Sources of Inflation in Developing Countries

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1.... Introduction

This paper develops stylized facts about the inflationary process in developing countries. To this end, we examine the sources of inflation in a sample of 53 developing countries grouped into four regions—Africa, Asia, the Mediterranean and South America. The data used are annual and span the period 1964 to 1998. Our broad-brush approach is intended to complement the many previous analyses of inflation in developing countries that have typically focused on the experience of individual countries or a small group of them.[1]

We group sources of inflation into four categories. First, as discussed by Montiel (1989), inflation in developing countries is often linked to underlying fiscal imbalances. Such imbalances can lead to an increase in inflation either by triggering higher money growth, as in Sargent and Wallace (1981), or by triggering a balance of payments crisis and forcing an exchange rate depreciation, as in Liviatan and Piterman (1986). Another possibility, examined by Coe and McDermott (1997) for 13 Asia economies, is that—as in the industrial countries— inflation in developing countries is "an indication of an overheating economy" and responds to an activity variable such as the output gap. A third source of inflation, examined by Ball and Mankiw (1995), is supply-side "cost shocks"—movements in the prices of particular goods, such as oil, that lead to persistent changes in the aggregate price level. Finally, as discussed by Chopra (1985), inflation may have a substantial inertial component

[1] For example, Moser (1995) provides evidence on the dominant factors influencing inflation in Nigeria, while Montiel (1989) examines inflation in Argentina, Brazil, and Israel.

arising from the sluggish adjustment of inflationary expectations or the existence of staggered wage contracts.

To provide evidence on the relative importance of these four sources for inflation, we include in our analysis:

1. money growth and exchange rates, variables suggested by the fiscal view;
2. the output gap and a measure of the world business cycle;
3. changes in the prices of oil and non-oil commodities, to capture cost shocks;
4. past realizations of inflation, to reflect the inertial component of inflation.

In examining the sources of inflation, we do not explore the underlying political and institutional features in each country which either lead to high inflation rates or provide an atmosphere conducive to achieving price stability.[2] Instead, we focus on the proximate' sources of inflation suggested by the four views discussed above.

The remainder of the paper is organized as follows. The next section presents our econometric method, after which section three discusses data. Section four provides results, first for developing countries taken as a whole, and then for various groups of countries distinguished by their region and their exchange rate regime. Section five concludes.

2. Econometric method. Econometric method. Econometric method. Econometric method

We estimate vector autoregressions (VAR's) with at least the following six variables: oil prices, non-oil prices, output gap, money growth, inflation, and exchange rates. The

[2] Examples of these institutional features, along with recent studies, include: central bank independence, Alesina and Summers (1993); openness to trade, Romer (1993) and Lane (1996); and country size and development, Campillo and Miron (1996).

approach is similar to that of Montiel (1989), with the exception that we pool together data across the various countries instead of estimating separate VAR's for each country. We also discuss results in which we add measures of fiscal deficits and the world business cycle to this base specification.

For our cross-country panel of data, let *t* denote time, and *i* index countries. We pool the data across countries and estimate VAR's of the form:

$$Z_{it} = A(L)\, Z_{it-1} + è_i + \varepsilon_{it}$$

where $A(L)$ is a one-sided polynomial in the lag operator (L), è$_i$ denotes a set of country-specific fixed effects and ε_{it} is a vector of normally distributed errors.[3] By pooling across countries, we impose the restriction that the estimated coefficients in each equation are the same across each country in the VAR. The fixed effects are intended to capture country-specific influences on inflation due to differences in unionization rates, wage bargaining structures, or concentration ratios, all of which potentially explain the behavior of prices, but for which country- or industry-specific data are not available. In Section 4 below, we split the countries into several groups to examine the sources of inflation across regions and other groups of countries.

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[3] It is well known that least squares estimates are biased in the presence of both fixed effects and lagged endogenous variables. However, as discussed by Nickell (1981) and Hsiao (1989, pp. 73-76), the bias is inversely proportional to the time dimension (T) of the panel; in our data set T is between 20 and 30, so that the size of the bias is likely to be small. Note that the dynamic panel data model of Holtz-Eakin, Newey, and Rosen (1988) is not appropriate for our case, since the asymptotics rely on the width of the panel (number of countries) going to infinity.

Use of a VAR allows us to look at the effect of different assumptions as to the contemporaneous interactions of the variables, notably the interactions of money growth, inflation, and exchange rates, without imposing any constraints on the particular channels through which the factors interact.[4] We present variance decompositions for inflation, as well as results on the effect of innovations ("shocks") in each of the variables on inflation. As usual, an innovation is defined as the component of each variable which is orthogonal to lags of all variables as well as contemporaneous values of variables ordered before it in the VAR. While this provides an economically meaningful definition of shocks, a pitfall of the non-structural VAR methodology is that certain results may be sensitive to the ordering of the variables in the system. This is discussed extensively in Section 4.

3.... Data

We use annual data on 53 developing countries for the years 1964 to 1998. Table 1 presents summary statistics, along with a list of the individual countries. Major oil-producing countries are excluded from the sample.[5] Data on money growth, inflation and nominal exchange rates come from the IMF *International Financial Statistics*. Money growth is the difference of the log of either base money (line 14), or M2 (line 35l, which is line 34 plus line 35). The choice of monetary aggregate does not affect our results. Inflation is the difference of the log of the CPI (line 64), while the nominal exchange rate is measured as the difference of the log of the bilateral nominal exchange rate with the US dollar (line rf). The exchange

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[4] See Clarida and Gali (1996) for a related structural model.

[5] Removing the oil-producing nation of Gabon from the sample does not change our results.

rate is specified as units of domestic currency per dollar, so that an increase in the exchange rate represents a depreciation of the currency. It would be preferable to use an exchange rate which takes into account bilateral exchange rates with each country's major trading partners (such as the nominal effective exchange rate, lines nec and neu in IFS); unfortunately, such a measure is not available for many of the countries in our sample. We use nominal rather than a measure of the real exchange rate; this is because real exchange rates already take into account the inflation rates we seek to explain.

Data on fiscal deficits are from the IMF's World Economic Outlook database. These are measured as the central government balance as a share of GDP, so that a negative sign indicates a deficit. A measure of the general government deficit rather than the central government deficit is available for a limited subset of countries and years; the correlation between the overlapping observations of the two measures is in excess of 0.9.

The output gap is constructed as the log of potential output minus the log of actual output, so that an increase in the output gap reflects a slowdown in economic activity relative to potential. Of course, this could also indicate an increase in potential with no change in actual output. Actual output is per capita real GDP (RGDPCH) from version 5.6 of the Summers-Heston database, while potential GDP is constructed by using the filter from Coe and McDermott (1997) to smooth the log of per capita real GDP. The McDermott filter is similar to the Hodrick-Prescott filter, with the advantage that the smoothing parameter is chosen optimally by the data.[6] A measure of labor market slack such as the unemployment

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[6] Note, however, that developing countries may experience particularly large positive supply shocks by importing new technologies from the industrial countries. These large increases in potential output would tend to be averaged over by our use of a smoothing filter to construct potential output.

rate would be an obvious alternative to the output gap as a measure of real activity; unfortunately, this is not available on a consistent basis for the broad range of developing countries. We also examine the impact on inflation of the "world business cycle," measured here as the GDP-weighted growth rates of the seven largest industrial countries.

