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**China after the crisis:
the elemental
macroeconomics**

Rod Tyers

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Key to symbols used in tables

n.a.	not applicable
..	not available
-	zero
.	insignificant

Abbreviations

CPI	Consumer Price Index
GDP	Gross Domestic Product
GTAP	Global Trade Analysis Project
IMF	International Monetary Fund
NBER	National Bureau of Economic Research

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Abstract

Although the ‘country runs’ of the Asian crisis stopped at the Chinese border, their effects nonetheless included a realignment of real exchange rates and a rise in the risk premium demanded of investments in China. These appear to have combined with a rise in the domestic savings rate to slow the country’s economic growth and its rate of labour absorption. The government’s macroeconomic policy responses were to fix parity with the US dollar, undertake a fiscal expansion and, more recently, raise the minimum wage. This paper uses an elemental comparative static model, combining graphical with numerical analysis, to examine the changes in the Chinese economy due to the crisis and the contemporaneous domestic shocks.

Introduction

The Asian crisis brought to a halt two decades of rapid economic expansion in East and Southeast Asia. In the most affected countries it caused substantial real contractions associated with a surge of insolvencies following capital flight and unexpectedly large currency depreciations (McLeod and Garnaut 1998; Goldstein 1998; and Wong 1998). These ‘country runs’, however, ended at the Chinese border. Fixed nominal parity with the US dollar was announced and successfully defended. Of course, China’s vulnerability to such a run was always comparatively small. Although its major domestic banks continue to carry a high proportion of non-performing loans, they are not independent of the state and are unlikely to be allowed to fail (Fernald and Babson 1999). Moreover, China has official foreign reserves roughly equal to export earnings and capital controls restricting short-term capital inflow.

The crisis has, however, brought change in China. Its exports to crisis-affected Asian countries have declined; as has the competitiveness of its exports to other regions. The risk premium on investments in China also appears to have risen. The government’s defence of a fixed exchange rate is a departure from earlier policy that has limited the range of policy instruments available to foster adjustment to these external shocks, but independent changes within China have been at least equally important. The long process of transferring economic activity from the state to the private sector continued during and after the crisis. Considering that the state had previously offered private households full insurance against education, health, and retirement expenses, this trend, of necessity, transfers risk to the individual and thereby increases the motivation for private saving. Since the mid-1990s the sanctioning of urban private home ownership, combined with an acceleration in lay-offs from state owned enterprises, appears to have accelerated this trend, boosting the perceived need for savings (Meng 1998). A rise in private savings has, indeed, occurred and it appears to have fuelled a very substantial capital outflow during the crisis period. The principal macroeconomic response has been a ‘soft budget’ policy of insufficient magnitude to prevent deflation and a slowdown in growth. More recently, in an apparent attempt to stem the contraction in private consumption, the government has raised the wages of public sector workers and the minimum wage of all workers.

This paper examines these external and internal changes using a comparative static macroeconomic model of the small open economy. The analytical model is first used to develop a graphical approach to the assessment of the shocks and policy responses. Then parameter values are added and the model is used to quantify these effects. Section 2 offers a brief review of events within and outside China in the crisis period. Section 3 develops the model and its graphical application. The shocks and policy responses are examined in Section 4.

The crisis and events in China

The most obvious real consequence of the financial crisis that began in Southeast Asia was a reallocation of investment around the world. As capital flew from the affected countries, investment stalled, asset prices fell, and exchange rates depreciated. Meanwhile, the opposite occurred in recipient countries such as the United States. By themselves, however, the capital account shocks had only small short run effects on output in Asia. The more serious problem was exposure to foreign denominated debt by domestic firms and financial institutions. 'Country runs' therefore precipitated numerous insolvencies and the sluggish resolution of the associated property rights issues led to the closure of some plants and considerable lay-offs at others (World Bank 1999). Output and income contracted substantially, causing imports to drop and current accounts to switch from deficit to surplus. From China's perspective, this caused the loss of the affected countries as export markets and a considerable drop in the prices of competing exports abroad.

Through the mid 1990s, a key Chinese policy objective had been to 'get the exchange rate right', and a 'real targets' approach was adopted whereby the nominal rate was set in relation to the cost of earning a unit of foreign exchange through exports.¹ In effect this ensured the stabilisation of the real exchange rate.² With the advent of the crisis in 1997 the government fixed nominal parity with the US dollar. That this brought a departure from the real targets approach is evident from the ensuing effects on China's real exchange rate. Nominal parity with an appreciating US dollar in a period of low inflation ensured real appreciations against a number of China's trading partners (Yang and Tyers 2000:6; Fernald and Babson 1999: Figure 1). Deflation in China has, however, ensured that a real depreciation has been enjoyed relative to the US and, more recently, against Europe. In spite of the reduced competitiveness of Chinese exports relative to those from crisis affected countries, the value of Chinese exports continued to grow through early 1998, only beginning to fall off later that year. Exports to other Asian countries fell first and most dramatically while the growth of those to the US and Europe had virtually ceased by the end of the year (Fernald and Babson 1999; Hu 1999).

