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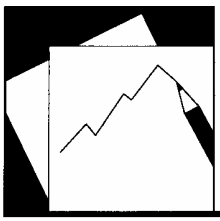

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Obstacles to Disinflation: What Is the Role of Fiscal Expectations?

Oya Celasun, R. Gaston Gelos, and Alessandro Prati

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Obstacles to Disinflation: What Is the Role of Fiscal Expectations?

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Abstract

Is backward-looking behavior in pricing or imperfect credibility of stabilization efforts responsible for the failure of inflation rates to decline to targeted levels during many disinflation programs? This paper assesses the relative importance of these two factors during a number of disinflation attempts in developing and transition economies. Using survey data, we find that expectations of future inflation play a much more important role than past inflation in shaping the inflation process. We also find that an improvement in primary fiscal balances significantly reduces inflation expectations. This suggests that during stabilization episodes, priority should be given to building fiscal credibility by strengthening public finances.

JEL Classification Numbers: E52, F41, E61, E65

Keywords: Disinflation, stabilization, inflation dynamics, emerging markets, expectation formation

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I. INTRODUCTION

A widely studied problem of many disinflation programs has been that inflation has often failed to fall as quickly as targeted, even when there appeared to be a strong monetary policy adjustment. Failure of price setters to behave consistently with policy announcements has been shown to result eventually in output losses.[2] If the exchange rate is the nominal anchor of the disinflation program, inflation inertia leads to real exchange rate overvaluation and an eventual recession, even if an economic boom occurs in the initial phases of the program. If money is the nominal anchor, the failure of inflation to decline as targeted leads to a liquidity crunch with adverse effects on output. Therefore, if output losses are to be minimized, it is crucial that inflation expectations be aligned with the targets of policymakers. This paper seeks then to answer the most critical policy question in disinflations: what drives the inflation process and the evolution of inflation expectations?

The failure of inflation rates to decline to targeted levels has been attributed to a number of different factors, most prominently to the existence of backward-looking behavior in price setting or the imperfect credibility of the stabilization effort, particularly on the fiscal front. Dornbusch (1982), Rodriguez (1982), and Dornbusch and Werner (1996) espouse the view that inflation is sticky during disinflations because of backward-looking pricing or indexation mechanisms that develop under chronic inflation. The preferred policy in this case is to implement heterodox policies to ensure deindexation, or adopt a gradualist disinflation program. Buiter and Grafe (2001) and Ghezzi (2001) provide models for discussing the analytical issues involved.

An alternative view on disinflations from chronic inflation rates is that disinflation programs are often less than fully credible. The most popular explanation for the lack of credibility hypothesis is the imperfect credibility of the fiscal adjustment. As forcefully argued by Sargent and Wallace (1986), if the monetary authority is not in a position to influence the government's deficit path, a tighter current monetary policy may not only fail to reduce inflation, but it may even yield higher current inflation, if the public expects the fiscal policy stance to be unsustainable. This is due to the logic that—under the dominance of the fiscal authorities—tighter money now necessarily implies looser money tomorrow, which, for sufficiently forward looking agents, implies lower current money demand, and therefore, higher inflation. In an open economy setting, Calvo (1987) shows how an exchange rate based stabilization may eventually fail if the fiscal house is not in order—with inflation

[2] See Calvo and Végh (1999) for a survey of the literature on disinflation policies in chronic inflation countries.

persistence and a consumption boom before the abandonment of the program. A difficulty for this branch of the literature has been the lack of strong evidence on a short-term link between inflation and fiscal deficits.[3, 4]

Given that there are political costs involved in both deindexation efforts and fiscal retrenchment, policymakers are likely to want to prioritize among them. Should policymakers focus first on deindexation, manage expectations by use of a drastic reduction in the growth rate of money or the exchange rate, and then, after having amassed political support, bring the fiscal house in order? Or should a significant fiscal adjustment come first, which would presumably convince the public of the need to change their pricing policies? Commentators from academia, the media, and the public are often divided over this issue during disinflations. After the successful disinflation programs of the 1990s in many emerging economies, this seems to be a good moment to take stock of their experiences. Moreover, while hyperinflations have become nearly extinct over the last decade, and inflation rates have declined in the developing world, the problem remains topical, as many countries still face high inflation: in 2002, 35 countries experienced inflation rates over ten percent.

The goal of this paper is to assess the relative importance of inflation stickiness and fiscal credibility in shaping the inflation process during eleven disinflation attempts in ten developing and transition economies. In particular, we investigate the extent to which inflation expectations during disinflation attempts were significantly related to past inflation and to the evolution of actual and expected fiscal deficits.

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[3] Other studies were motivated by the premise that expectations of an eventually unsustainable fiscal stance may drive inflation during a stabilization program even when there is not a contemporaneous correlation between fiscal deficits and inflation. Drazen and Helpman (1990), for instance, show that if the current fiscal stance is viewed as being inconsistent with eventual debt sustainability, a future fiscal adjustment is expected, and depending on how the public expects the debt sustainability problem to be resolved (a future increase in seignorage, expenditure cuts, or tax increases) inflation can react in different ways.

[4] Recent evidence (e.g. by Catao and Terrones, 2003), however, establishes a strong link between fiscal deficits and inflation in high-inflation countries, but not in low-inflation cases.

We follow an innovative approach to address these issues, using survey expectations compiled by Consensus Economics, Inc. on inflation and fiscal deficits and building on the recent empirical literature on inflation persistence.[5, 6] Survey data offer a unique possibility to assess the credibility of a stabilization program and to explore the determinants of expected inflation without imposing very restrictive model assumptions. Roberts (1995 and 1997) pioneered the use of survey expectations in the context of estimating Phillips curves and inflation dynamics in the United States. To our knowledge, survey data have not yet been used to disentangle different sources of inflation inertia during stabilizations.[7] The study of eleven cases that differ in some key dimensions help us understand why some disinflation attempts succeed and others do not.

We first assess the relative contribution of past inflation and inflation expectations in shaping the inflation process during disinflations. To this end, we estimate for all countries a structural inflation model that nests two different types of pricing behavior: a fraction of agents set prices on the basis of expected future inflation, while the rest set prices at the rate of lagged inflation.[8] In these estimates, we proxy expected inflation with survey measures of inflation expectations (which may not necessarily be rational). We find that, in all cases, expected future price changes are much more important than lagged inflation in driving the inflation process.

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[5] Given its centrality in the design and implementation of monetary policy, a large body of research has studied the nature of short-term inflation dynamics. Recently, an issue of heated debate in the literature has been the degree and determinants of inflation persistence. See, for example, Fuhrer and Moore (1995), Galí and Gertler (1999), and Rudd and Whelan (2001).

[6] *Consensus Forecasts* publications from Consensus Economics, Inc. summarize the economic forecasts of 10–20 prominent economic and financial forecasters in most Eastern European and Latin American countries. The participants of the surveys are mostly local banks, think tanks, and business associations, which are likely to have close links with price setters in the local real sector. The forecasted variables include fiscal balances, inflation, and exchange rates, among others.

[7] The only paper using survey expectations in the context of a stabilization effort is Carlson and Valev (2001), which studies the differences in the credibility of the Bulgarian currency board across different types of agents. Roberts (1997) estimates the relative importance of sticky inflation and imperfect credibility in explaining U.S. inflation persistence with survey data on inflation expectations, but he does not focus on disinflation episodes.

[8] We use a model that is a modification of Calvo's (1983) model as in Chadha, Masson, and Meredith (1992) and Galí and Gertler (1999).

Second, we go one step further and investigate the determinants of inflation expectations, attempting to identify a set of macroeconomic variables that price setters use in their inflation forecasts. In particular, we test whether past inflation, actual and forecasted measures of fiscal balances, and other variables that might be used to predict future excess demand and marginal costs are significantly related to inflation expectations.

Here, we find that, while past inflation often influences expectation formation, the primary fiscal balance has a significant negative impact on inflation expectations in ten out of the eleven episodes. This suggests that adjustments in the primary balance had a signaling role and were a central force in reducing expected inflation rates.[9] In the five episodes for which we have survey data on the expected one year–ahead total fiscal balance, we also find a significant relationship between the latter and the evolution of inflation expectations. In the unsuccessful disinflation attempts that were not associated with failed exchange rate pegs, we find that fiscal deteriorations precede the return of high inflation. There appear to be no significant patterns as to whether backward-looking pricing behavior is more prevalent in failed disinflations than in successful ones.

II. DISINFLATION EPISODES: SAMPLE SELECTION

Our dataset covers a variety of disinflation episodes. In most of them, disinflation is successful with inflation declining and remaining below ten percent. In some instances, we classify the disinflation as failed either because the disinflation effort never brought inflation rates below ten percent or because the inflation rate initially declined but then rose again above ten percent following a currency devaluation. We also include cases of ongoing disinflation whose outcome remains uncertain.

Our samples begin at the time of the start of the disinflation effort.[10] For the successful disinflations, the samples run until the end of the year in which 12-month inflation declines to—and remains—below ten percent. For the cases in which the outcome is still uncertain, the estimation sample runs until early 2003. The samples include the months in which a twelve-month-ahead inflation expectation is observed. As the surveys are mostly available at a bimonthly frequency, the estimation frequency of our regressions is also mostly bimonthly.

