviation | | $r_{i,t} - \bar{r}_i, \quad i = ARG, BRA, ..., VEN$ | |
| $r_{i,t}$ | Real Interest Rate for country $i$ in period t | $r_{i,t} = (i - \pi)_{i,t}$ | |
| $\bar{r}_i$ | Mean of $r$ for country $i$ | $\bar{r}_{i,t} = \sum_{i=1996}^{2002} \frac{r_{i,t}}{7}$ | |
| Fiscal Balance Deviation | | $f_{i,t} - \bar{f}, \quad i = ARG, BRA, ..., VEN$ | |
| $f_{i,t}$ | Fiscal Balance as a percentage of nominal GDP for country $i$ in period t | $f_{i,t} = \left( \frac{Fiscal\ balance}{GDP} \right)_{i,t}$ | |
| $\bar{f}_i$ | Mean of $f$ for country $i$ | $\bar{f}_{i,t} = \sum_{i=1996}^{2002} \frac{f_{i,t}}{7}$ | |
| Ouput gap: real output deviation from its Hodrick-Prescott-filtered trend $\bar{y}_i$, for country $i$. | | $y_{i,t} - \bar{y}_i$ | |

a. Annual data from 1996 to 2002. Sample: Argentina, Brazil, Chile, Colombia, Ecuador, Malaysia, Mexico, Peru, Philippines, Thailand, and Venezuela.

b. In the case of Chile, we used the Monetary Policy Rate (*Tasa de Política Monetaria*) as the (real) interest rate, and in the case of Mexico, the 28-day Cetes rate.

## Appendix B
## Chile: Data, Sources, and Definitions [a]

| Variable | Description | Sources |
|---|---|---|
| Interest Rate | Monetary Policy Rate (PR) | Central Bank of Chile (CBC) |
| Fiscal Balance | Nominal Fiscal Balance (net incomes) in millions of Chilean pesos | Ministry of Finance of Chile |
| Output | Real GDP, base year: 1996=100.<br>Nominal GDP in millions of Chilean pesos | Central Bank of Chile |
| Country Risk | EMBI+ stripped spread over US 10-year Treasury Bills ($\rho_1$), basis points, average | JP Morgan, for 1999.I-2003.I. |
| | Credit Ratings ($\rho_2$) | Institutional Investor, for 1990.I-1998.IV |
| Prices | CPI growth ($\pi$) | INE |
| | Inflation target of the CBC ($\pi$ upper bar) | Central Bank of Chile |
| External Variables | Terms of Trade | Bennett and Valdés (2001), for 1991-1999<br>Central Bank of Chile, *Informe Económico y Financiero*, for 2000-2003 |
| | US GDP, seasonally adjusted | FED St. Louis (www.stls.frb.org) |

| Regression Variables | Definitions | |
|---|---|---|
| $r_t - \bar{r}$ | Dependent Variable. Nominal and UF-Indexed Policy Rate in period *t*, expressed in deviations of its mean or long-run value. UF-Indexed until 2001.II and quarterly adjusted with inflation target since 2001.III. For the long-run policy rate we used: arithmetic mean, filters (HP, BP, and deterministic trends) and the series by Contreras and García (2002b). | |
| $f_t - \bar{f}$ | Dependent Variable. Nominal Fiscal Balance as a percentage of Nominal GDP, in period *t*, $f_t = \left( \frac{Fiscal\ \ Balance}{GDP} \right)_t$ seasonally adjusted using ARIMA X12. Expressed in deviations of its mean or long-run value.For the long-run fiscal balance we used: arithmetic mean and filters (HP, BP, and deterministic trends). | |
| $\pi_t - \bar{\pi}$ | Regressor. Expressed in percents. Constructed as the difference between inflation rate and the CBC inflation target. | |
| $y_t - \bar{y}$ | Regressor. Output gap: percent deviation of the (log of) real output (*y*) from its filtered trend (y upper bar). Seasonally adjusted using ARIMA X12. For the long-run value (y upper bar) we used: arithmetic mean, filters (HP, BP, and deterministic trends) and the series by Contreras and García (2002a). | |
| $\rho_t$ | Regressor that is included multiplying output gap. | Expressed in basis points. Constructed using country risk spreads ($\rho_1$) for 1999.II-2003.I, and *Institutional Investor* credit *ratings* ($\rho_2$) through simple extrapolation for 1990.I-1999.I. |
| | | For sensitivity analysis, we also used the *Institutional Investor* credit rating. Expressed as ranking from 1 to 100. |

a. Quarterly data from 1991.1 to 2003.1. Since CBC inflation target is available from 2001, the sample begins in that year.

