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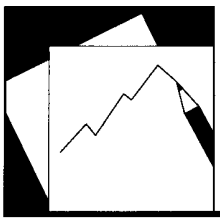

IMF Working Paper

Monetary Policy and Relative Price Shocks in South Africa and Other Inflation Targeters

Alfredo Cuevas and Secil Topak

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African Department

Monetary Policy and Relative Price Shocks in South Africa and Other Inflation Targeters

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Authorized for distribution by Sharmini Coorey

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Abstract

When faced with a relative price shock, monetary authorities often aim to contain its second round effects on inflation while accepting first round effects. We analyze the experience of South Africa and other inflation targeters to explore whether and when this policy prescription implies changing the monetary policy stance. Inflation targeting central banks differ on how aggressively they typically react to relative price shocks, reflecting differences in resilience of underlying inflation to such shocks. An examination of individual policy decisions reveals the importance of the broader economic context in framing the responses to relative price shocks.

JEL Classification Numbers: E31, E52, E58

Keywords: Monetary policy; supply shocks; relative prices; inflation; Taylor rules.

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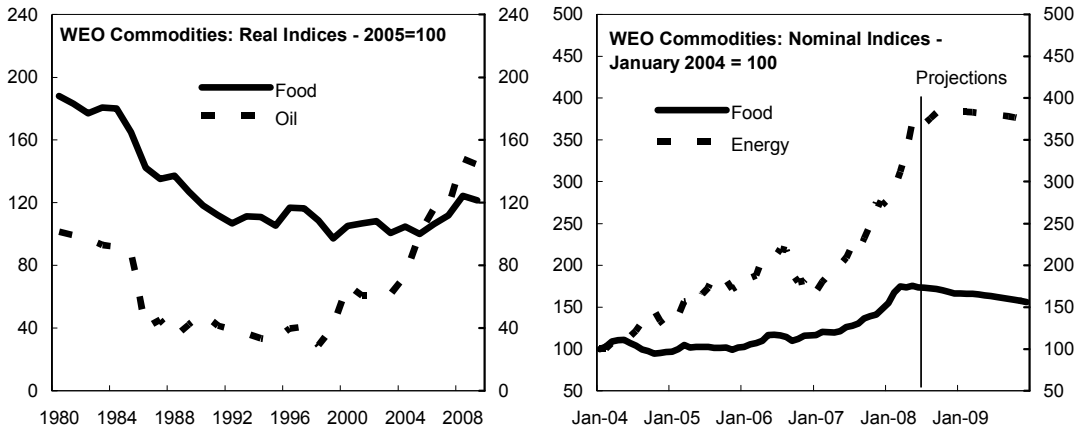
I. INTRODUCTION

This paper discusses the policy response by a sample of central banks to oil and food price shocks, drawing some lessons which can help put in context developments in South Africa. The shocks (Figure 1) are essentially changes in the relative prices of those goods, although there usually are questions on just how persistent these changes may be. Still, in certain contexts even temporary shocks may undermine the stability of inflation expectations, while in others even shocks that may be expected to be permanent may not threaten to touch off an inflationary spiral.[1] Indeed, Mishkin (2007) argues that an energy price shock may not merit a tightening of the monetary policy stance "as long as the permanent change in relative energy price does not lead to a change in the underlying trend rate in inflation—a crucial assumption." If one accepts this view, a key question is where and when that crucial assumption about the resilience of underlying inflation trends holds true. We try to answer this question by examining the influence of oil and food price shocks on overall inflation and on monetary policy in South Africa and a number of other countries since the late 1980s.

Figure 1. Food and Price Shocks in Perspective



Source: *WEO*, April and June 2008.

The paper starts with a discussion of "first and second round effects" of supply shocks and identifies evidence of second round effects in South Africa. It follows with an econometric analysis of monetary policy responses to supply shocks in a number of countries after the 1980s. We then examine in some detail a number of recent monetary policy decisions in several inflation-targeting countries to get a better sense of what determines central bank responses to these shocks. The final section offers concluding remarks. Before proceeding, a point on terminology: increases in the prices of food and fuel are often seen as "supply

[1] The period of analysis covered in this paper predates the fall in oil prices and in the main stock exchanges in the world that took place in late 2008.

shocks"; however, the rise in these prices in the last few years are demand driven on a global scale, even if from a single country perspective they look like supply shocks. Thus, we will call them "relative price shocks," and we will refer to the rise in the prices of all other consumer goods as "underlying inflation."[2]

II. First and Second Round Effects of Relative Price Shocks

In September 2005, in the wake of Hurricane Katrina, which caused major temporary disruptions to the US oil industry, the Reserve Bank of New Zealand (RBNZ) issued the following statement: "Monetary policy will not attempt to offset the unavoidable first round price effects of the oil spike. However, it will be used to resist any flow-through to ongoing price and wage inflation." This statement is representative of the view that monetary policy should be concerned only with containing the second round effects of relative price shocks. This approach can be interpreted as implicitly targeting underlying inflation, whatever the formal target may be. There is a small literature on the inflation index one should target in the presence of relative price shocks (e.g. Aoki (2001); Kamps and Pierdzioch (2002)). These papers often favor indexes that abstract from such shocks, such as "core" or domestic inflation indexes, largely to prevent policy mistakes from responding to noisy shocks.

However, first and second round effects may be hard to distinguish in practice. The first round effect of increases in certain food and fuel prices is often taken to be their *direct* impact on the general price index, although conceptually the *indirect* cost-push effects on low-margin goods that use food and fuel as inputs should be considered as first round too, given the virtually assured pass-through. In South Africa, food represents 26 percent of the CPIX basket;[3] gasoline accounts for 5.1 percent of the basket. Using the 2002 input-output matrix, we estimate that the total (direct plus indirect) first round effect of a 1 percent rise in the prices of a broad set of food items is a 0.35 percent rise in the cost of consumption.[4] However, indirect first round effects may only happen after a lag, making it difficult to distinguish them from other effects. Moreover, when faced with a series of shocks, distinguishing first round effects from other effects becomes harder. For practical reasons, in the statistical analysis that follows we use the narrower definition of first round effects; but even then it is clear that South Africa has a significant exposure to these shocks.

The second round effects of relative price shocks include their eventual impact on inflation expectations, wage settlements, and price setting in the economy at large—in this section, we will concentrate on effects on economy-wide inflation and on inflation expectations due to

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[2] In some countries the latter would correspond to the concept of "core inflation."

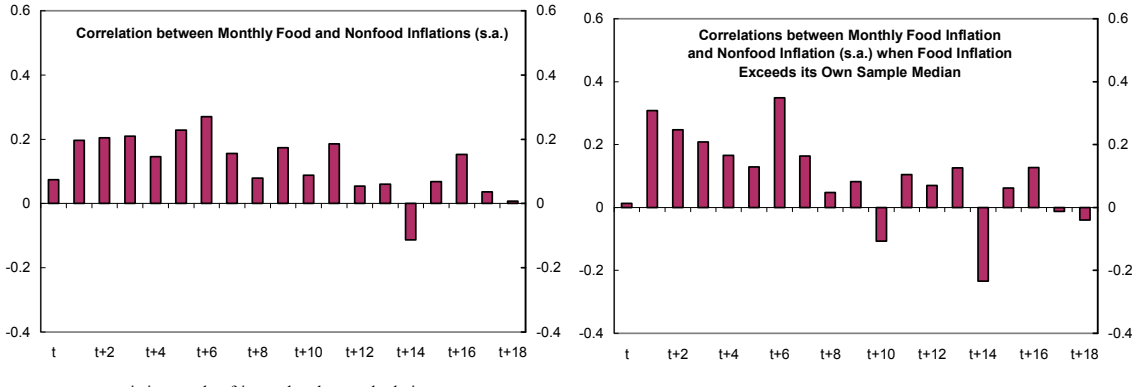
[3] CPIX is CPI excluding the interest on mortgage loans.

