A note on the pass-through from exchange rate and foreign price changes to inflation in selected emerging market economies

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1. Introduction

This note presents estimates of the pass-through of exchange rate changes and import price changes (measured in foreign currency) into domestic inflation in a group of 13 emerging market economies. The note focuses on the variation in the pass-through elasticities across and within countries, and on their evolution during the 1980s and 1990s. The model and estimation methods used are very simple and are intended to illustrate how the pass-through effects can be analysed with only a few data series in a "bare bones" framework that could be easily replicated by analysts and interpreted by policymakers in the emerging market economies. The main findings are as follows:

- Changes in exchange rates are more strongly and more contemporaneously correlated with inflation than are changes in import prices. There is also some evidence of statistical causality running from exchange rate changes to inflation and, in several countries, from import price changes to inflation.
- Import price and exchange rate elasticities of inflation are approximately the same in four countries in the sample. In two countries the import price elasticity is higher, and in seven countries the exchange rate elasticity is higher. These results indicate that the approach followed in most of the literature, whereby the pass-through effect is estimated from import prices in domestic currency, may not be appropriate. Rather, it seems necessary to analyse the two pass-through effects separately.
- Cross-country differences in the size of pass-through coefficients are large and seem to be related to the volatility - but not the persistence - of inflation.
- The pass-through from exchange rate changes into inflation has generally been stronger than the pass-through from import prices, but has declined since the mid-1990s, probably as a result of more stable macroeconomic conditions and structural reforms implemented in the emerging economies.

The next section describes the data and the estimating framework used. The third section analyses the results of the regressions, and the fourth section provides tentative interpretations of the results.

2. Data and estimation

To estimate the pass-through effect, a very simple specification was adopted. The dependent variable is the average quarterly change in (the log of) a country's consumer price index (dp_t), and the explanatory variables are average quarterly changes in (the logs of) lagged prices (dp_{t-1}), import prices measured in foreign currency (dp^*_t) and the nominal exchange rate (de_t), as well as the output gap ($y_t - y^*_t$):[1]

$$dp_t = c + \beta_1 dp_{t-1} + \beta_2 dp^*_t + \beta_3 de_t + \beta_4 (y_t - y^*_t) + u_t \qquad (1)$$

[1] Up to four lags of each explanatory variable were used in estimation, but only one lag is specified in equation (1) to simplify notation.

The expected signs of all parameters in the above equation are positive: higher past inflation, an increase in the foreign currency price of imports, a currency depreciation and a positive output gap are all expected to lead to higher domestic inflation. The lagged CPI is included to allow the possibility of a partial adjustment of domestic inflation to the explanatory variables.[2]

The above specification seeks to estimate separately the pass-through of exchange rate and import price changes into inflation. It is therefore more general than standard pass-through models, which make no distinction between changes in import prices measured in foreign currency and exchange rate changes - these two effects are lumped together in a single variable, import prices in *domestic* currency. For example, in one variant of these models changes in the domestic price of imports are essentially "exhausted" in prices "at the docks", ie, the first-stage pass-through is approximately unity. The modelling effort then focuses on the extent to which prices "at the docks" are absorbed in producer profit margins or markups, which depends on the cost of domestic inputs (primarily labour) used in the distribution and sale of imported goods, and on the structure of competition in import-competing industries.[3]

The specification of the import price variable is thus crucial for the above model. An ideal indicator would be trading partners' export prices weighted by the shares of imports from these countries. However, these time series are not available: although the main trading partners of the emerging economies are industrial countries, a significant proportion of their imports come from other emerging markets (eg regional trade in Asia), for which the export price series are not available. In consequence, this note uses an alternative indicator, import prices measured in foreign currency. These data are available for most of the countries in the sample, but the series are relatively short - data going back to the 1980s are available only for Korea, South Africa, Brazil and Mexico.

One rationale for looking at import prices measured in foreign currency as a separate pass-through channel could be that firms and households in the emerging economies have started to follow more closely foreign price developments and take them into account in formulating their business decisions, thus affecting domestic inflation. There are several potential forces behind these developments. The emerging economies have opened up to foreign trade and investment; industrial countries have considerably expanded production in developing countries, resulting in growing importance of intra-industry trade; the economic transformation in central and eastern Europe has taken hold; and means of transportation, communication and information have improved considerably. As a result, foreign prices can be expected to affect domestic inflation not just through the cost of traded goods and services, but also via cross-border price comparisons and inflation expectations. One of the aims of this note is to test whether the influence of foreign prices on inflation has increased in recent years.

The exchange rate is also assumed to affect inflation through several channels: the standard pass-through channel (import price cum markup), and other channels that are not modelled explicitly, eg the impact of exchange rate changes on inflation expectations. Instead of the nominal effective exchange rate, this note uses nominal bilateral exchange rates (domestic currency against the US dollar or the Deutsche mark). The empirical argument for this approach is that the dollar (or Deutsche mark) rate can be easily observed by businesses and households even in less developed countries, whereas the nominal effective rates are poorly understood and available only with considerable lags even in industrial countries. Thus, signals from exchange rate changes to inflation expectations and the CPI are more likely to emanate from changes in a key bilateral exchange rate followed daily by the agents than from the nominal effective rate.

Another difference from the existing literature is that inflation in this note is measured by headline consumer price indices, without adjustment for volatile components such as food, energy or administered prices. The weight of these items in consumer price indices of the emerging economies is often close to or in excess of 50%, so excluding them would significantly limit the relevance of

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[2] Thus, the short-run exchange rate elasticity is given by β_3, the long-run elasticity by $\beta_3/(1 - \beta_1)$; the short-run import price elasticity by the coefficient β_2, and the long-run elasticity by $\beta_2/(1 - \beta_1)$; etc. The discussion in this note focuses on short-term elasticities.