China's capital controls notwithstanding, capital outflows appear to have accelerated markedly in 1997 and 1998, as indicated in Table 1. Estimates of unsanctioned outflows include both private outflows on the capital account and, on the current account, the effects of under-invoicing of exports on the one hand and over-invoicing of imports on the

other. Taken together, these appear to have more than doubled to about six per cent of China's GDP. When the contemporaneous slowdown in the rate at which official foreign reserves were accumulated is accounted for, the change represents an increase in the capital account deficit (current account surplus) of at least US\$ 30 billion. In magnitude, this is about a quarter of the corresponding change in the collective current account of the crisis affected countries (principally Indonesia, Malaysia, Thailand and Korea) over 1996–98. As a proportion of GDP it is about half the change in those countries.

By itself, this capital outflow suggests a rise in the risk premium on investment in China, as perceived both within China and outside. Indeed, Fernald and Babson (1999) estimate that this premium rose by about 250 basis points between 1996 and 1998. Yet autonomous domestic changes played an important role. Reforms to foster the transfer of economic activity from the public to the private sector and the expanded reliance on markets in the allocation process continued through the crisis period. Indeed, there appears to have been an acceleration just prior to, and during, the crisis. The housing market was liberalised in the mid-1990s and private ownership sanctioned in urban areas, followed by a rapid increase in the proportion of privately owned accommodations. Second, the proportion of non-agricultural workers enjoying 'cradle to grave' welfare services in the state sector declined to less than 30 per cent by 1998, with substantial and comparatively prominent lay-offs taking place in 1997 (Meng 1998). Thus, the perceived probability of obtaining or retaining state employment has declined and the need for savings to finance housing, health, education, and retirement, has increased.

Three distinct macroeconomic shocks therefore appear important in the crisis period: a real appreciation relative to most trading partners, a rise in the risk premium on investment in China and an autonomous substitution of private saving for private consumption. There have also been some substantial macroeconomic policy shocks. First, as indicated above, the retention of the fixed US dollar parity has tied up monetary policy. In spite of the

Table 1 The capital account and unsanctioned outflows, US\$ billion

	1994	1995	1996	1997	1998
<i>Capital account</i>					
+ Capital inflow	40.9	41.0	46.2	53.4	50.4
- Sanctioned capital outflow	5.7	-7.8	6.2	19.0	14.8
- Unsanctioned capital outflow	8.4	18.3	11.1	31.6	62.9
= Net foreign saving in China, S_{NF}	25.8	30.5	28.9	2.8	-27.3
- Change in reserves, ΔR	30.5	22.5	31.7	35.7	5.1
= Capital account, $S_{NF}-\Delta R$	-3.7	8.0	-2.8	-32.9	-32.4

Sources: Synthesis of capital flight calculations by Yang and Tyers (2000), based on original estimates by Song, W.B. (1999). Data are from Song, W.B. (1999) and State Statistics Bureau (1999). For 1998, capital inflows and foreign reserves are from *A Statistical Survey of China*, 1999. Capital flight via misinvoicing is assumed to be the same as for 1997 (Song, W.B. 1999). Smuggling data are from Yu (1999). Outward FDI is derived from inward FDI from the Survey, and the net FDI available from the Macro Team of CASS (1999)

increase in the supply of domestic savings, the real interest rate is estimated to have risen from -4.8 per cent in 1995, to 7.2 per cent in 1998.³ This was facilitated, in part, by a dramatic deceleration in the rate of accumulation of official foreign reserves. These had grown by over US\$30 billion per year between 1995 and 1997 but expanded by a mere US\$5 billion in 1998. Second, a 'soft budget' policy has been maintained since the mid-1990s. Official estimates of fiscal deficits ranged in the vicinity of 0.8 per cent of GDP until 1998, when there was a rise to 1.1 per cent. Government spending had been below 12 per cent of GDP in the two years prior to the crisis but rose to 13 per cent in 1998.⁴

Turning to the consequences of these shocks, the combination of the real appreciation, which reduced export growth, restrictive monetary policy, and the outflow of capital, appears to have contracted overall domestic demand, causing deflation. Growth in the CPI, which had exceeded 24 per cent in 1994, has since declined each year, reaching an official -0.8 per cent in 1998. Official estimates of GDP growth rates do appear to have declined as a consequence, from the ten per cent achieved in the mid 1990s to 7.8 per cent in 1998, although this official rate is widely believed to be an overestimate. Moreover, an unusually large part of expenditure on GDP in 1998 was investment by state owned enterprises and this included inventory investment (Fernald and Babson 1999:6). Nonetheless, total investment as a share of GDP has risen slightly, and productive capacity continues to be transferred from the state sector to the presumably more productive private sector, all of which suggests the slowdown is not the result of lower productivity growth. The culprit is more likely to be nominal wages that are sticky downward, excessive real wage growth, and rising unemployment.

Wage rigidities are not unexpected in China, where the labour market is more highly regulated than in other developing countries. Official statistics suggest that the deflation in 1998 was indeed associated with a spurt in real wage levels (Yang and Tyers 2000:8). The accuracy of these statistics is impaired, however, by the incomplete capturing of bonus and in-kind payments. The evidence on unemployment is also mixed. The principal source of lay-offs has been the state sector, but workers laid off by this sector are not included in the unemployment statistics. The official unemployment rate is therefore an underestimate.⁵ Despite the incomplete and occasionally unsatisfactory evidence, there does appear to have been a slowdown in output growth associated with a rise in unemployment.