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[9] The evidence we present is consistent with the prediction of the model of **Drudi** and Prati (2000), in which primary balances have a signaling role when there are doubts on the sustainability of the fiscal regime.

[10] Lack of data on inflation expectations prevents us from covering also the period before the start of the disinflation and capturing possible shifts in expectations. An exception is Venezuela, where data availability permits us to include the three years prior to the 1997–2001 disinflations. We chose to exclude the hyperinflationary periods prior to the adoption of the 1994 Real Plan in Brazil and the end-1997 currency board in Bulgaria.

Our eleven stabilization episodes are: Brazil 1994-98 (successful), Bulgaria 1997-2002 (successful), Colombia 1993-99 (successful), Ecuador 1992-2002 (unsuccessful until 2000, successful after the dollarization in mid-2000), Peru 1993-97 (successful), Mexico 1995-2001 (successful), Turkey 1998-2003 (unsuccessful until 2001, ongoing since 2001), Uruguay 1990-98 (successful), Russia 1995-1998 (unsuccessful) and Russia 1999-2003 (ongoing), and Venezuela 1996-2003 (unsuccessful). Appendix I describes each stabilization episode in detail. Appendix II lists all data sources.

The choice of these countries and episodes is largely dictated by the availability of data on inflation expectations; for example, while the 1980s witnessed a plethora of mostly failed stabilization efforts throughout the developing world, data on inflation expectations are not available for that decade. Nevertheless, the sample is varied with the appealing feature that indexation practices varied considerably across countries. While these episodes differ in their specific aspects, they all include conscious efforts of the respective governments to disinflate, typically after a period of excessively loose macroeconomic policies.

III. Is Inflation Driven by Expectations of Future Inflation?

The success of a disinflation attempt in an economy where price setters are forward looking would depend mainly on the credibility of the regime change. This argument has prominently been made by Sargent (1986); according to rational expectations general equilibrium theories, "under the proper hypothetical conditions a government could eliminate inflation very rapidly and with virtually no Phillips curve costs in terms of foregone real output or increased unemployment. The 'measure' that would accomplish this would be a once-and-for-all, widely understood and widely agreed upon change in the monetary or fiscal policy regime."[11]

However, it has often been argued that in chronic-inflation countries, possibly through backward-looking indexation mechanisms typical of high-inflation environments, current inflation is driven mostly by past inflation, creating an additional obstacle to rapid disinflation.[12] In this section, we estimate the relative importance of past versus expected future inflation in driving the inflation process in our sample of eleven disinflation episodes. This exercise not only provides a test of whether our measures of inflation expectations are relevant for actual inflation outcomes, but it also helps us gauge the extent of backward-looking rule-of-thumb behavior (indexation) in price setting.

[11] An early exposition of this view can also be found in Calvo (1986).

[12] See, for example, the discussions in Dornbusch (1982), Rodriguez (1982), or Buiter and Grafe (2001).

A. Survey Data on Inflation Expectations

We measure expectations of inflation as the average inflation forecast of the participants surveyed by Consensus Economics. Participants in the surveys provide end-year inflation forecasts for the current year and the following year at a bimonthly or monthly frequency. We take the weighted average of the forecasts for the current and following year to obtain one-year-ahead inflation forecasts. In December, for instance, the one-year-ahead inflation forecast would simply be the forecast for the next year. In January, we attach a weight of 11/12 to the forecast for the current year, and 1/12 to the forecast for next year forecast, given that eleven months in the year ahead are in the current year and one is in the following year. In February, the weights would be 10/12 and 2/12 for the current and next years' forecasts respectively.

Figure 1 presents plots of actual inflation over the last 12 months against one-year ahead inflation forecasts formed a year earlier. In most episodes, expectations of inflation track actual inflation much better in the later stages of disinflations than in the earlier stages, suggesting that credibility is built gradually. This seems to be the case even in disinflations from very high inflation rates (Brazil and Bulgaria). Disinflation failures due to exchange rate crises seem to have caught forecasters by surprise. Examples are Mexico 1995, Russia 1998, Ecuador 1999-2000, and Turkey 2001.

A plot of actual inflation during the past 12 months against inflation expected for the following year (not shown) reveals a fairly tight correlation between the two, which is confirmed by our regressions on the importance of expected versus past inflation in driving current inflation. During most periods of rapid disinflation, forecasters predict future inflation to be lower than current inflation. Among failed cases, in Venezuela expected inflation exceeds current inflation for a prolonged period of time (1998-2001) prior to the resumption of accelerating inflation in 2002, but adverse expectations do not seem to have played an important role in other disinflation failures, where the failures were driven by exchange rate crises (Ecuador (1999), Turkey (2001), and Russia (1998)).

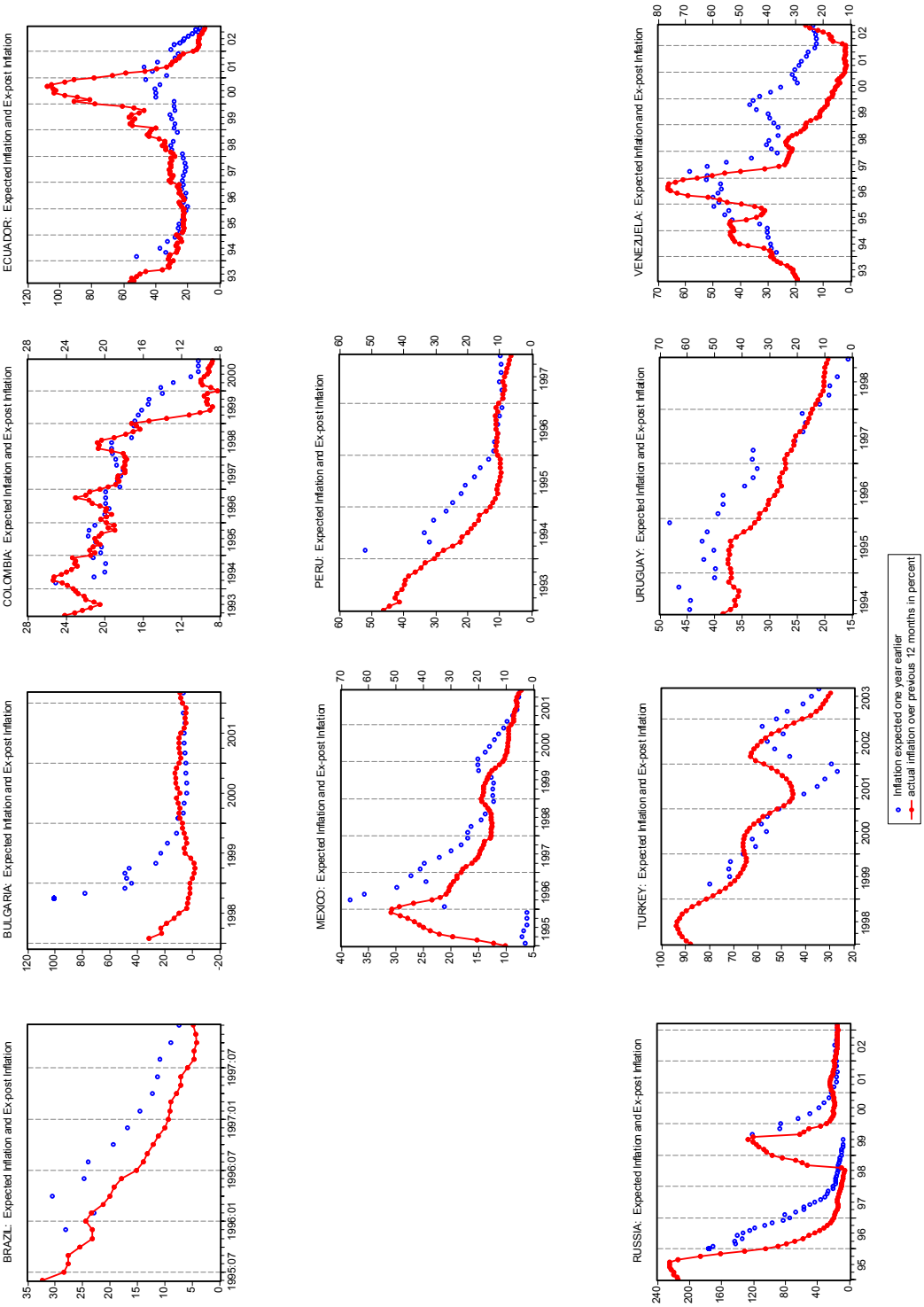
B. The Model

We estimate an empirical model that nests backward- and forward-looking price-setting behavior as in Galí and Gertler (1999).[13] This modifies the purely forward-looking Calvo (1983) model by assuming that a fraction of the firms in the economy are backward-looking and update the average new price in the most recent round of price adjustments by the most recently observed inflation rate.[14] The resulting inflation rate in period t, π_t equals:

[13] Obstfeld (1995) and Ghezzi (2001) use similar specifications.