[3] A full pass-through at the second stage is defined by the share of the cost of an imported item in the retail price, which is typically around two thirds in smaller industrial countries (see Dwyer and Leong (2001)). Since distributors in competitive markets often vary their markups, sometimes in inverse proportion to changes in the exchange rate so as to absorb the effects of currency depreciation, the pass-through is usually incomplete in the short term.

estimates.[4] Given the difficulties of obtaining reliable estimates of potential GDP, the output gap serves basically as a controlling variable, to ensure that the pass-through coefficients are not affected by the omission of such a major determinant of inflation as the business cycle.[5]

Equation (1) was estimated separately for South Africa, Brazil, Chile, Mexico, Peru, the Czech Republic, Hungary, Poland, Turkey, Korea, Malaysia, the Philippines and Thailand, using ordinary least squares. This method was chosen for its simplicity and because unit root tests rejected the hypothesis of non-stationarity - all variables (except the output gap) enter in log difference form, which was sufficient to induce stationarity.[6] The equations were estimated separately for the longer-run period (from the 1990s or earlier to 2000-01), and two subperiods split around mid-sample points. For the Czech Republic, Hungary, Malaysia, Poland, Thailand and Turkey, only the longer period was considered because of the shortness of the time series on import prices.

3. Results

Relationships between inflation, import prices and exchange rates in the 1990s are depicted in Graphs 1 and 1a. In Latin America (with the exception of Mexico), central Europe and South Africa, currency depreciation and domestic inflation generally moved in step, especially in the second half of the 1990s. In Mexico and the four Asian countries, however, there is no clear relationship prior to the crises of 1994 (Mexico) and 1997-98 (Asian countries): nominal exchange rates moved little, while inflation was stable (with the exception of the Philippines) (Graph 1a). The devaluations of 1997-98 did not push up inflation in Asia (or in Brazil in 1994 and 1999). And since 1997-98, inflation has moved at a similar pace in all four Asian countries, despite differing exchange rate movements: appreciation in Korea, a fixed rate in Malaysia, and depreciation in the Philippines and Thailand. In most countries, import prices have moved at a considerably slower pace than domestic prices and the foreign CPI, shown in Graphs 1 and 1a for comparison (foreign inflation is measured as the import-weighted average of inflation rates in the main trading partners). However, in the last few years, changes in import prices have been similar to or faster than changes in domestic (as well as foreign) prices in Chile, South Africa, Korea, Malaysia and Thailand.

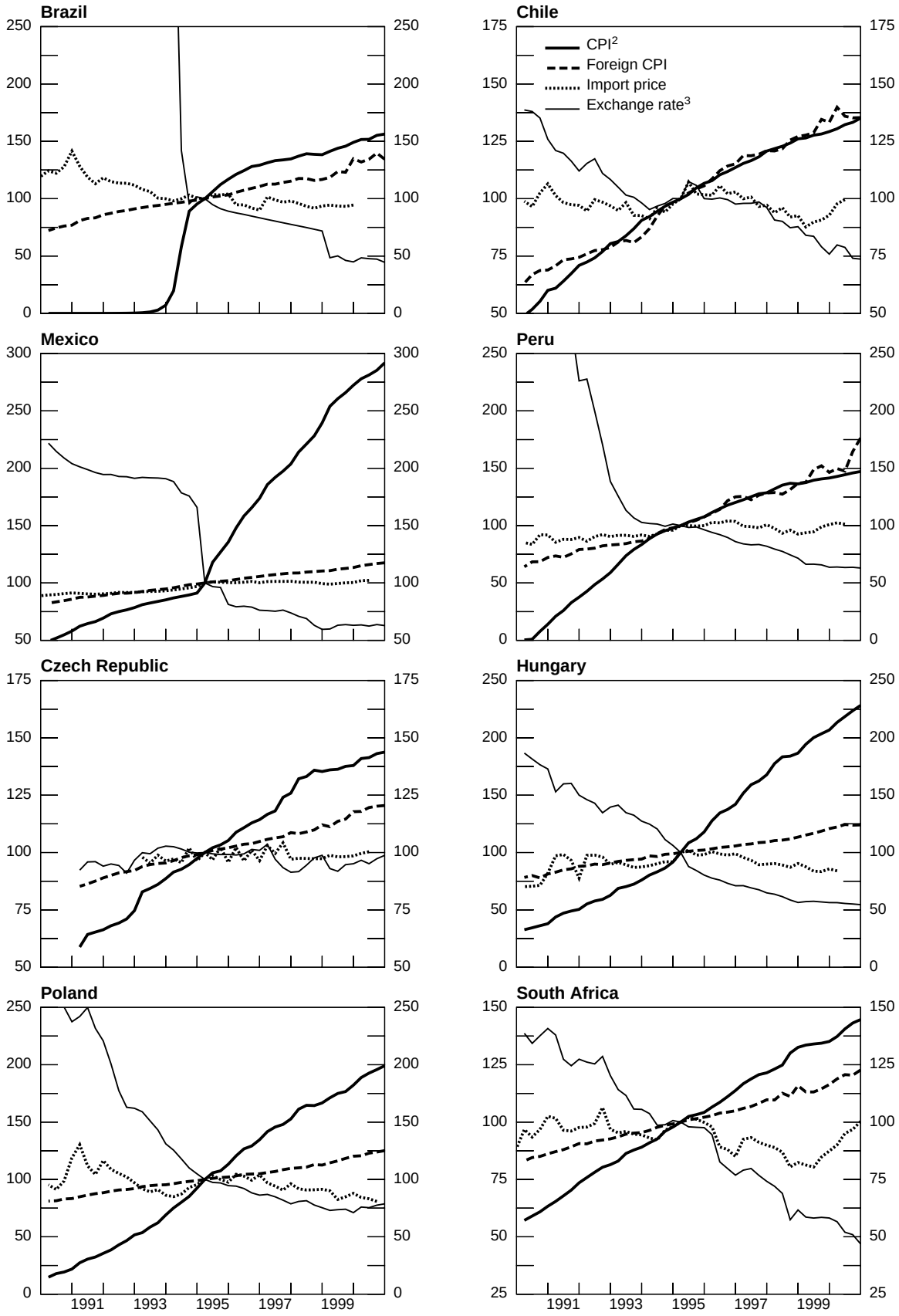
[4] For example, Darvas (2001) considers the behaviour of non-food, non-energy and non-administered prices.