In sum, macroeconomic events in China during the crisis period appear to have comprised three important shocks and two key policy changes. The shocks are the crisis-driven external price decline, the rise in the risk premium, and the spontaneous substitution of private saving for private consumption in the home economy. The policy changes are the adoption of a fixed nominal exchange rate and the fiscal expansion. With a view to arresting the leakage of private consumption into saving, however, the government has added a nominal wage rise to these. The nominal wages of government workers are to be raised by between 20 and 30 per cent. At the same time, the minimum wage to be paid to all workers will be increased by 30 per cent.

The model

The model is of the *IS-LM-AS* type, depicting a small open economy. ‘Smallness’ keeps the risk-adjusted rate of return on investment demanded by foreigners, r^* , and the foreign price level, P^* , exogenous.⁶ The model emphasises the short run, or at least a length of run within the average gestation period of investment. The productive capital stock is therefore constant and unaffected by the level of investment.⁷ Although the model allows the domestic price level to vary, it is comparative static, so that there is no continuous inflation to separate the real from the nominal rate of interest. Finally, flows on the capital account are motivated by divergences between the domestic interest rate and the risk-adjusted rate of return demanded by investors abroad.

The demand side of the model has equilibrium in the markets for money and a single interest-bearing asset, ‘bonds’. Money market equilibrium equates real money demand, m_d , with real money supply, yielding an *LM* curve. The nominal money supply then depends on the monetary base and hence the assets of the central bank. GDP is Y , the domestic interest rate is r , and the domestic price level is P .

$$LM: m_d = g_1 Y - g_2 r = \frac{M_s}{P}.$$

The monetary base is $B = M_s/\theta$, where θ is a money multiplier. Official foreign reserves are R and DC is the central bank’s holding of domestic credit, so that $B=R+DC$.

Turning to the components of domestic absorption, consumption, C , depends negatively on the real interest rate—to reflect wealth effects—and positively on disposable income so that $C=a_1-b_1r+c(Y-T)$.⁸ The tax system is assumed linear: $T=t+\tau Y$. Investment is $I=a_2-b_2r$, and government spending, G , is exogenous. Private saving by domestic residents is $S_D=Y-T-C$, which is the same as $S_D=s^*Y-a_1-st+b_1r$. The marginal propensity to save out of domestic GDP is $s^*=(1-c)(1-\tau)$. Saving in the home economy by foreigners net of saving abroad by domestic residents is S_{NF} . This is the private component of net inflow on the capital account and it depends on the domestic and foreign real interest rates, so that $S_{NF}=S_{NF}^0 + \phi(r-r^*)$, or $S_{NF}=(S_{NF}^0 - \phi r^*) + \phi r$. The overall net inflow on the capital account is this less any accumulation of official foreign reserves, ΔR . We now have all the world’s saving that is directed to the home economy. This, along with domestic government saving, must equal domestic investment. Thus, the Hicksian *IS* identity is $I=(T-G)+S_D+(S_{NF}-\Delta R)$, which yields an *IS* curve of the form⁹

$$IS: r = \frac{a_1 + a_2 - S_{NF}^0 - ct}{b_1 + b_2 + \phi} + \frac{1}{b_1 + b_2 + \phi} (G + \Delta R) + \frac{\phi}{b_1 + b_2 + \phi} r^* - \frac{\tau + s^*}{b_1 + b_2 + \phi} Y.$$

By substituting the traditional money market equilibrium (LM) condition above, we have the aggregate demand (AD) curve,

$$AD: P = \frac{M_s}{f_1 Y - f_2 (G + \Delta R) - f_3 r^* - f_4}.$$

Here the f s are positive constants that consolidate the above parameters. This relationship is useful when the exchange rate is floating and the nominal money supply is exogenous. When the exchange rate is fixed, however, the monetary instruments are dedicated to its fixity and therefore endogenous. It is then useful to construct a version of the AD curve along which the exchange rate is constant. To do this we need to represent the current account of the balance of payments. Recall that private net inflows on the capital account are $S_{NF} = S_{NF}^0 + \phi(r - r^*)$. Ignoring the net capital income component of the current account, inflows on the capital account must finance any surplus of imports over exports. Imports then depend positively on both domestic disposable income and the real exchange rate, while exports depend negatively on the real exchange rate so that $M = a_3 + b_3 e_R + \mu(Y - T)$ and $X = a_4 - b_4 e_R$. Here μ is the marginal propensity to import from disposable income. The real exchange rate is defined as the relative price of the home good, or $e_R = E/P^*$, where the nominal exchange rate, E , is the value of the home currency in terms of the foreign (say US\$ per unit of the home currency). The balance of payments condition therefore takes the form

$$BOP: S_{NF} - \Delta R = M - X$$

or

$$r = r^* + \frac{1}{\phi} [a_3 - a_4 - S_{NF}^0 - \mu t + \Delta R + (b_3 + b_4) e_R + \mu(1 - \tau)Y]$$

Returning to the IS curve, the interest rate can this time be substituted out by the balance of payments condition above. This yields the alternative AD , or $IS-BOP$, curve

$$IS - BOP: P = \frac{P^*}{E} (h_1 + h_2 G - h_3 \Delta R - h_4 r^* - h_5 Y).$$

Here too, the h s are positive constants that consolidate the parameters introduced earlier. The main exogenous shifters are the nominal exchange rate, E ; the foreign price level, P^* ; the change in official foreign reserves, ΔR ; government spending, G ; and the foreign interest rate, r^* . When these variables are exogenous, monetary policy, or at least its ultimate effect on the nominal money supply, is endogenous.