We construct a measure of non-oil commodity prices by matching disaggregated data on the value of imports for each country from the UN commodity trade database to commodity-specific prices of 23 commodities from IFS.[7] The prices for the 23 individual commodities are aggregated together using each country's import weights to create a country-specific measure of non-oil commodity prices. As a result, movements in the price of a particular commodity will have the largest effect on inflation in countries that most heavily import that item. The measure of oil prices is the average oil price from IFS in dollars; this is a global price and is thus the same for each country. Energy prices of course vary by country due to country-specific tariffs, excise taxes, and differences in the productivity of the electrical generating and heating industries. Unfortunately again, country-specific measures of energy prices are not available for our wide range of developing countries.

Table 1 provides a summary of the data, in total, by region, and for individual countries, with the countries sorted by average rates of inflation within each region. Average rates of inflation vary widely across regions, with moderate to low rates generally found in Africa and Asia, but quite high average rates in most South American and Mediterranean countries. Using median rather than mean rates of inflation gives similar results.

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[7] The commodities are: cereals, vegetable oil, beef, lamb, sugar, bananas, coffee, cocoa, tea, timber, cotton, wool, rubber, tobacco, hides, copper, aluminum, iron ore, tin, nickel, zinc, lead, and fertilizer.

The long run relationship implied by the quantity equation is evident in the large correlation between money growth and inflation in the whole sample, though the strength of the relationship varies across country groupings. Most notably, there is a strong correlation between money and inflation in countries with high inflation (average inflation above 10 percent), but a much weaker relationship in low inflation countries (average inflation below 10 percent). This is true for the individual regions and countries as well.

Surprisingly, we find only weak evidence of a negative correlation between fiscal balance and either money growth or inflation in the sample as a whole. However, the correlation is strongest (that is, most negative) in countries with high average rates of inflation, particularly in the Mediterranean region. In Africa, inflation and money growth appear to decrease with a fiscal deficit, though of course these raw correlations do not control for other factors and do not imply anything about causality. Further, 7 of the 16 African countries in the sample are members of the CFA Franc Zone (Cameroon, Congo, Gabon, Ivory Coast, Niger, Senegal, and Togo), and thus do not pursue independent monetary policies. Positive output growth in these countries likely leads to both fiscal surplus and to capital inflows. These inflows would be expected to expand the money supply, which is endogenous with the fixed exchange rate regime, thus providing for the positive correlations between fiscal balance, money growth, and inflation.

We next turn to results from the VAR's, which allows an examination of conditional correlations between variables, issues of causality, and effects of various shocks to inflation.

4.... Specifications and Results

Our method is to first find specifications which best characterizes the entire sample, and then to present results separately for various groupings of countries. Our base specification for the VAR is the following six equation system:

1. Oil price growth
2. Non-oil commodity price growth
3. Output gap
4. M2 growth
5. Exchange rates
6. Inflation

This base specification does not include measures of fiscal balance or the world business cycle; these are considered in section 4.5 below, though it turns out that adding these variables to the system does not affect our main results. Four lags used in the VAR's. The results do not change much if we use two, three, or five lags instead of four.

The ordering of the variables is discussed in section 4.1, followed by variance decompositions showing the importance of each variable in accounting for inflation movements in section 4.2, and impulse response functions showing the response of inflation to various shocks in section 4.3. Sensitivity analysis follows in section 4.4.

4.1.124.124.1 Ordering of the Variables

Table 2 provides two sets of results that are helpful in discussing the ordering of variables in the VAR. The top part of the table shows values of the F-statistic for the null hypothesis that the four lags of the variable in the first column can be excluded from the each of the regressions in the other six columns without loss of explanatory power. A large F-statistic (small significance level) indicates a rejection of the null and means instead that the variable in a given row does forecast the variable listed at the top of the column. We also discuss results from block exogeneity tests in which we estimate the equations jointly, both unconstrained and then with the constraint that lags of particular variables in certain equations are set to zero. This allows us to compute a χ^2 statistic for the null hypothesis that particular variables do not "Granger cause" others. For example, money growth "causes" inflation if omitting lags of money from the inflation equation changes the coefficients of the six equations in a statistically significant way (that is, if we reject the null hypothesis that the coefficients are not affected by omitting lags of money).

The bottom part of the table shows the correlations between errors in the six equations. A high correlation between the errors in particular equations indicates that the ordering of those equations might (but does not necessarily) matter for the results of the variance decompositions and impulse response functions.

We use these results as a guide to make several assumptions as to the ordering of the base specification. We first assume that price movements in oil and non-oil commodities are driven by exogenous developments that are not affected in the same year by the other factors. For oil prices, of course, the biggest developments in prices have resulted from OPEC-related supply disturbances. Oil and non-oil price movements are closely related, with a correlation coefficient of the errors from the two equations just over 0.4. In all of our specifications, however, we find that it makes very little difference which of the two is ordered first. We also experimented with a single variable which combines oil and non-oil commodity prices, as before using import values as weights. While this does not affect results for the other four variables, the fit of this one equation is substantially worse than the fit of either of the two separate regressions.

The other large correlations in the errors of the six equations are those between money growth, inflation, and exchange rates. We assume that the contemporaneous correlation between innovations in money growth and inflation innovations reflects causation from money growth to inflation, though there is clearly some feedback from inflation to monetary aggregates within the year. A similar assumption is made with respect to the correlation between exchange rate and inflation.[8] That leaves the issue of the direction of causation between exchange rate innovations and money growth innovations; in this case, we consider both possibilities.

Finally, Table 2 indicates that the output gap forecasts inflation (F-statistic of 3.34, significance level of 0.01), while we cannot reject the null hypothesis that inflation provides no information on the output gap (F-statistic of 0.54, significance level of 0.71). Similarly, block exogeneity tests indicate that the output gap "causes" inflation ($\div^2$ statistic of 60.9, significance level of 0.00), but lags of inflation can be safely omitted from the output gap equation ($\div^2$ statistic of 2.28, significance level of 0.68). We thus order the output gap before inflation. Though Table 2 also shows that lags of money growth forecast the output gap but not vice-versa, the correlation between the errors of these two equations is quite small and both variables cause each other. Fortunately, it turns out that the ordering of money growth and the output gap does not matter for our results. We thus place the output gap before M2

[8] The F-statistics in Table 2 indicate that lags of inflation provide information on exchange rate movements, while we cannot reject the null hypothesis that lags of exchange rates do not forecast inflation. However, block exogeneity tests indicate that inflation and exchange rates Granger cause each other, though we much more decisively reject the null that inflation has no affect on exchange rates ($\div^2$ statistic of 208.4) than we do the null that exchange rates have no affect on inflation ($\div^2$ statistic of 34.7).

growth in order to pair money growth and inflation and thus most cleanly isolate their interaction.

4.2.2.2.2 Importance of the Six Factors as Influences on Inflation

Table 3 shows the results from variance decompositions for the two alternative specifications discussed above. Three key findings emerge. First, inflation is mainly a fiscal phenomenon. Under the first specification, money growth accounts for over two-thirds of the variance of inflation at both short and long term horizons; under the second ordering, this role is assumed by exchange rate movements. Second, past realizations of inflation account for between ten and twenty percent of inflation movements. This suggests an important role for inflationary expectations and institutional features such as indexation schemes, both of which allow past inflation to influence current wages and price-setting. Third, the cost shocks and output gap play a relatively minor role in accounting for inflation.