[14] As in the original Calvo (1983) model, only a fraction of firms are assumed to change prices every period while the rest keep prices constant. See Galí and Gertler (1999) for a thorough discussion.

Figure 1: Current Inflation and Forecast Formed One Year Earlier



$$\pi_t = \alpha + (1-\delta)\pi_{t-1} + \delta\pi_{t+1} + \lambda mc_t \quad (1)$$

where $E_t\pi_{t+1}$ is the one-period-ahead expected inflation rate in period t, and mc_t is the real marginal cost in period t. The higher is the share of backward-looking price setters, the larger is the weight 1-δ on the lagged inflation term.[15] If δ equals one, we obtain the fully forward-looking Calvo (1983) specification. Details on this equation are provided in Box 1.

Given that a typical firm in the small open economies of our sample is likely to use imported intermediate goods and domestic labor as inputs in production, we proxy real marginal costs with a combination of real effective exchange rates (the ratio of the trade-share-weighted average of foreign consumer price levels to the domestic price level, which is a proxy of the real cost of imported inputs) and domestic real unit labor costs (both in deviation from a linear trend). [16] [17] There are several episodes for which we do not have data on real unit labor costs; in those cases, we only use the real effective exchange rate. The real effective exchange rate is not only a measure of marginal cost, it is closely linked to domestic excess demand: When the real effective exchange rate is below trend, the domestic price level is below the price level in trading partner countries (adjusted for the long run trend), and demand pressures will build up to bring the domestic price level toward foreign prices, in the spirit of the purchasing power parity hypothesis.

C. Estimation Results

Our dependent variable is the 12-month inflation rate at the end of a given month. The driving variables, the deviation of real unit labor costs and real exchange rates from trend, are the 12-month averages for the same 12-month period. Expected inflation is for the 12 months following the current month, and lagged inflation refers to the period between 12 and 24 months ago.

We estimate Equation (1) with both OLS and instrumental variable (IV) methods. The IV regressions address the possible endogeneity of real exchange rates and average real unit labor costs to the unobservable disturbance to inflation in the current period. Our instruments

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[15] Other models of inflation persistence—such as Chadha, Masson, and Meredith (1992), Fuhrer and Moore (1995), Jadresic (2000), Driscoll and Holden (2003)—yield similar equations.

[16] The level of excess demand measured as the output gap is often used to proxy real marginal costs (see e.g. Fuhrer and Moore, 1995). Galí and Gertler (1999) argue, however, that real unit labor costs are a better proxy for marginal costs, since the output gap is likely to be measured with considerable error.

[17] See Celasun (2003) for a discussion of the real exchange rate as a driving force in equations of inflation dynamics in small open economies.

Box 1. The Structural Inflation Equation

Following Calvo (1983), firms are assumed to face exogenous constraints on the timing of price changes: a fraction $1-\gamma$ of firms change their price in any given period, while the rest keep their price unchanged. Following Galí and Gertler (1999), a constant share ω of firms set prices in a forward looking manner while the rest are backward looking. The average newly set price (in logarithms), V_t, is a linear combination of prices posted by backward and forward looking price setters, V_t^b and V_t^f:

$$V_t = \omega V_t^b + (1-\omega)V_t^f. \tag{1}$$

Backward-looking price setters who receive a price-change signal in period *t-1* update the newly-set price in period *t*-1 by the most recently observed inflation rate:

$$V_t^b = V_{t-1} + \pi_{t-1}, \tag{2}$$

where $\pi_t = P_t - P_{t-1}$ and P_t is the logarithm of the price level (defined below). The new price chosen by forward-looking firms, V_t^f, is a weighted average of expected optimal future prices—which the firms would choose if they could reset their prices in each period. Assuming monopolistic competition, the period *s* optimal price equals the level of nominal marginal cost in period *s*, nmc_s (both in logarithms and in percent deviation from steady state):

$$V_t^f = (1-\gamma)\sum_{k=0}^{\infty}\gamma^k (nmc_{t+k}). \tag{3}$$

The average price level is the average of previously posted prices weighted by the probability that these prices are still in force:

$$P_t = (1-\gamma)\sum_{k=1}^{\infty}\gamma^{k-1}V_{t-k}. \tag{4}$$

Equations (1-4) can be combined to yield the equation that governs inflation dynamics:

$$\pi_t = \alpha + (1-\delta)\pi_{t-1} + \delta\pi_{t+1} + \lambda mc_t$$

where $\delta = \frac{\gamma}{\gamma+\omega}$, $\lambda = \frac{(1-\omega)(1-\gamma)^2}{\omega+\gamma}$, α is a constant term, and mc_t is the real marginal cost in logarithms and percent deviation from steady state, $mc_t = nmc_t - P_t$.

are the12-month lagged inflation rate, expected one-year-ahead inflation, 12-month lags of the real exchange rate and of the real unit labor costs (when available), and a measure of current foreign demand (the detrended level of industrialized trade partners' imports weighted by the export shares to each trading-partner industrialized country).[18] Table 1 and Table 2 present the estimation results.

In all cases, expected future inflation is more important than lagged inflation in determining current inflation. The coefficient on lagged inflation is positive and significant in only four cases, and the coefficient on expected future inflation is much larger than that on lagged inflation. In five of the OLS regressions (Brazil, Mexico, Peru, Russia (1995-98) and Turkey) and in seven of the IV regressions (Brazil, Colombia, Ecuador, Mexico, Peru, Russia (1995-98) and Turkey, we cannot reject the hypothesis that the coefficient on expected future inflation is equal to one. It is worth noting that the real exchange rate deviation from a linear trend appears to perform quite well as a driving variable for inflation, as it is estimated to have the expected significant positive coefficient in most samples.

The results are robust to excluding the real marginal cost proxies from the equation. When we run regressions of actual inflation on past and expected inflation only, we still estimate much higher coefficients on expected inflation relative to past inflation. Data availability constraints prevent us from formally testing the stability of coefficients over time and across inflation rates, but in most cases, the coefficients on lagged and future expected inflation are robust to the use of alternative samples. There seems, however, to be some instability associated with the coefficients on real marginal costs when we estimate our regressions using different samples.

Our findings shed some light on the question of whether backward-looking indexation practices disappear when inflation reaches very high levels, such as in Brazil and Bulgaria prior to the adoption of their respective disinflation policies. In Bulgaria, we estimate a statistically significant coefficient—close to 50 percent—on lagged inflation in both the OLS and IV regressions. In Brazil, despite anecdotal evidence of indexation (Goldfajn, 1998), we find a small and negative coefficient on lagged inflation (and a statistically insignificant coefficient if we do not constrain the coefficient on lagged and expected inflation to sum to one), suggesting no significant amount of indexation behavior. In cases of disinflation from more moderate levels, such as in Turkey, Uruguay, and Venezuela, we find statistically significant coefficients on lagged inflation. This evidence suggests that the degree of backward-looking behavior depends more on the institutional characteristics of each economy and the nature of the disinflation policies than on inflation levels per se.

[18] The level of imports in industrialized trade partners are likely to be correlated with the aggregate demand for a country's goods, and hence the real effective exchange rate and real unit labor costs, but not correlated with the domestic supply shocks that affect inflation.

Table 1. Inflation Dynamics (OLS estimates)

	Bulgaria	**Brazil**	**Colombia**	**Ecuador**	**Mexico**	**Peru**	**Russia**	**Russia**	**Turkey**	**Uruguay**	**Venezuela**
Lagged Inflation	0.252** (0.096)	-0.320 (0.229)	-0.381*** (0.112)	-0.096** (0.038)	0.077 (0.103)	-0.060 (0.067)	-0.046 (0.044)	-0.399** (0.102)	0.484** (0.269)	0.366** (0.152)	0.238** (0.119)
Expected Future Inflation	0.748** (0.096)	1.320*** (0.229)	1.381*** (0.112)	1.096*** (0.038)	0.923*** (0.103)	1.060*** (0.067)	1.046*** (0.044)	1.399*** (0.102)	0.516** (0.269)	0.634*** (0.152)	0.762*** (0.119)
Real Exchange Gap	1.382*** (0.479)	0.736*** (0.202)	3.836 (7.944)	1.409*** (0.135)	0.494*** (0.082)	0.819*** (0.103)	0.253*** (0.079)	182.07*** (38.52)	0.476 (0.63)	-0.582* (0.311)	0.449** (0.183)
Unit labor costs	13.360*** (4.554)	-0.103 (0.569)	0.000 (0.000)	-	0.004** (0.002)	-	-0.005 (0.013)	0.01*** (0.003)	-1.111 (1.071)	-	-
Constant	1.616*** (0.580)	17.475 (10.512)	0.029*** (0.009)	0.149*** (0.016)	0.023** (0.009)	0.020*** (0.007)	0.432*** (0.094)	0.103*** (0.024)	0.0.81** (0.043)	-0.046** (0.022)	0.020 (0.014)
Sample	1997:12-2000:11	1994:8-1997:12	1993:03-1999:12	1993:03-2002:12	1995:04-2001:12	1993:03-1997:12	1995:01-1998:11	1999:01-2003:03	1998:01-2003:01	1993:03-1998:12	1993:03-2003:04
Number of obs.	27	20	40	68	40	28	44	26	33	34	60
R^2	0.56	0.76	0.86	0.91	0.93	0.93	0.97	0.91	0.70	0.94	0.76
Success?	Yes	Yes	Yes	No	Yes	Yes	No	Uncertain	No (until 2000) Uncertain since 2000	Yes	No

Note: Newey-West standard errors are given in parentheses; "*","**","***" indicate significant at the 10, 5, and 1 percent level, respectively.