It remains to complete the model with the supply side. Recall that the length of run considered here is one over which the stock of useful physical capital is unaffected by new investment. If the technology is Cobb-Douglas and the expenditure share of variable labour is β , output depends on variable labour input as $Y = \alpha L^\beta$. At this length of run, in a heavily regulated economy such as that of China, we would expect to see at least some

nominal wage rigidity. Equating the marginal product of mobile labour with the real wage, W/P , and setting the nominal wage, W , exogenous, we have the short run aggregate supply curve

$$\text{SAS}(W) : P = \frac{W}{\alpha\beta} \left(\frac{Y}{\alpha} \right)^{\frac{1-\beta}{\beta}}.$$

In equilibrium the three curves in P – Y space intersect at a common point, as illustrated in Figure 1.¹⁰ They must always do so since one of the downward sloping curves always has an endogenous shifter. If the exchange rate is fixed, the *IS-BOP* curve applies and monetary policy must conform, thereby shifting the *AD* curve for consistency with the other two. If the exchange rate is floating, E is endogenous and the *AD* curve is active. Monetary policy is set exogenously and the exchange rate adjusts, shifting the *IS-BOP* curve to conformity.

The directional effects of shifters are also indicated in Figure 1. When the exchange rate is floating, the *AD* curve is active and it shifts conventionally, with rises in either government spending or the nominal money supply shifting it upward or to the right.¹¹ When the exchange rate is fixed, the *IS-BOP* curve is active. It has five exogenous shifters. A rise in the foreign price level, P^* , shifts the *IS-BOP* curve upward and to the right.

Figure 1 The curves in P – Y space and their shifters

Imagine that the level of output is fixed in a clearing labour market. We then seek the direction of any vertical shift by asking what the change in the domestic price level is. Since output is fixed and the only shock is that to P^* , savings supply and the interest rate are unaffected and so, therefore, are net inflows on the capital account. The real exchange rate and net imports must be constant. So the home price level rises by the same proportion as the foreign one. Hence, for constant output, a rise in P^* raises the demand side equilibrium price level and hence the *IS-BOP* curve shifts upward. A rise in the foreign interest rate, r^* , or in the interest premium required to attract savers to China, shifts the curve downward and to the left, however. This is because an increase in outflows on the capital account reduces net imports and depreciates the real exchange rate. For given output and for given E and P^* , the demand side equilibrium price level is therefore lower.

Finally, an increase in official foreign exchange reserves also shifts the *IS-BOP* curve downward and to the left. This is because, other things equal, the increase adds to outflows on the capital account. Net imports contract and the relative price of foreign goods in the home economy rises, implying a real depreciation. For constant output and a fixed nominal exchange rate this implies a lower price level and hence the curve shifts downward. For a given equilibrium Y, P combination, however, the *IS-BOP* curve represents a relationship between the nominal exchange rate and the change in official foreign reserves. A rise in one is consistent with a fall in the other. Throughout our analysis, we consider the change in reserves to be exogenous. In the world of the floating rate we will consider it to be constant, so that it is always the more sustainable change in E , rather than in ΔR , that restores equilibrium. When the exchange rate is fixed, changes in ΔR become important in the short run. Because the nominal money supply is then endogenous, however, the change in it, combined with the change in reserves will imply a pattern of sterilisation via $\Delta R + \Delta DC = \Delta B$.

Analysis

The key shocks to be considered are of three types. First are those associated with the external crisis; second, those associated with continuing reforms within the Chinese economy and, third, macroeconomic policy responses by the Chinese government. The external crisis caused a decline in the foreign price level, P^* , representing the increased competitiveness of exports from China's crisis-affected neighbours combined with a fall in demand for China's exports to Asia. Equally important, however, was a rise in the interest premium required on Chinese investments that was associated with a perceived increase in the risk of devaluation. The key shock associated with domestic reforms is an autonomous increase in the private savings rate, represented as a decline in the marginal propensity to consume. And the policy responses are, first, the fixing of parity with the US dollar, second, a fiscal expansion and, third, a subsequent rise in the nominal wage of government workers and in the minimum wage of all workers.

These shocks are examined both graphically and numerically. Although their magnitudes are generally observable, that of the change in the marginal propensity to consume is not yet clearly estimated. For this reason, the model is used initially to calibrate the change in this parameter by rendering it endogenous and imposing all the other changes in combination with known balance of payments outcomes.

Parameters for China

Some idea of the magnitudes involved can be obtained from the assignment to the model of stereotypical parameters for China. To suit the analysis of shocks during the period 1996–99, a set of reference values for the key variables is also assigned, with Chinese GDP rounded at US\$1000 billion. The complete reference values and parameters are listed in Table 2.