The next four tables show how the four regional groups depart from the benchmark for all developing countries as a whole. In the case of Africa (Table 4), past realizations of inflation play a predominant role, accounting for two-thirds to three-fourths of the variance of inflation. The role of fiscal influences undergoes a corresponding diminution. One important additional result here is that the uncertainty about the relative importance of money shocks and exchange rate shocks is reduced as well. For instance, at step 10, money shocks account for between 6 and 10 percent of the variance of inflation, whereas exchange rates account for between 14 and 18 percent. Cost shocks are a bit more important than for developing countries as a whole, the output gap a bit less so.

For Asia (Table 5), the results are similar to those for Africa, but with some shift in emphasis. The predominant factor, again, is past realizations of inflation. But cost shocks play an important role, eclipsing the role of fiscal factors. Note that the uncertainty about the respective roles of money and exchange rate shocks is quite narrow; at step 10, money shocks account for between 8 and 9 percent, while exchange rate shocks account for between 7 and 8 percent.

The results for South America present a sharp contrast (Table 6). Inflation displays very little persistence in this case. Most of the explanatory power comes from the fiscal variables, although our method is unable to delineate the respective roles of money and exchange rate shocks. The results for the fourth group, the Mediterranean countries, fall in between those for Asia and Africa, on the one hand, and South America on the other.

What accounts for these differences across regions in the sources of inflation? While a complete investigation of this issue is not conducted in this paper, we suggest that the differences can be traced to differences in exchange rate regimes. To substantiate this conjecture, we segment the sample into countries whose exchange rate regime was, on average over the sample period, close to a fixed exchange rate regime and those whose regime was closer to a floating exchange rate regime. This segmentation was carried out by relying on careful work by Ghosh, Gulde, Ostry and Wolf (1995), who have classified the exchange rate regimes of a large sample of countries over the period 1960-1990 into nine regimes, ranging from single currency pegs to floating regimes with no intervention. We collapsed the nine regime classified into two categories, those that are relatively fixed and those that are closer to a floating exchange rate regime, based on the average value of the regime over the sample period.

The average exchange rate regime differs quite a bit across regions. In Africa, 16 of the 19 countries in our sample countries have pegged systems and two others are close to fixed. The eleven Asian countries tend to have regimes that are intermediate between pegged and floating regimes; in our classification, the majority of these countries end up being classified with the fixed exchange rate countries. In South America, while a few countries have fixed systems (e.g., Panama), the vast majority—14 of the 19 countries in our sample—end up being characterized as floating.

Given this close correspondence between regions and exchange rate regimes, the results on how the variance decomposition of inflation differs across regimes should come as no surprise. Table 8 shows the variance decomposition of inflation for the countries in the fixed exchange rate group. It is evident that the results are reminiscent of the results for the African and Asian regions and quite different from those for South America. That is, (1) inflation has a substantial inertial component; (2) fiscal variables are the second most important source, and the range of uncertainty about the relative importance of M2 growth and the exchange rate is narrow; and (3) cost shocks and the output gap play a modest role. For the floating exchange rate group, the results resemble those for South America (Table 9): Fiscal variables are predominant, inflation is not very persistent, cost shocks are unimportant and the output gap somewhat less so.

4.3.3.3.3 Response of Inflation to Various Shocks

The impulse responses under for the two orderings of the VAR are shown in Charts 1a and 1b for the sample of all countries. In addition to the point estimates (the solid lines), the charts show error bands two standard deviations wide (the dashed lines).[9] Looking down the

[9] The standard errors of the impulse responses are computed by the Monte Carlo method described in

column labeled "inflate" in each graph provides the estimated response of inflation to a one standard deviation shock to each of the six factors.

Regardless of the ordering chosen, the following conclusions hold. First, expansionary policies, whether reflected in faster money growth or depreciation, lead to higher inflation and the impact is statistically significant. The response of inflation to money innovations is hump-shaped, with the largest impact coming a year after the monetary impulse. Second, positive oil and non-oil innovations raise inflation by only a modest amount and the impact is borderline statistically significant. Third, an output gap—that is, a weakening of the economy—leads to a statistically significant decline in inflation in all specifications, but only with a long lag of one to two years and after an initial movement in the other direction. Moreover, the magnitude of the inflation response to real activity is generally small. Our results thus provide at best weak support for the "gap model" of inflation in developing countries. One explanation for the perverse initial response of inflation to a slowdown of output is that it may reflect governments' initial reliance on inflation-causing fiscal deficits in the face of falling revenues. Fourth, an exogenous increase in inflation has a persistent effect, with a statistically significant increase in inflation for two to three years following the initial impulse.

As demonstrated in the previous section, there is a close overlap between the variance decomposition of inflation for regions and the decomposition for exchange rate regimes. Not surprisingly, this correspondence continues to hold for the impulse responses as well. The

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the manual for RATS 4.2, using 1000 draws from the estimated asymptotic distribution of the VAR coefficients and the covariance matrix of the innovations. The point estimate and standard errors are the mean and standard deviation across draws of the simulated impulse responses.

responses for Asia and Africa resemble those for fixed exchange rate regimes, while the responses for South America are close to those for floating exchange rate regimes. In the interest of brevity, therefore, only the impulse responses for exchange rate regimes are reported in Charts 2a and 2b for fixed exchange rates and Charts 3a and 3b for floating exchange rates. For fixed exchange rate regimes the noteworthy findings are that: (1) both oil and non-oil innovations have strong and statistically significant impacts on inflation; and (2) the response of inflation to money innovations is muted, though statistically significant, and does not have a hump shape. For floating exchange rate regimes, oil and non-oil innovations have virtually no impact. Money innovations play a significant role, as do exchange rate innovations, particularly in the case where they are ordered ahead of M2 in the VAR system.

4.4.5.5.5 Sensitivity Analysis

We examined several alternative specifications in addition to the orderings discussed in sections 4.1 to 4.3.[10] Using base money rather than M2 as our measure of money growth hardly affects our results. Similarly, adding the "world business cycle" (the GDP-weighted growth rates of the G7 countries) as an additional variable in the VAR has little effect on our results, as this turns out to explain less than one percent of the variance of inflation in the whole sample, and no more than four percent in any of the groupings of countries.

We also examine the impact of shocks to the fiscal balance on inflation, money growth, and exchange rates by adding the fiscal balance to the system before money growth. The effect of a fiscal impulse on inflation depends on whether the ratio of fiscal balance to

[10] Details on these results are available from the authors.

GDP exceeds some “threshold” value. For countries in which the average deficit is smaller than 5 percent of GDP, the ratio of the fiscal balance to GDP accounts for little of the variance of inflation, and a one standard deviation innovation in the deficit to GDP ratio has essentially no effect on inflation. In these “small deficit” countries, the fiscal balance explains less than 1 percent of money growth and less than 2 percent of exchange rate movements. Deficits matter much more, however, when the average fiscal deficit exceeds 5 percent of GDP. In these “large deficit” countries, the fiscal balance accounts for 7 percent of inflation movements, and an increase in the deficit leads to a statistically significant increase in inflation. Similarly, the fiscal balance accounts for over 5 percent of the variance of money growth and over 4 percent of exchange rate movements in these countries.

