TRADE PRICE SHOCKS AND INSULATION:
AUSTRALIA'S EXPERIENCE WITH FLOATING RATES

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G.P.O. Box 4, Canberra 2601, Australia
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While many countries moved to floating exchange rate systems in the early seventies, Australia experimented with a variety of pegged and managed regimes until the currency was floated in December 1983.\(^1\) In particular, throughout the period of turbulent price movements associated with the early seventies and the first oil price shock in 1974 the rate was not allowed to float freely. The paper argues that in important respects the subsequent floating rate regime has served the economy much better than it was served by the regimes of the seventies and that a floating rate remains preferable to pegged or managed rates. The theme of the paper is that a floating rate system provides the potential for insulation from the disparate and substantial foreign price movements to which the Australian economy is subject and that this is an extremely valuable attribute of floating rates with important implications for the level of activity as well as for nominal variables. Further, there appears to be empirical support for the proposition that such insulation has occurred since the exchange rate was floated in Australia.

The capacity of a flexible rate regime to insulate against foreign inflation is well known.\(^2\) If foreign inflation is uniform across commodities and steady, then the theoretical proposition is that, provided the Fisher Effect works abroad, the exchange rate will appreciate at the rate of foreign inflation.\(^3\) Consequently, domestic currency traded goods prices will remain constant, that is the exchange rate appreciation will insulate all other domestic nominal and real variables from the effects of foreign inflation. However, in practice relevant foreign price movements are anything but uniform and steady. Graph 1, showing annual rates of change of Australian foreign currency export and import prices and of the index of domestic consumer prices, clearly illustrates this. Hence, it is necessary to rework the "inflation" insulation property to appreciate the form it would take in such conditions. The reformulated proposition is that, other things being equal, nominal exchange rate movements would be a weighted average of changes in foreign currency trade prices.

1 Blundell-Wignall and Gregory (1990) set out the nature and timing of changes in these systems in table 1. p.230.
2 See, for instance, Turnovsky [1979], Pitchford [1985].
3 It is important to note that this proposition is also closely associated with the capacity of flexible rates to ensure independence of monetary policy. For a small country with fixed rates, not only would the foreign price inflation be fully imported, but foreign monetary expansion would induce a commensurate rate of increase in the domestic money supply.
Thus, there is an expectation that 'on average' the exchange rate mechanism will still have an insulating role when trade price movements are diverse. It is this reformulated proposition which will be expounded and tested in the present paper.

It has been claimed that the major benefit from floating has been the capacity of this system to ameliorate the effects of the considerable terms of trade shocks to which Australia is periodically subject. However, it is argued here that the potential of a flexible rate to insulate against nominal foreign currency trade price shocks is possibly its most important advantage. This does not preclude the exchange rate having a role with respect to terms of changes because, as changes in export and import prices and terms of trade changes are definitionally related, the foreign price insulation property of floating rates applied to these trade prices includes important aspects of exchange rate amelioration of the effects of terms of trade movements. Finally, another beneficial property of floating rates is thought to be their capacity to insulate against real shocks. This is closely related to the terms of trade insulation and, while of considerable interest, is not separately examined here.

Section I treats the theoretical basis for insulation both with respect to nominal trade price and terms of trade shocks. Discussion and empirical analysis of experience of trade price shocks and insulation is undertaken in Section II and conclusions are set out in Section III.

I. Theoretical Aspects of the Inflation Insulation Property

If exchange rates are neither pegged nor managed it can be shown that the monetary authorities will usually be able to control the domestic money supply. Further, under certain circumstances, the domestic inflation rate and all domestic nominal and real variables (other than the nominal exchange rate) will be independent of the foreign inflation rate. This is the standard foreign inflation insulation property of flexible exchange rates.

