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# The Inflationary Impact of Repetitive Devaluation: Reply

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I am grateful for this opportunity to reply to the Peel and Sheehey remarks concerning my paper on the inflationary impact of repetitive devaluation.

Let me clarify, first, the confusion which is apparently present in my paper and which has led Mr. Peel to misunderstand the explanation and specification of my model. In brief, the confusion concerns the definition of two variables: MD and P*. The first variable is not, as Peel understood it to be, the nominal demand for money but, indeed, the real demand for money. While I naturally assume the responsibility for this confusion since I did not make it explicit that MD was in real terms, I must explain that I thought it would be obvious since the entire model is expressed in real terms and, for most variables in it, I made that quite clear. I should add that nowhere do I state or imply that MD is the nominal demand for money for that would indeed be a crucial mistake. For illustrative purposes, a demand-for-money function in nominal terms could be specified as follows:

$$8)\ MD = q + sP(YD) - tr - UP^*$$

where P is the level of prices, YD is the level of aggregate demand in real terms, r is the real rate of interest and P* stands for price expectations. In this case, the nominal demand for money is a function of nominal income and the cost (both actual and expected) of holding cash balances.

With regard to the second variable at issue, namely P*, it is not, as Mr. Peel thought it was, the expected rate of inflation. Rather, it is the expected level of prices—what I called 'price expectations' and should perhaps have called 'price-level expectations'. For the sake of greater conceptual clarity, let us now redefine P* as the expected change in the level of prices, namely, $(\Delta P)^e$, and let us redefine Equation (10) as follows:

$$P^* = (\Delta P)^e = k + m\Delta P_{t-1} + n\Delta R_{t-1}$$

where $P_{t-1}$ is the level of prices in the previous period, $R_{t-1}$ is the price of foreign exchange in the previous period, and the symbol Δ stands for 'change in'. Here expectations about how much prices are going to change are a function of how much prices changed in the previous period—but note that there is an implicit lag since $\Delta P_{t-1} = P_{t-1} - P_{t-2}$—and a function of how much the exchange rate changed in the previous period—where $\Delta R_{t-1} = R_{t-1} - R_{t-2}$.

In light of the existing confusion perhaps it would be interesting to demonstrate that, even if the demand-for-money function were to be specified in nominal terms and the price-expectational term were to be redefined as I now suggest, it is still possible to derive an equation which is, in substance, identical to Equation (2) in the original paper. (It should be recalled that the said equation was one of four equations to be tested empirically.) For this purpose, I shall now specify the model directly in terms of changes in all variables instead of in levels.

Let changes in real aggregate demand (ΔYD) be defined as the addition of changes in real consumption (ΔC), real investment (ΔI), real government purchases (ΔG), and real exports (ΔE) as well as the substraction of changes in

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real imports ($\Delta M$). Say that changes in real consumption are a function of changes in real aggregate demand and of expected changes in the level of prices ($P^*$, where $P^* = (\Delta P)^e$); that changes in real investment are a function of changes in the real rate of interest ($\Delta r$); that changes in real exports are positively related to changes in the previous period's exchange rate ($\Delta R_{t-1}$); and that changes in real imports are negatively related to changes in the previous period's exchange rate, as well as positively related to changes in real aggregate demand. Assume that changes in what is now defined as the nominal demand for money ($\Delta MD$) are a positive function of both changes in the level of prices ($\Delta P$) and of changes in real income ($\Delta YD$) while being negatively related to both changes in the real rate of interest ($\Delta r$) and to expected changes in the level of prices ($P^*$). Since this continues to be a short-run model, let changes in aggregate supply ($\Delta YS$) be a positive function of changes in prices ($\Delta P$) and a negative function of expected changes in prices ($P^*$). (We are implicitly assuming the existence of a short-run Phillips curve.) Finally, let us define $P^*$ as being a function of past changes in the level of prices ($\Delta P_{t-1}$) and of past changes in the exchange rate ($\Delta R_{t-1}$). In this model, changes in the nominal money supply ($\Delta MS$), government spending ($\Delta G$), and in both the exchange rate of the level of prices in the previous period are taken as exogenous. Equilibrium is assumed in the money and commodity markets. Consequently, this new model's ten equations can be written in the following manner:

(1) $\Delta YD = \Delta C + \Delta I + \Delta G + \Delta X - \Delta M$

(2) $\Delta C = a + b\Delta YD + cP^*$

(3) $\Delta I = d - e\Delta r$

(4) $\Delta X = f + g\Delta R_{t-1}$

(5) $\Delta M = h - i\Delta R_{t-1} + j\Delta YD$

(6) $\Delta MD = q + s\Delta P + t\Delta YD - u\Delta r - vP^*$

(7) $\Delta MD = \Delta MS$

(8) $\Delta YD = \Delta YS$

(9) $\Delta YS = w\Delta P - xP^*$

(10) $P^* = k + m\Delta P_{t-1} + n\Delta R_{t-1}$

By algebraic manipulation we can obtain an equation for $\Delta r$ from both the money and commodity markets:

$$\Delta r = a' + c'\Delta P_{t-1} + e'\Delta G + n'\Delta R_{t-1} - b'\Delta YD$$

$$\Delta r = q' + s'\Delta P + t'\Delta YD - v'\Delta R_{t-1} - u'\Delta MS - m'\Delta P_{t-1}$$

where $a' = (1/e)(a + ck + d + f - h)$; $c' = cm/e$; $e' = 1/e$
$n' = (1/e)(cn + g + i)$; $b' = (1/e)(1 - b + j)$;
$q' = (1/u)(q - vk)$; $s' = s/u$; $t' = t/u$; $v' = vn/u$;
$u' = 1/u$; and $m' = vm/u$