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## Table 1. International Evidence: Cyclical Degree of Monetary and Fiscal Policy

***Dependent Variables: Interest Rate Deviation and Fiscal Balance Deviation (From Their Respective Means)***
***Sample: 11 Countries, annual data for 1996-2002 period***
***Estimation Method: GLS (Cross-Section Weights)- Fixed Effects*** [a]

| **Regressor** | **Interest Rate Deviation** | | **Fiscal Balance Deviation** | |
|---|---|---|---|---|
| | **Full Sample** | **Restricted Sample** [b] | **Full Sample** | **Restricted Sample** [b] |
| Output Gap | 73.02307**<br>(2.36935) | 43.83110**<br>(4.967) | 18.69710**<br>(1.386) | 60.45749**<br>(10.046) |
| Output Gap x Country Risk Spread | -0.025981**<br>(-0.002549) | -0.05335**<br>(0.021) | -0.00390**<br>(0.0003) | -0.105271**<br>(0.0225) |
| **Statistics** | | | | |
| No. Countries | 11 | 9 | 11 | 9 |
| No. Observations | 77 | 63 | 77 | 63 |
| $R^2$ (unweighted) | 0.0658 | 0.0164 | 0.3482 | 0.5131 |
| Neutral-Policy Country Risk Spread (basis points)[c] | 2811 | 822 | 4797 | 574 |

a. White-Heteroskedasticity-Consistent Standard Errors and Covariance are reported in parentheses. Signs ** denote statistical significance at 5% level.
b. Excludes Argentina and Ecuador.
c. It is the result of dividing the coefficient of output gap by the negative of the coefficient of de output gap-country risk.