[4] The goods are agricultural products, meats, fish, fruit and vegetables, and several other products, accounting for 26 percent of household consumption in the 2002 input-output table. See Statistics South Africa (2006).

the low frequency (semi-annual) of available wage data for South Africa. Second round effects propagate through direct and indirect channels—i.e., inflation expectations might react both to oil price shocks and to headline inflation, which incorporates first round shocks. These effects may unfold over long periods of time, and may evolve in complex ways. For example, a rise in the price of food will boost CPI directly and raise costs where food is used as an input; but it will also reduce consumers' purchasing power, depressing demand for other goods (and/or at a later stage). Second round effects may also be instantaneous, actually preceding first round impacts, in the same way that an announcement can have an impact before the action takes place. Thus, if world oil prices surge, this might boost inflation expectations even before domestic fuels prices have been updated.

Partial evidence of second round effects in South Africa can be obtained by looking at certain correlations. The left-hand chart in Figure 2 shows correlations between monthly food and nonfood inflations at various time horizons for the period January 2000-March 2008, using seasonally adjusted data. A rise in food prices (our relative price shock) tends to be followed by upward movements in nonfood inflation, peaking at lags of about six months. The positive correlations are suggestive of pass-through from food to nonfood prices; but they appear moderate. The right-hand-side chart restricts the analysis to cases in which the change in food prices was above its own sample median. We observe that in this case the correlations are higher earlier, suggesting the presence of threshold effects whereby second round effects are more intense when the original shock is larger; we again observe a peak at sixth months, suggesting semiannual price revisions in South Africa. This simple bivariate analysis is not conclusive, though, since food and nonfood inflation might just be responding with different speeds to some third factor, such as exchange rate changes. Also, as we warned earlier, we use a narrow definition of first round effects, and thus some of the movements in the price of non-food items could be indirect first round effects, instead of true second round effects.

Figure 2. Evidence of Second Round Effects of Shocks to Food Prices



Sources: Statistics South Africa and IMF staff's calculations.

Further evidence of pass-through from relative price shocks to general inflation was obtained from Granger causality tests. Tests using one and two lags indicate that monthly food and

fuel inflation helps forecast inflation in the rest of the price index in South Africa (marginally for two lags), but not the other way around. Adding more lags to the tests reduces the significance of the results, but in all cases higher F statistics are obtained when trying to reject the null that food and fuel inflation does not cause underlying inflation in South Africa.

Table 1. Granger Causality Tests

	Lags: 1		Lags: 2	
Null Hypothesis:	F-Statistic	Probability	F-Statistic	Probability
FOOD&FUEL does not Granger Cause REST	5.238	0.024	2.309	0.104
REST does not Granger Cause FOOD&FUEL	0.266	0.607	0.034	0.967

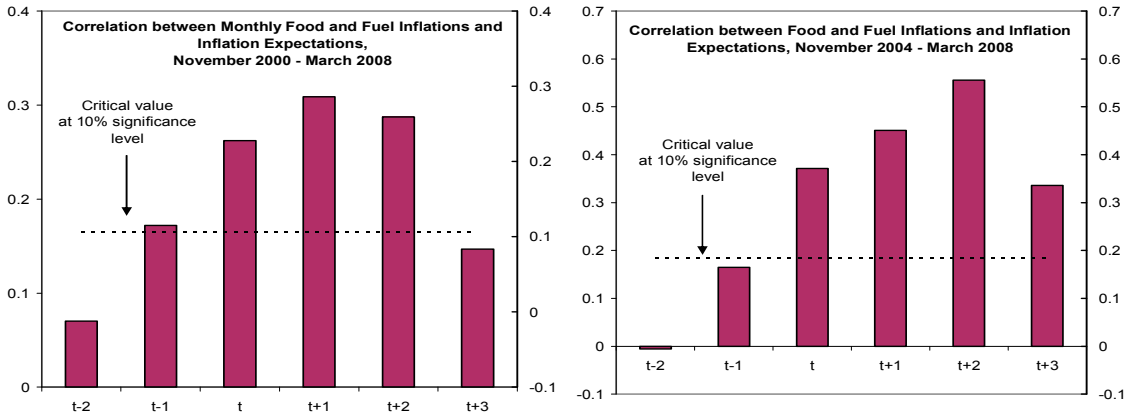
Sample: 1998M01- 2008M03

The second round effects of relative price shocks can also be observed in the correlations between monthly changes in the food and fuel components of the CPI and changes in medium- to long-term inflation expectations (inflation expectations are measured as the spread between CPI-indexed and regular government bonds of comparable maturity[5]). The left-hand-side chart in Figure 3 shows these correlations for the period November 2000-March 2008.[6] As already noted, inflation expectations can respond to relative price shocks as soon as these are observed. In the case of food prices, market players observe the CPI publication of Statistics South Africa, which is released with a lag of one month. In the case of fuel prices, they only need to observe the international price of oil; however, the first round impact of the oil price shock on the fuel component of the CPI occurs one-to- two months later because of the particulars of the mechanism for fuel price setting in South Africa. Therefore, we estimate correlations between the observed change in the oil and food components of CPI at time *t*, on the one hand, and changes in inflation expectations both before and after time *t* on the other. We find that a rise in food and fuel prices tends to lead to an increase in inflation expectations, starting two months earlier than the measured change in CPI, and peaking one month later. The positive correlations suggest the presence of second round effects of relative price shocks. The right-hand-side chart intends to capture threshold effects by looking at the same correlations only from November 2004 to March 2008, when food and fuel prices were systematically above their sample median. We observe that, in this case, the correlations are generally stronger, but, surprisingly, peak at a lag of two months.

[5] The bonds are the CPI-indexed R179, maturing on January 8, 2013, and R186, maturing on March 31, 2013.

[6] See Kymn (1968) for a derivation of critical values.

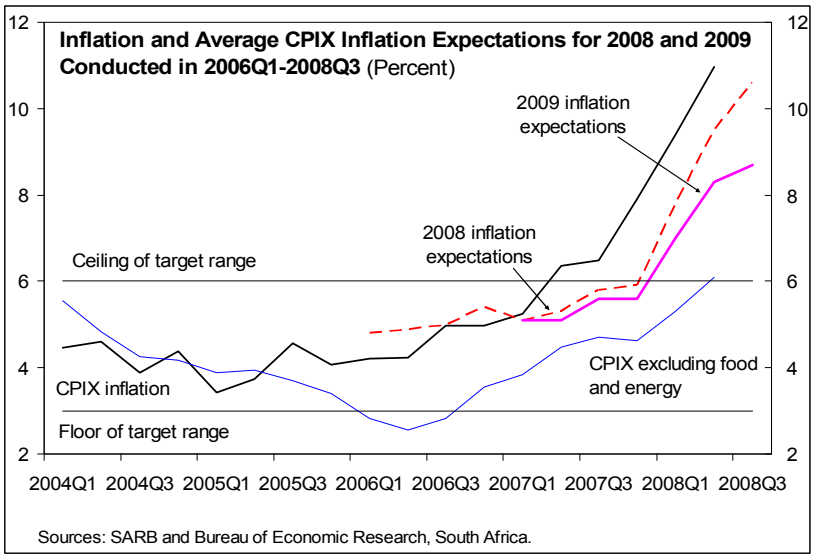
Figure 3. Effects of Relative Price Shocks on Inflation Expectations



Sources: Statistics South Africa, Datastream, and IMF staff's calculations.