Basically, the circumstances required to hold are that there is no money illusion in relevant domestic and foreign decisions so that real variables will not depend on nominal variables. If this is so abroad and at home, the foreign real interest rate will be independent of the foreign inflation rate and the domestic real money supply and real exchange rate will also be independent of the foreign rate of inflation. The independence of the real and nominal money supply of foreign inflation ensures that the domestic inflation rate is similarly independent. The independence of the real exchange rate of foreign inflation, combined with that of the domestic inflation rate, means that the nominal exchange rate must move to offset the effects of foreign inflation. To see these points precisely, define the real money supply $\bar{m}$ and the real exchange rate $\bar{e}$ as

\begin{align*}
(1.1) \quad & \bar{m} = m \cdot \bar{p} \\
(1.2) \quad & \bar{e} = e + \bar{p} \cdot \bar{p}
\end{align*}

all variables being measured in logarithms and

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$m$</td>
<td>nominal money supply</td>
</tr>
<tr>
<td>$\bar{p}$</td>
<td>foreign currency price of imported good</td>
</tr>
<tr>
<td>$\bar{p}$</td>
<td>price index</td>
</tr>
<tr>
<td>$\bar{p}$</td>
<td>price of foreign money</td>
</tr>
</tbody>
</table>

Differentiating with respect to time to get proportional rates of change yields

\begin{align*}
(1.3) \quad & \bar{\bar{m}} = \bar{m} - \bar{p} \\
(1.4) \quad & \bar{\bar{e}} = \bar{e} + \bar{p} \cdot \bar{p} - \bar{p}
\end{align*}

where $\bar{\bar{m}} = d\bar{m}/dt$. From (1.3) the independence of $\bar{m}$ and $\bar{\bar{m}}$ ensures that $\bar{p}$ is also independent of the foreign inflation rate. Given this, the independence of $\bar{\bar{e}}$ is, from (1.4), ensured by appropriate movements in $\bar{\bar{e}}$. For example, if the real exchange rate were constant

\[ (1.5) \quad \bar{\bar{e}} = \bar{p} + \bar{p} \]

and if the domestic macro settings were such that the domestic inflation rate was zero the exchange rate would appreciate at the rate of foreign inflation.

Now consider the nature of insulation from foreign price shocks in a small open economy producing exportables, importables, importables and non-traded goods. In the case in which the foreign inflation rate is uniform across all commodities the one good model

\[ 5 \text{ Other than the usual money demand relation that real money demand depends on the nominal interest rate.} \]
results carry across to the three good model. However, it has been emphasised that in practice foreign currency traded goods price movements are very much more volatile than foreign consumer price inflation rates. The theory needs adaptation to be able to deal with such circumstances.

Market clearing for the non-traded good is given by

\[(1.6) \quad y = -\alpha + \mu (s - q) + \alpha q (e + q - \psi) + \delta \xi (e + q - \psi)\]

where the price index \(\psi\) is

\[(1.7) \quad \psi = \alpha s (e + \xi) + \alpha q (e + q) + \alpha_p p\]

Again, all endogenous variables other than interest rates are measured in logarithms.

Symbols are

\[
\begin{align*}
\gamma & \quad \text{output of non-traded goods} \\
\delta & \quad \text{GDP measured without terms of trade effects} \\
p & \quad \text{price of non-traded goods} \\
s & \quad \text{price of exportables in foreign currency} \\
q & \quad \text{price of importables in foreign currency} \\
\psi & \quad \text{consumption price index} \\
\xi & \quad \text{the price of foreign currency} \\
\epsilon & \quad \text{the price of domestic currency} = e \\
\rho & \quad \text{domestic real interest rate} \\
a_i & \quad \text{weight of good } i \text{ in consumption price index, } i = x, M \\
x & \quad \text{exportables, importables}
\end{align*}
\]