**Figure 1a. Country Risk Spreads**
**(Argentina, Brazil, Colombia, Ecuador, Venezuela: 1996-2002)**

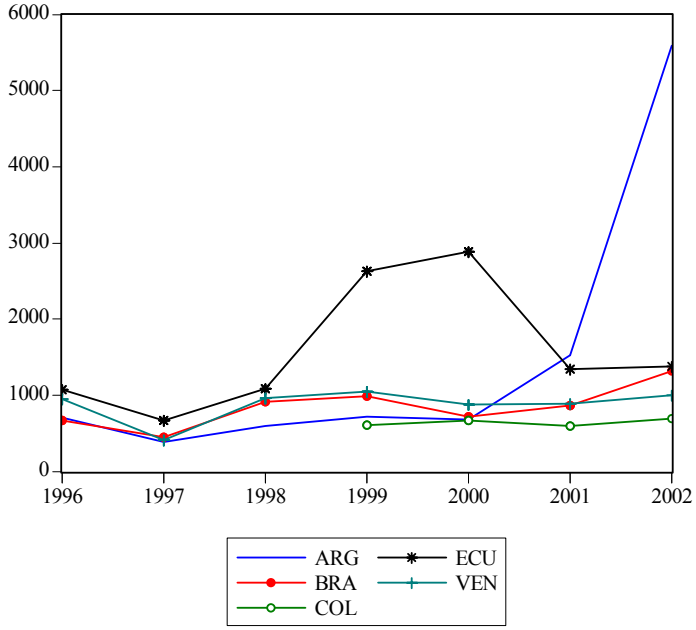



**Figure 1b. Country Risk Spreads**
**(Chile, Malaysia, Mexico, Peru, Philippines, Thailand: 1996-2002)**

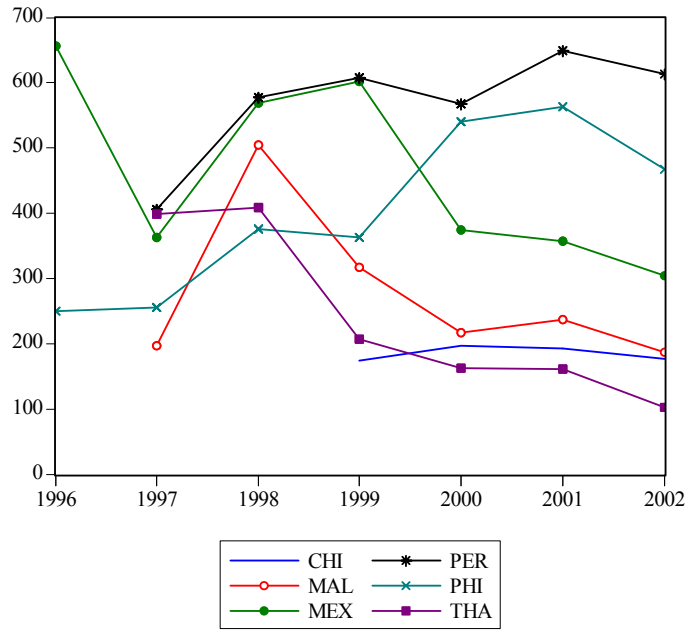


**Figure 2. UF-Indexed Policy Rate Deviations from its Long-Run Level and Output Gap (Chile: 1991.I-2003.I)**

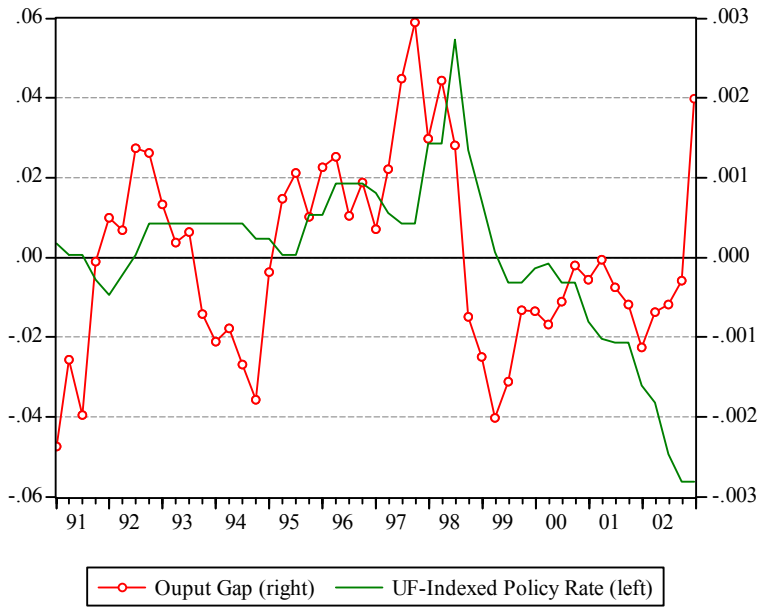
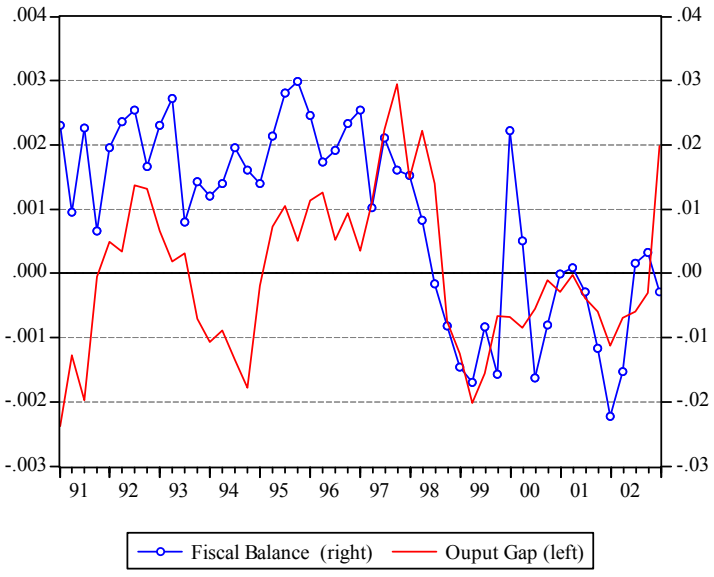