Table 2. Inflation Dynamics (IV estimates)

	Bulgaria	Brazil	Colombia	Ecuador	Mexico	Peru	Russia	Russia	Turkey	Uruguay	Venezuela
Lagged Inflation	0.494*** (0.155)	-0.363 (0.374)	-0.389* (0.224)	-0.085** (0.036)	0.172 (0.143)	-0.045 (0.077)	-0.003 (0.085)	-0.385*** (0.107)	0.485 (0.286)	0.358** (0.147)	0.230** (0.110)
Expected Future Inflation	0.506*** (0.155)	0.647* (0.374)	1.389*** (0.224)	1.085*** (0.036)	0.828*** (0.143)	1.045*** (0.077)	1.002*** (0.085)	1.385*** (0.107)	0.515* (0.286)	0.642*** (0.147)	0.770*** (0.110)
Real Exchange Gap	0.264*** (0.732)	0.732 (0.192)	-0.772 (10.26)	0.129*** (0.016)	0.419*** (0.088)	0.759** (0.336)	-0.415 (0.326)	0.184*** (0.027)	0.541 (0.736)	-0.510 (0.332)	0.327* (0.183)
Real Unit Labor costs	0.255*** (0.0662)	-0.258 (1.045)	-0.002 (0.006)	-	0.007** (0.003)	-	-0.058 (0.034)	0.01*** (0.003)	-0.802 (0.997)	-	-
Constant	2.780*** (0.760)	19.53 (17.61)	0.027* (0.014)	0.145*** (0.016)	0.032*** (0.008)	0.017 (0.011)	-0.214 (0.341)	0.108*** (0.027)	0.079** (0.045)	-0.04 (0.021)	0.021 (0.013)
Sample	1997:12-2001:11	1994:08-1997:12	1993:03-1999:12	1993:03-2002:12	1995:04-2001:12	1993:03-1997:12	1995:12-1998:11	1999:01-2002:11	1998:01-2003:01	1993:03-1998:12	1993:03-2003:04
Number of obs.	27	20	40	68	40	28	33	24	33	34	60
R^2	0.22	0.76	0.85	0.90	0.91	0.93	0.77	0.91	0.69	0.94	0.75
Success?	Yes	Yes	Yes	No	Yes	Yes	No	Uncertain	No (until 2000) Uncertain since 2000	Yes	No

Note: Newey-West standard errors are given in parentheses; "*","**","***" indicate significant at the 10, 5, and 1 percent level, respectively.

Overall, our results suggest only a limited role for backward-looking rule-of-thumb behavior in pricing. Of course, most of our cases are successes, but the results seem to be similar for countries with failed stabilization episodes. While we do not seem to find evidence that past inflation alone is more important than expectations of future inflation, inflation expectations themselves might still embody a significant weight on past inflation. We turn to the issue of what drives inflation expectations in the next section.

IV. What Determines Inflation Expectations?

Given that inflation expectations appear to be a key driving force of inflation dynamics, this section analyzes their determinants. In particular, we examine the extent to which the evolution of fiscal balances influences inflation expectations. We consider separately the role of the primary fiscal balance and that of the expected total balance. We first present some graphical evidence on the bivariate relationship between expected inflation and fiscal balances and then the regressions results.

A. Data

We consider two different fiscal variables in our analysis: the primary fiscal balance as a share of GDP and the expected total balance as a share of GDP. The primary balance (which excludes interest expenditures) is a more exogenous measure of current fiscal policy than the total balance.[19] In addition, the primary balance has the potential to signal the government's commitment to fiscal adjustment during a stabilization.[20]

Reductions in inflation expectations indeed tend to be associated with an improvement in primary balances (Figure 2). Examples are Brazil in 1994-95, Uruguay in 1995-98, Peru in 1993-94 and 1996, Mexico in 1995-2001, Venezuela in 1996-2002, Ecuador in 1999-2002, Russia and Turkey since 1998. Even in Bulgaria, where primary balances declined together with inflation expectations, the primary balance was close to 6 percent of GDP when disinflation began. There is also some indication that increases in inflation expectations were associated with worsening primary balances. This was the case of Uruguay and Venezuela in 1994 and Ecuador in 1997-99.

Reductions in inflation expectations also tend to be associated with improvements in expected total balances. The appeal of this measure is that it is forward looking, measuring the expected fiscal policy for the same period for which inflation is forecast. We construct the 12-month-ahead expected overall balance measure by taking a weighted average of the survey expectation of the overall balance for the end of the current year and of that for the following year from Consensus Forecasts, using the same weights used in the computation of one-year-ahead expected inflation. Figure 3 shows that in the five countries for which expectations on future total fiscal balances are available, there is again a clear inverse relationship between fiscal balances and inflation expectations. Of course, these are only suggestive, bivariate relationships; in the following section, we investigate the determinants of expectations more formally.

[19] Nonetheless, the primary balance can also be an endogenous regressor as discussed and addressed below.

[20] Drudi and Prati (2002) present evidence on the signaling role of primary balances on credit ratings in the case of four European economies undergoing fiscal consolidation. This signaling role is likely to extend to inflation expectations during disinflations.