By setting both equations equal to one another we can solve for $\Delta YD$ and obtain an equation of the type:

$$\Delta YD = a'' + c''\Delta P_{t-1} + e''\Delta G + u''\Delta MS + n''\Delta R_{t-1} - s''\Delta P$$

where $a'' = (a' - q')/(b' + t')$; $c'' = (c' + m')/(b' + t')$;
$e'' = e'/(b' + t')$; $u'' = u'/(b' + t')$; $n'' = (n' + v')/(b' + t')$;
and $s'' = s'/(b' + t')$

Similarly, from Equations (9) and (10) we can solve for ΔYS as follows:

$$\Delta YS = -k' + w\Delta P - m'\Delta P_{t-1} - n'''\Delta R_{t-1}$$

where $k' = xk$; $m' = xm$; and $n''' = xn$

By setting both equations equal to one another we can solve for ΔP and obtain an equation of the type:

$$\Delta P = \gamma_1 + \gamma_2 \Delta P_{t-1} + \gamma_3 \Delta R_{t-1} + \gamma_4 \Delta G + \gamma_5 \Delta MS$$

This was one of the equations that was successfully tested in the paper and which lends credence to the hypothesis that past exchange-rate changes can have, by influencing the formation of price expectations, an important impact on the present and the future level of prices. Consequently, and despite these and other changes that can be introduced in the model, neither the econometric results I obtained nor my policy conclusion can be 'heavily discounted'.

With regard to Mr. Sheehey's remarks, I should say that I find them a useful—indeed, valuable—addition to my paper. Sheehey is of course right in stating that an exchange-rate change can have two effects: one on the price of imports (and perhaps even on the price of exports) and one on price expectations, and that we must differentiate between the two. Since my paper deals with the latter effect, one should try to exclude the former. I did that by measuring the effect on prices of past exchange-rate changes; Sheehey proposes that we should take a price index that excludes import (and, if possible, export) goods. He takes the trouble of so doing and finds that the exchange-rate variable loses much of its power over prices, at least in the case of Chile. The question is now a truly empirical one: do past exchange-rate changes help determine (through, for example, a price-expectational mechanism) the current price of non-traded goods? I still think they do.

Using quarterly data and period averages, I first ran the following equation:

$$\Delta PH = -8{\cdot}44 - 0{\cdot}31\Delta PH_{t-1} + 39{\cdot}19\Delta R_{t-1} + 100{\cdot}20\Delta MS_{t-1}$$

$$(1{\cdot}62)\ (1{\cdot}60) \qquad (2{\cdot}41) \qquad (8{\cdot}33)$$

$$\bar{R}^2 = 0{\cdot}82 \qquad F = 29{\cdot}39 \qquad DW = 2{\cdot}40$$

thus obtaining a result for the coefficient of $\Delta R_{t-1}$ which implies that past exchange-rate changes do have some (previously unexplained) effect on current, non-traded goods' prices.

To try to avoid what Sheehey feels is a problem with quarterly averages of the exchange-rate variable, I ran the same equation as above but with $\Delta R_{t-1}$ measured in terms of end-of-period data. (This means that, for example, the change in non-traded goods' prices between 1969IV and 1970I will be explained, in part, by the change in the exchange rate between September 30 and December 31, 1969.) Said equation yields the following results:

$$\Delta PH = -8{\cdot}27 - 0{\cdot}21\Delta PH_{t-1} + 36{\cdot}00\Delta R_{t-1} + 95{\cdot}42\Delta MS_{t-1}$$

$$(1{\cdot}63)\ (1{\cdot}29) \qquad (2{\cdot}54) \qquad (7{\cdot}71)$$

$$\bar{R}^2 = 0{\cdot}82 \qquad F = 30{\cdot}42 \qquad DW = 2{\cdot}68$$

Here again, past exchange-rate changes still have a statistically-significant effect on current, non-traded goods' prices.

In summary, I feel that (a) omitting the traded components of the price index is a useful suggestion which tends to reduce the predictive power of past exchange-rate changes as we continue to eliminate the direct effect of devaluations upon domestic prices and concentrate on the indirect effect which is the one I attempted to explain; but (b), even when we do so, the effect I describe can still be verified for the case of Chile save when we use (as Sheehey did) end-of-period data for all the variables involved.

Certainly, additional work needs to be undertaken to further verify the hypothesis I have suggested and to determine whether Sheehey's results are, as I imply, an exception.

In closing, I should add that, in the last two years, there has been additional theoretical and empirical work in this area. The contributions deal with the previously unstudied impact of exchange-rate changes upon domestic wages, the demand for money, and other economic aggregates. For those readers who have a continuing interest in the subject, may I mention the papers by Blejer *[1976]*, Goldstein *[1974 and 1975]*, and Porzecanski *[1974]*.

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