A reference simulation

The first step in the numerical analysis is to subject the model to all the shocks in the period 1996–98. This provides a rough validation while at the same time enabling a calibration for the change in China's marginal propensity to consume and the rise in the risk premium on investment. The numerical experiment is conducted as follows

Exogenous variables

Held fixed W : nominal wage rigid
 E : fixed nominal exchange rate

Shocks from recorded events

ΔR : the accumulation of reserves slows by US\$25 billion
 G : government spending rises by a per cent of GDP
 P^* : foreign price level falls by 3.5 per cent.¹²

Calibration shocks, also from relatively reliable records

S_{NF} : private net inflows on the capital account transit from positive US\$30 billion to negative US\$25 billion (Table 1)
 I : gross domestic investment remains constant

Endogenous variables: $Y, C, X, M, e_R, r, M_S, L, P, w=W/P$
 For calibration: c, r^*

The results are listed in Table 3. They show a shortfall in GDP, relative to potential, of five per cent and a corresponding shortfall in employment of just under 11 per cent. These are very likely overestimates, for the following reasons

- Full nominal wage rigidity is probably too strong an assumption to apply to all China's labour markets.
- The simulated decline in the domestic price level is larger than recorded.¹³
- This simple model does not accommodate the mitigating effects of intersectoral demand changes and resource movements.¹⁴

The reference outcomes are, nonetheless, taken as the baseline against which further results will be compared.

Table 2 Reference magnitudes of key variables and parameters^{a,b}

Variable	Values in US\$ billion
<i>Expenditures on GDP</i>	
GDP, Y	1000
Consumption, C	480
Investment, I	370
Government spending, G	130
Exports, X	160
Imports, M	160
<i>Balance of payments</i>	
Net foreign saving in China, S_{NF}	30
Change in official foreign reserves, ΔR	30
Current account surplus, $X-M$	0
<i>Money market</i>	
Monetary base ($M0$), B	135
Nominal money supply ($M1$), M_s	470
Home nominal and real interest rate, r	070
<i>Supply side</i>	
Expenditure share on variable labour, β	0.45
<i>Elasticities^c</i>	
Consumption, C , to the home interest rate, r	-0.2
Investment, I , to the home interest rate, r	-3.0
Exports, X , to the real exchange rate, e_R	-3.0
Imports, M , to the real exchange rate, e_R	3.0
Net foreign savings, S_{NF} , to the home interest rate, r^d	4.6
Real money demand, m_{D^1} , to GDP, Y	0.5
Real money demand, m_{D^1} , to the home interest rate, r	-0.1
<i>Marginal propensities</i>	
To consume out of disposable income, c	0.8
To import out of disposable income, μ	0.3
<i>Marginal tax rate, τ</i>	
	0.2
<i>Money multiplier, θ</i>	
	3.5

Notes: a These magnitudes are indicative only. They are structured to correspond roughly with the Chinese economy during the crisis period. The magnitudes on the balance of payments are set to resemble those of 1996.

b Reference values of the key price variables, P , P^* , E , e_R , are set at unity and the initial quantity of variable labour used to 100. The reference value of the nominal wage, W , calibrates to 4.5.

c The model uses linear coefficients derived from these elasticities.

d This value is calibrated based on the estimated change in the risk premium between 1996 and 1998 by Fernald and Babson (1999). They estimate the premium to have risen from about 125 to 375 basis points during this period. At the same time, from Table 1, private flows on the capital account transited from a net inflow of US\$30 billion to a net outflow of US\$25 billion.

Sources: State Statistical Bureau (1999); IMF (1999).

Table 3 Effects of all the reference (1997–98) macroeconomic shocks ^a

Variable	Per cent change	Value before	Value after	Difference
<i>Expenditures on GDP</i>				
GDP, Y	-5.0	1000	950	-50
Consumption, C	-18.4	500	408	-92
Investment, I	0.0	370	370	0
Government spending, G	7.7	130	140	10
Exports, X	6.3	160	170	10
Imports, M	-13.8	160	138	-22
<i>Balance of payments</i>				
Private net inflow, S_{NF}	-190	30	-27	-57
Change in official reserves, ΔR	-83	30	5	-25
Current account surplus, $X-M$		0	32	32
<i>Saving</i>				
Marginal propensity to save, $1-c$ ^b	35	0.20	0.27	0.07
Disposable income, Y_D	-4.5	880	840	-40
Tax revenue, T	-8.3	120	110	-10
Government saving, $T-G$	201	-10	-30	-20
Domestic private saving, S_D	13.7	380	432	52
Total private saving, $S = S_D + S_{NF}$	-1.2	410	405	-5
<i>Nominal money supply</i>				
Monetary base, B	-7.9	135	125	-11
Nominal money supply, M_S	-7.9	470	433	-37
<i>Interest rate</i>				
Home interest rate, r	0.0	0.07	0.07	0.0
Foreign interest rate, r^*	41.4	0.063	0.088	0.026
<i>Exchange rate</i>				
Real exchange rate, e_R	-2.1	1.00	0.98	-0.02
Nominal exchange rate, E	0.0	1.00	1.00	0.00
<i>Supply side</i>				
Real wage, $w=W/P$	5.8	4.50	4.76	0.26
Nominal wage, W	0.0	4.50	4.50	0.00
Employment, L	-10.7	100.0	89.3	-10.7
<i>Price level</i>				
Home price level, P	-5.5	1.00	0.95	-0.06
Foreign price level, P^*	-3.5	1.00	0.97	-0.04