Second round effects from recent relative price shocks appeared to be under way in South Africa in 2008. Inflation expectations stood well above the upper limit of the target band and growth in the CPIX without food and fuel has been accelerating (Figure 3). Thus, in terms of Mishkin's "crucial assumption" cited above, it seems that in 2008 in South Africa underlying trend rates of inflation were being affected by relative price shocks, and that, historically, large relative price shocks have contributed to movements in underlying inflation.

Figure 4. Second Round Effects May Already Be in Train in South Africa



III. Historical Perspective on Monetary Policy Responses to Relative Price Shocks

In this section, we use regression analysis to characterize the behavior of several central banks in the face of relative price shocks since the late 1980s, by which time the lessons from the 1970's and 1980's oil shocks can be expected to have been absorbed. We estimate policy response functions for Australia, Iceland, New Zealand, Norway, and the UK, and Brazil, Colombia, Chile, Korea, Turkey, and South Africa, all of which now have inflation targeting frameworks. We estimate these reaction functions both for the periods since each country's date of adoption of inflation targeting and for periods that start much earlier, going back several years where data allows it (see the appendix for a description of the data). This helps determine whether policy reactions have been different under inflation targeting.

We start from the premise that (i) when facing relative price shocks, central banks try only to contain their second round effects, and (ii) they will not use their policy levers unless they have reason to believe that underlying trends in inflation are placed at risk by those shocks. This premise is not limiting, and in fact we can do little better than to adopt it, as it would be virtually impossible to determine whether an observed policy action was an attempt to undo first round effects or to contain second round effects of a shock. When we look at the behavior of the central banks in our sample, we find that it is not uncommon for them to react strongly to relative price shocks. This can be taken as evidence that such shocks have often been seen as a threat to underlying inflation. This would confirm that the lessons from the 1970's and early 1980's have been internalized.

The basis of all models is a policy rule that allows for differentiated responses to "relative price inflation" and underlying inflation. A simple model of this type is the following:[7]

$$i_t = \alpha + \beta_{und}\ \pi_t^{Und} + \beta_{rel}\ r_t + \lambda\ z_t + \gamma\ y_t + \varepsilon_t \qquad (1)$$

In expression (1), i_t is the nominal policy interest rate; π_t^{und} is underlying inflation in the last 12 months, z_t is the nominal *depreciation* of a country's currency during the same period, y_t is the output gap, and r_t is an indicator of relative price movements for key products (food and fuel). Underlying inflation, as noted previously, denotes the rate of inflation excluding food and fuel items. The relative price variable r_t is the residual from an auxiliary regression of headline inflation against underlying inflation—and thus reflects the component of the change in oil and food prices that is uncorrelated to changes in the prices of all other goods. In richer countries where food has a small weight in the headline price index, underlying

[7] Taylor's (1993) pioneering work on policy rules had an even simpler rule, including on the right hand side only general inflation and the output gap.

inflation should be a more satisfactory predictor of headline inflation, reducing the influence of r_t on headline inflation (see the appendix for a fuller explanation).[8]

One might expect $\beta_{rel} = 0$ and $\beta_{und} > 0$ in cases where inflation expectations are well anchored and underlying inflation is not vulnerable to relative price shocks—that is, where Mishkin's crucial assumption holds. But even if a bank is focused on second round effects only, sensitivity of underlying inflation to relative price shocks could motivate $\beta_{rel} > 0$. (This is similar to the inclusion of an output gap in a Taylor rule for a central bank which has only an inflation objective: the output gap is there because if affects the inflation outlook.) Thus, β_{rel} reflects the central bank's views on the inflation risks from relative price shocks.

Equation (1) and its variants may be subject to bias because the right-hand side variables could react to interest rate changes—this is especially clear for the exchange rate. Thus, we ran the ordinary least squares (OLS) regressions replacing the right-hand side variables with their one-period lags. This could also be justified on grounds that some of these variables are observed by policy makers with a lag. We also estimated the regressions with instrumental variables (IV), using as instruments six month's worth of lags of our inflation variables and of the exchange rate. Table 2 shows both OLS and IV results for equation 1 using the longest sample periods available, which in several cases start well before the adoption of inflation targeting. The results of OLS and IV are qualitatively similar, but the magnitude of some OLS coefficients appears somewhat more plausible. An additional difficulty arises because r_t is a "generated regressor," a factor which does not affect the consistency of least squares coefficients, but which generally leads to the underestimation of their true standard errors. This deficiency arises because conventional statistical techniques do not take into consideration that r_t is itself calculated using coefficients estimated in an earlier regression. We followed the procedure proposed in Murphy and Topel (1985) to calculate corrected standard errors.

Our approach, based on single equation estimation procedures, differs from that of Harjes and Ricci (2008) and Ortiz and Sturzenegger (2008), who estimate small macro models with Bayesian methods in order to obtain consistent estimates of monetary policy reaction functions for South Africa and other countries. Their results are broadly consistent with ours, as we will discuss below.

[8] The use of this variable allows us to include in the analysis countries for which indices of food and fuel prices are not available, and could not be derived from information on headline and underlying inflation. Were such information available, one could substitute the growth in a food and fuel price index for r_t in expression (1). The resulting regression coefficients and their interpretation would be different, but the information contained in the analysis would not change. We also estimated the policy response function with a version of r_t defined as the ratio of total inflation to underlying inflation. The results were very similar to those we report in the paper.

Table 2. Estimation of Equation 1 for Selected Countries

Policy Interest Rate as in Equation 1 with OLS on lagged right-hand-side variables

	United Kingdom	Australia	New Zealand	Norway	Iceland	Korea	Colombia	Chile	Turkey	Brazil	South Africa
Underlying inflation(t-1)	**0.423**	**1.443**	**1.373**	**1.825**	**0.815**	**1.624**	**1.738**	**1.070**	**1.580**	**0.591**	**1.532**
	6.34	*5.97*	*6.20*	*4.28*	*4.61*	*13.57*	*6.26*	*10.63*	*7.14*	*3.40*	*9.75*
"Relative price" shocks(t-1)*	**1.673**	-0.174	0.081	-0.099	0.669	0.233	**1.406**	-0.453	-0.620	-1.194	0.217
	13.90	*-0.76*	*0.32*	*-0.31*	*1.27*	*0.66*	*2.17*	*-2.58*	*-2.05*	*-3.05*	*1.12*
Output gap(t-1)	**0.006**	**0.004**	**0.018**	-0.002	0.001	0.003	**0.000**	0.002	0.000	0.001	-0.002
	4.270	*2.52*	*2.12*	*-1.43*	*0.38*	*0.84*	*2.52*	*1.14*	*-0.19*	*0.51*	*-1.13*
Depreciation(t-1)	**0.063**	-0.026	**0.048**	-0.012	0.018	**0.071**	-0.034	0.004	-0.008	0.030	**0.052**
	3.640	*-1.3*	*2.2*	*-0.41*	*0.7*	*2.74*	*-1.48*	*0.16*	*-0.27*	*1.18*	*2.8*
R-squared	0.835	0.603	0.433	0.569	0.435	0.654	0.641	0.808	0.559	0.305	0.663
Observations	120	72	71	25	59	121	47	31	52	46	61
Frequency	Bimonthly	Quarterly	Quarterly	Bimonthly	Bimonthly	Bimonthly	Bimonthly	Bimonthly	Monthly	Bimonthly	Bimonthly
Sample dates	Jan'88 - Jan'08	Q1'90 - Q4'07	Q2'89 - Q4'07	Dec'02 - Feb'08	Mar'97 - Feb'08	Jan' 88 - Mar'08	Dec'98 - Oct'07	Jan'03 - Feb'08	Jan'04-Apr'08	July'00-May'08	Jan'98 - Feb'08

Source: IMF staff estimates based on central bank and statistical institute data.
Coefficients in boldface are significant at the right-hand-side 5 percent level or better. t-statistics in italics are based on standard errors corrected using the Murphy-Topel procedure. Regressions' constants not shown.
* Residuals from a regression of headline inflation on underlying inflation and a constant.