**Figure 3. Fiscal Balance Deviations from Its Long-Run Level and Output Gap (Chile: 1991.I-2003.I)**



**Figue 4. Inflation Rate Deviations from its Target and Ouput Gap (Chile: 1991.I-2003.I)**

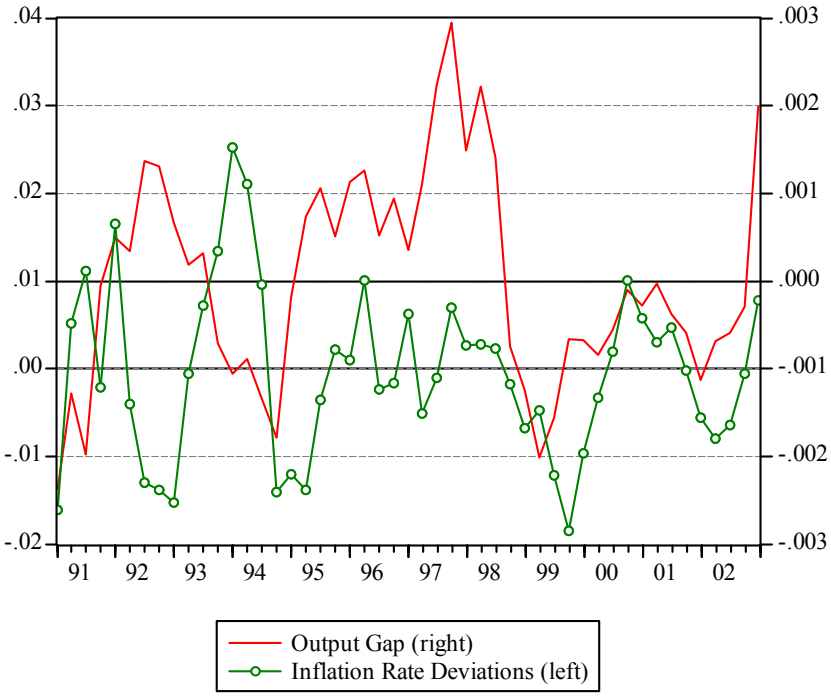


**Table 2a. Evidence for Chile: Cyclical Degree of Monetary Policy (Nominal Policy Rate)**

***Dependent Variable: Nominal Policy Rate (NPR) Deviations from its Long-Run Value***
***Sample: Chile, quarterly data, 1991.I-2003.I***
***Estimation Method: Generalized Method of Moments[a] and Ordinary Least Squares***

| **Regressor** | **Deterministic (Sample) Mean of NPR** | | | | | | | **Stochastic Mean of NPR** | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **HP filter** | **BP filter** |
| | OLS | GMM[b] | GMM[b] | GMM[b] | GMM[b] | GMM[c] | GMM[b] | GMM[b] | GMM[b] |
| Constant | -0.005163 (0.0011) | -0.006129 (0.0006) | -0.005647 (0.0004) | -0.006095 (0.0133) | -0.004133 (0.0079) | -0.006547 (0.0000) | -0.005780 (0.0000) | -0.000307 (0.5908) | -0.000601 (0.5344) |
| Lagged Dependent Variable | 0.929644 (0.0000) | 0.934064 (0.0000) | 0.922723 (0.0000) | 0.869137 (0.0000) | 0.875200 (0.0000) | 0.976621 (0.0000) | 0.963423 (0.0000) | 0.879785 (0.0000) | 0.760996 (0.0001) |
| Inflation Rate Deviation from its Target | -0.112915 (0.5171) | 0.009835 (0.9751) | 0.146483 (0.5861) | 0.029019 (0.9231) | 0.096413 (0.8100) | 0.028672 (0.8829) | 0.037007 (0.9005) | -0.140994 (0.6829) | 0.111114 (0.7865) |
| Output Gap | | | | | | | | | |
| *Hodrick-Prescott (HP)* | 8.146273 (0.2436) | 30.27779 (0.0041) | ... | ... | ... | 32.03438 (0.0001) | -22.02047 (0.0934) | 20.54120 (0.03269 | 19.32574 (0.0272) |
| *Band-Pass (BP)* | ... | ... | 26.15269 (0.0513) | ... | ... | ... | ... | ... | ... |
| *Deterministic Trend* | ... | ... | ... | 29.37008 (0.0546) | ... | ... | ... | ... | ... |
| *Contreras and García´s* | ... | ... | ... | ... | 23.68991 (0.0112) | ... | ... | ... | ... |
| Output Gap x Country Risk | | | | | | | | | |
| *Sovereign Spread* | -0.037361 (0.2209) | -0.120660 (0.0103) | -0.102635 (0.0943) | -0.126865 (0.0912) | -0.106911 (0.0245) | -0.132746 (0.0009) | ... | -0.089161 (0.0573) | -0.085474 (0.0626) |
| *Institutional Investor* | ... | ... | ... | ... | ... | ... | 0.454471 (0.0646) | ... | ... |
| **Statistics** | | | | | | | | | |
| $R^2$ | 0.986407 | | | | | | | | |
| F-Statistic (P-Value) | 0.000000 | | | | | | | | |
| J-Statistic (P-Value) | | 0.7219 | 0.6201 | 0.3197 | 0.7249 | 0.4483 | 0.2205 | 0.6149 | 0.2498 |
| **Neutral-Policy Country Risk** | | | | | | | | | |
| Sovereign Spread (basis pts) | 218 | 251 | 255 | 232 | 222 | 241 | ... | 230 | 226 |
| Institutional Investor (index) | ... | ... | ... | ... | ... | ... | 48 | ... | ... |