[5] The output gap is measured as a percentage deviation of quarterly real GDP (in domestic currency at constant prices) from trend real GDP, estimated from annual data using the Hodrick-Prescott filter.

[6] This means that the pass-through of exchange rate and import price changes could also have been estimated using an error correction model. However, because of the short data series, this alternative was not explored.

Graph 1

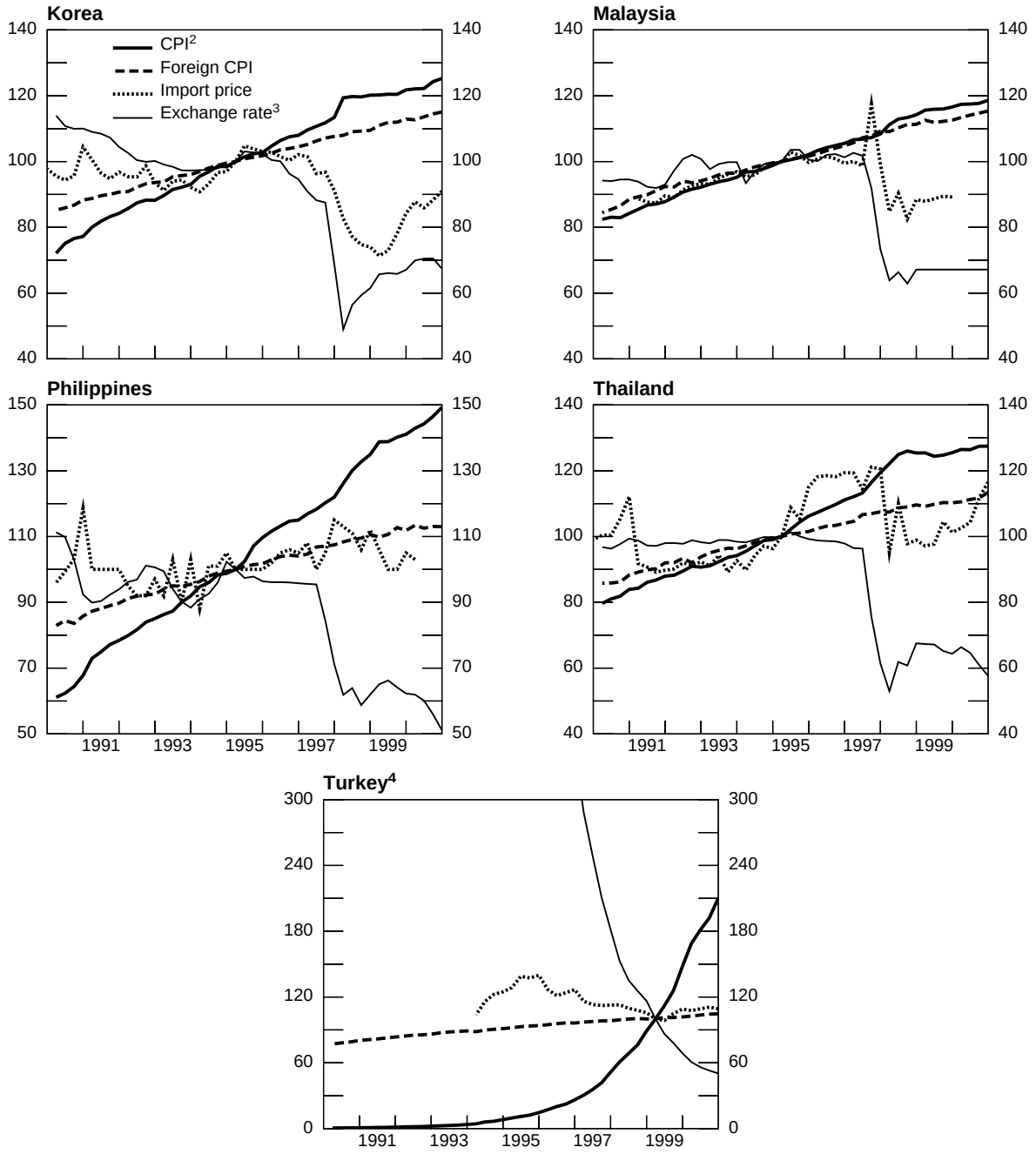
Consumer prices, import and foreign prices and exchange rates[1]



[1] 1995Q1 = 100. [2] Consumer price index. [3] Nominal exchange rate; an increase indicates an appreciation.

Graph 1a

Consumer prices, import and foreign prices and exchange rates[1]



[1] 1995Q1 = 100. [2] Consumer price index. [3] Nominal exchange rate; an increase indicates an appreciation. [4] 1999Q1 = 100.

Cross-correlations between changes in domestic prices, on the one hand, and movements in import prices or exchange rates, on the other, are shown in Tables 1 and 2. The impact on domestic inflation is measured over different time horizons, from the contemporaneous impact (dp_t) to the impact four quarters ahead (dp_{t+4}). Import price changes have been weakly correlated with domestic inflation in Asia and Latin America (with the exception of Mexico) (Table 1), but the correlations became higher in the second half of the 1990s, especially in Latin America. In the transition economies, these correlations are considerably stronger, around 0.45. Import price changes generally take about two to four quarters to filter through to inflation. However, in South Africa, Mexico and Turkey, inflation is highly correlated with import price changes in the same quarter, while in Hungary and Poland inflation is highly correlated with import price changes from the previous quarter.