Policy Interest Rate as in Equation with instrumental variables

	United Kingdom	Australia	New Zealand	Norway	Iceland	Korea	Colombia	Chile	Turkey	Brazil	South Africa
Underlying inflation(t)	**0.408**	**7.636**	**1.271**	**2.881**	**0.994**	**1.747**	**1.972**	**1.015**	**3.827**	**0.559**	**1.494**
	5.71	*7.28*	*3.67*	*2.73*	*4.71*	*14.57*	*4.88*	*6.08*	*3.38*	*3.39*	*11.47*
"Relative price" shocks(t)*	**1.730**	-0.325	-0.144	0.165	0.721	0.038	**2.858**	-1.146	-1.903	-1.631	**0.629**
	13.70	*-1.23*	*-0.36*	*0.24*	*0.99*	*1.14*	*2.35*	*-4.06*	*-2.49*	*-4.13*	*3.41*
Output gap(t)	-0.003	**0.004**	0.015	0.002	0.001	0.957	0.000	0.003	-0.002	0.002	-0.007
	-0.51	*2.54*	*1.39*	*0.96*	*0.71*	*1.66*	*0.61*	*1.29*	*-1.15*	*0.54*	*-2.67*
Depreciation(t)	**0.061**	-0.053	0.028	-0.009	-0.014	0.002	-0.071	-0.029	-0.201	0.046	**0.037**
	2.79	*-1.98*	*0.99*	*-0.1*	*-0.4*	*0.62*	*-1.62*	*-0.99*	*-1.61*	*1.68*	*2.15*
R-squared	0.819	0.585	0.245	0.416	0.420	0.680	0.486	0.624	.	0.308	0.736
Observations	117	72	69	22	56	121	45	31	46	44	57
Frequency	Bimonthly	Quarterly	Quarterly	Bimonthly	Bimonthly	Bimonthly	Bimonthly	Bimonthly	Monthly	Bimonthly	Bimonthly
Sample dates	Jan'88 - Jul'07	Q1'90 - Q4'07	Q2'89 - Q2'07	Dec'02 - Aug'07	Mar'97 - Aug'07	Jan' 88 - Mar'08	Dec'98 - Jun'07	Jan'03 - Feb'08	Jan'04 - Oct'07	July'00-Jan'08	Jan'98 - Jun'07

Source: IMF staff estimates based on central bank and statistical institute data.
Coefficients in boldface are significant at the right-hand-side 5 percent level or better. t-statistics in italics are based on standard errors corrected using the Murphy-Topel procedure. Regressions' constants not shown.
* Residuals from a regression of headline inflation on underlying inflation and a constant.
** Lag *a* equals 2 if bimonthly data, and 1 if quarterly data.

Table 3. Distribution of the OLS Coefficient on Underlying Inflation

	Model variant	*Coefficient is positive and significant at 10%*	*Statistically insignificant at 10% (one-tailed test)*
1	Equation 1	Aus, Bra, Chl, Col, Ice, Kor, NZ, Nor, SA, Tky, UK	
2	Replaces π_t^{und} with its one-year lead	Aus, Bra, Chl, Ice, Kor, Nor, SA, UK	Col, NZ, Tky
3	Oil price replaces r_t	Aus, Bra, Chl, Col, Ice, Kor, NZ, Nor, SA, UK	Tky
4	Combines variants (2) and (3)	Aus, Bra, Chl, Col, Ice, Kor, NZ, SA, UK	Nor, Tky

Source: IMF staff's estimates based on data from central banks.

Table 4. Distribution of the OLS Coefficient on Relative Price Shocks

	Model variant	*Coefficient is positive and significant at 10%*	*Statistically insignificant at 10% (one-tailed test)*
1	Equation 1	Col, UK	Aus, Bra, Chl, Ice, Kor, NZ, Nor, SA, Tky
2	Replaces π_t^{und} with its one-year lead	Chl, Ice, UK	Aus, Bra, Col, Kor, NZ, Nor, SA, Tky
3	Oil price replaces r_t	Col, UK	Aus, Bra, Chl, Ice, Kor, NZ, Nor, SA, Tky
4	Combines variants (2) and (3)	Ice	Aus, Bra, Chl, Col, Kor, NZ, Nor, SA, Tky, UK

Source: IMF staff's estimates based on data from central banks.

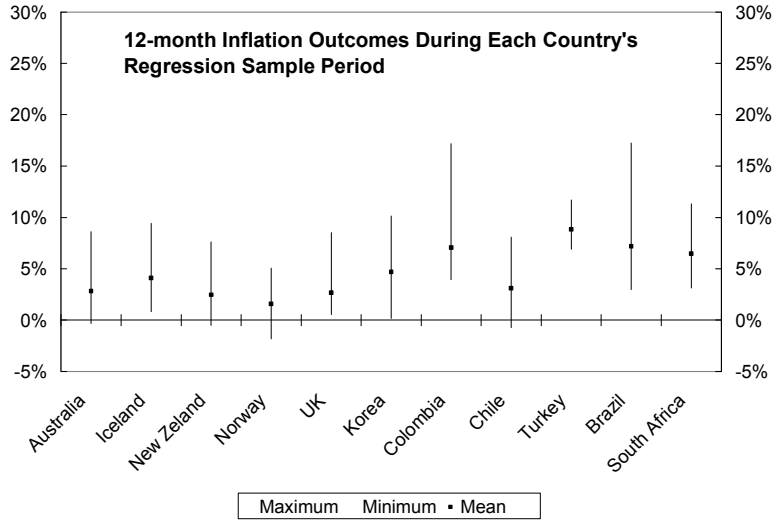
We estimated several variants of the basic model, including by replacing π_t^{und} with its one-year lead to capture inflation expectations, and replacing r_t with the change in world oil prices measured in local currency.[9] Tables 3 and 4 report the results of OLS regressions for all variants of the basic model, presenting summary information on the two coefficients of highest interest: those on the underlying and relative price inflation variables.

A majority of countries and models feature significant responses to underlying inflation, but not to relative price shocks. Regressions for New Zealand provide the clearest example of this configuration. In these countries, it seems that underlying inflation has been resilient to relative price shocks, so that any policy reactions aimed to contain second round effects have been small or infrequent enough to be statistically indistinguishable from the absence of a reaction. In these cases, there seems to be little doubt that central banks have not been keen to react to relative price shocks, acting instead as if they were targeting underlying inflation.

[9] All models were also run with a lag of i_t on the right hand side to allow for gradual policy reactions as in Clarida, Gali and Gertler (1998). Including the lagged variable reduced the explanatory power of other variables in most regressions. These results are omitted in the interest of brevity.

There are some other countries (Colombia, Chile, Iceland, South Africa and the UK) where the policy rate does respond to relative price inflation in at least some specifications. Based on the initial premise we put forward, this suggests that central banks in these countries take action in anticipation of possible threats to underlying inflation. What could explain this? Compared to New Zealand, countries such as Colombia and South Africa have a higher exposure to food shocks and during the sample period experienced relatively higher inflation (Figure 5).[10] The central banks in these countries might therefore be more concerned about the effects of relative price shocks on inflation expectations. Thus, results displayed in Tables 2 and 4, where these countries' regressions sometimes show a significant role for relative price shocks, is not surprising. But this argument does not apply to the UK, which shows $\beta_{rel} > 0$ despite its moderate inflation, nor to Brazil, where relative price shocks do not seem to affect policy despite a relatively higher inflation in the sample period.