Figure 2: Inflation Expectations and Primary Balance

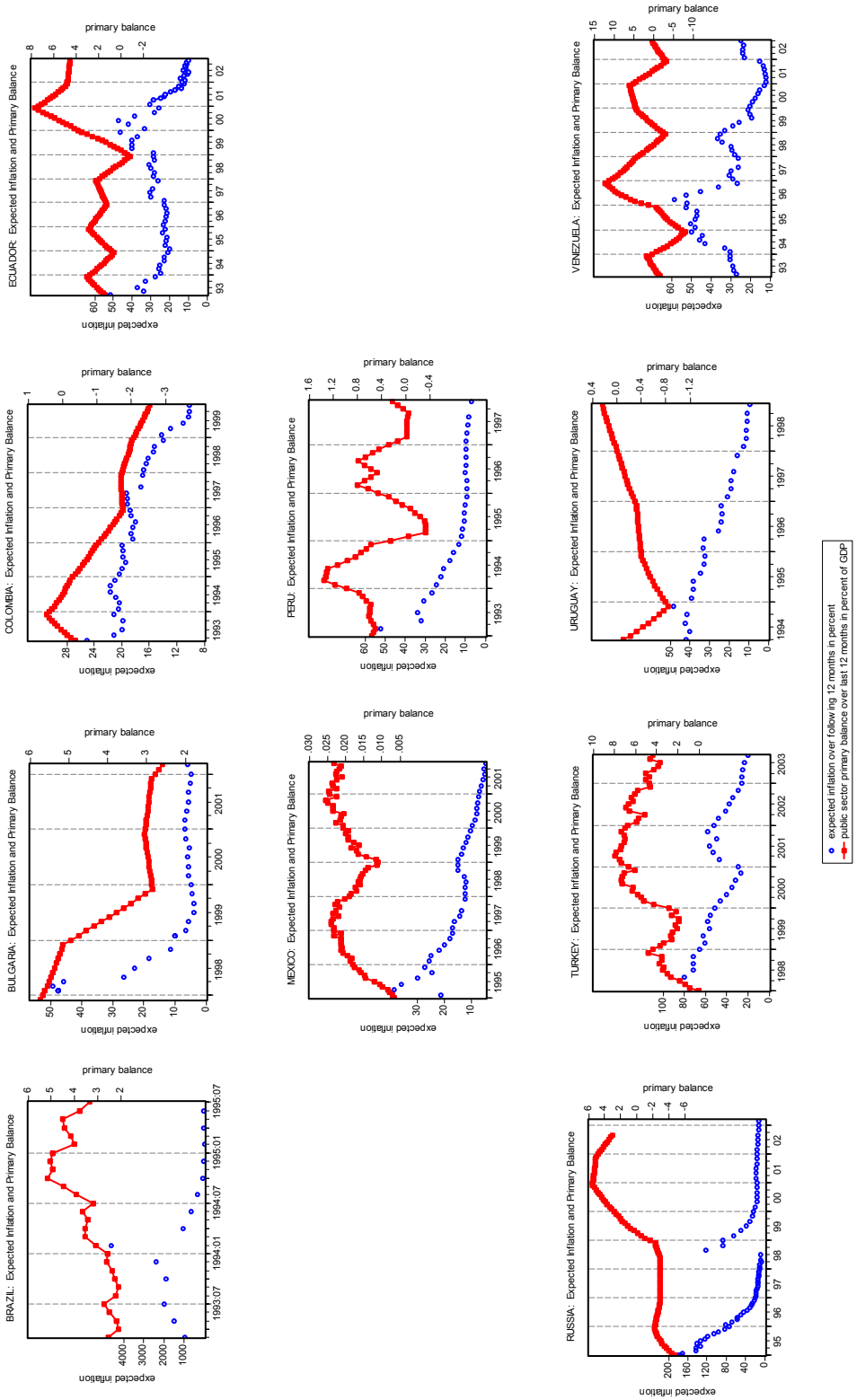
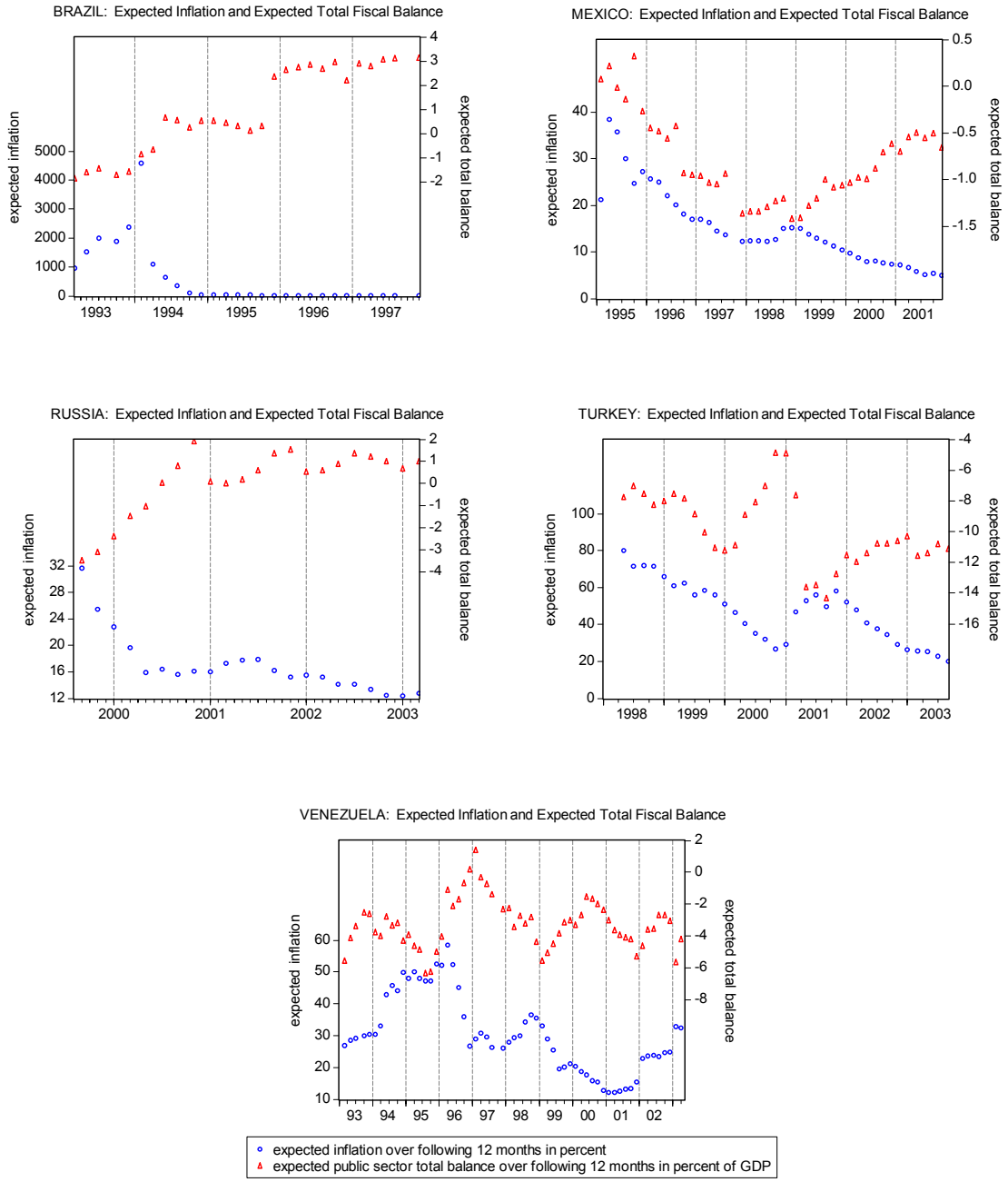


Figure 3: Inflation Expectations and Fiscal Expectations



B. Estimation Results

In our regressions, in addition to the fiscal variables, we include other candidate variables that are likely to inform expectations about future inflation. Backward-looking agents are likely to pay attention to past inflation.[21] The structural model of Section 2 implies that forward-looking agents would also need to forecast future marginal costs and prices to predict inflation. We therefore include the real exchange rate and real unit labor costs (averages over the past year, in deviation from a time trend) in our specification.[22] Moreover, future prices and marginal costs are likely to depend on the monetary policy stance (measured as the average money market interest rate minus the average inflation rate in the past year) and exchange rate movements (measured as the average rate of exchange rate depreciation over the past year).[23] To allow for lags in data release, all explanatory variables are lagged by two months except the money market rate minus inflation rate, which is lagged by four months to minimize its potential endogeneity to expected inflation. Lastly, the effect of fiscal variables on inflation expectations is likely to depend on the degree of central bank independence. While we cannot control explicitly for this factor in our regressions because measures of central bank independence do not have enough time-series variation, Box 2 assesses of the importance of central bank independence in our sample.

We estimate two sets of regressions. For every episode, we run regressions of expected one-year-ahead inflation on the primary balance as a share of GDP (in the twelve month period up to two months before the current month) and on all the control variables.[24] For the five episodes for which we have data on the expected overall balance in the year ahead, we also estimate a second set of regressions using this measure in place of the primary balance.

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[21] For forward-looking price setters, lagged inflation may be useful in predicting future inflation if the monetary authority follows a policy rule that depends on past inflation. However, this is unlikely to be the case during disinflations, especially for the cases where an exchange rate peg was adopted, which are Brazil, Bulgaria, Ecuador (after 2000), Turkey (after 2000), Russia (1995-98), and, implicitly, Peru.

[22] Depending on the persistence of the cycles in the real unit labor cost or the real exchange rate in each country, the lags of these variables might affect forecasts of future inflation with a negative or positive sign.

[23] Under exchange rate pegs, the money market interest rate is related to the intensity of capital flows rather than the autonomous monetary policy stance.

[24] We have also estimated IV regressions with the past overall balance instead of the primary balance, obtaining results that are qualitatively very similar. This is not surprising because, once overall balances are instrumented, their information content is very similar to that of primary balances. We do not report these estimates here for the sake of brevity.

Box 2. Central Bank Independence and the Importance of Expected Fiscal Deficits for Inflation Expectations

The extent to which inflation expectations are driven by expectations about fiscal outcomes is likely to depend partly on the degree of central bank independence. A completely independent central bank should be able to shield price stability against loose fiscal policy if it is clear to price setters that the monetary authority will refuse to monetize deficits and if the fiscal path is not determined completely independently of monetary policy.

However, for developing countries, the empirical results on the relationship between central bank independence and inflation are mixed. For a broad set of developing countries, Sturm and de Haan (2001) construct a measure of central bank independence based on the turnover rate of central bank governors, along the lines of Cukierman (1992). The idea is that central banks with higher turnover rates can be regarded as less independent. For developing countries, such a measure is likely to be more indicative of the actual degree of independence than legal indicators. The authors find that, when including control variables (such as debt ratios), the effect of central bank independence on inflation often becomes insignificant. Similar results are reached by Jácome and Vázquez (2004) using an index of legal bank independence, who report an insignificant impact of central bank independence once a broad array of structural reforms are controlled for.

There is some indication that in our sample, the importance of fiscal variables for inflation expectations may be related to central bank independence. For the eight countries from our sample for which data are available the average turnover is roughly equal to that of the average across developing countries. Contrary to what one would expect, Venezuela, a country that unsuccessfully attempted to disinflate, has zero governor turnover. However, while the small sample precludes formal inference, across countries, turnover is mildly negatively correlated with the estimated coefficient on the primary balance in Table 3 (correlation coefficient -0.18). This is in line with the notion that more independent central banks may protect price stability from fiscal pressures.

Average Turnover of Central Bank Governors, 1990–98

Brazil	0.75
Colombia	0.00
Ecuador	0.75
Mexico	0.25
Peru	0.00
Turkey	0.25
Uruguay	0.50
Venezuela	0.00
Average	**0.31**
Median	**0.25**

Source: Sturm and de Haan (2001).

For each set of regressions, we discuss potential endogeneity problems—such as reverse causality from inflation expectations to fiscal variables—that may bias our estimates, and address them by lagging regressors and using instrumental variables with Generalized Method of Moments (GMM) estimation techniques.

V. Inflation Expectations and Primary Fiscal Balances

There are reasons to suspect some degree of simultaneity between primary fiscal balances and expected inflation, which, if not addressed, may lead us to underestimate or overestimate the true effect of fiscal balances on inflation expectations. We lag primary balances to avoid the most obvious sources of reverse causality but using lagged variables may not take care of all possible sources of endogeneity.