5.... Conclusions

The paper makes two contributions. First, our results provide a quantitative benchmark for the relative importance of various sources of inflation and trace out the dynamic response of inflation to different shocks. We find that the sources of inflation are quite diverse in African and Asian countries, which tend to have low to moderate rates of average inflation. Fiscal variables—as reflected either in money growth or in adjustments in exchange rate pegs—matter, but so too do shocks to the prices of oil and non-oil commodities and the output gap. Most important of all in these countries, however, is the inertial component of inflation. This implies that anti-inflationary policy in developing countries with moderate and low inflation should focus on structural issues such as labor market rigidities and indexation schemes that affect the expectational relationship between past and future inflation. In countries with higher rates of average inflation, such as many in South America, fiscal variables are predominant, with inertial inflation playing a much smaller role.

Second, we present evidence suggesting that the differences in the relative importance of sources of inflation across regions arise from differences in the exchange rate regime. The contribution of money growth to inflation is far less important in fixed exchange rate regimes than in floating exchange rate regimes. In recent years, many developing countries have departed, or are contemplating departing from, fixed exchange rate regimes. Our results suggest that this move can be inflationary unless the new monetary arrangement is able to assume some of the role that an exchange rate peg in moderating the impact of money shocks on inflation.

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Table 1: Summary Statistics

Country	Obs	Inflation average	M2 growth average	M2 growth corr with inflation	Fiscal Balance/GDP average	Fiscal Balance/GDP corr with inflation	Fiscal Balance/GDP corr with M2 growth
All Countries (51 countries)	1695	0.164	0.222	0.928	-0.045	-0.019	-0.009
Inflation below 10% (24 countries)	924	0.066	0.128	0.371	-0.050	-0.017	0.018
Inflation above 10% (29 countries)	771	0.276	0.333	0.945	-0.039	-0.047	-0.039
Africa (24 countries)	494	0.088	0.130	0.481	-0.059	-0.006	0.032
Burkina Faso	15	0.035	0.116	0.455	-0.169	0.087	-0.090
Niger	35	0.054	0.075	0.419	0.019	0.200	0.383
Morocco	35	0.057	0.120	0.587	-0.060	-0.265	0.145
Ethiopia	32	0.061	0.116	0.242	-0.047	-0.220	-0.291
Gabon	34	0.062	0.116	0.574	-0.216	0.161	-0.068
Togo	31	0.064	0.112	0.419	-0.042	-0.190	0.184
Senegal	31	0.064	0.085	0.475	-0.018	-0.218	-0.009
Seychelles	27	0.068	0.147	0.280	-0.083	0.127	0.111
Cote D Ivoire	35	0.071	0.110	0.558	-0.066	0.129	0.516
Congo	33	0.071	0.087	0.272	-0.052	-0.138	0.276
Cameroon	29	0.079	0.101	0.463	-0.031	0.089	0.567
Mauritius	35	0.082	0.161	0.391	-0.060	-0.213	0.262
Kenya	29	0.106	0.157	0.325	-0.052	-0.267	-0.099
Algeria	26	0.116	0.165	-0.003	0.051	-0.407	0.239
Madagascar	34	0.117	0.141	0.302	-0.049	-0.485	-0.185
Ghana	33	0.275	0.275	0.527	-0.062	-0.218	-0.009
Asia (11 countries)	351	0.093	0.172	0.812	-0.035	-0.018	0.086
Singapore	35	0.031	0.134	0.103	0.035	-0.117	-0.149
Malaysia	34	0.036	0.140	0.336	-0.031	-0.139	0.154
Thailand	35	0.054	0.163	0.289	-0.013	0.067	0.168
Bangladesh	12	0.060	0.156	0.365	-0.079	-0.601	-0.627
Fiji	28	0.072	0.104	0.530	-0.030	0.120	0.179
India	34	0.083	0.148	-0.310	-0.058	-0.018	-0.315
Pakistan	35	0.084	0.142	-0.132	-0.073	-0.091	-0.230
Sri Lanka	35	0.087	0.142	0.317	-0.104	0.020	-0.203
Korea	35	0.099	0.241	0.228	-0.016	-0.492	-0.564
Philippines	35	0.106	0.161	0.102	-0.019	0.186	0.188
Indonesia	33	0.282	0.371	0.969	-0.004	-0.179	-0.182
South America (19 countries)	638	0.270	0.327	0.957	-0.025	-0.081	-0.064
Panama	35	0.030	0.119	0.259	-0.082	-0.558	-0.008

Country	Obs	Inflation	M2 growth		Fiscal Balance/GDP		
		average	average	corr with inflation	average	corr with inflation	corr with M2 growth
Barbados	32	0.074	0.109	0.276	0.049	0.443	0.235
Trinidad	34	0.084	0.124	0.420	0.023	-0.226	0.287
Honduras	35	0.090	0.157	0.437	-0.061	0.270	0.389
Guatemala	35	0.093	0.146	0.529	-0.029	0.369	0.276
El Salvador	35	0.103	0.139	0.391	-0.023	-0.403	0.111
Dominican Rep	35	0.114	0.175	0.424	-0.003	0.064	0.152
Paraguay	35	0.126	0.207	0.552	-0.009	0.671	0.620
Costa Rica	34	0.135	0.213	0.369	-0.042	0.232	0.026
Jamaica	35	0.156	0.192	0.681	-0.065	0.298	0.439
Colombia	31	0.182	0.234	0.514	-0.008	-0.336	-0.176
Ecuador	34	0.201	0.272	0.717	-0.017	0.462	0.514
Mexico	35	0.235	0.297	0.431	-0.046	-0.622	-0.268
Chile	35	0.366	0.468	0.920	0.043	0.010	0.041
Bolivia	35	0.419	0.494	0.982	-0.070	-0.682	-0.702
Uruguay	35	0.448	0.467	0.597	-0.020	0.103	0.064
Peru	35	0.604	0.623	0.990	-0.045	-0.090	-0.067
Argentina	35	0.784	0.811	0.980	-0.060	-0.082	-0.069
Brazil	18	1.422	0.951	0.944	-0.007	0.422	0.323
Mediterranean (7 countries)	212	0.147	0.216	0.846	-0.092	-0.163	-0.240
Malta	35	0.035	0.099	0.072	-0.019	0.349	0.176
Cyprus	35	0.047	0.127	0.146	-0.016	-0.571	-0.224
Jordan	28	0.075	0.135	0.521	-0.146	-0.451	-0.795
Egypt	35	0.102	0.165	0.539	-0.153	0.119	-0.075
Syria	33	0.107	0.173	0.086	-0.105	0.329	-0.271
Israel	34	0.318	0.409	0.813	-0.126	-0.236	-0.350
Turkey	12	0.329	0.406	0.881	-0.052	-0.367	-0.383

Table 2: Ordering of the Variables

Regressions with 4 lags

F-Tests

All countries, 1485 observations

Influence on Inflation	Dependent Variable					
	Oil price	Non-oil prices	Output Gap	M2 growth	Inflation	Exchange rate
Oil	160.06 (0.00)	3.09 (0.02)	1.68 (0.15)	1.68 (0.15)	1.57 (0.18)	1.39 (0.23)
Non-oil	569.12 (0.00)	111.78 (0.00)	0.48 (0.75)	1.39 (0.23)	2.03 (0.09)	1.26 (0.28)
Output Gap	0.36 (0.84)	2.81 (0.02)	191.26 (0.00)	0.36 (0.84)	6.54 (0.00)	4.20 (0.00)
M2 growth	5.77 (0.00)	5.44 (0.00)	6.28 (0.00)	25.40 (0.00)	29.26 (0.00)	15.28 (0.00)
Inflation	1.82 (0.12)	2.36 (0.05)	3.30 (0.01)	8.33 (0.00)	21.54 (0.00)	13.12 (0.00)
Exchange rate	4.23 (0.00)	3.95 (0.00)	5.15 (0.00)	0.24 (0.91)	1.96 (0.10)	5.74 (0.00)
R^2	0.64	0.29	0.42	0.64	0.72	0.60

Significance level in parentheses. A large F-statistic and low significance level indicates that the variable in the first columns provides predictive information on the corresponding variable in the top row.