a. GMM estimations were performed using bandwidth by Andrews (1991) and the kernel quadratic spectral. *P*-values are in parentheses. b. Instrumental variables are a constant and lags of the regressors. c. Instrumental variable set also includes terms of trade and US output gap.

**Table 2b. Evidence for Chile: Cyclical Degree of Monetary Policy (Indexed Policy Rate)**

***Dependent Variable: UF-Indexed Policy Rate (UF-PR) Deviations from its Long-Run Value***
***Sample: Chile, quarterly data, 1991.I-2003.I***
***Estimation Method: Generalized Method of Moments [a] and Ordinary Least Squares***

| **Regressor** | **Deterministic (Sample) Mean of UF-PR** | | | | | | | **Stochastic Mean of UF-PR** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **HP filter** | **BP filter** | **C&G(2002b)** |
| | OLS | GMM[b] | GMM[b] | GMM[b] | GMM[b] | GMM[c] | GMM[b] | GMM[b] | GMM[b] | GMM[b] |
| Constant | 0.000913<br>(0.5191) | -0.00301<br>(0.1247) | -0.001261<br>(0.4994) | -0.001970<br>(0.1821) | -0.00039<br>(0.8003) | -0.001701<br>(0.2713) | -0.003008<br>(0.1845) | -0.002275<br>(0.0709) | -0.002273<br>(0.23158) | -0.002384<br>(0.1541) |
| Lagged Dependent Variable | 0.741654<br>(0.0000) | 0.843010<br>(0.0000) | 0.758399<br>(0.0000) | 0.915437<br>(0.0000) | 0.67285<br>(0.0000) | 0.915972<br>(0.0000) | 0.868306<br>(0.0000) | 0.755917<br>(0.0000) | 0.876945<br>(0.0000) | 0.885023<br>(0.0000) |
| Inflation Rate Deviation from its Target | 0.009933<br>(0.8986) | 0.319322<br>(0.0771) | 0.461512<br>(0.7416) | -0.059485<br>(0.8505) | -0.19961<br>(0.4515) | -0.682436<br>(0.3149) | -0.663767<br>(0.0702) | 0.110456<br>(0.7400) | 0.321512<br>(0.1819) | -0.255018<br>(0.5285) |
| Output Gap | | | | | | | | | | |
| *Hodrick-Prescott (HP)* | 5.026829<br>(0.2040) | 38.68531<br>(0.0521) | ... | ... | ... | 20.61607<br>(0.0392) | -30.43482<br>(0.1045) | 22.05191<br>(0.0260) | 38.06243<br>(0.0799) | 36.73604<br>(0.0262) |
| *Band-Pass (BP)* | ... | ... | 43.68338<br>(0.0331) | ... | ... | ... | ... | ... | ... | ... |
| *Deterministic Trend* | ... | ... | ... | 16.13834<br>(0.0799) | ... | ... | ... | ... | ... | ... |
| *Contreras and García´s* | ... | ... | ... | ... | 16.3873<br>(0.0484) | ... | ... | ... | ... | ... |
| Output Gap x Country Risk | | | | | | | | | | |
| *Sovereign Spread* | -0.02384<br>(0.1320) | -0.14963<br>(0.0904) | -0.182278<br>(0.0901) | -0.062133<br>(0.1323) | -0.0648<br>(0.0982) | -0.072102<br>(0.1028) | ... | -0.077115<br>(0.0864) | -0.145842<br>(0.1349) | -0.143632<br>(0.0706) |
| *Institutional Investor* | ... | ... | ... | ... | ... | ... | 0.651357<br>(0.0453) | ... | ... | ... |
| **Statistics** | | | | | | | | | | |
| $R^2$ | 0.908036 | | | | | | | | | |
| F-Statistic (P-Value) | 0.000000 | | | | | | | | | |
| J-Statistic (P-Value) | | 0.7955 | 0.1969 | 0.2324 | 0.3244 | 0.5799 | 0.7826 | 0.3314 | 0.4620 | 0.3244 |
| **Neutral-Policy Country Risk** | | | | | | | | | | |
| Sovereign Spread (basis pts) | 211 | 259 | 240 | 260 | 253 | 286 | ... | 286 | 261 | 256 |
| Institutional Investor (index) | ... | ... | ... | ... | ... | ... | 47 | ... | ... | ... |