Notes: a The shocks are to the foreign price level, P^* ; private capital flows, S_{NF} ; government spending, G ; and the change in foreign reserves, ΔR . The nominal exchange rate, E ; domestic investment, I ; and the nominal wage, W ; are held constant. The marginal propensity to consume, c ; the foreign interest rate, r^* ; and the level of government spending, G , are endogenous. In most subsequent simulations S_{NF} and I are made endogenous while the sources of the shocks are P^* , c , G , ΔR and r^* .

b This is the marginal propensity to save from disposable income.

Source: Simulations using the model discussed in the text.

Also evident from Table 3 are the calibration results. The most important is the implied change in the marginal propensity to consume, c , by seven per cent of disposable income. The associated marginal propensity to save out of disposable income therefore rises from 0.20 to 0.27. The change in the interest premium is less important because the parameters in the equation for net private inflow on the capital account are themselves calibrated based on the Fernald and Babson estimates of risk premia before and after the crisis (see notes to Table 2). The simulated rise in r^* by about 250 basis points is therefore expected. In all the numerical simulations that follow, these changes in both c and r^* are exogenous and the levels of investment, I , and net private inflow on the capital account, S_{NF} , are made endogenous.

Effects of the crisis alone

The crisis shocks are those to P^* and r^* . In calculating the independent effects of these shocks the characterisation of China's macroeconomic policy regime is important. In the mid-1990s reserves were accumulating at about US\$30 billion per year and the exchange rate was determined by 'real targeting' (Song, L.L. 1999; Zhang 1999). Faced with the crisis shocks, had the Chinese government continued to accumulate reserves at this rate the maintenance of a constant real exchange rate would have required a substantial nominal appreciation, a decline in the home price level, and a large loss of output. Since this is clearly unrealistic, the case considered here has China maintaining fixed nominal parity with the US dollar and decreasing its rate of accumulation of reserves by the observed US\$25 billion.

Taking first a graphical approach, China's fixed exchange rate regime requires that the active downward sloping curve be the *IS-BOP* curve.¹⁵ The curve shifts downward as explained in the previous section and as shown in Figure 2. Although the shocks to P^* and r^* have opposing effects on the real exchange rate, both contract domestic demand and so both cause the equilibrium domestic price level to fall. The real wage therefore rises and output declines. Because the nominal money supply is endogenous, it must contract sufficiently for the *AD* curve to make a compatible downward shift. Monetary policy is thereby restrictive in defence of the fixed nominal exchange rate.

The slowdown in the rate at which official foreign reserves are accumulated requires that a contraction in *DR* also be represented, as in Figure 2. This causes an offsetting upward shift in the *IS-BOP* curve, because it tends to appreciate the real exchange rate and, with a fixed E , this raises the price level and hence restores some lost output.¹⁶ The fact that the price level in China did fall confirms that the central bank's manipulation of reserves was only partially offsetting.

The corresponding numerical analysis of these shocks is summarised in Table 4. The primary effect is a change in the domestic capital market. The rise in the investment premium reverses the private flow on the capital account so that the total quantity of saving available to finance domestic investment is reduced. Investment falls, and the domestic interest rate rises. The reduced inflow on the capital account also causes a small

real depreciation. Since the foreign price level falls, the home price level must fall by more. This raises the real wage and reduces output, in turn further reducing the supply of savings and hence the decline in domestic investment. By comparison, in the reference case the autonomous rise in the rate of saving finances the reversal on the capital account, leaving domestic investment constant. The real exchange rate change is slightly greater in the reference case, because there is no rise in the home interest rate to moderate the outflow on the capital account. Consequently, the decline in the home price level and hence in output is also slightly larger.

The crisis with a flexible exchange rate

For the present purpose, imagine that the exchange rate regime is a pure float and refer, again, to Figure 2. Ignore any expectations-driven short run tendency to overshoot and consider the equilibrium change. In this case the active downward sloping curve is the AD curve. Even though this curve is shifted by the changes to r^* and DR , the nominal money supply can be set to position it wherever the central bank desires. Assume the objective is to hold the price level constant so as to avoid real wage rises that cause unemployment and lost output. Only a small monetary expansion is required to ensure that the AD curve retains its original position, as does the equilibrium depicted in the diagram. The $IS-BOP$

Figure 2 The crisis alone, with a fixed nominal exchange rate

Table 4 Effects of the (external) crisis alone with a fixed nominal exchange rate^a