B. Correlations between residuals of the six equations

	Non-oil	Output gap	M2 growth	Inflation	Exch rate
Oil	0.415	-0.098	0.081	0.056	-0.038
Non-oil		0.003	0.058	0.061	-0.047
Output gap			0.056	0.120	0.180
M2 growth				0.822	0.728
Inflation					0.825

Table 3: Variance Decompositions for Inflation Equation
All Countries

Money growth before exchange rates

Period	Oil price	Non-oil prices	Output Gap	M2 growth	Exchange rate	Inflation
0	0.2	0.2	1.9	66.5	11.6	19.6
1	0.2	0.5	1.2	77.8	7.9	12.5
2	0.1	0.7	1.1	80.2	6.8	11.1
3	0.1	0.7	1.6	80.2	6.7	10.7
4	0.2	0.7	2.1	79.7	6.7	10.6
5	0.2	0.7	2.2	79.7	6.6	10.6
10	0.2	0.7	2.3	79.8	6.6	10.5

Exchange rates before money growth

Period	Oil price	Non-oil prices	Output Gap	Exchange rate	M2 growth	Inflation
0	0.2	0.2	1.9	68.4	9.7	19.6
1	0.2	0.5	1.2	68.2	17.4	12.5
2	0.1	0.7	1.1	66.7	20.3	11.1
3	0.1	0.7	1.6	65.2	21.7	10.7
4	0.2	0.7	2.1	64.4	22.0	10.6
5	0.2	0.7	2.2	64.2	22.2	10.6
10	0.2	0.7	2.3	64.0	22.3	10.5

Table 4: Variance Decompositions for Inflation Equation
Africa

Money growth before exchange rates

Period	Oil price	Non-oil prices	Output Gap	M2 growth	Exchange rate	Inflation
0	0.3	0.8	0.8	9.2	11.1	77.8
1	0.7	2.9	0.8	10.8	12.1	72.6
2	1.4	4.0	0.8	10.2	12.5	71.0
3	2.6	4.0	1.0	10.3	12.3	69.8
4	3.2	5.2	1.1	10.0	12.3	68.2
5	3.7	6.6	1.1	9.7	13.0	65.9
10	3.7	7.9	1.2	10.1	13.8	63.3

Exchange rates before money growth

Period	Oil price	Non-oil prices	Output Gap	Exchange rate	M2 growth	Inflation
0	0.3	0.8	0.8	17.1	3.2	77.8
1	0.7	2.9	0.8	19.0	3.9	72.6
2	1.4	4.0	0.8	18.8	3.9	71.0
3	2.6	4.0	1.0	18.4	4.2	69.8
4	3.2	5.2	1.1	18.1	4.2	68.2
5	3.7	6.6	1.1	18.4	4.4	65.9
10	3.7	7.9	1.2	18.2	5.7	63.3

Table 5: Variance Decompositions for Inflation Equation
Asia

Money growth before exchange rates

Period	Oil price	Non-oil prices	Output Gap	M2 growth	Exchange rate	Inflation
0	4.8	4.7	1.1	0.1	5.3	84.1
1	9.7	21.6	0.8	3.0	7.7	57.2
2	9.8	22.1	1.2	7.4	6.8	52.6
3	9.5	21.5	1.4	8.5	6.7	52.4
4	9.4	21.1	1.6	8.6	6.9	52.5
5	9.4	20.8	1.6	9.0	6.8	52.5
10	9.4	20.7	2.9	9.1	6.7	51.2

Exchange rates before money growth

Period	Oil price	Non-oil prices	Output Gap	Exchange rate	M2 growth	Inflation
0	4.8	4.7	1.1	5.4	0.0	84.1
1	9.7	21.6	0.8	8.5	2.2	57.2
2	9.8	22.1	1.2	7.7	6.6	52.6
3	9.5	21.5	1.4	7.5	7.7	52.4
4	9.4	21.1	1.6	7.7	7.7	52.5
5	9.4	20.8	1.6	7.6	8.1	52.5
10	9.4	20.7	2.9	7.5	8.3	51.2

Table 6: Variance Decompositions for Inflation Equation
South America

Money growth before exchange rates

Period	Oil price	Non-oil prices	Output Gap	M2 growth	Exchange rate	Inflation
0	0.2	0.1	4.4	76.9	8.5	9.9
1	0.1	0.3	2.8	87.0	4.8	4.9
2	0.1	0.6	2.5	88.6	4.1	4.1
3	0.2	0.6	4.1	87.3	3.9	3.9
4	0.3	1.2	5.9	84.7	3.8	4.1
5	0.3	1.5	6.5	83.8	3.8	4.1
10	0.4	1.6	6.6	83.6	3.8	4.1

Exchange rates before money growth

Period	Oil price	Non-oil prices	Output Gap	Exchange rate	M2 growth	Inflation
0	0.2	0.1	4.4	78.5	6.9	9.9
1	0.1	0.3	2.8	77.5	14.3	4.9
2	0.1	0.6	2.5	76.2	16.5	4.1
3	0.2	0.6	4.1	74.2	17.0	3.9
4	0.3	1.2	5.9	71.9	16.7	4.1
5	0.3	1.5	6.5	71.1	16.4	4.1
10	0.4	1.6	6.6	71.0	16.3	4.1

Table 7: Variance Decompositions for Inflation Equation
Mediterranean

Money growth before exchange rates

Period	Oil price	Non-oil prices	Output Gap	M2 growth	Exchange rate	Inflation
0	2.8	0.0	3.3	27.3	12.4	54.2
1	4.9	0.7	1.5	41.0	6.5	45.6
2	4.8	0.9	1.4	43.7	5.4	43.9
3	4.4	0.8	1.1	51.7	5.8	36.2
4	4.9	0.7	1.0	55.7	5.4	32.2
5	6.3	0.7	1.0	55.3	5.1	31.5
10	7.4	1.2	1.2	54.7	5.0	30.5

Exchange rates before money growth

Period	Oil price	Non-oil prices	Output Gap	Exchange rate	M2 growth	Inflation
0	2.8	0.0	3.3	27.3	12.3	54.2
1	4.9	0.7	1.5	21.2	26.2	45.6
2	4.8	0.9	1.4	19.4	29.7	43.9
3	4.4	0.8	1.1	16.1	41.3	36.2
4	4.9	0.7	1.0	14.6	46.5	32.2
5	6.3	0.7	1.0	14.0	46.5	31.5
10	7.4	1.2	1.2	13.8	45.9	30.5

Table 8. Variance Decompositions for Inflation Equation
Fixed Exchange Rate Regime Countries

Money growth before exchange rates

Period	Oil price	Non-oil prices	Output Gap	M2 growth	Exchange rate	Inflation
0	0.2	0.9	1.8	5.1	20.6	71.4
1	2.2	5.3	1.6	7.2	22.4	61.2
2	2.7	6.6	1.6	8.1	21.3	59.7
3	3.1	6.5	1.6	9.1	21.4	58.4
4	3.2	6.5	1.6	9.7	21.1	57.8
5	3.5	6.5	1.8	10.0	21.0	57.3
10	3.7	7.0	2.2	10.4	20.6	56.1