First, even if our lagged fiscal regressors are predetermined, the estimated coefficients could be biased if shocks to expected inflation are serially correlated and there are reasons to expect reverse causation from inflation expectations to fiscal balances.[25] Second, for those countries without monthly fiscal data, our interpolated regressors are not fully predetermined even though they are lagged. In this case, we interpolate end-year fiscal balances to obtain monthly observations. As a consequence, data from the future months—which overlap with the inflation forecast horizon—are used to construct the fiscal balance measures,[26] thus allowing possible feedback effects to bias our estimates.

However, are there any channels through which inflation expectations can affect the primary balance? The obvious feedback effect through the fiscal policy reaction function is likely to be of little consequence in our case. During a disinflation program, the government may react to increases in inflation expectations by tightening fiscal policy. The government would adopt this policy in an attempt to reduce domestic demand or enhance the credibility of the fiscal adjustment, and thereby correct the deterioration in inflation expectations. However, these corrective measures have implementation lags that make this an unlikely source of significant bias. As a matter of fact, the existing empirical literature on the effects of fiscal policy, makes the identifying assumption that policymakers cannot respond much to changes

[25] When monthly fiscal data are available, the fiscal regressors are predetermined because they measure fiscal outcomes realized between two and fourteen months prior to the observation date while inflation expectations refer to the following twelve months. In the absence of serial correlation, this rules out any possible feedback from the latter to the former that can bias our estimates.

[26] For example, the interpolated fiscal balance for the 12-month period ending in July 1995 would be constructed as a weighted average of the fiscal balances in December 1994 and December 1995, with weights of 5/12, and 7/12 respectively. The 12-month fiscal deficit ending in July 1995 would be used as a regressor for expected 12-month ahead inflation in September 1995 so there would be 3 months of overlap between expected inflation and our fiscal balance measure.

in the economic environment *within the same calendar year* (see, for example, Perotti (1999)).

A more likely potential source of bias are the dynamics of output, real exchange rate, and real wages that are known to characterize imperfectly credible exchange-rate-based stabilizations. The resulting bias in OLS estimates can, however, be either positive or negative. The increase in output typically associated with the initial phases of exchange rate based stabilizations could automatically increase VAT, sales tax, and import tariff revenues, which, in turn, would improve the primary balance (see Talvi, 1995). Inflation and inflation expectations would fall less than targeted but, as long as they decline somewhat, a spurious *negative* correlation between inflation expectations and primary balances may emerge.

The real appreciation that characterizes exchange-rate-based stabilizations can, however, bias the OLS coefficients in an opposite direction by depressing real government revenues from commodity exports.[27] In the presence of a real appreciation, the domestic currency equivalent of export revenues denominated in dollars would fall in percent of GDP, resulting in a spurious *positive* correlation between inflation expectations and the primary balance-to-GDP ratio, which would both decline at the outset of the stabilization.

Real public sector wages are also likely to increase in the early stages of an imperfectly credible stabilization causing primary balances to deteriorate as inflation expectations decline, thus making it more difficult to find evidence that fiscal adjustment reduces inflation expectations. The increase in real wages would take place at the outset of stabilizations whenever wage agreements reflect inflation expectations and these tend to be systematically pessimistic as shown in Figure 1.

A simple graphical analysis confirms that, in the disinflation episodes that we study, the correlation between fiscal balances and output growth is not always positive, suggesting that the variation in domestic output is not the main driving force of fiscal balances.[28]

To correct for these potential (positive or negative) biases, we use a host of instrumental variables. Specifically, we attempt to weed out the variation in fiscal balances that are endogenous to domestic inflation, or to the component of domestic output that is endogenous to domestic inflation. We use the share of capital expenditures in GDP, which is often an important source of savings during fiscal retrenchment and not likely to vary with inflation expectations. We also use individual income or corporate income tax rates as measures of fiscal effort that are not endogenous to the current domestic business cycle. In addition, we use measures of external demand, proxied by the weighted average (according to bilateral

[27] In Ecuador, Mexico, Russia, and Venezuela, for instance, a sizable share of government revenues are from oil sales.

[28] In addition, the correlations between inflation expectations and real output growth are also weak, and vary significantly across episodes.

trade weights) of industrialized country trade partners total imports, and world interest rates proxied by the average one year government bond rate in the United States. These instruments should capture external demand pressures on the domestic economy and would then be correlated with the domestic output cycle and fiscal balances but exogenous to expected inflation. Furthermore, we include a nominal commodity export price index as well as an index of world oil prices, to capture the exogenous swings in fiscal balances due to world commodity prices.[29] Finally, we include an index of import prices, a unit value index of manufactures exported by 20 developed countries, to capture exogenous shifts in tariff revenues.[30]

All these instruments are measured for the 12-month period preceding the month of observation, and lagged two months (as are our regressors). We also include in the set of instruments all other regressors in our specification (except the primary balance), and estimate our equations using the Generalized Method of Moments (GMM).

The regression results indicate that the fiscal primary balance is a significant determinant of expected inflation in both successful and unsuccessful disinflation episodes. The primary balance enters our equations with a statistically significant negative coefficient in all cases except Colombia. In nine out of the eleven estimations, the coefficient is significant and positive at the 1 percent confidence level (Table 3).

For the case of Colombia, given the opposite long term trend in expected inflation and the primary balance (see Figure 2), we have also estimated regressions (not shown) of the change in expected inflation (at various horizons) on the change in the primary balance (at the same horizon). This exercise yields a negative—but often insignificant—coefficient on the latter, lending some support to the hypothesis that increases in the primary fiscal balance are associated with lower inflation expectations, but the multivariate analysis shows that the evolution of the primary fiscal balance was not an important determinant of expected inflation. A distinguishing characteristic of the Colombian episode is that the disinflation starts from a relatively low level compared to the other cases in our sample,[31] suggesting that fiscal variables may play a smaller role in disinflations from moderate inflation levels.

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[29] The index of export commodity prices would tend to be positively correlated with fiscal balances, but the sign of the correlation between oil prices and fiscal balances would depend on whether the country exports oil. In our sample, Ecuador, Mexico, Russia, and Venezuela derive a large amount of fiscal resources from oil exports.

[30] Some of our instruments could also be considered as additional regressors in our specifications. We use Hansen's test of overidentifying restrictions to test the validity of our instruments and the appropriateness of our baseline specification in which we use these variables only as instruments. All specifications pass the test at a 5 percent confidence level.

[31] In fact, Colombia experienced a disinflation from 30 to 22 percent between 1991 and 1993, but we do not have data on inflation expectations for the period before 1993:03.

Table 3. Inflation Expectations: Primary Balance

	Brazil	Bulgaria	Colombia	Ecuador	Mexico	Peru	Russia	Russia	Turkey	Uruguay	Venezuela
Inflation (-2)	0.080*** (0.001)	0.028*** (0.009)	0.617*** (0.037)	0.035 (0.122)	0.982*** (0.102)	0.605*** (0.036)	0.453*** (0.161)	-0.709*** (0.110)	-1.370*** (0.258)	0.864*** (0.125)	0.512*** (0.063)
Primary Balance (-2)	-0.155*** (0.022)	-1.055*** (0.241)	0.280 (0.175)	-4.965*** (1.386)	-0.004*** (0.001)	-0.642*** (0.084)	-1.105 *** (0.329)	-1.229 *** (0.254)	-1.008 *** (0.129)	-2.627* (1.359)	-1.735*** (0.111)
Exchange Rate Depreciation (-2)	0.047*** (0.010)	0.022*** (0.002)	-0.109 *** (0.017)	0.077** (0.032)	0.007 (0.039)	0.071*** (0.012)	-0.266 (0.189)	-0.314*** (0.065)	0.908*** (0.179)	-0.135 (0.081)	0.104*** (0.035)
Money Market Rate (-4) minus Inflation Rate(-4)	-0.012*** (0.002)	0.013* (0.007)	-0.001 (0.001)	-0.000 (0.006)	-0.030*** (0.008)	-	-	0.007 (0.006)	0.005*** (0.001)	-0.006*** (0.001)	0.0002 (0.0004)
Real Unit Labor Cost (-2)	-0.039*** (0.003)	-0.171*** (0.041)	0.011 (0.014)	-	-0.003*** (0.001)	-	-0.003 (0.021)	-0.023*** (0.003)	-1.014*** (0.092)	-	-
Real Exchange Rate (-2)	-2.695*** (0.398)	-1.551*** (0.452)	9.316*** (2.746)	5.712* (3.249)	-1.763 (1.210)	-0.413*** (0.092)	0.999 (1.059)	0.793** (0.359)	-0.385*** (0.039)	-0.199*** (0.030)	-0.088 (0.118)
Constant	0.036*** (0.081)	0.070*** (0.005)	0.105*** (0.024)	0.363*** (0.103)	0.062** (0.023)	0.025*** (0.004)	-0.021 (0.128)	0.934*** (0.192)	0.92*** (0.171)	0.123** (0.034)	0.09*** (0.027)
Sample	1994:08-1997:12	1997:12-2001:11	1993:03-1999:12	1993:03-2002:12	1995:04-2001:12	1993:03 - 1997:12	1995:02-1998:11	1999:01 - 2003:01	1998:01-2003:03	1994:02 - 1998:12	1993:03-2003:02
Number of obs.	20	27	40	68	40	28	43	25	34	29	59
J-statistic (p-value)	0.273	0.147	0.205	0.056	0.146	0.289	0.107	0.172	0.110	0.182	0.154
R^2	0.91	0.97	0.88	0.80	0.59	0.92	0.82	0.87	0.28	0.98	0.74
Success?	Yes	Yes	Yes	No	Yes	Yes	No	Ongoing	No (until 2000) Ongoing since 2000	Yes	No

Note: GMM estimates. Variable bandwidth Newey West standard errors are given in parentheses; "*","**","***" indicate significance at the 10, 5, and 1 percent level, respectively. Variables which do not have coefficient estimates were excluded because of data unavailability. Instruments include all the regressors except the primary balance-to-GDP ratio, Public sector capital expenditures/GDP (-2), Trade partners import demand (-2), nominal commodity import price index (-2), unit value index of manufactures imports (-2), crude oil price index (-2), average one-year U.S. bond interest rate (-2), top-bracket corporate or individual income tax rate (-2) and (-14).