Variable	Per cent change	Value before	Value after	Difference
<i>Expenditures on GDP</i>				
GDP, Y	-4.6	1000	954	-46
Consumption, C	-6.6	500	467	-33
Investment, I	-10.7	370	331	-39
Government spending, G	0.0	130	130	0
Exports, X	4.9	160	168	8
Imports, M	-11.7	160	141	-19
<i>Balance of payments</i>				
Private net inflow, S_{NF}	-171	30	-21	-51
Change in official reserves, ΔR	-83	30	5	-25
Current account surplus, $X-M$		0	27	27
<i>Saving</i>				
Marginal propensity to save, $1-c^b$	0.0	0.80	0.80	0.00
Disposable income, Y_D	-4.2	880	843	-37
Tax revenue, T	-7.6	120	111	-9
Government saving, $T-G$	92	-10	-19	-9
Domestic private saving, S_D	-1.0	380	376	-4
Total private saving, $S = S_D + S_{NF}$	-13.5	410	355	-55
<i>Nominal money supply</i>				
Monetary base, B	-7.6	135	125	-10
Nominal money supply, M_S	-7.6	470	434	-36
<i>Interest rate</i>				
Home interest rate, r	3.6	0.070	0.072	0.002
Foreign interest rate, r^*	41.4	0.063	0.088	0.026
<i>Exchange rate</i>				
Real exchange rate, e_R	-1.6	1.00	0.98	-0.02
Nominal exchange rate, E	0.0	1.00	1.00	0.00
<i>Supply side</i>				
Real wage, $w=W/P$	5.3	4.50	4.74	0.24
Nominal wage, W	0.0	4.50	4.50	0.00
Employment, L	-9.9	100.0	90.1	-9.9
<i>Price level</i>				
Home price level, P	-5.1	1.00	0.95	-0.05
Foreign price level, P^*	-3.5	1.00	0.97	-0.04

Notes: a The shocks are to the foreign price level, P^* , and to the foreign interest rate, r^* . The nominal exchange rate, E , and the nominal wage, W , are held constant.

b This is the marginal propensity to save from disposable income.

Source: Simulations using the model discussed in the text.

curve does not shift, because, even though the changes to P^* , r^* , DR , and G , have the net effect of shifting it down, the now endogenous nominal exchange rate simply depreciates to offset these changes. The corresponding numerical analysis is summarised in Table 5. Even though output and income do not change, the shocks to the capital account and savings still result in a small real depreciation. Since the home price level is unchanged, the nominal exchange rate must adjust by the sum of the real exchange rate change and the fall in the foreign price level. In this case, the complete adjustment is about seven per cent.

These results make the float appear relatively attractive in the face of the shocks to which the Chinese economy has been subjected. Yet this analysis falls short of exposing the associated risks. First, overshooting could be considerable, with the potential to cause insolvencies and their resulting real effects in the manner of the crisis elsewhere in Asia (Yang and Tyers 1999). Second, as Dornbusch (1999) points out, nominal depreciation is a 'beggar thy neighbour' policy in any but a truly small country and it could elicit competitive devaluations in neighbouring countries. Finally, a float would also remove the exchange rate as the 'nominal anchor' (Edwards 1996).

The fiscal expansion

A key component of the Chinese policy response has been a fiscal expansion. In the diagram, this shock tends to shift the *IS-BOP* curve back upward and to the right. Conveniently, it also shifts the *AD* curve upward and to the right. While the fixed exchange rate regime is retained, any difference in the points of intersection of the two curves with the *SAS(W)* curve is resolved through an endogenous change in the nominal money supply. The downside, however, is that the domestic real interest rate rises. Government projects crowd out private investment, with possible consequences for private sector growth. To examine this effect, the numerical model was used to assess how large a bond-financed fiscal expansion would have been needed to restore the original level of GDP following the reference shocks. The answer is an expansion larger than half of GDP, sufficient to more than crowd out all private sector investment. Clearly, the 'soft budget' policy cannot be expected to restore potential output all by itself.

The nominal wage rise

Apparently out of a concern to reduce deflation by expanding consumption, the Chinese government has granted a substantial nominal wage increase to workers in the state sector and a rise in the legal minimum wage of all workers. The nominal wages of government workers are to be raised by between 20 and 30 per cent. On average, this amounts to a non-agricultural wage rise of two per cent. At the same time, however, the minimum wage to be paid to all workers will be increased by 30 per cent. For present purposes, a nominal wage shock of five per cent is roughly representative.

This is a supply side shock which shifts the *SAS(W)* curve upward. The effect is illustrated in Figure 3. The proportional change in the nominal wage is reflected in the diagram by the size of the vertical shift in the *SAS(W)* curve. The endogenous money

Figure 3 Effect of the nominal wage rise

supply then adjusts to accommodate the change and ensures that all three curves intersect at a common combination of price level and output. The domestic price level is raised by this change, although that rise is necessarily smaller than the change in the nominal wage (the size of the vertical shift). Output therefore falls. The corresponding numerical analysis is summarised in Table 6. Ironically, considering its apparent objective, the policy causes a decrease in domestic consumption expenditure. The reduction in output also reduces domestic saving, which raises the domestic real interest rate. In turn, this draws in foreign saving and raises the real exchange rate and hence net imports.

In the end, because it tends to raise the price level, the wage increase might be seen as serving the objective of slowing the deflation,¹⁷ but there is an obvious downside. It exacerbates the tendency of the earlier, crisis-related shocks to reduce output and increase unemployment. In spite of the continuing fiscal expansion, the decline in the foreign price level, the rise in autonomous private saving, and this rise in the nominal wage act collectively to reduce output below its potential.