a. Estimations were performed using bandwidth by Andrews (1991) and the kernel quadratic spectral. *P*-values are in parentheses. b. Instrumental variables are a constant and lags of the regressors. c. Instrumental variable set also includes terms of trade and US output gap. C&G(2002b) denotes the paper by Contreras and García (see reference list).

**Table 3. Evidence for Chile: Cyclical Degree of Fiscal Policy**

***Dependent Variable: Fiscal Balance Deviations (as Percentage of GDP) from its Long-Run Value***
***Sample: Chile, quarterly data, 1991.I-2003.I***
***Estimation Method: Generalized Method of Moments [a] and Ordinary Least Squares***

| **Regressor** | **Deterministic (Sample) Mean of Fiscal Balance (FB)** | | | | | | | **Stochastic Mean of FB** | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **HP filter** | **BP filter** |
| | OLS | GMM[b] | GMM[b] | GMM[b] | GMM[b] | GMM[c] | GMM[b] | GMM[b] | GMM[b] |
| Constant | 0.002280 (0.2371) | 0.002340 (0.3023) | -0.001016 (0.7084) | 0.002030 (0.4223) | 0.004457 (0.0341) | -0.000621 (0.7445) | 0.001587 (0.6554) | -0.002516 (0.0344) | -0.000901 (0.6170) |
| Lagged Dependent Variable | 0.686011 (0.0000) | 0.579355 (0.0100) | 0.857335 (0.0006) | 0.504740 (0.0445) | 0.527487 (0.0530) | 0.905892 (0.0000) | 0.570108 (0.0474) | 0.206021 (0.8379) | 0.086530 (0.7262) |
| Output Gap | | | | | | | | | |
| *Hodrick-Prescott (HP)* | 4.505106 (0.4244) | 32.26691 (0.0382) | ... | ... | | 19.78498 (0.1078 | -66.13880 (0.0602) | 25.37781 (0.0416) | ... |
| *Band-Pass (BP)* | ... | ... | 26.60494 (0.0759) | ... | ... | ... | ... | ... | 15.73326 (0.0446) |
| *Deterministic Trend* | ... | ... | | 31.78699 (0.0249) | ... | ... | ... | ... | ... |
| *Contreras and García's* | ... | ... | ... | ... | 20.51772 (0.0225) | ... | ... | ... | ... |
| Output Gap x Country Risk | | | | | | | | | |
| *Sovereign Spread* | -0.017064 (0.4742) | -0.141088 (0.0489) | -0.116476 (0.0973) | -0.140645 (0.0352) | -0.091988 (0.0423) | -0.088190 (0.1205) | ... | -0.105184 (0.04948) | -0.060779 (0.0682) |
| *Institutional Investor* | ... | ... | ... | ... | ... | ... | 1.176050 (0.0493) | ... | ... |
| **Statistics** | | | | | | | | | |
| $R^2$ | 0.556363 | | | | | | | | |
| F-Statistic (P-Value) | 0.000000 | | | | | | | | |
| J-Statistic (P-Value) | | 0.2786 | 0.3341 | 0.4381 | 0.1627 | 0.3192 | 0.6331 | 0.1679 | 0.2543 |
| **Neutral-Policy Country Risk** | | | | | | | | | |
| Sovereign Spread (basis pts) | 264 | 229 | 228 | 226 | 223 | 224 | ... | 241 | 259 |
| Institutional Investor (index) | ... | ... | ... | ... | ... | ... | 56 | ... | ... |

a. Estimations were performed using bandwidth by Andrews (1991) and the kernel quadratic spectral. *P*-values are in parentheses. b. Instrumental variables are a constant and lags of the regressors. c. Instrumental variable set also includes terms of trade and US output gap.

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