Figure 5. Indicators of Inflation in Sample Countries



Sources: Staff estimates based on central banks and statistical institutes data.

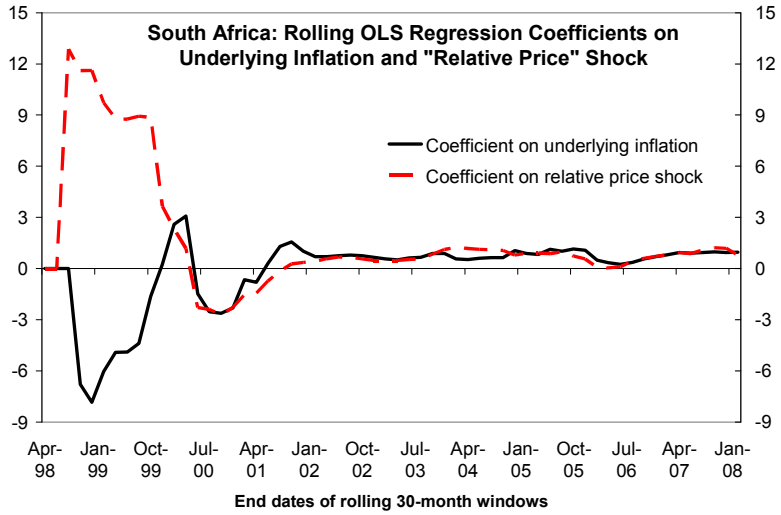
It may be that the sample period encompasses more than one distinct monetary policy "regime," whose average policy response function has the features shown above. Indeed, six of our countries adopted inflation targeting well after the start of the sample periods covered in our regressions: Australia, Iceland, Korea, South Africa, Turkey, and the UK. To explore the relevance of this fact, we ran again our Table 1 regressions for those countries on sample sets starting only once inflation targeting was in place (in the case of the UK, we also ran a regression on a sample starting when the Bank of England gained its formal autonomy in 1997, nearly five years after inflation targeting was adopted). The results, shown on Table 5,

[10] Note, however, that different societies may not have the same tolerance of inflation, a factor we do not explore here.

confirm and indeed strengthen the result that monetary policy in the UK does react to relative price shocks—and adds the Reserve Bank of Australia to the group of banks which do so. Again, the reason for the difference in the results for New Zealand, on the one hand, and the UK and Australia on the other is not apparent.

In the case of South Africa, Table 5 strengthens the result that policy rates react to relative price shocks. Indeed, monetary policy has become more systematic with the adoption of inflation targeting in 2001. Figure 6 depicts rolling regression estimates of equation 1 for South Africa using 30-month windows. The coefficient measuring the policy reaction to relative price shocks diminished and stabilized at a positive level similar to that of the coefficient on underlying inflation after the adoption of inflation targeting. Prior to that, both coefficients are unstable, very large in absolute value, and bear opposite signs.[11] The behavior of these coefficients in the early part of our sample is likely due to the strong movements in the interest rate in response to large exchange rate swings observed at that time.

Figure 6. Rolling Estimates of Equation 1 for South Africa



Sources: Statistics South Africa and IMF staff's estimates.

Like Harjes and Ricci (2008) and Ortiz and Sturzenegger (2008), we find that the SARB has a strong focus on consumer inflation. Our models, however, allow us to note that the SARB seems to react both to underlying inflation and relative price shocks. Also, while Ortiz and Sturzenegger (2008) find that the SARB's overall policy reaction function has been remarkably stable in the period from 1984 to 2006, we find that the SARB's policy reaction

[11] Charts for rolling regression coefficients estimated with IV, and also using directly food and fuel inflation instead of r_t (not shown) have similar characteristics.

function has become more stable and its response to relative price shocks has become more aggressive in the period under inflation targeting.

Table 5. Re-Estimation of Equation 1 for the Period Under Inflation Targeting

Policy Interest Rate as in Equation 1 with OLS on lagged right-hand-side variables after the introduction of inflation targeting							
	United Kingdom (I)	United Kingdom (II)	Australia	Iceland	Korea	Turkey	South Africa
Underlying inflation(t-1)	**0.182**	**0.173**	**0.258**	**1.510**	-0.235	**0.861**	**1.001**
	2.33	*2.03*	*1.90*	*4.15*	*-1.84*	*2.18*	*11.30*
"Relative price" shocks(t-1)*	**0.843**	**0.798**	**0.369**	0.885	0.219	0.505	**0.772**
	4.09	*3.23*	*2.31*	*0.97*	*1.12*	*0.96*	*7.65*
Output gap(t-1)	**0.003**	**0.003**	0.001	0.003	0.000	0.000	0.000
	2.190	*2.33*	*0.83*	*1.08*	*0.14*	*-0.18*	*0.06*
Depreciation(t-1)	**0.031**	**0.062**	-0.007	-0.017	**0.058**	-0.052	0.006
	3.120	*4.1*	*-0.76*	*-0.25*	*3.06*	*-1.24*	*1.38*
Constant	**0.056**	**0.055**	**0.048**	0.025	**0.052**	**0.088**	**0.042**
	46.020	*30.81*	*16.35*	*1.36*	*17.22*	*2.55*	*16.73*
R-squared	0.200	0.196	0.201	0.572	0.427	0.311	0.951
Observations	92	64	57	35	57	29	48
Frequency	Bimonthly	Bimonthly	Quarterly	Bimonthly	Bimonthly	Monthly	Bimonthly
Sample dates	Oct'92 - Jan'08	May'97 - Jan'08	Q4'93 - Q4'07	Mar'01 - Feb'08	Apr' 98 - Mar'08	Jan'06-Apr'08	Feb'00 - Feb'08

Source: IMF staff estimates based on central bank and statistical institute data.
Coefficients in boldface are significant at the right-hand-side 5 percent level or better. t-statistics in italics are based on standard errors corrected using the Murphy-Topel procedure. Regressions' constants not shown.
* Residuals from a regression of headline inflation on underlying inflation and a constant.
In United Kingdom (I), sample period starts after inflation targeting was introduced.In United Kingdom (II), sample period starts after Bank of England gained its independence.

Policy Interest Rate as in Equation with instrumental variables after the introduction of inflation targeting							
	United Kingdom (I)	United Kingdom (II)	Australia	Iceland	Korea	Turkey	South Africa
Underlying inflation(t)	**0.198**	**0.183**	0.210	**2.158**	**-0.273**	**3.514**	**1.094**
	2.45	*2.07*	*1.20*	*2.67*	*-0.81*	*2.21*	*10.74*
"Relative price" shocks(t)*	**0.937**	**0.777**	**0.476**	1.558	0.808	-3.521	**0.864**
	3.37	*2.53*	*2.58*	*0.64*	*0.53*	*-1.37*	*6.58*
Output gap(t)	0.004	**0.002**	0.000	0.004	0.000	-0.002	-0.001
	1.71	*0.89*	*0.37*	*1.67*	*0*	*-1.02*	*-1.32*
Depreciation(t)	**0.038**	**0.061**	-0.016	-0.189	**0.076**	-0.149	-0.006
	2.6	*3.31*	*-1.31*	*-0.83*	*1.90*	*-1.67*	*-1.11*
Constant	**0.056**	**0.055**	**0.049**	-0.014	**0.053**	-0.112	**0.038**
	39.4	*28.14*	*11.51*	*-0.28*	*5.93*	*-0.93*	*10.68*
R-squared	0.139	0.175	0.172	0.497	0.000	0.000	0.917
Observations	92	64	57	35	57	28	47
Frequency	Bimonthly	Bimonthly	Quarterly	Bimonthly	Bimonthly	Monthly	Bimonthly
Sample dates	Oct'92 - Jan'08	May'97 - Jan'08	Q4'93 - Q4'07	Mar'01 - Feb'08	Apr' 98 - Mar'08	Jan'04 - Feb'08	Jan'98 - Dec'07

Source: IMF staff estimates based on central bank and statistical institute data.
Coefficients in boldface are significant at the right-hand-side 5 percent level or better. t-statistics in italics are based on standard errors corrected using the Murphy-Topel procedure. Regressions' constants not shown.
* Residuals from a regression of headline inflation on underlying inflation and a constant.
** Lag *a* equals 2 if bimonthly data, and 1 if quarterly data.
In United Kingdom (I), sample period starts after inflation targeting was introduced.In United Kingdom (II), sample period starts after Bank of England gained its independence.