Exchange rates before money growth

Period	Oil price	Non-oil prices	Output Gap	Exchange rate	M2 growth	Inflation
0	0.2	0.9	1.8	24.3	1.4	71.4
1	2.2	5.3	1.6	27.2	2.4	61.2
2	2.7	6.6	1.6	26.0	3.4	59.7
3	3.1	6.5	1.6	26.4	4.1	58.4
4	3.2	6.5	1.6	26.1	4.7	57.8
5	3.5	6.5	1.8	25.9	5.1	57.3
10	3.7	7.0	2.2	25.4	5.6	56.1

Table 9. Variance Decompositions for Inflation Equation
Flexible Exchange Rate Regime Countries

Money growth before exchange rates

Period	Oil price	Non-oil prices	Output Gap	M2 growth	Exchange rate	Inflation
0	0.3	0.1	5.6	71.5	8.7	13.7
1	0.2	0.3	3.7	83.3	5.1	7.5
2	0.2	0.4	3.2	85.5	4.3	6.3
3	0.2	0.5	4.9	84.2	4.2	6.0
4	0.2	0.8	7.0	81.8	4.1	6.0
5	0.2	0.9	7.7	81.1	4.1	6.0
10	0.3	0.9	7.9	80.9	4.0	6.0

Exchange rates before money growth

Period	Oil price	Non-oil prices	Output Gap	Exchange rate	M2 growth	Inflation
0	0.3	0.1	5.6	73.2	7.1	13.7
1	0.2	0.3	3.7	73.2	15.2	7.5
2	0.2	0.4	3.2	72.3	17.6	6.3
3	0.2	0.5	4.9	69.8	18.6	6.0
4	0.2	0.8	7.0	67.5	18.5	6.0
5	0.2	0.9	7.7	66.8	18.4	6.0
10	0.3	0.9	7.9	66.6	18.3	6.0