In (1.6) the demand for non-traded goods is assumed to be a function of the real interest rate \(\rho\), real GDP consisting of terms of trade effects \(s - q\) and real GDP as conventionally measured without terms of trade effects \(\delta\), the relative price of exportables \(\epsilon + \xi\) and the relative price of importables \(\epsilon + q\). Supposing goods are gross substitutes, these effects will have signs such that the elasticities \(\mu, \alpha, \delta_\xi, \delta_q\) are all positive. The terms of trade and GDP enter this demand function through the income effects of their changes on real demand. Foreign currency tradable prices are assumed exogenous for the economy considered. Further, the real interest rate will be taken to be exogenous. From interest parity the domestic real interest rate equals the foreign real interest rate plus the expected depreciation of the real exchange rate.\(^6\) If now the assumption is made that the expected depreciation of the real exchange rate is zero the domestic real interest rate can be taken to equal the foreign real interest rate which will be treated as a parameter independent of the foreign inflation rate.\(^7\)

To isolate the insulation question in this framework, hold other variables constant to find the nominal exchange rate responses to changes in foreign prices. These are given by

\[(1.8) \quad \frac{\partial e}{\partial s} = \frac{\delta_x + \mu}{\delta_x + \delta_M} < 0\]

\[(1.9) \quad \frac{\partial e}{\partial q} = -\frac{\delta_M - \mu}{\delta_x + \delta_M} < 0\]

\[(1.10) \quad \frac{\partial e}{\partial s} + \frac{\partial e}{\partial q} = \frac{\delta_x + \delta_q}{\delta_x + \delta_M} \left[ \frac{\delta_M - \mu}{\delta_x + \delta_M} \right] = \frac{\delta_x + \delta_q}{\delta_x + \delta_M} \left[ \frac{\delta_M - \mu}{\delta_x + \delta_M} \right] \left( ds + dq \right)\]

If \(ds = dq\) it follows that \(de = ds = dq\) which is the standard insulation result. It is shown in Long and Pritchett that, provided goods are gross substitutes, \(\delta_M - \mu\) is unambiguously positive and so the derivative (1.9) is unambiguously negative. Thus, for example when importables prices alone rise, the nominal exchange rate appreciates, but by a smaller proportion than the rise in those prices and the same is true for exportables prices, so the exchange rate appreciates partly, but not wholly, to offset individual foreign currency price rises. In general, with other influences held constant, its movements will be a weighted average of those of the two prices.

To obtain total effects differentiate (1.6) totally with respect to time

\[(1.11) \quad \dot{\epsilon} = -s - \frac{\delta_x + \delta_q}{\delta_x + \delta_M} \left( \delta_M - \mu \right) \left( \psi (s - q) \right) + \frac{\partial s}{\delta_x + \delta_M} \left( \dot{s} - \dot{q} \right) - \frac{1}{\delta_x + \delta_M}\]

where \(s = \delta_x + \delta_M\).

\(^6\) Defining the real exchange rate in the conventional way as the domestic currency valued foreign consumption price index divided by the domestic consumption price index.

\(^7\) These assumptions will not be critical if the domestic real interest has an insignificant effect on real demand for the length of period considered.
Combining the terms of trade effect into its component price effects and labelling groups of coefficients,

\[(1.12) \delta = a_x \delta + a_y \delta - \delta + a_{\delta} \delta + a_{\gamma} \delta\]

Thus the non-traded goods market equilibrium condition implies that movements in the exchange rate will depend not only on the proportional rate of change of foreign currency prices and domestic inflation, but also on real GDP, the real interest rate and real non-traded goods output changes. Note that if the exchange rate were pegged or managed, (1.12) would not be expected to hold without significant modification to take account of the nature and extent of official intervention in spot and futures foreign exchange markets.

One way of appreciating the nature of the insulation result in the three good model is to compare this system with two good, traded/non-traded goods, model. This latter model can be constructed from the former by averaging the prices of traded goods. The standard insulation result will hold for the traded/non-traded goods system in the form that, assuming the absence of money illusion and other things being equal, the exchange rate will appreciate at the rate of increase of the foreign currency traded goods price. This price rises at a rate determined by the average of the rates of increase of foreign currency export and import prices in the underlying three good model. Hence the rate of appreciation of the exchange rate is the average of the inflation rates of foreign currency export and import prices.