The role of lagged inflation in driving inflation expectations is uneven across countries. Lagged inflation is estimated to have a statistically significant coefficient in 10 out of 11 episodes, but the coefficient is negative in two cases. The estimated coefficient for Brazil and Bulgaria are very small. Only in the cases of Mexico and Uruguay, we fail to reject the hypothesis that the coefficient on lagged inflation is one, which suggests a strong degree of backward-looking behavior only in these two episodes.

Most of the estimated coefficients on the other regressors are statistically significant but in some regressions, they have signs that are different from those expected.[32] Our results on the significance of the fiscal balance and lagged inflation are, however, robust to the exclusion of these other control variables.

Our specifications pass the test of overidentifying restrictions at least at 5 percent confidence levels, implying that our instruments are valid. In addition, we find that our results on the significance of fiscal balances are robust to including the crude oil price, or the twelve-month change in the crude oil price in the equation and not only in the set of instruments.

When the same equations are estimated with OLS rather than GMM, we obtain qualitatively similar results regarding the signs of the estimated coefficients. A main difference is that the coefficients on the fiscal balances are much more significant in the GMM regressions, suggesting that, if we neglected the potential endogeneity bias in our data, we would underestimate the impact of fiscal balances on expected inflation.

A. Inflation Expectations and Expected Total Balances

In the estimates with expected total balances, there is an additional potential source of bias. The sign of the bias can again be either positive or negative depending on the currency denomination of the debt. On the one hand, the total fiscal balance includes nominal interest expenditures, and inflation expectations have an impact on the nominal interest rate bill. Negative shocks to expected inflation would reduce nominal interest rates on domestic-currency-denominated instruments and, thus, improve the total fiscal balance. This endogenous effect would generate a spurious negative correlation between total fiscal balances and expected inflation. On the other hand, if a reduction in inflation expectations is associated with a real appreciation as in the case of exchange-rate-based stabilizations, the

[32] The sign of the coefficient on the rate of exchange rate depreciation is negative and significant in Colombia and Russia and that of the money market interest is positive and significant in Bulgaria and Turkey. The coefficients on lagged real unit labor costs and real exchange rates (deviated from trend) are mostly negative, implying that agents expect lower cost pressures and inflation in the year ahead if cost pressures have been high in the past year.

real value of the interest bill on foreign currency debt would decline determining a spurious positive correlation between fiscal balances and expected inflation, which would then lead us to underestimate the impact of the fiscal balance in OLS regressions. To correct for these possible biases, we run GMM estimates with the same set of instruments used for the primary fiscal deficit and adding only the 12-month lagged primary deficit.

The effect of the expected future total balance on expected inflation is negative and statistically significant in all the five episodes that we study (Table 4). The estimated coefficient on lagged inflation is positive and significant in all cases except for Russia. While price setters use information on past inflation to form inflation expectations, this is clearly not the only driving force of expectations. Most importantly, we do not find that the role of past inflation is larger in failed disinflations.

VI. CONCLUSIONS

Contrary to the popular notion that, at high inflation levels, lagged inflation becomes the primary determinant of current inflation (i.e., inflation becomes *inertial*), we provide evidence that, in all of the cases studied, expected future price changes were more important than lagged inflation in driving the inflation process.

Inflation expectations, in turn, are significantly influenced by the evolution of fiscal variables. Adjustments in the primary balance appear to play a critical role in reducing expected inflation rates in all the successful disinflations. In the unsuccessful disinflation attempts that were not associated with failed exchange rate pegs, we find that fiscal deteriorations precede the return of high inflation. Interestingly, we could not find significant differences in the degree of backward-looking pricing behavior between failed and successful disinflation programs.

This suggests that building fiscal credibility is key to reducing inflation from high levels. Achieving fiscal credibility is, of course, no trivial task and often requires institutional changes. Studying the institutional reforms that can help reach this goal is beyond the scope of this paper, but a topic that deserves further research.

Table 4. Inflation Expectations: Expected Total Balance

	Brazil	**Mexico**	**Russia**	**Turkey**	**Venezuela**
Inflation (-2)	0.067*** (0.001)	1.161*** (0.132)	-0.533*** (0.089)	0.947*** (0.114)	0.617*** (0.056)
Expected Total Balance (-2)	-0.050** (0.019)	-0.032*** (0.007)	-0.057*** (0.010)	-0.022** (0.008)	-0.053*** (0.004)
Exchange Rate Depreciation (-2)	0.021** (0.006)	0.062 (0.047)	-0.062 (0.043)	0.016 (0.060)	0.032 (0.028)
Money Market Rate (-4) minus Inflation Rate(-4)	-0.076*** (0.016)	-0.003*** (0.001)	0.018*** (0.002)	0. 045*** (0.004)	-0.017* (0.008)
Real Unit Labor Cost (-2)	0.006** (0.002)	-0.009 (0.006)	-0.011*** (0.001)	-0.649*** (0.148)	-
Real Exchange Rate (-2)	0.412*** (0.002)	-0.442*** (0.135)	-0.661** (0.280)	1.636*** (0.167)	-0.125* (0.071)
Constant		-0.027* (0.013)	0.122*** (0.029)	-0.706*** (0.125)	-0.042 (0.032)
Sample	1994:08- 1997:12	1995:04- 2001:12	1999:01- 2003:01	1998:05- 2003:03	1993:03- 2003:02
Number of obs.	20	39	25	30	59
J-statistic (p-value)	0.288	0.152	0.195	0.232	0.182
R^2	0.76	0.57	0.90	0.75	0.65
Success?	Yes	Yes	Ongoing	No (until 2000) Uncertain since 2000	No

Note: GMM estimates. Variable bandwidth Newey West standard errors are given in parentheses; "*","**","***" indicate significance at the 10, 5, and 1 percent level, respectively. Variables which do not have coefficient estimates were excluded because of data unavailability. Instruments include all the regressors except the primary balance-to-GDP ratio, Public sector capital expenditures/GDP (-2), Trade partners import demand(-2), nominal commodity import price index(-2), unit value index of manufactures imports(-2), crude oil price index(-2), average one-year U.S. bond interest rate(-2), top-bracket corporate or individual income tax rate(-2) and (-14), Primary Balance/GDP(-12).

Disinflation Episodes

After unsuccessful stabilization attempts under various plans (latest of the *Collor plan*), the **Brazilian** government adopted the *Real plan* in July 1994. Among other things, the plan involved a change in numeraire; all prices were allowed to be quoted in a unified reference value that would be replaced by a new currency, the real. Prices were already indexed, and the new mechanism was intended to move relative prices to their equilibrium values before the real would be introduced and pegged to the dollar.[33] The government also issued legislation to deindex the economy, and reducing the proportion of indexed public debt. Annual inflation fell from 46 percent in June 1994 to 9.5 in September. In contrast to the previous stabilization attempts, the Real Plan showed lasting results, and inflation remained below 10 percent until early 2003.

Following overly expansionary macroeconomic policies in the late eighties, and with a history of moderately high inflation, **Uruguay** started to conduct tighter fiscal and monetary policies in 1990. The government's strategy included an attempt to break with backward-looking indexation mechanisms; public sector wage adjustments were now made based on forward-looking inflation targets.[34] Initially, the target of bringing down in one year to 30 percent was missed, and a more gradualist approach was adopted. CPI inflation, which had reached 130 percent during 1990, began to fall gradually but steadily, reaching 35 percent at end-1995 and 9 percent at end-1998.

In early 1990, the **Peruvian** economy was facing a severe crisis characterized by hyperinflation and a sharp drop in output. The government that took office in July 1990 implemented a macroeconomic stabilization program, which was aimed at drastically reducing inflation. Inflation fell from an average of about 7,500 percent in 1990 to 410 percent in 1991 and to 74 percent in 1992. From then onwards, the reduction in inflation rates was more gradual, with average CPI growth dropping to about 10 percent in 1995.