IV. Recent Monetary Policy Decisions Around the World

The statements and minutes released to the press by the monetary authorities in our sample countries between mid-2007 and mid-2008 indicate that the responses to relative price shocks

are not mechanical, but vary according to the relevant context.[12] The releases reveal concern over oil and food prices throughout the world. However, these shocks, global in nature and thus a source of inflation risk in virtually all countries, play out differently in each case depending on recent inflation, the likely future trajectory of inflation, the state of expectations, the strength of demand, and other factors.[13] The three responses we examine are tightening, easing, and lengthening of the policy horizon (we do not discuss the choice to leave rates unchanged because we discuss easing, a more extreme choice).

A common action in the period of analysis was to raise the policy rate. Table 6 presents some detail on a few of these tightening decisions. In virtually all cases, the rise in food and fuel shocks is mentioned as an inflation risk. However, other concerns which raised the vulnerability to those shocks were also mentioned. In particular, tightening occurred where underlying inflation, headline inflation and/or inflation expectations were already a cause for concern and other sources of inflation pressure were at work—usually strong aggregate demand or currency depreciation.

Table 6. Selected Recent Tightening Decisions

Country / date	Decision	Food and fuel shocks	Inflation: recent and outlook	Demand factors	Other considerations
Australia March 2008	Hike, 25 bp	Press release discusses commodity prices as TOT shock to demand	High headline inflation 2007; high underlying inflation	Demand growth outpacing capacity	Tight labor market
New Zealand July 2007	Hike, 25 bp	Mentions rising food and fuel prices as inflation risk	High, rising domestic (nontraded) inflation	High levels of capacity utilization	Tight labor market; but strong currency
Colombia Feb. 2008	Hike, 25 bp	Food caused inflation to breach band	Nonfood inflation and expectations have been rising	Demand has slowed down, but still strong	No sign of impact from global slowdown
Chile June 2008	Hike, 50 bp (larger than previous increases)	Supply shocks raised inflation (headline and core) and expectations	Well above target's "tolerance range"	Strong demand growth	Labor market and wages still stable
Turkey May 2008	Hike 50 bp (start of a tightening cycle)	Aim to contain second round effects of food and fuel	Inflation gets farther away from band, projected to stay high	Slowing demand supports disinflation	Pass-through from currency depreciation

Sources: Various central banks' press releases and published minutes.

[12] In this section we add Canada to increase the variety of experiences analyzed.

[13] Also, the pass-through from international to domestic prices is affected by institutional arrangements.

Despite the rise in food and fuel prices, some central banks decided to ease monetary policy (Table 7). In most such decisions two factors were key: (i) the risk of recession either mitigated or outweighed the inflation risk from relative price shocks, and (ii) trends in headline and underlying inflation seemed reasonably subdued at the time of the easing decisions. An exception was Turkey, where the inflation rate was well above its target; yet, even in that case, an argument was made that previous tightening and softening demand conditions implied that inflation would move down toward the target.

Table 7. Selected Recent Easing Decisions

Country / date	Decision	Food and fuel shocks	Inflation: recent and outlook	Demand factors	Other considerations
Brazil July and Sep. 2007	Cut rates 50 bp + 25 bp—end of easing cycle	Risk from global inflation mentioned in minutes released to the press	Inflation projected within target; stable expectations	Early signs of demand strength	Import growth a relief valve
Canada Jan. and March 2008	Cut rates, 25 bp + 50 bp	Not mentioned in these press releases	Headline 2.2 percent and core 1.4 percent in 2007	Strong demand in 2007; but concern over US slowdown	Strong Canadian dollar
United Kingdom Dec. 2007 and Feb. 2008	Cut rates, 25 bp + 25 bp	Food and oil to raise inflation "quite sharply;" pressures to fade away later; lesser upward risk	Essentially on target (2.1 percent); but measures of expectations "currently elevated"	Concerns over deceleration abroad and at home; larger downward risk	Financial sector shocks, tighter monetary conditions
Turkey Dec. 2007 and Jan. 2008	Cut rates, 50 bp + 25 bp (part of an easing cycle started in Sept. 2007)	Supply shocks raised inflation temporarily; but also weakened demand. Will look out for 2nd round effects	Outside target; but projected to fall despite risks from food and fuel	Slowing demand supports disinflation	Monetary tightening from 2007 still working through system

Sources: Various central banks' press releases and published minutes.

The Bank of England's decisions to cut rates reported in Table 7 offer an interesting counterpoint to the evidence from the previous section of the paper. There we found that, other things constant, the BoE tends to react actively to relative price shocks. In Table 7, however, we see clearly that other things were not constant, and that upward risks to inflation

from high fuel and food prices were more than offset by growing downward risks arising from illiquidity in financial markets and weakening demand conditions.
In addition to changing their policy rates, some central banks have decided implicitly or explicitly to extend their time horizon for bringing inflation back to target once it was forecast to exceed it. In the recent experience, the marked acceleration of inflation, combined with adherence to a gradual approach to tightening (the usual interest rate increases are still 25 or 50 basis points in most cases, with no indication that policy lags are getting shorter), imply a longer time until inflation returns to target. In Chile, for example, the June 2008 decision referred to the central bank's commitment to "reduce the current elevated inflation *toward* 3 percent in the policy horizon" (emphasis added). This choice is consistent with the overall inflation targeting framework, as we will more abundantly discuss below.

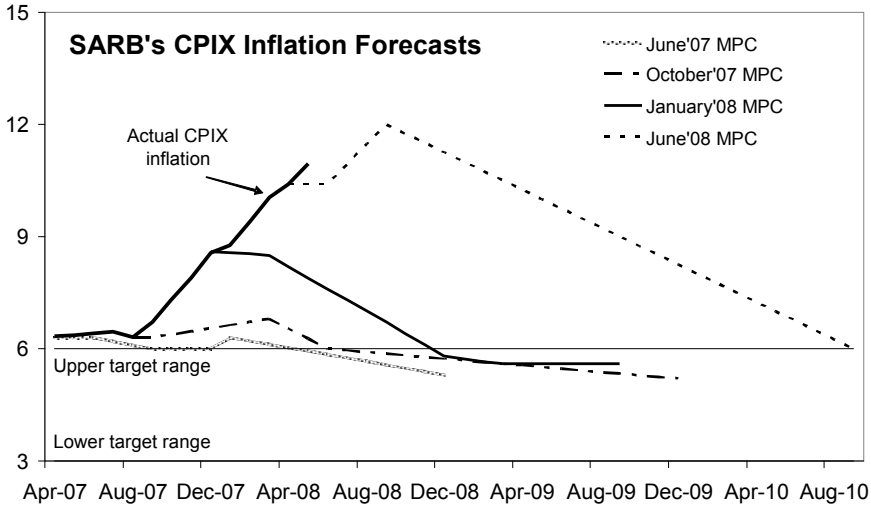
The only case in our sample where an explicit change was made to the inflation targeting framework was Turkey. In June 2008, Turkey's central bank, in conjunction with the government, announced it would increase its inflation targets for 2009, 2010 and 2011 to 7.5, 6.5, and 5.5 percent, respectively, from 4 percent. Having failed to meet their inflation targets of 5 percent in 2006 and 4 percent in 2007, and with headline inflation pushing into double digit range, the monetary authorities argued that food and energy shocks that were expected to persist in the coming months would make it impossible to meet the inflation target in the near term. They also explained that expectations were becoming increasingly backward-looking, and that the official target was losing effectiveness as an anchor for expectations. Finally, they indicated that their decision to revise the inflation targets for the next several years did "not necessarily mean that monetary policy will be looser in the forthcoming period." Although this decision may have been seen as producing more realistic targets, and thus improving monetary policy transparency, it entailed a risk that inflation expectations could become unhinged. In a sense, it risked freezing the impact of adverse relative price shocks on inflation expectations and foregoing possible benefits on expectations from a retreat in commodity prices such as the one taking place in the last months of 2008 (which markets did not foresee at the time of Turkey's decision).