While the type of insulation studied here applies to prices, in practice its application is certainly broader. Falls in product prices are liable to induce output falls and rises in input prices, as the oil price shocks demonstrated, can also lead to reduced output. When inflation is imported and affects domestic price indices, the instinct of the monetary authority will lead it to raise interest rates and bring on a recession. Unstable prices may well mean unstable output.

Now consider the question of insulation from terms of trade fluctuations. From (1.12) the terms of trade effect is subsumed into the foreign currency trade price movements so that examination of these will include any terms of trade changes. A recent appraisal of exchange rate policy by Blundell-Wignall and Gregory (1990) concludes that because Australia is a commodity exporting country subject to substantial swings in its terms of trade, control of inflation is greatly assisted by a floating rate regime.8

There would seem to be two main ways in which the terms of trade/exchange rate relationship might be expected to aid macroeconomic management. First, assuming that the real exchange rate and the terms of trade are correlated, movements in the latter require adjustments in the former and these adjustments will be 'easier' in a floating rate regime.9 This effect is subsumed in the price insulation property of flexible rates. The second adjustment issue arises because terms of trade changes imply movements in real income. Improvements in the terms of trade are expansionary thus leading to price rises because they imply a rise in real income. Worsened terms of trade imply a fall in real income and so put downward pressure on prices, other things being equal.10 If this is the relationship they had in mind, it follows that the inflation target is closely related to an output target. The expansionary and contractionary effects of higher real income are likely to impact both on prices and output. Hence, if stabilising output growth is an additional target of policy, their arguments for a floating rate regime on the grounds of controlling inflation apply equally to the output target.

Indeed, there is theoretical justification for this in the paper by Roper and Turnovsky [1980]. They formulate a Keynesian type model with fixed prices and variable output, rather than the variable price and fixed output class of model employed by B/G. This is used to examine the consequences of a criterion involving

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8 In their words "the choice of a broadly floating exchange rate is essential for low-inflation monetary policy in a commodity exporting country," p.268. Their argument is partly based on a theoretical model of optimal intervention to minimise the variance of inflation around a target level in the face of terms of trade shocks and partly on empirical results supporting the view that the real exchange rate is significantly correlated with the terms of trade.

9 For example, if a real depreciation is required there is less likely to be pressure on domestic real and nominal variables if the real depreciation is effected through nominal depreciation than through a fall in domestic prices.

10 These relationships are spelt out for the exportables, importables and non-traded goods model in Long and Pitchford [1993].
the minimisation of the variance of real output around a target value. Their conclusion is that floating is preferable if the source of the shocks is real demand. Terms of trade shifts can be interpreted through their effects on real income and hence can be looked on as real demand shifts. Reinforcing this work, Stemp [1990] has examined the consequences of including both output and price deviations in the objective function of the authorities. Again, his conclusion is that where output-based rather than monetary shocks dominate, some form of floating is optimal.11

The above results are subject to an important caveat. Terms of trade movements imply changes in real income and are therefore a real shock. However, if the assumption is maintained that foreign currency export and import prices are exogenous, no amount of implicit or explicit intervention can offset the relative price shift. The effects on demand of a given terms of trade (and hence real income) rise can be offset, say, by monetary restraint, but relative prices and equilibrium real income will remain affected as long as the terms of trade increase lasts. Presumably, the role for active or passive intervention with respect to the impact effects on real variables is to attempt to offset any tendency for these to cause temporary excess demand or supply.

II. An Evaluation of Price Insulation in the Floating Rate Regime

It has been shown above that floating exchange rates have a price insulation attribute. The aim of the present section is to see whether and to what extent this property has operated since Australia's exchange rate was floated and to suggest why it may have been beneficial to economic management. This will be approached in section a through a review of some major episodes of foreign price shocks and in section b by attempting to see how well equation (I.12) performs empirically in the post- and pre-float period.