Table 1

Correlation between import price changes and domestic inflation (dp_{t+i})[1]

	dp_t	dp_{t+1}	dp_{t+2}	dp_{t+3}	dp_{t+4}
Korea	– 0.14	0.06	**0.24**	0.13	0.09
Malaysia	– 0.36	– 0.48	0.21	**0.26**	– 0.15
Philippines	– 0.47	0.19	– 0.35	**0.27**	– 0.07
Thailand	0.06	– 0.04	– 0.02	**0.28**	0.07
South Africa	**0.31**	– 0.02	0.00	0.16	0.05
Brazil	0.02	0.02	– 0.10	– 0.06	**0.08**
Chile	– 0.09	– 0.17	0.01	– 0.33	**0.03**
Mexico	**0.36**	0.34	0.24	**0.36**	0.33
Peru[2]	– 0.28	– 0.15	– 0.21	**– 0.04**	– 0.10
Czech Republic	0.22	– 0.39	**0.43**	– 0.34	0.52
Hungary	0.41	**0.47**	– 0.02	0.13	**0.47**
Poland	0.17	**0.45**	0.17	– 0.09	0.01
Turkey	**0.25**	– 0.01	– 0.25	– 0.39	– 0.03

[1] Based on average quarterly changes in consumer prices. The highest correlation in each row is shown in bold. [2] Most of the correlations are positive for the second half of the 1990s.

Exchange rate changes are more strongly and more contemporaneously correlated with inflation than are import price changes (Table 2). In Brazil and Poland, inflation is almost perfectly correlated with exchange rate changes in the same quarter. In Malaysia, Mexico and Peru, these correlations are also very high, around 0.7-0.8 with a delay of one quarter. In the Philippines, Thailand, Hungary, Poland and Turkey, correlations between inflation and exchange rate changes in the same or the previous two quarters are around one half.

Table 2

Correlation between exchange rate changes and domestic inflation (dp_{t+i})[1]

	dp_t	dp_{t+1}	dp_{t+2}	dp_{t+3}	dp_{t+4}
Korea	**0.38**	0.24	– 0.08	– 0.08	– 0.09
Malaysia	0.31	**0.68**	0.43	– 0.04	0.05
Philippines	0.02	0.36	**0.45**	0.01	– 0.00
Thailand	0.43	0.48	**0.49**	0.14	– 0.10
South Africa	0.06	**0.07**	0.02	– 0.05	– 0.06
Brazil	**0.97**	0.84	0.66	0.54	0.52
Chile	0.08	0.02	– 0.00	**0.14**	0.10
Mexico	0.61	**0.72**	0.48	0.40	0.41
Peru	0.65	**0.81**	0.74	0.73	0.70
Czech Republic	0.10	0.04	**0.19**	0.12	0.04
Hungary	**0.41**	– 0.02	– 0.05	0.09	0.07
Poland	**0.92**	0.44	0.09	0.26	0.67
Turkey	**0.54**	0.25	0.08	0.32	0.04

[1] Based on average quarterly changes in consumer prices. The highest correlation in each row is shown in bold.

To further assess the dynamic behaviour of the variables in equation (1), a series of Granger causality tests was performed. The null hypothesis that import prices do not cause domestic inflation is rejected for Korea, the Philippines, South Africa, the Czech Republic and Poland (Table 3). The hypothesis that exchange rate changes do not cause inflation is rejected for all the countries except Thailand, Chile, Hungary and - surprisingly - Brazil and Turkey. However, Granger causality tests for the *monthly* changes in inflation and exchange rates rejected the hypothesis of no causality running from exchange rates to inflation for Brazil, Hungary and Turkey. Causality between the output gap and inflation cannot be rejected for Korea, Malaysia, Thailand, Peru and the central European countries. These results indicate that the assumption of statistical causality running from the nominal exchange rate to consumer prices and, to a lesser extent, from import prices to consumer prices, is valid for most of the countries in the sample.

Table 3

Granger causality tests

Null hypothesis	Korea	Malaysia	Philippines	Thailand	South Africa	Turkey[1]
$\Delta \log (P^*) \not\Rightarrow \Delta \log (P)$	√*		√		√	
$\Delta \log (E) \not\Rightarrow \Delta \log (P)$	√	√	√		√	
$(GDPGAP) \not\Rightarrow \Delta \log (P)$	√	√		√		

Null hypothesis	Brazil[1]	Chile	Mexico	Peru	Czech Rep	Hungary[1]	Poland
$\Delta \log (P^*) \not\Rightarrow \Delta \log (P)$					√		√
$\Delta \log (E) \not\Rightarrow \Delta \log (P)$			√	√			√
$(GDPGAP) \not\Rightarrow \Delta \log (P)$				√*	√	√	√

Note: Based on quarterly data. *P* = consumer price index; *P** = import prices in foreign currency; *E* = nominal exchange rate (an increase means a depreciation); *GDPGAP* = output gap; Δ = quarterly change.

- The bivariate regressions are of the form: $X_t = \alpha_0 + \alpha_1 X_{t-1} + \ldots + \alpha_n X_{t-n} + \beta_1 Y_{t-1} + \ldots + \beta_n Y_{t-n}$; $Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \ldots + \alpha_n Y_{t-n} + \beta_1 X_{t-1} + \ldots + \beta_n X_{t-n}$ for all possible pairs of (X,Y) series in the group.
- √ means that the hypothesis that X does not cause Y is rejected at a 5% level (* at a 10% level). The results are based on an F-test for the joint hypothesis that $\beta_1 = \beta_2 = \ldots = \beta_n$ are jointly equal to zero for each equation.

[1] Granger causality tests for monthly changes in inflation and exchange rates rejected the hypothesis of no causality running from exchange rates to inflation.

Least-squares estimates of the parameters in equation (1) are shown in Table 4. ***Import price elasticities*** range from 0.5 in Turkey and the Czech Republic to around 0.1 or less in Asia and Chile (Graph 2a). The pass-through of import prices is relatively strong in emerging Europe: a 1% increase in import prices raises domestic inflation by 0.3-0.5%. For the two largest Latin American economies - Brazil and Mexico - the pass-through of import prices is statistically insignificant. One reason for the higher pass-through of import prices in emerging Europe than other areas could be greater proximity of the transition economies to their main trading partners. In addition, these economies went through a simultaneous price and trade liberalisation in the first half of the 1990s. Domestic prices thus had to adjust suddenly from a very low level - consumer goods and services were heavily subsidised under central planning - to a new, higher level. In addition, consumer preferences initially shifted to foreign goods and services.