Where does South Africa's Reserve Bank stand against this context? The Monetary Policy Committee (MPC) statements emphasize the containment of second round effects; but with a high degree of concern over the original shocks themselves. This is broadly consistent with our observations in the previous section, where we found that under some specifications and especially in recent years, relative price shocks seem to have had a bearing on monetary policy decisions. For example, the MPC statement described oil prices as a "threat" after Brent crude reached $70 dollars a barrel in April 2006. Still, like other central banks, the SARB reacted to these shocks only when context, especially ongoing headline and underlying measures of inflation, heightened their impact. Thus, it was not until June 2006 that the SARB started a tightening cycle, motivated by a deterioration in the general outlook for inflation.

After its interruption in early 2008, tightening resumed in April 2008, with supply shocks taking on a more prominent place in SARB's MPC statements. In that release, the SARB noted that the deteriorated inflation outlook reflected the impact of "a series of supply side shocks." A point highlighted in the press release was the large increase in inflation expectations, which had breached the inflation target band, as shown earlier in Figure 4. Essentially, the argument appeared to be that second round effects were under way and needed to be countered. Thus, hikes in oil and food prices were seen as requiring a strong response, as expectations, underlying inflation, and credibility were at risk.

The SARB seems also to have chosen, implicitly, to accept a possibly longer time to return inflation to the target band (Figure 7). This is especially clear in the June 2008 decision, when following a steep increase in headline inflation, and against expectations of a larger-than-usual interest rate hike, the SARB decided to increase the repo rate by the usual 50 basis points. In its policy statement, the SARB acknowledged that inflation would now take longer to return to the 3–6 percent target band.[14]

Figure 7. Implicit Lengthening of the Policy Horizon in South Africa



Sources: SARB, Statistics SA.

This raises the question whether there is an optimal horizon for bringing inflation back to within the target band. In practice, any such horizon should also be set against the broader economic context. It is clear that there are limits on the speed of convergence to the target

[14] On July 1, 2008, Statistics South Africa announced changes in the basket and weights for the CPI, which will be implemented with effect from the January 2009 CPI release. There are fewer goods in the new basket, and a lower weight is given to food products (18.8 percent of CPI as opposed to 26.6 percent) and a higher weight to durable goods. Some analysts estimate that inflation in South Africa in mid-2008 would have been about 2 percent lower had the changes in the CPI basket been implemented starting in January 2008.

dictated by the nature of the policy transmission mechanism and the lags that characterize it. Within those limits, some trade-offs can be faced. On the one hand, there could be upfront output costs of a more aggressive approach to disinflation. On the other, a more gradual approach could carry costs in terms of credibility and entrenchment of high inflation expectations, which in their turn could lead to higher sacrifice ratios and output costs of delayed attempts at disinflation down the road. These trade-offs are not static, but vary over time and with the state of the economy. Thus, in a context with significant uncertainties over the state of the cycle, as that which characterized 2008 in South Africa, some lengthening of the horizon was justified. Even so, the SARB did raise its policy rate in June 2008 with a view to ensuring that inflation would be placed on a downward path.

V. Concluding Remarks

Central bankers have distilled the lessons from the oil shocks of the 1970s and 1980s into a view that seeks to balance the acceptance of some inevitable effects of relative price shocks on the price level and the need to keep inflation under control, if necessary by pursuing an active monetary policy. This tension is reflected in a conceptual distinction between the first and second round effects of a relative price shock and the responses that policy should give to them. Indeed, inflation targeting central banks generally aim to resist the latter even as they accept the former.

In practice, however, distinguishing between the first and second round effects of relative price shocks is not always easy. The line between indirect first round effects and some second round effects can be blurred, as it depends on whether or not firms experiencing cost push pressures from the initial shock must inevitably pass them on to their clients. With many relative price shocks happening in succession, and with their various effects unfolding over time at different speeds, it may be difficult to tell whether a given rise in certain prices is of one type or the other, or a mixture of both. For policymakers and the public, therefore, it can be difficult to tell, at least initially, whether second round effects are in progress after some relative price shock has taken place.

Similarly, it may be difficult for an observer to ascertain that a central bank is organizing its policy around the distinction between first and second round effects. As long as the central bank remains inactive following a shock (and controlling for other factors), it might seem reasonably certain that it is not reacting to first round shocks—and its inaction may, in a positive light, be taken for confidence that eventual second round effects are unlikely to be significant. In our empirical work we identified some countries, such as New Zealand, where such seems to have been the typical behavior of the monetary authorities over long periods of time. But when a central bank changes its policy stance in the face of a relative price shock, it may be difficult for an observer to verify that the policy action is geared to preempt possible second round effects of the shock and not to try to offset its first round effects.

This difficulty can explain some of the criticism that has been lobbed at those central banks which have reacted to relative price shocks in recent times. This criticism essentially faults those central banks with excess zeal in seeking to resist that which is inevitable—that is, to combat first round effects. However, such criticism disregards the point that where inflation expectations and underlying inflation can be unhinged by those shocks and their effects, policy action is necessary—not to try to undo the first round effects of the shocks, but to contain their second round effects. The econometric analysis presented in this paper shows, indeed, that a number of effective central banks, including the Bank of England and the Reserve Bank of Australia, have under inflation targeting consistently leaned towards reacting to relative price shocks.

The implications from the evidence in this paper offer a complement to the standard discussion in favor of targeting a concept of inflation other than headline inflation. A common view is that in the presence of supply or relative price shocks, a "core" or underlying inflation target is superior because it reduces policy volatility and the risk of policy mistakes. Underlying this view is the notion that food and fuel ("non-core") inflation is largely noise—e.g., the prices of various agricultural products fall or rise as they go into and out of season, and the price of fuels rises in the northern Winter and falls back in the Spring. Thus, the recommendation to target core inflation, "ignoring" relative price shocks, is largely a recommendation to respond only to permanent supply shocks. Our examination of monetary policies in a number of inflation targeting countries, both developed and developing, suggests broader considerations: central banks take action where and when relative price shocks can pose a threat to underlying inflation. Verifying that risk certainly may include judging the likely duration of the shock, but it also extends to making an assessment of the economy's vulnerability to the shock, in general and at a particular point in time given the prevalent economic context. The emphasis is on judging the risks arising from the shock, rather than the durability of the shock itself. An important implication of this line of reasoning is that even if a central bank chooses to target a "core index," it will be well advised to remain vigilant of relative price shocks and even to act when those shocks may threaten to contaminate the general inflation process.