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11 These conclusions are not really all that surprising in that they are special cases of basic Mundell-Fleming results. With perfectly mobile financial capital, pegged rates insulate an economy from domestic monetary shocks while floating rates insulate from real shocks, such as those induced by terms of trade changes, is provided by a floating rate. See Bruce and Purvis [1985] and Pitchford [1990].

a. The experience of trade price shocks

The nominal exchange rate was pegged in a variety of ways before November 1971, managed from that date to December 1983 and has floated from then to the present.12 The float has not been entirely without intervention. Reserve Bank intervention is measured by its net market purchases of foreign exchange and is sterilised.13 If intervention were substantial and clearly effective, it could be argued that the Australian dollar, rather than floating since December 1983, has been managed. However, there is doubt on both theoretical and empirical grounds about the effectiveness of sterilised intervention. Economic theory suggests that sterilised intervention can have a lasting impact on the exchange rate only to the extent that domestic and foreign assets are imperfect substitutes.14 Further, empirical work, including that in the present paper, does not support the view that sterilised intervention is particularly effective. Also, a stated purpose of intervention has been to smooth fluctuations in the nominal exchange rate and the data shows that intervention has been on both sides of the market. The other way in which the float could have been impure is if monetary policy had targeted the exchange rate. There has been talk of this from time to time in Australia as an adjunct to inflation policy, but if it has been practiced it has not appeared to last for any significant length of time. Hence it seems reasonable for present purposes to assume that the float has not been subject to excessive intervention or targeting.

I shall follow the usual convention in Australia of treating the foreign currency price of domestic currency as the exchange rate, though the reciprocal (price of foreign currency) is often a more convenient measure and is used at times. The nominal exchange rate whether measured against the US$, the Yen or as a trade weighted index (the effective exchange rate)
shows considerable depreciation from the mid-seventies to the mid-eighties, particularly in 1985-86.

The behaviour of foreign currency traded goods prices is central to the paper. For most Australian exports and imports it is regarded as reasonable to assume that domestic demand and supply have little impact on world prices. Hence, the foreign currency prices of the commodities Australia exports and imports are taken to be exogenous variables. It follows that fluctuations in such prices have the potential to introduce substantial shocks into the economy. The implicit price deflator for exports and imports were converted to foreign currency units by multiplying them by the trade weighted exchange rate index. Their annual rates of change (quarter this year to same quarter previous year) are compared with that of the Australian consumption price deflator in graph 1 and with those of the TWI in 2. Clearly, these trade prices were subject to large fluctuations, even in the eighties when OECD country inflation rates were low and stable. Moreover, these fluctuations are absorbed in some fashion, in that consumption price inflation is far steadier than either series. The property of floating rates at issue is their capacity to absorb foreign nominal price movements. The data in graph 2 suggest the hypothesis, to be tested later, that the trade weighted index more closely followed foreign currency trade prices in the eighties than previously.

While the traded goods prices tend to move together, there is sufficient lack of synchronisation and different degrees of change to cause large swings in the terms of trade. To take only one example, Australia’s export prices increased rapidly in the early seventies, while import prices rose somewhat later with the first oil price shock, so producing a rise and then a fall in the terms of trade. Terms of trade fluctuations are a source of considerable variation in Australia’s real income.

15 Rather than constructing the data on foreign currency trade prices from domestic currency indexes, it would have been preferable to have had data on trade prices in foreign currencies from which to build up an index. Support for the claim that the constructed indexes measure what they purport to can be had from comparing them with the RBA’s foreign currency index of commodity prices. The series show how similar movement.

16 Using a formula derived in Long and Pitchford (1993), in 1972/73 and 1988/89 terms of trade improvements contributed 2.6% and 2.3% to real GDP, respectively, while a deterioration in 1974/75 subtracted 1.5% from GDP. Such real income movements can be expected to give rise to significant changes in demand and hence pose problems for macroeconomic management.