Chart 1A: Impulse Responses for All Countries Pooled Together

Money growth ordered before exchange rate growth

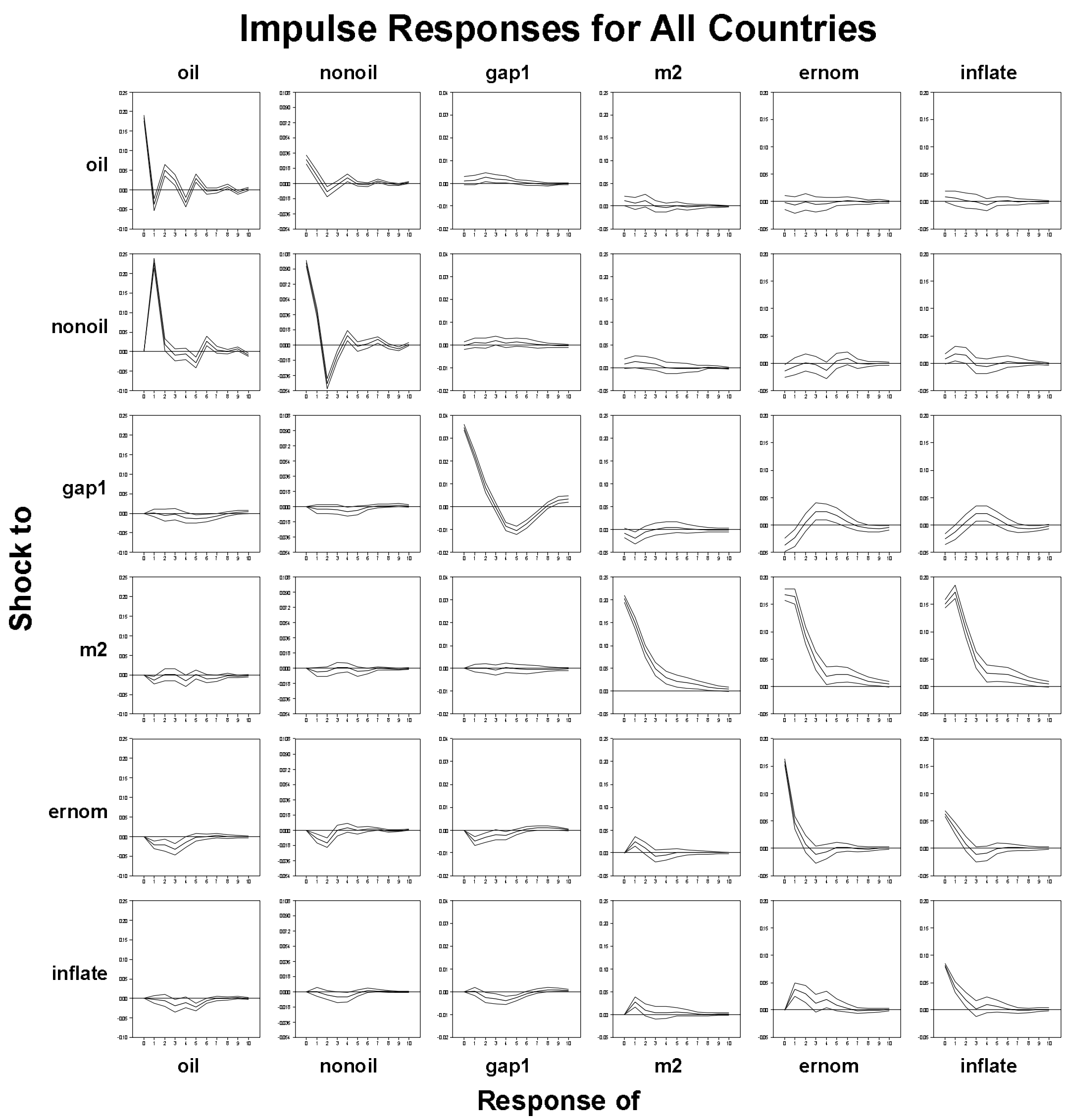

Chart 1B: Impulse Responses for All Countries Pooled Together

Exchange rate growth ordered before money growth

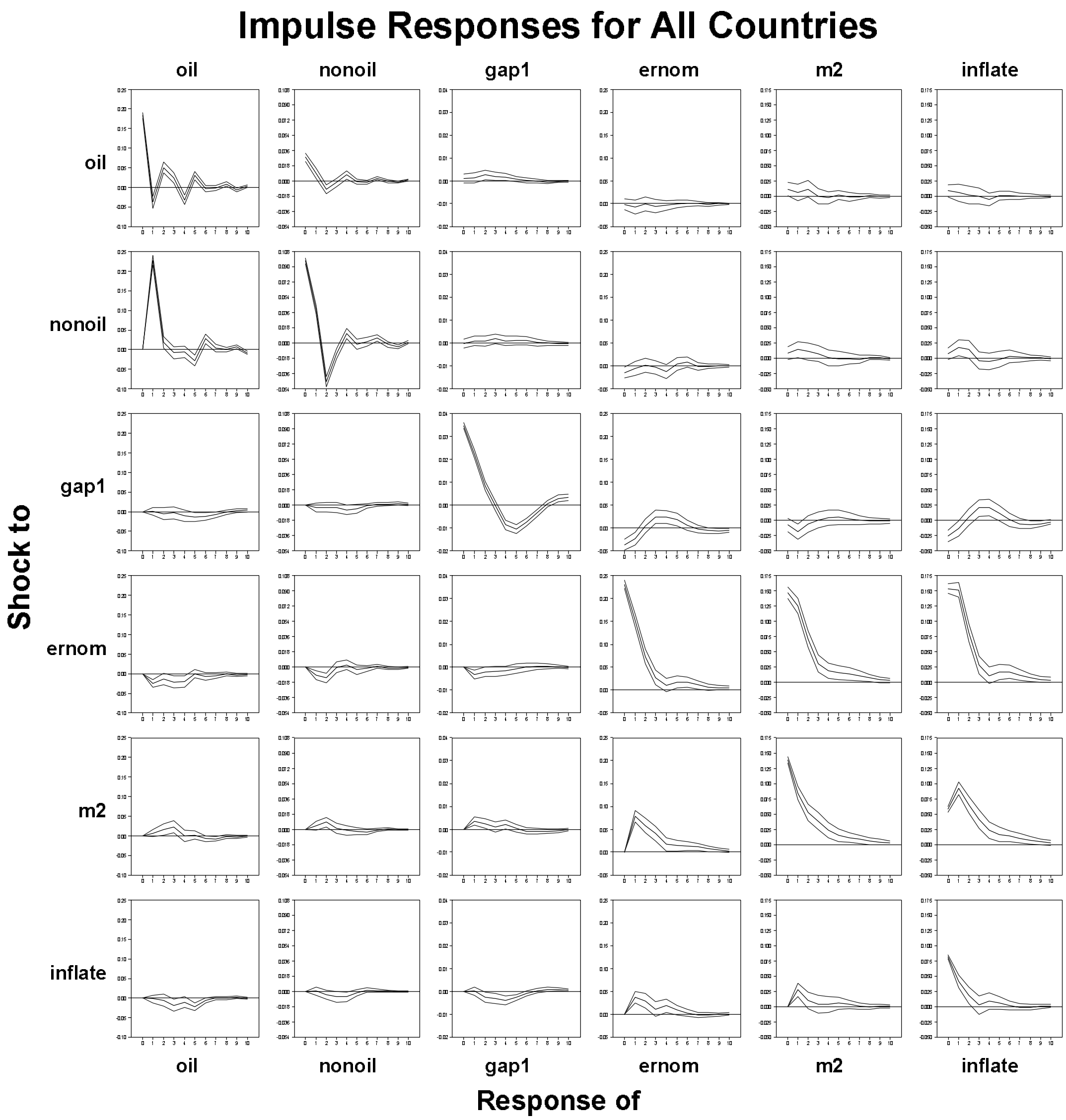

Chart 2A: Impulse Responses for Countries with Fixed Exchange Rates

Money growth ordered before exchange rate growth

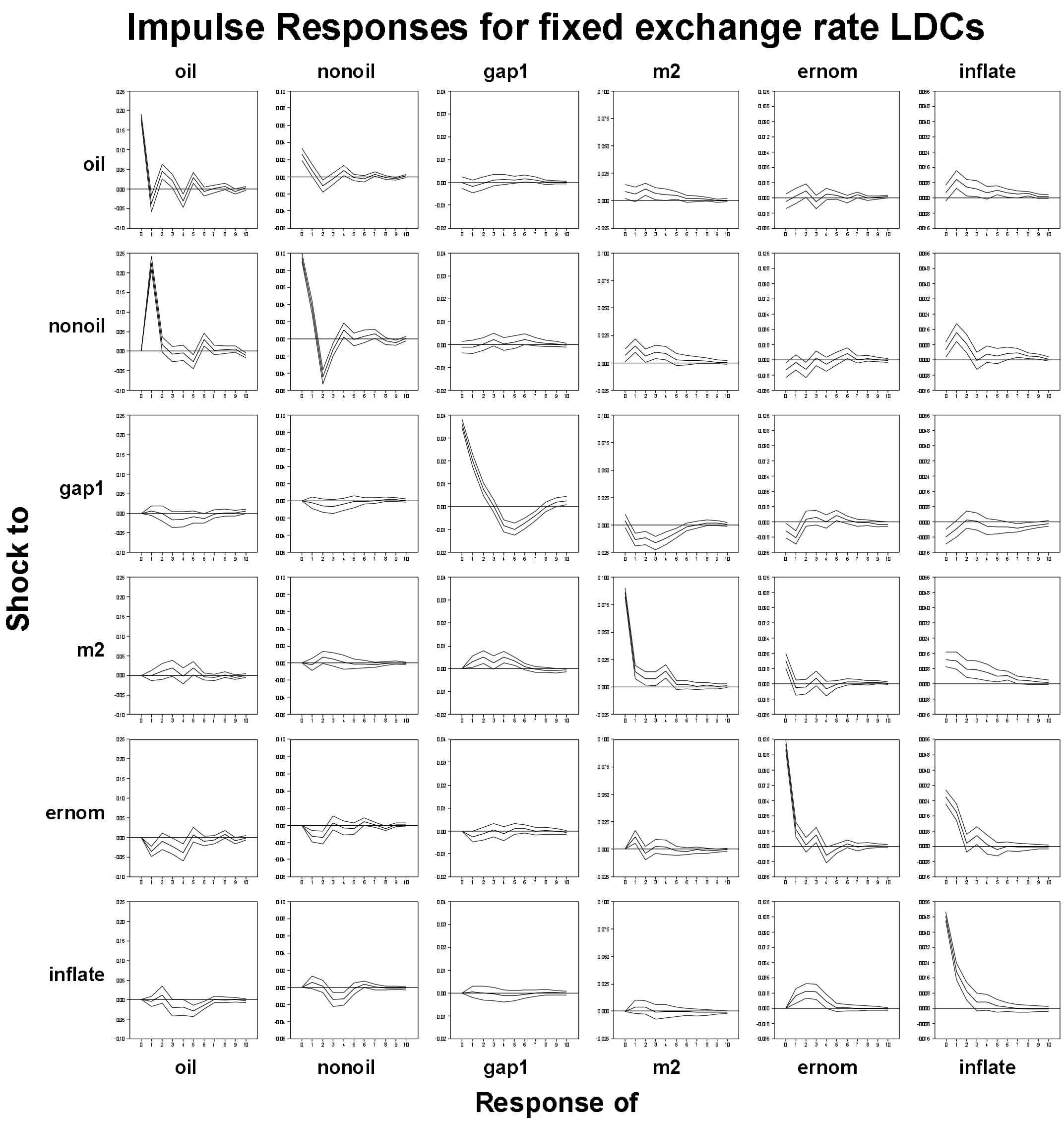