Estimates of ***exchange rate elasticities*** are very high for Mexico and Brazil, indicating more or less full pass-through of exchange rate changes into inflation (Graph 2b). The pass-through is also fairly high in Turkey, Hungary and Poland. In other countries, the impact of exchange rate changes on inflation is less pronounced. It is interesting that the lags on the exchange rate coefficients in Table 4 are all shorter (mostly *t-2*) than the lags on import price coefficients (mostly *t-3* and *t-4*). This indicates a much quicker pass-through - at most two quarters - of exchange rate changes than of import price changes; the latter affect inflation after two to four quarters.

Table 4

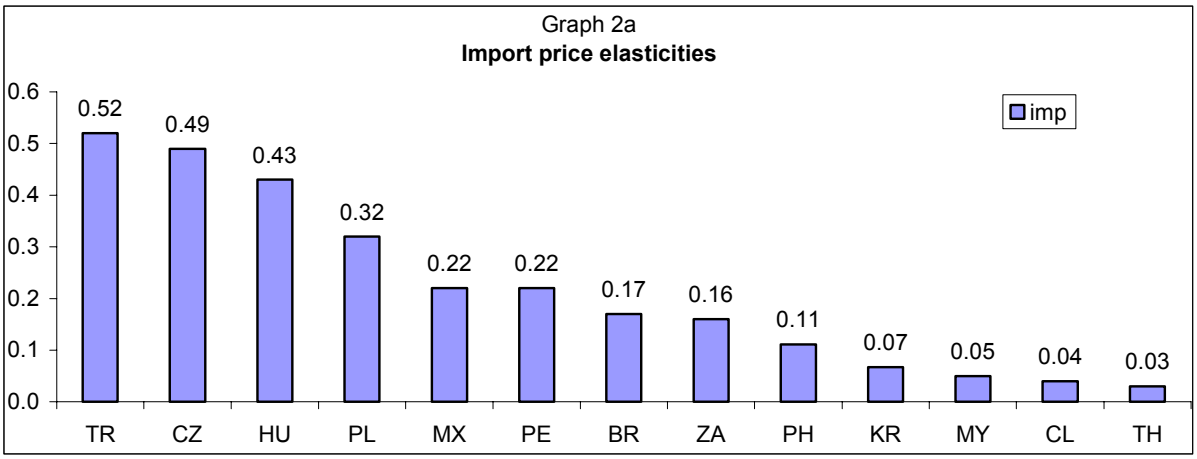
Pass-through of foreign currency import price and exchange rate changes into inflation in selected emerging market economies, 1981-2001[1]

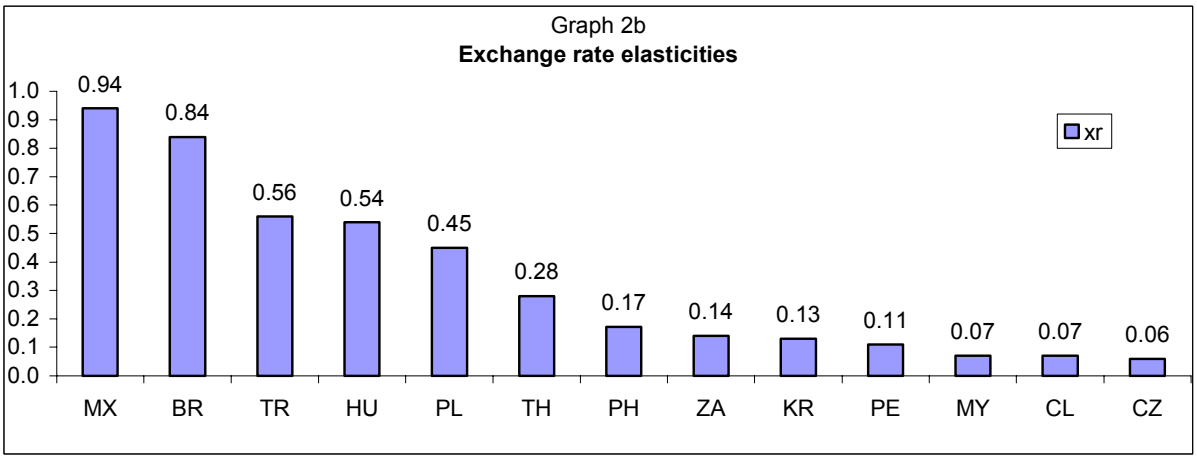
Countries and sample periods	Δcpi_{t-1}	Δcpi_{t-4}	Δimp	Δimp_{t-2}	Δimp_{t-3}	Δimp_{t-4}	Δxr	Δxr_{t-1}	Δxr_{t-2}	Gap[2]	R2	Durbin Watson
Korea (81:2 - 00:4)	0.25[3] (2.54)	0.29 (3.27)		0.07 (1.87)			0.09 (3.89)	0.04 (1.69)		–0.11	0.42	1.75
Malaysia (94:2 - 00:4)		0.49 (3.83)		0.05 (3.98)					0.07 (4.78)	0.13	0.67	1.58
Philippines (91:2 - 00:3)		0.26 (2.65)			0.07 (3.36)	0.04 (2.14)		0.08 (2.96)	0.09 (3.46)	–0.72	0.44	1.25
Thailand (94:1 - 01:1)		0.37 (2.22)			0.03 (1.35)			0.10 (3.78)	0.18 (2.47)	0.06	0.59	1.34
South Africa (88:1 - 00:4)	0.53 (4.07)		0.16 (3.11)				0.14 (3.32)			0.29	0.42	2.15
Brazil (87:1 - 00:3)	0.21 (5.19)				0.17 (1.06)		0.84 (19.52)			2.21	0.97	2.16
Chile (91:2 - 00:3)		0.48 (6.62)	–0.09 (–2.20)	0.06 (1.78)		0.07 (1.87)			0.07 (1.78)	–0.43	0.82	1.99
Mexico (87:1 - 00:4)		0.19 (2.88)			0.22 (0.44)		0.36 (6.76)	0.40 (7.84)	0.18 (3.73)	0.94	0.83	1.43
Peru (91:1 - 00:3)		0.07 (11.94)			0.22 (3.52)				0.11 (22.65)	–1.68	0.98	0.87
Czech R. (94:2 - 00:4)	0.34[4] (3.08)	0.33[3] (3.09)	–0.19 (–3.41)	0.20 (3.14)	0.18 (2.37)	0.30 (3.99)			0.06[5] (2.32)	0.89	0.87	2.33
Hungary (93:2 - 00:1)		0.45 (4.75)	0.43 (5.71)				0.54 (5.28)			0.16	0.78	1.92
Poland (90:4 - 00:4)		0.11 (5.69)	0.19[6] (3.19)	0.13 (2.45)				0.23 (2.61)	0.22 (2.56)	–1.27	0.85	2.65
Turkey (95:2 - 00:4)		0.26 (3.30)				0.52 (3.64)	0.56 (6.04)			3.26	0.76	1.51