Four episodes of large movements in foreign currency trade prices stand out clearly in graph 1. They are centred on

1. the early seventies
2. 1980
3. the mid-eighties
4. the late eighties

The first two occurred essentially before and the last two after floating. Consider each in turn:

1. Export prices increased substantially in the early seventies while import prices rose somewhat later in the mid-seventies (graph 1). To appreciate the magnitude of the shocks it can be noted that to the December quarter 1972 foreign currency export prices rose over the year by 24% and to the December quarter 1973 by 39%. To June 1974 the import price increase was 35%. With managed and pegged rates one consequence was a substantial increase in the money supply in the early seventies and in part another was an increase in the inflation rate to 18% in the middle of the decade. Wage claims escalated on the basis of this and expected future inflation. The authorities treated this inflation as if were no different from that would originate from domestic sources in a closed economy. Their response was a tightening of monetary policy in 1974-75 which helped to cause reduced growth and increased unemployment. The inflation rate fell somewhat, though because of the large imported inflation component it remained high through the seventies. A floating exchange rate could have been expected to result in greater control over the money supply as well as a significant insulating appreciation of the TWI, both in the export boom of the early seventies and to insulate against the import price rise following the first oil price shock. The benefit to the economy would have been less imported inflation, greater monetary autonomy and a lessened need for contractionary anti-inflation policies.

17 Each of the swings involved price rises or falls in excess of twenty percent. Using the criterion that an episode starts when price increases clearly accelerate or decelerate, they can be dated roughly as June 72 - March 75; June 79 - December 81, March 85 - March 87, March 88 - June 89.

18 To complicate matters there were also domestic inflationary pressures particularly from increased government expenditure.
2. The second episode, centred on 1980, involved foreign currency traded goods prices first rising rapidly and then more slowly (e.g. in the year to March 1980 there was a 27% export price and 22% import price rise). Once more large wage claims resulted. Monetary policy was again tightened. This shock was over before the floating of the rate in December 1983. It is interesting that the changes in both export and import prices were sufficiently closely synchronised in time and size that the terms of trade hardly changed. These foreign price rises could well have helped to maintain a high inflation rate through this period, despite continued tight monetary policy and the recession of 1982-83. A floating rate system might have been expected, other things being equal, to induce appreciation of the same order of magnitude as the foreign price rises so resulting in a lower inflation rate than a pegged rate system.

3. Foreign currency traded goods prices fell in the mid-eighties, with the fall in export prices (23% to September 1986) larger than that of import prices (17%). From (1.12) the insulating response would be a depreciation. It turns out that this was a period of substantial depreciation. The aspects of this episode which attracted the attention of the authorities at the time was concern about whether the depreciation was excessive and whether the worsening of the terms of trade would result in further rises in the current account deficit.

This was a period of continuing inflation so it might be argued that Australia could have benefited from a pegged rate regime by importing deflation. However, this would also have required downward pressure on the money supply as the authorities would have had to sell foreign exchange to prevent the depreciating insulation response. Further, unless they had opted for fixed rates, they would have needed to be aware of the trend traded goods prices were taking and this is no mean task. Given its potential to impose significant costs, anti-inflation policy is probably best conducted as an explicit monetary policy exercise.

4. The final episode saw both import and export prices rising at about the same time, but with import prices rising at a lesser rate. For example, annual rises to December 1988 were 28.4% for exports and 13% for imports. In this period of floating, the exchange rate appreciated at a rate intermediate between the rates of increase of the two traded goods prices. Such a response would help to insulate against imported inflation. In fact, the inflation rate came down slowly during this period. While the magnitude of these shocks was less than that of 1972-74, it is probable that with a pegged exchange rate they would have provided significant pressure both on the domestic inflation rate and the money supply. The flexible rate regime may well have reduced the capacity of these shocks to increase inflationary pressure. The interesting thing about this episode is that, apart from the terms of trade improvement, it attracted almost no interest from the authorities and commentators, perhaps because the exchange rate response concealed the nominal price rises.