Chart 2B: Impulse Responses for Countries with Fixed Exchange Rates

Exchange rate growth ordered before money growth

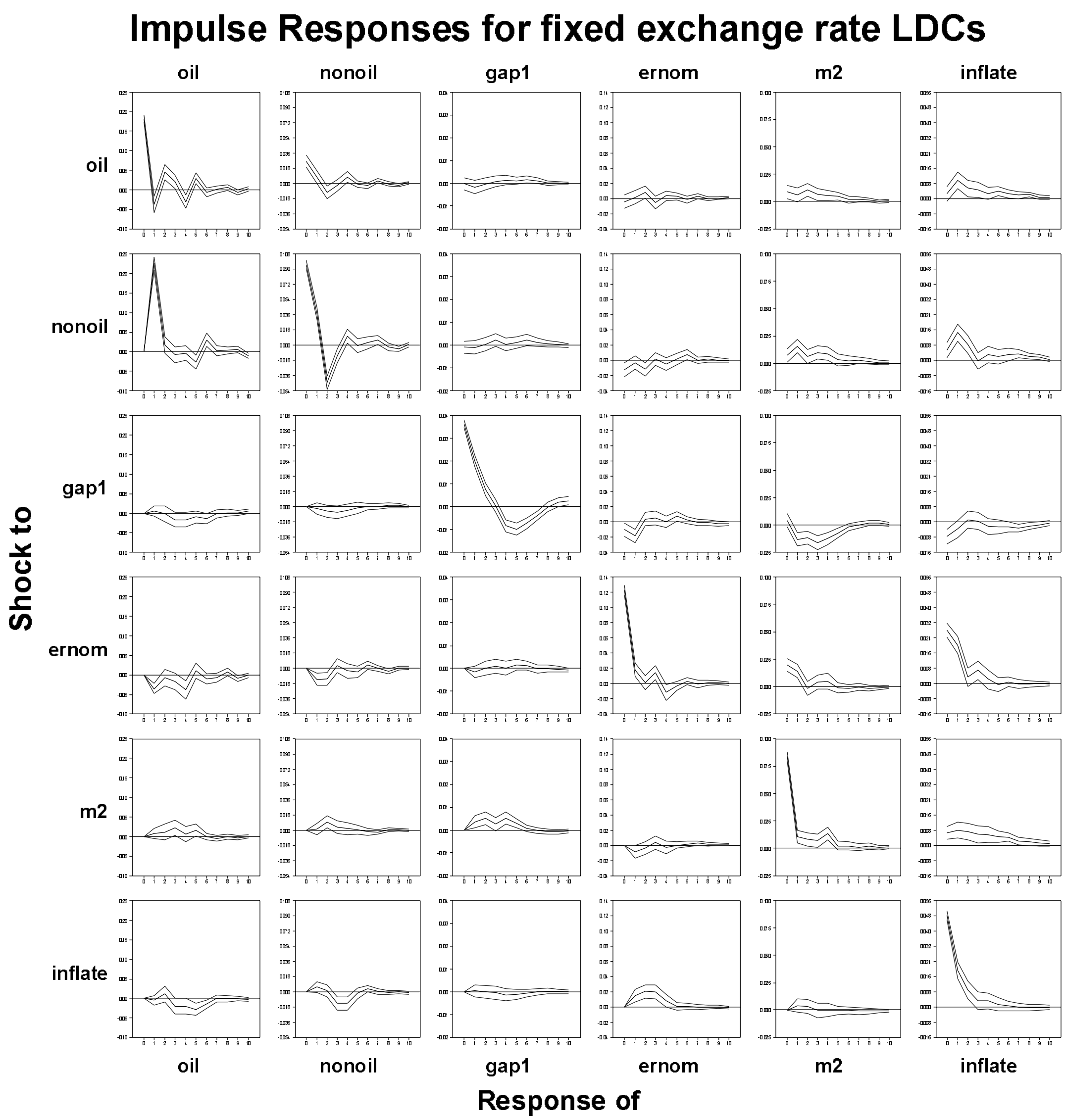

Chart 3A: Impulse Responses for Countries with Flexible Exchange Rates

Money growth ordered before exchange rate growth

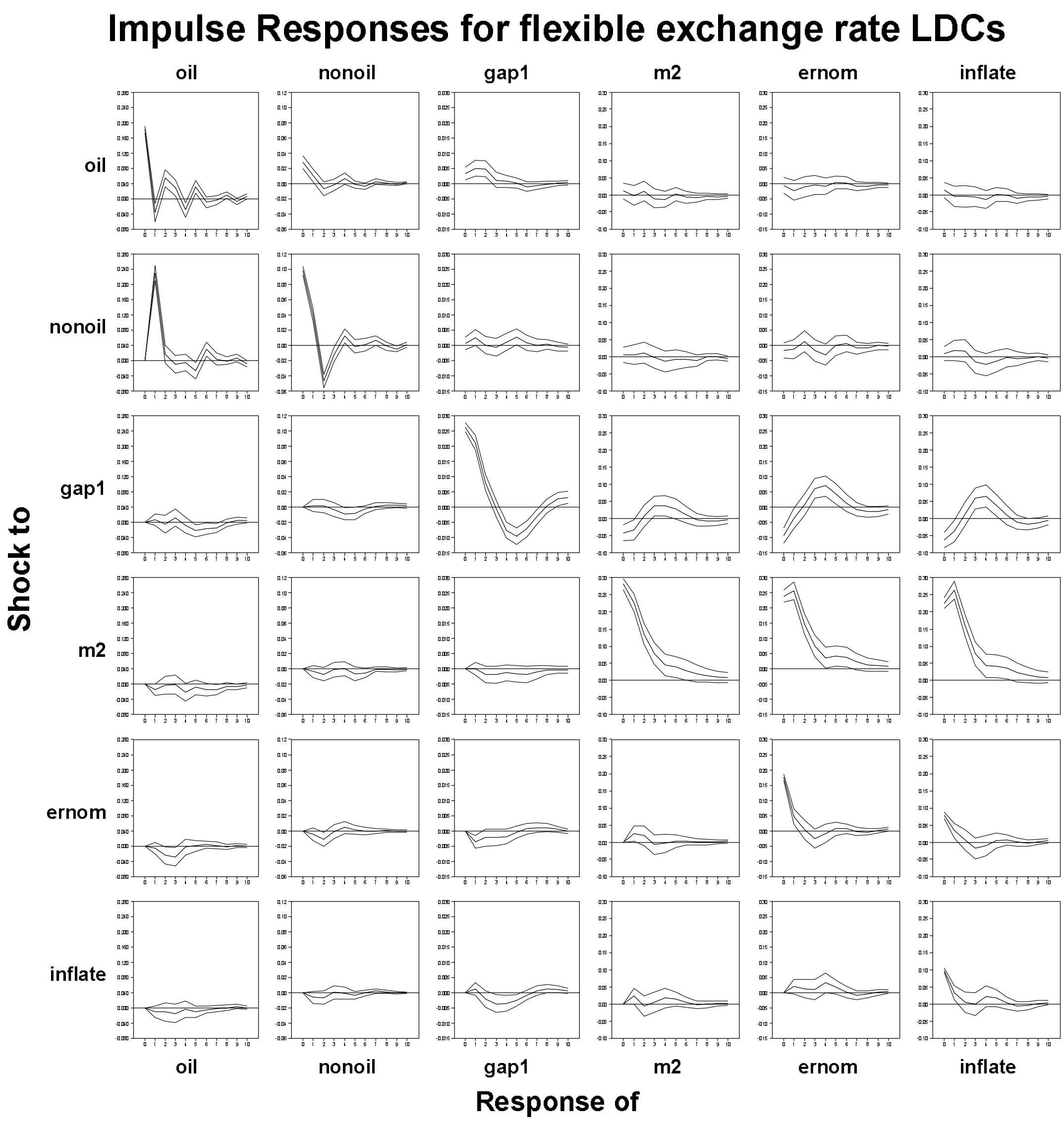

Chart 3B: Impulse Responses for Countries with Flexible Exchange Rates

Exchange rate growth ordered before money growth