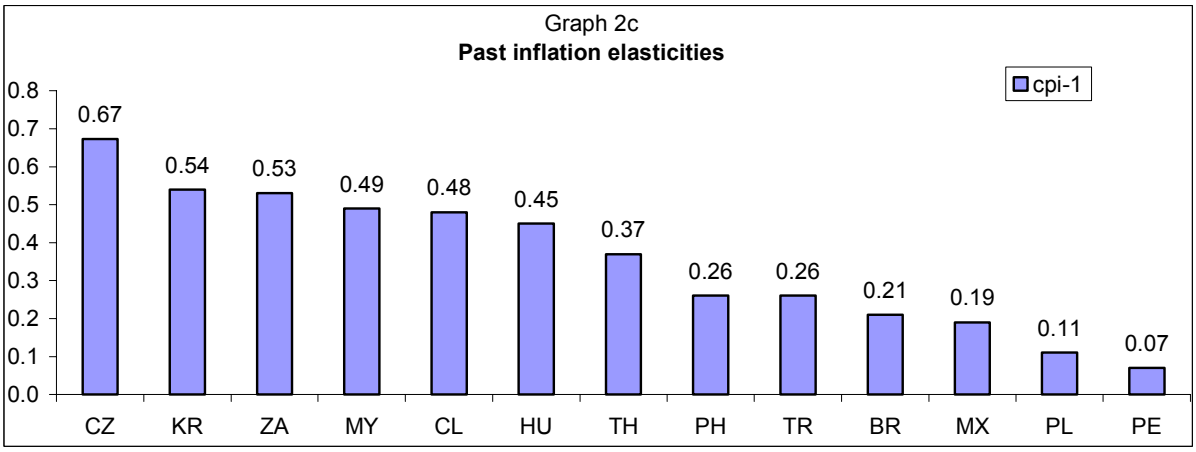
Note: Δcpi = quarterly average change in log of consumer prices; Δimp = quarterly average change in log of import prices in foreign currency; Δxr = quarterly average change in log of nominal exchange rate; gap = output gap (percentage deviation of actual GDP from potential); t-statistics are shown in parentheses.

[1] Estimates of the constant term are not shown in order to simplify the table. [2] This column shows the sum of all statistically significant estimates of the output gap coefficient, from t to t-4. [3] Coefficient for Δcpi_{t-3}. [4] Coefficient for Δcpi_{t-2}. [5] Coefficient for Δxr_{t-4}. [6] Coefficient for Δimp_{t-1}.

Comparing the size of the two sets of pass-through coefficients one can notice that four countries - Malaysia, South Africa, Chile and Turkey - have exchange rate and import price elasticities of approximately the same size. In seven countries the exchange rate elasticity is higher; in two countries (the Czech Republic and Peru) the import price elasticity is higher. These results clearly indicate that it is appropriate to estimate the two pass-through effects separately.







There is considerable inflation inertia in many emerging economies. The highest estimated ***past inflation elasticity*** is for the Czech Republic and the lowest for Peru (Graph 2c). Interestingly, the estimated coefficients are fairly low in countries that experienced high inflation at different periods in the past - Brazil, Mexico, Peru, the Philippines, Poland and Turkey (see Table A1).

The estimated relationship between the ***output gap and inflation*** is statistically significant for all the countries with the exception of Hungary and South Africa, and the sign is for the most part positive. Differences in the size of coefficients are large - an increase in the output gap of 1 percentage point is estimated to raise quarterly inflation by 3.3 percentage points in Turkey and 2.2 percentage points in Brazil, and to have almost no impact in the Asian economies. The negative coefficient for Poland probably reflects the events of the early 1990s, when the sharp fall in output resulting from systemic shocks (including the collapse of central planning and trade among former socialist economies)

coincided with price liberalisation. Similarly, disruptions in the economy caused by hyperinflation could explain why the output gap coefficient for Peru is negative. But the negative (and statistically significant) coefficients for Chile, Korea and the Philippines are hard to explain.

Have the estimated pass-through parameters changed over time? For Korea, South Africa, Brazil, Mexico and Peru, the null hypothesis of no structural break in parameters is rejected by the Chow test (Table 5). It should be noted that the time series for the countries for which the Chow test is not significant are rather short. Alternative estimates where import prices are replaced by foreign inflation easily reject the null hypothesis of no structural break in parameters for all 13 countries in the sample.

Table 5

In-sample Chow breakpoint stability test

	Korea	Philippines	South Africa	Brazil	Chile	Mexico	Peru
F-statistic	3.07*	1.77	3.47*	9.61*	1.52	4.08*	8.67*

Note: The Chow tests were calculated for sample periods shown in Table A2.

* Indicates that the null hypothesis of no structural break has been rejected.

The estimated exchange rate elasticities declined in all the countries in the second half of the 1990s, though the change was very small in the Philippines, South Africa and Chile (Table 6). While the import price elasticity tended to decline, it rose in Chile, Mexico and South Africa. The decline in the exchange rate pass-through was particularly large in Brazil, Mexico, Peru and Korea. The decline in the import price pass-through was large in Korea, Brazil and Peru. The persistence of inflation has declined only in Brazil and Chile.