After years of high inflation rates (between 25 and 30 percent since 1974), in **Colombia**, the Gaviria government (1990-94) aimed to tackle the problem and to reduce inflation to 14 percent by 1994. This proved harder than expected, but despite missing initial targets, a gradual but steady decline in the CPI growth rate began. Backward-looking indexation was gradually reversed; for example, while wages were typically set based on previous year's inflation, in 1994 wages were partly based on the inflation target for that year. Inflation dropped from 32 percent in 1990 to 23 percent in 1994, and reached 11 percent by 1998.

Mexico after 1995 is another example of a successful stabilization after a currency crisis. The December 1994 devaluation initially resulted in a large jump in prices, and inflation increased from 7 percent in 1994 to 52 percent in 1995. Against a background of fiscal and monetary tightening, inflation was brought down to single digit levels in 2000.

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[6] See Goldfajn (1998).

[34] See Massoler (1997).

After experiencing a major crisis and hyperinflation, **Bulgaria** adopted a currency board in early 1998, and average inflation dropped from about 1250 percent in 1997 to below ten percent in just 1 year. The currency board has retained wide acceptance and inflation has remained subdued at single digit levels.

After two devaluations of the Bolivar with associated large price jumps, in **Venezuela**, the authorities started to implement a program of adjustment and reform (the *Agenda Venezuela*) in mid-1996. The program used the exchange rate as the main anchor to reduce inflation during the period 1996-1998. This was initially accompanied by a significant tightening of fiscal policy. Inflation declined almost to 10 percent by 2001 but then, following expansionary fiscal and monetary policies, increased back to almost 30 percent in-mid 2003.

In **Ecuador**, after many years of macroeconomic instability and high inflation, a new government began to implement stricter fiscal policies in 1992 as part of an overall stabilization and reform package. In response to these policies, inflation fell from an average of around 50 percent in 1988-92 to 22 percent in 1995. Inflation, however, never dropped below that level, and the stabilization effort ultimately proved unsuccessful. In 1998-99, the economy experienced a major crisis, with inflation accelerating to over 100 percent in 2000. In mid-2000, the Ecuadorian authorities announced the adoption of the U.S. dollar as legal tender. The rate of inflation declined to single digits only at end-2002.

The **Russian** and **Turkish** experiences offer an opportunity to study two disinflation efforts carried out in the same country under different circumstances at different points in time. The case of Russia during 1995-98 is an example in which reductions in inflation were not accompanied by sufficient fiscal discipline. In particular, following a reduction in the primary deficit in early 1995, federal government revenues kept eroding, and structural reforms to address these issues were postponed. Therefore, the stabilization achieved from 1995 onwards with an exchange-rate band proved eventually unsustainable when the external environment deteriorated in 1997-98. After the crisis of August 1998, the institutional setting for the conduct of macroeconomic policies was strengthened. Reforms of the central bank and the payments system were accompanied by fiscal reforms, such as reductions in subsidies and improvements in the tax system. As a result, fiscal and inflationary outcomes improved considerably, and inflation fell from about 100 percent in early 1999 to 15 percent at end-2002.

Turkey, after experiencing inflation rates around 80 percent in 1996-97, adopted tighter monetary and fiscal policies in 1998. With inflation reduced to 65 percent at end-1999, the authorities embarked on an ambitious exchange rate-based disinflation program backed by substantial fiscal tightening. The exchange rate peg was abandoned in February 2001 amid a financial crisis, leading inflation to increase from 45 percent to about 60 percent in mid-2002. A renewed stabilization program adopted in May 2001 has been accompanied by substantial primary surpluses. Inflation has since steadily decreased to below 30 percent by mid-2003, and fiscal discipline has largely been sustained.

Table 5. Key Macroeconomic Indicators Around Disinflation Periods

	Inflation (End of Period)	Primary Balance (Percent of GDP)	Real GDP Growth (Percent)
Brazil			
1992	965.20	2.25	
1993	2490.99	2.60	
1994	941.25	5.04	5.86
1995	23.17	0.36	4.23
1996	10.04	-0.09	2.68
1997	4.83	-0.91	3.29
1998	-1.79	0.01	0.14
1999	8.64	3.28	0.78
Bulgaria			
1995	32.66	7.81	-1.80
1996	311.57	8.59	-8.04
1997	547.68	7.60	-5.58
1998	1.63	5.67	4.01
1999	6.96	4.95	2.30
2000	11.26	2.86	5.39
2001	4.82	3.03	4.03
2002	3.81	2.78	4.00
Colombia			
1992	25.13	-0.72	4.04
1993	23.03	0.47	5.38
1994	23.38	-0.22	5.83
1995	18.99	-0.98	5.20
1996	21.54	-1.75	2.06
1997	17.72	-1.70	3.43
1998	16.69	-2.03	0.57
1999	9.23	-2.54	-4.18
2000	8.75	-2.01	2.90
2001	7.64	-1.73	1.39
Ecuador			
1992	60.22	0.76	3.61
1993	30.96	3.01	2.00
1994	25.38	0.63	4.70
1995	22.79	2.86	1.75
1996	25.53	1.24	2.40
1997	30.67	2.17	4.05
1998	43.40	-0.87	2.12
1999	60.71	3.45	-6.30
2000	91.00	7.67	2.80
2001	22.44	4.76	5.12
2002	9.36	4.52	3.01
Mexico			
1993	8.01	3.34	1.94
1994	7.05	2.07	4.46
1995	51.97	4.67	-6.22
1996	27.70	4.34	5.14
1997	15.72	3.51	6.78
1998	18.61	1.71	4.91
1999	12.32	2.51	3.74
2000	8.94	2.61	6.57
2001	4.42	2.55	-0.31
2002	5.70	1.77	0.90

	Inflation	Primary Balance	Real GDP Growth
	(End of Period)	(Percent of GDP)	(Percent)
		Peru	
1992	44.94	0.55	-0.43
1993	33.27	0.50	4.76
1994	14.31	0.45	12.82
1995	9.76	-0.04	8.58
1996	11.16	1.02	2.49
1997	6.27	4.14	6.75
1998	5.82	1.52	-0.53
1999	3.66	-1.05	0.95
		Russia	
1993	840.00	-5.40	-13.01
1994	215.10	-8.44	-13.46
1995	131.30	-2.50	-4.16
1996	21.80	-2.96	-0.97
1997	11.00	-3.26	1.81
1998	84.40	-3.37	-4.90
1999	36.50	2.98	5.40
2000	20.20	7.50	9.02
		Turkey	
1996	82.29	1.76	7.01
1997	85.73	0.13	7.53
1998	84.64	4.75	3.09
1999	64.87	2.17	-4.71
2000	54.92	6.10	7.36
2001	54.40	7.01	-7.50
2002	44.96	4.63	7.78
		Uruguay	
1992	58.91	2.09	7.93
1993	52.88	0.45	2.66
1994	44.09	-0.85	7.28
1995	35.44	-0.40	-1.45
1996	24.33	-0.33	5.58
1997	15.17	-0.03	5.05
1998	8.63	0.24	4.77
1999	4.17	-2.29	-2.85
2000	5.05	-1.73	-1.44
		Venezuela	
1992	27.65	-2.41	6.05
1993	37.80	1.54	0.28
1994	53.55	-7.65	-2.35
1995	44.86	-0.74	3.95
1996	70.92	11.37	-0.20
1997	31.92	0.80	6.37
1998	26.16	-3.54	0.17
1999	18.25	3.98	-6.09
2000	12.61	5.11	3.24
2001	11.58	-4.63	2.79
2002	27.17	0.71	-8.90

Data Sources

Series	**Source**
Inflation Expectations	Consumer price inflation expectations from Consensus Forecasts, Eastern Europe Consensus Forecasts, Latin American Consensus Forecasts.
Consumer Price Index	For Brazil, the Consumer Price index for São Paulo from the Central Bank of Brazil (for consistency with Consensus Forecasts), for all other countries, consumer price indices from the *International Financial Statistics*, International Monetary Fund.
Real effective exchange rate	*Information Notice System*, International Monetary Fund
Real unit labor costs	Real unit labor cost indices or labor's share in GDP, from country statistical sources, IMF Staff estimates, authors' own calculations.
Real Gross Domestic Product	Country statistical sources, *International Financial Statistics* and World Economic Outlook Database, International Monetary Fund.
Industrialized Trade Partners Imports	For each country, the weighted average of the industrialized trade partners' total imports, weights (export shares) and total imports from the *Direction of Trade Statistics*, International Monetary Fund
Primary Balances/GDP	Country statistical sources, IMF Staff estimates, World Economic Outlook Database, International Monetary Fund.
Expected Total Balances/GDP	Eastern Europe Consensus Forecasts, Latin American Consensus Forecasts.
Exchange Rates	*International Financial Statistics*, International Monetary Fund.
Money Market Interest Rates	Country statistical sources, *International Financial Statistics*, International Monetary Fund.
Capital Expenditure/GDP	Country statistical sources, IMF Staff estimates, World Economic Outlook Database, International Monetary Fund.

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