This review of these trade price shocks strongly suggests that the exchange rate mechanism was much more insulating in the post- than the pre-float period. Further, the advantage of floating for policy would appear to be that import of inflationary and deflationary pressures, both directly through domestic currency trade prices and indirectly through the effects of supporting the rate on the money supply, is lessened.

The major influences on the exchange rate are later found to be the foreign currency trade price movements and the inflation rate and that movements in the TWI have tended to track trade price movements more closely in the post- than in the pre-float period. The greatest deviations occur in the 1972-75 and 1979-80, episodes singled out above as times when trade price shocks were not only considerable, but also when the economy appeared to import inflation.

b. A test for insulation

Now turn to a test of the hypothesis that the exchange rate was insulating in the post-float period and that the insulation it then provided was superior to that in the pre-float era. Based on (1.12) the equation tested was

\[ (II.1) \ E = a_0 + a_2 \hat{i} + a_3 \hat{p} + a_4 \hat{y} + a_5 \hat{p} + a_6 \hat{y} + \epsilon \]

19 It would have been preferable to test the insulation property in a macroeconometric model with at least the three relevant production sectors.
The theory implies that

\[(I.2) \ a_2 > 0, a_4 > 0, a_5 = 0, a_6 < 0, a_7 = 1, a_7 = -1\]

While this appears to be a partial relationship, most of the variables on the right hand side of (I.2) can be seen to have some claim to exogeneity. Foreign currency traded goods prices are often taken to be exogenous, while an argument was made above for treating the real interest rate in the same way. The inflation rate can be taken to represent exogenous monetary policy. Output variables cannot be so treated, but turn out not to be significant in the regressions.

Quarterly data from March 1971 to March 1992 was used for the tests. The trade weighted index was taken as the measure of the nominal exchange rate and the rate of change of the consumption price deflator as the measure of inflation. Because there are no data for the output of non-traded goods, this variable was excluded from the regressions. The proportional rates of change were initially taken to be annual rates over the same quarter for the preceding year. However, better results were obtained with rates of change of variables over the previous quarter. The OLS regression results, with the dependent variable being the quarterly proportional rate of change of the TWI, are shown in Table 1 and 2. The first table treats the floating rate period and the second the pre-float data. Real interest variables did not perform well in any of the regressions so were omitted from subsequent tests. When GDP growth variables were significant they were of the wrong sign.\(^{20}\) The results for the post-float period appear to be improved by including a lag of two periods for the domestic inflation variable, though no other lags were significant. This general lack of lagged effects seems consistent with the view that the exchange rate is quick to adjust. The signs of the coefficients on foreign currency trade price changes are positive, as the theory would suggest and from Table 1 add to 1.21. The sign on the inflation variable with no lag is negative and with two quarters lag is positive. Their sum is -0.61 which accords with the theoretical proposition that higher inflation depreciates the exchange rate. The restrictions are that

\[\sum a_i = 1\]

The sum of coefficients on trade prices is unity and the sum of the coefficients on the inflation variable is minus one. These were tested singly and jointly and it was found that the results could not be taken as contradicting them.\(^{21}\) The lag structure suggests exchange rate overshooting with respect to an inflationary (monetary) shock.

As well as the variables suggested by (I.2) an intervention variable, namely net market purchases of foreign exchange as a percent of total reserves was included in the regressions. Sterilised intervention does not seem to have an important effect on the TWI in that while it was significant in a number of tests it was found to have the wrong sign. This is consistent with the notion that sterilised intervention had no detectable effect but was put into effect when exchange rates were moving in the opposite direction to that which the intervention was meant to achieve.