Table 6

Change in the pass-through

	Lagged inflation		Import price		Exchange rate	
	1st period	2nd period	1st period	2nd period	1st period	2nd period
Korea	0.23	0.30	0.18	0.06*	0.11	0.05
Philippines	– 0.18	0.16*	0.03	– 0.06	0.18	0.16
South Africa	0.03*	0.49	0.01	0.04*	0.13	0.11
Brazil	0.24	0.03	0.50	0.19	0.96	0.04*
Chile	0.43	0.06*	0.03*	0.07	0.04*	0.02*
Mexico	0.14	0.40	0.14*	0.28**	1.06	0.34
Peru	0.07	0.52	0.31	0.13	0.16	0.01*

Note: Based on sample periods shown in Table A2.

* Indicates estimates that are not statistically significant at the 5% level. ** Indicates estimates that are statistically significant at the 10% level.

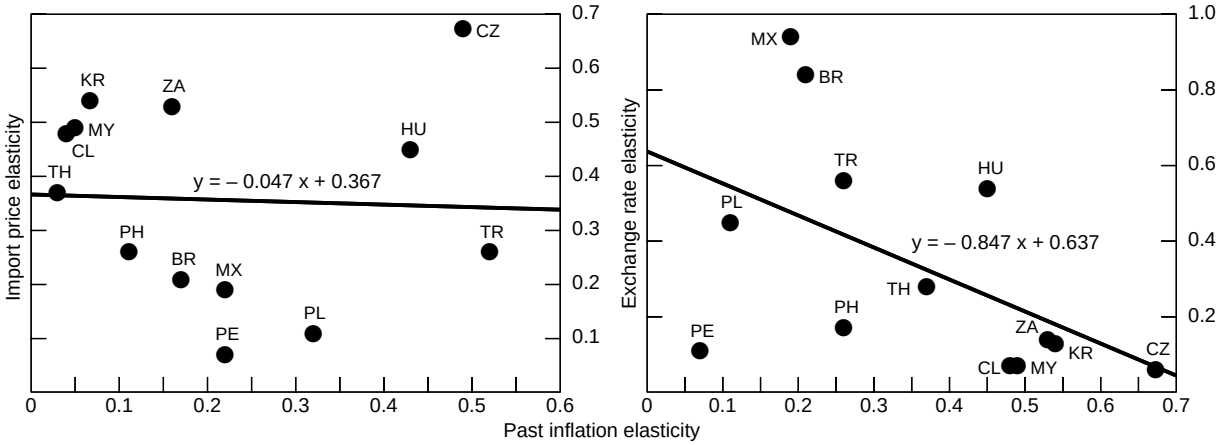
4. Tentative interpretations

The above results provide support for a pass-through model that separates the effects of changes in exchange rates and import prices measured in foreign currency. There are large differences in the size of the pass-through coefficients across countries. Within most countries, the main channel for the transmission of external influences is exchange rate movements. However, the exchange rate pass-through has declined in recent years.

Why do the pass-through coefficients differ so much across countries? One factor could be different histories of inflation performance. Taylor (2000) has argued that lower persistence and volatility of inflation reduce the degree to which firms are able to pass through to their own prices both price increases at competing firms and cost increases due to exchange rate movements or other factors. Thus, low and stable inflation should lead to a virtuous circle of declining markups and weakening pricing power of firms, and less inflationary implications of monetary expansions (including exchange rate depreciation). The link between volatile inflation and the size of the exchange rate pass-through has been documented for the OECD countries (see Campa and Goldberg (2001)).

Graph 3

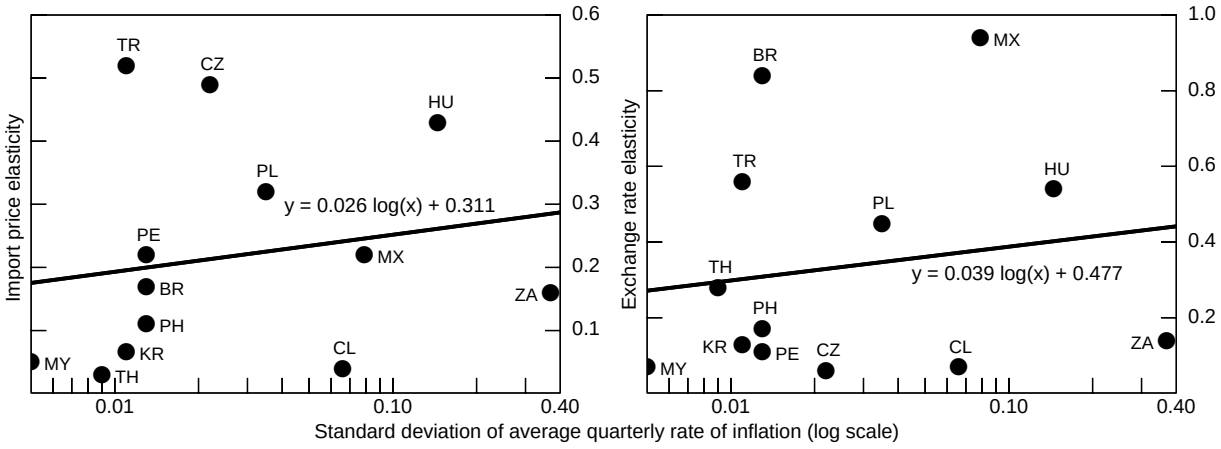
Import price elasticity, exchange rate elasticity and persistence of inflation



The empirical evidence from the emerging economies only partly supports these arguments. The cross-country relationship between inflation persistence (measured by past inflation elasticity), on the one hand, and import price or exchange rate elasticities, on the other, is clearly negative (Graph 3). Lower persistence of inflation in the emerging economies is associated with higher, not lower pass-through elasticities. There seems to be no intuitive explanation why this relationship holds, but statistically it is fairly robust. At the same time, volatility of inflation (measured by the standard deviation of average quarterly inflation rates) does seem to be positively correlated with pass-through elasticities (Graph 4).