The evidence examined in this paper suggests that a policy of containment of second round effects may imply a relatively more aggressive stance against relative price shocks when the goods whose prices are spiking represent a large proportion of the consumption basket, and where there is a history of high and variable inflation. That said, the contrast between our results for Australia and New Zealand and for Brazil and South Africa illustrates how tricky it can be to predict how a given central bank will tend to respond to relative price shocks based on a few stylized features of the economy or its history. Further research is needed to identify the main structural features of an economy (including the degree of vulnerability of its price indexes to these shocks, but not stopping there) that would counsel a more aggressive approach to relative price shocks as a general rule.

When analyzing individual policy decisions, we also saw that specific reactions to relative price shocks are heavily dependent on the broader economic context shaping a country's inflation outlook. A more aggressive response to relative price shocks is usually observed in the presence of already high inflation and rising inflation expectations, and when strong demand and other factors generate baseline inflation pressures. The choice on the speed of disinflation once relative price shocks have pushed inflation above target is also a policy variable that is set taking into account the broad economic panorama. In these cases, the rise in headline inflation resulting from first round effects, and the long horizon for disinflation put a premium on effective communication of the nature of the ongoing shocks and the role of monetary policy.

The analysis of individual policy decisions also offers some counterpoint to a type of criticism sometimes directed at central banks, especially those under inflation targeting: that they might be pursuing procyclical policies. This concern is based on the generally accepted observation that adverse supply shocks pose a policy dilemma: they both tend to hurt output and to fuel inflation, and by responding aggressively to the latter, a central bank could worsen the former. Thus, a mechanical policy geared to respond to relative price shocks could be procyclical. However, as we could appreciate by looking at a series of specific monetary policy decisions in our sample of central banks, monetary policy decisions are far from mechanical, and even in the face of relative price shocks which many saw as permanent, some central banks chose to ease monetary policy taking into account the wider context in which inflation evolves. That said, most central bankers would likely agree with Ed Gramlich (2004), who wrote that although some additional unemployment and inflation may have to be accepted for some period of time, the best response is likely to involve policy rate increases because "[...] the worst possible outcome is for monetary policy makers to let inflation come loose from its moorings."

Against this background, we found the general approach to relative price shocks followed by the SARB under inflation targeting to be mainstream, and to display the features one would expect in a country where food and fuels make up a large part of the consumption basket, and where memories of relatively high inflation are still fresh. An examination of its specific policy actions in the last year also indicate that, as other central banks, the SARB has followed a flexible approach that takes into account the broader economic context that affects the inflation outlook.

Appendix

Derivation of the regressor r_t

The overall or "headline" price *index* can be written as $h=w\,u + (1-w)\,n$, where u is the underlying inflation index, w is its weight in the consumption basket, and n is the index for the rest of the goods (those responsible for non-underlying inflation). Then the relationship between the various inflations is

$$\pi_t^h = \frac{wu_t}{h_t}\,\pi_t^u + \frac{(1-w)n_t}{h_t}\,\pi_t^n$$

Now, we can write non-underlying inflation π^n as consisting of an element correlated to underlying inflation, and another element v_t orthogonal to underlying inflation:

$$\pi^n = a_0 + a_1\,\pi^u + v,$$

where time indices are omitted for convenience. We can then rewrite headline inflation:

$$\pi_t^h = \left(a_0\,\frac{(1-w)n_t}{h_t}\right) + \left(\frac{wu_t}{h_t} + a_1\,\frac{(1-w)n_t}{h_t}\right)\pi_t^u + \frac{(1-w)n_t}{h_t}\,v_t$$

This expression resembles a regression of headline on underlying inflation (the difference between it and such a regression is that the terms in the first two brackets are constant in the regression). In the text, we use the residual from such a regression, which is the variable called r_t. As we can see, the importance of the residual from a regression of headline inflation on underlying inflation depends, roughly speaking, on the weight of non-underlying prices in the consumption basket, $1-w$. If w is very close to 1, the regression will have excellent fit and the residual will account for a small part of the variation in headline inflation. Fit also depends on how closely correlated underlying and non-underlying inflations are: if v_t has relatively low variation, explaining a small portion of the variance of π^n, the fit of the headline inflation regression will also be good. Also, if a_1 is large, the effects of non-underlying inflation on total inflation (and policy) will be confounded with the effects of underlying inflation on total inflation (and policy). Hence our interest in the orthogonal component v_t, which combined with the weight of goods in the non-underlying index, $1-w$, is obtained as a residual r_t from the regression of headline on underlying inflation.

Data sources

Oil prices and exchange rates are from the *World Economic Outlook* and *International Financial Statistics*, respectively. Other data sources are shown in the table below. Output gaps were estimated by applying the Hodrick-Prescott filter to the output indicators.

	Inflation			Output		Policy Rate	
Country	Headline	Underlying	Source	Indicator	Source	Indicator	Source
United Kingdom	Retail Price Index excl. interest rates on mortgage bonds (RPIX)	RPIX excl. food, petrol and oil prices	Office of National Statistics	Manufacturing Production Index	Office of National Statistics	Official Bank Rate	International Financial Statistics
Australia	Consumer Price Index (CPI)	CPI excl. volatile items	Australian Bureau of Statistics	Gross Domestic Product	International Financial Statistics	Cash Rate	Reserve Bank of Australia
New Zealand	Consumer Price Index (CPI)	CPI excl. government charges, food and fuel prices	Statistics New Zealand	Gross Domestic Product	International Financial Statistics	Official Cash Rate	International Financial Statistics
Norway	Consumer Price Index (CPI)	CPI adjusted for tax changes and excl. energy products	Statistics Norway	Manufacturing Production Index	Statistics Norway	Sight Deposit Rate	Sveriges Riskbank
Iceland	Consumer Price Index (CPI)	CPI excl. agricultural products, vegetables, fruits and petrol	Statistics Iceland	Gross Domestic Product	International Financial Statistics	Monetary Policy Interest Rate	Central Bank of Iceland
Korea	Consumer Price Index (CPI)	CPI excl. agricultural products and oils	Korea National Statistical Office	Manufacturing Production Capacity Index	Korea National Statistical Office	Base Rate	International Financial Statistics
Colombia	Consumer Price Index (CPI)	CPI excl. staple food, public utilities and fuel prices	National Department of Statistics	Gross Domestic Product	International Financial Statistics	Base Rate for Repo Auctions	Banco de la Republica
Chile	Consumer Price Index (CPI)	CPI excl. fresh fruit, vegetable and fuel prices	National Bureau of Statistics	Index of Economic Activity	Banco Central de Chile	Monetary Policy Interest Rate	Banco Central de Chile
Turkey	Consumer Price Index (CPI)	CPI excl. unprocessed food products and energy prices	Turkish Statistical Institute	Composite Leading Economic Indicator for Economic Activity	Central Bank of Turkey	Overnight Interest Rate	Central Bank of Turkey
Brazil	Consumer Price Index (CPI)	CPI excl. food and energy prices	Brazilian Institute of Geography and Statistics	Gross Domestic Product	Brazilian Institute of Geography and Statistics	SELIC Interest Rate	Central Bank of Brazil
South Africa	Consumer Price Index excl. interest rates on mortgage bonds (CPIX)	CPIX excl. food and petrol prices	Statistics South Africa	Coincident Business Cycle Indicator	South African Reserve Bank	Repo Rate	South African Reserve Bank

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Australia: www.rba.gov.au Brazil: www.bcb.gov.br

Canada: www.**bank**-banque-**canada**.ca

Chile: www.bcentral.cl

Colombia: www.banrep.gov.co

Iceland: www.sedlabanki.is

Korea: www.bok.or.kr

New Zealand: www.rbnz.govt.nz

Norway: www.norges-bank.no

South Africa: www.reservebank.co.za

Turkey: www.tcmb.gov.tr

UK: www.bancofengland.co.uk