<table>
<thead>
<tr>
<th>Dependent variable: TWI change</th>
<th>34 observations, 83q4 to 92q1</th>
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<tbody>
<tr>
<td>Regressor</td>
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<tr>
<td>Constant</td>
<td>.16</td>
</tr>
<tr>
<td>Expt price change</td>
<td>.73</td>
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<tr>
<td>Imp price change</td>
<td>.48</td>
</tr>
<tr>
<td>Inflation</td>
<td>-2.37</td>
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<tr>
<td>Inflation(-2)</td>
<td>1.76</td>
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<tr>
<td>R(^2)</td>
<td>0.88</td>
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<tr>
<td>Serial Correlation</td>
<td>chi-square(4) = 2.21(0.70)</td>
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<tr>
<td>Dickey-Fuller*</td>
<td>DF = -5.23(-4.85)</td>
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</table>

<table>
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<th>49 observations, 71q3 to 83q3</th>
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</tr>
<tr>
<td>Serial Correlation</td>
<td>chi-square(4) = 1.83(0.77)</td>
</tr>
<tr>
<td>Dickey-Fuller*</td>
<td>DF = -5.90(-4.33)</td>
</tr>
</tbody>
</table>

* Unit root test for residuals. 95% critical values in brackets.

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\(^{20}\) Because the non-traded goods market need not clear, a variety of indicators of disequilibrium, such as the unemployment rate, were also tried, but none performed well.

\(^{21}\) The Wald test gave chi-square parameters of 0.008, 2.36 and 3.52 for the restriction on trade prices alone, the restriction on the inflation variables alone and for both restrictions, respectively. These figures are significant at the 1% level.
The best result for the pre-Float period is shown in the second half of Table 1. These are in all important respects worse than for the latter period. The exchange rate system would seem to have performed less well in its insulating task prior to the float. For instance, for the pre-Float period the sum of the coefficients on trade price changes is 0.59 and on inflation is -0.43. However, when the exchange rate is pegged or managed it is perhaps not appropriate to treat it as a dependent variable. Rather the question then becomes one of the degree of monetary independence and of the extent to which inflation was imported.

III. Conclusions

It would seem reasonable to conclude that lack of flexibility in exchange rate adjustment to external price shocks in the seventies exacerbated Australia’s adjustment problems to the substantial price instability in that decade. Further, there would appear to be much greater capacity since the float for exchange rate flexibility to offset nominal trade price shocks. This presumably accounts for the fact that, despite these shocks being again considerable in foreign currency terms in the eighties, they would seem to have had little effect on the domestic economy (except through the terms of trade effects, which no system can insulate from).

Floating is to be preferred if monetary independence is required. Related to this, floating has the potential to moderate the effects on the domestic economy of the considerable foreign currency nominal trade price swings to which Australia is subject. Not only does this have benefits with respect to the control of inflation, but lesser absolute price changes also will imply lesser induced real effects in a system in which wages and price are not perfectly flexible. Testing these propositions with data on nominal exchange rate and trade price movements suggests that in the post-Float period the nominal exchange rate moved to offset foreign currency price fluctuations significantly better than before December 1983.

One conventional justification for floating rates has been that they ameliorate the effects of terms of trade fluctuations on the domestic economy. It was argued that, to the extent that the exchange rate mechanism can help in this matter, the insulation capacity against absolute price shocks subsumes its contribution. In any case, the exchange rate mechanism can help in this respect by producing effects on demand which assist in offsetting temporary excess demand and supply produced by terms of trade changes.

Some have argued for Australia, as for other countries, that exchange rates can behave in ways which have little to do with ‘market fundamentals’. One formalisation of this is that they follow paths, called ‘speculative bubbles’, which actually diverge further and further from fundamentals. The exchange rate equations in this paper can be thought of as based on the fundamentals of domestic inflation and foreign price movements. Because actual exchange rate movements are not divergent from such fundamentals, it seems probable that the Australian TWI has not been subject to speculative bubbles since the float.


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