Graph 4

Import price elasticity, exchange rate elasticity and inflation volatility

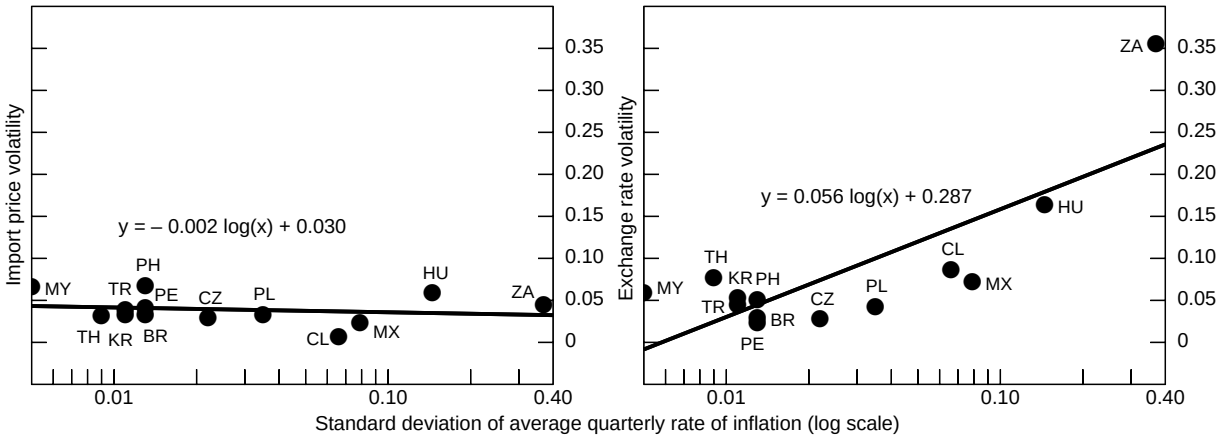


The next question that arises is: Why is the exchange rate pass-through in most countries higher than the import price pass-through? Statistically, exchange rate changes are on average twice as volatile

(as measured by the standard deviation of quarterly average changes) as import price changes and, unlike import price changes, are positively correlated with the volatility of inflation (Graph 5). This positive relationship of exchange rate changes apparently outweighs the impact of their greater volatility, which would normally imply a lower estimated value of exchange rate elasticity.

Graph 5

Import price, exchange rate and inflation volatility



A more intuitive explanation for the higher exchange rate pass-through relative to the import price pass-through could be that high inflation leads to currency substitution, where exchange rates play a role not only in transmitting external influences to domestic prices, but also in affecting the formation of expectations about future inflation. When currency substitution is widespread, changes in exchange rates tend to overshadow other influences on inflation, including changes in import prices. Another common channel for the transmission of exchange rate changes is indexation of wages and debt contracts, which was common in many high-inflation countries in the late 1980s and early 1990s.

The shifts in the rates of exchange rate and import price pass-through probably reflect two main influences: greater macroeconomic stability, and wide-ranging structural reforms implemented in the emerging economies during the 1990s. For example, as inflation and its volatility were sharply reduced in the second half of the 1990s, especially in Brazil, Mexico and Peru (Table A1), the exchange rate volatility dropped correspondingly. This has resulted in a significant reduction in exchange rate elasticities (Table 6). At the same time, in Brazil, Chile and Mexico (as well as South Africa), the import price pass-through has become stronger relative to the exchange rate pass-through.[7]

Structural reforms may have reinforced these trends. Domestic deregulation, foreign trade and investment liberalisation, and globally more integrated production of goods and services have increased competition in import-competing industries in the emerging economies, and made it more difficult for firms to pass on the price increases resulting from currency depreciation, while at the same time making producers and consumers more observant of foreign price movements. Latin American economies and South Africa, where the exchange rate elasticities declined and the import price elasticities rose in the second half of the 1990s, again illustrate these trends.

Additional factors played a role in the transition economies. As prices and foreign trade were liberalised and exchange rates were sharply devalued in the early 1990s - but were subsequently kept relatively stable for a number of years - transition economies experienced bouts of inflation as domestic prices began to adjust to a new, higher level. As a result, the import price pass-through has been stronger on average than in other countries, and it probably also dominated the exchange rate pass-through in Hungary and Poland initially.

[7] More precisely, the difference between import price and exchange rate elasticities in the first period has switched from negative to positive, or has become less negative, in the second period.

Table A1

Exchange rates, consumer and import prices in emerging market economies[1]

	Exchange rate[2]		Consumer price		Import price	
	Quarterly average	Standard deviation	Quarterly average	Standard deviation	Quarterly average	Standard deviation
Korea	– 0.6	0.053	1.3	0.011	– 0.1	0.033
Malaysia	– 1.2	0.059	0.8	0.005	– 0.1	0.067
Philippines	– 1.3	0.051	2.0	0.013	– 0.2	0.068
Thailand	– 1.6	0.077	1.1	0.009	0.8	0.032
Brazil	– 25.6	0.356	54.2	0.370	0.2	0.045
Chile	– 1.3	0.029	2.1	0.013	– 0.1	0.033
Mexico	– 3.9	0.087	6.6	0.066	0.5	0.007
Peru	– 4.7	0.072	6.4	0.079	0.3	0.024
Czech Republic	– 0.1	0.024	1.8	0.013	0.2	0.041
Hungary	– 2.9	0.028	4.1	0.022	– 0.2	0.029
Poland	– 4.2	0.164	9.9	0.145	0.1	0.059
Turkey	– 11.4	0.043	14.5	0.035	– 0.5	0.033
South Africa	– 2.4	0.045	2.4	0.011	0.2	0.039

[1] Based on quarterly average changes over the sample period defined in Table A2. [2] An increase indicates an appreciation.

Table A2

Sample periods for estimates of change in the pass-through

	1st period	2nd period
Korea	1981:02-1990:04	1991:02-2001:02
Philippines	1991:02-1995:04	1996:01-2000:04
South Africa	1989:01-1994:04	1995:01-2000:04
Brazil	1987:02-1994:02	1994:04-2000:01
Chile	1991:02-1995:04	1996:01-2000:04
Mexico	1987:01-1994:04	1995:01-2000:04
Peru	1991:01-1995:04	1996:01-2001:01

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