Table 5 Effects of reference shocks with a floating exchange rate regime and a zero inflation target^a

Variable	Per cent change	Value before	Value after	Difference
<i>Expenditures on GDP</i>				
GDP, Y	0.0	1000	1000	0
Consumption, C	-12.3	500	439	-61
Investment, I	4.6	370	387	17
Government spending, G	7.7	130	140	10
Exports, X	10.7	160	177	17
Imports, M	-10.7	160	143	-17
<i>Balance of payments</i>				
Private net inflow, S_{NF}	-198	30	-29	-59
Change in official reserves, ΔR	-83	30	5	-25
Current account surplus, $X-M$		0	34	34
<i>Saving</i>				
Marginal propensity to save, $1-c^b$	35	0.20	0.27	0.07
Disposable income, Y_D	0.0	880	880	0
Tax revenue, T	0.0	120	120	0
Government saving, $T-G$	101	-10	-20	-10
Domestic private saving, S_D	16.1	380	441	61
Total private saving, $S = S_D + S_{NF}$	0.5	410	412	2
<i>Nominal money supply</i>				
Monetary base, B	0.2	135	136	0
Nominal money supply, M_S	0.2	470	471	1
<i>Interest rate</i>				
Home interest rate, r	-1.5	0.070	0.069	-0.001
Foreign interest rate, r^*	41.4	0.063	0.088	0.026
<i>Exchange rate</i>				
Real exchange rate, e_R	-3.6	1.00	0.96	-0.04
Nominal exchange rate, E	-7.0	1.00	0.93	-0.07
<i>Supply side</i>				
Real wage, $w=W/P$	0.0	4.50	4.50	0.00
Nominal wage, W	0.0	4.50	4.50	0.00
Employment, L	0.0	100	100	0
<i>Price level</i>				
Home price level, P	0.0	1.00	1.00	0.00
Foreign price level, P^*	-3.5	1.00	0.97	-0.04

Notes: a The reference shocks are to the foreign price level, P^* ; the marginal propensity to consume, c ; the foreign interest rate, r^* ; government spending, G ; and the change in foreign reserves, ΔR . The nominal exchange rate, E is floating and therefore endogenous. Although, normally, the nominal money supply, M_S , would then be exogenous, here monetary policy is assumed to restore the original price level. P is therefore also exogenous, while M_S is endogenous.

b This is the marginal propensity to save from disposable income.

Source: Simulations using the model discussed in the text.

Table 6 Reference shocks with the planned nominal wage rise^a

Variable	Per cent change	Value before	Value after	Difference
<i>Expenditures on GDP</i>				
GDP, Y	-8.2	1000	918	-82
Consumption, C	-22.4	500	388	-112
Investment, I	-3.0	370	359	-11
Government spending, G	7.7	130	140	10
Exports, X	3.3	160	165	5
Imports, M	-15.7	160	135	-25
<i>Balance of payments</i>				
Private net inflow, S_{NF}	-185	30	-25	-55
Change in official reserves, ΔR	-83	30	5	-25
Current account surplus, $X-M$		0	30	30
<i>Saving</i>				
Marginal propensity to save, $1-c^b$	35	0.20	0.27	0.07
Disposable income, Y_D	-7.5	880	814	-66
Tax revenue, T	-13.7	120	104	-16
Government saving, $T-G$	267	-10	-36	-26
Domestic private saving, S_D	12.1	380	426	46
Total private saving, $S = S_D + S_{NF}$	-2.3	410	401	-9
<i>Nominal money supply</i>				
Monetary base, B	-8.6	135	124	-12
Nominal money supply, M_S	-8.6	470	430	-40
<i>Interest rate</i>				
Home interest rate, r	1.0	0.070	0.071	0.001
Foreign interest rate, r^*	41.4	0.063	0.088	0.026
<i>Exchange rate</i>				
Real exchange rate, e_R	-1.1	1.00	0.99	-0.01
Nominal exchange rate, E	0.0	1.00	1.00	0.00
<i>Supply side</i>				
Real wage, $w=W/P$	10.0	4.5	5.0	0.5
Nominal wage, W^c	5.0	4.5	4.7	0.2
Employment, L	-17.4	100	83	-17
<i>Price level</i>				
Home price level, P	-4.6	1.00	0.95	-0.05
Foreign price level, P^*	-3.5	1.00	0.97	-0.04

Notes: a The reference shocks are to the foreign price level, P^* ; the marginal propensity to consume, c ; the foreign interest rate, r^* ; government spending, G ; and the change in foreign reserves, ΔR . Here the nominal wage is also exogenous and it is shocked as shown. The nominal exchange rate, E , is held constant.

b This is the marginal propensity to save from disposable income.

c The nominal wage is exogenous in all experiments. It is here raised 5 per cent to represent the average effect of a government wage rise of 30 per cent and a rise of similar proportion in the official minimum wage.

Source: Simulations using the model discussed in the text.

Residual effects if the crisis recedes

The Asian recovery is raising the relative price of foreign goods and reducing the competitive pressure faced by Chinese exporters. Although uncertainty about China's future exchange rate regime may keep the interest premium on investment high for some time, the passing of the crisis and renewed stability in the region should also see its eventual return to pre-crisis levels. It is of interest, then to assess the residual effects of the internal shocks to the Chinese economy and the policy responses. Except for the fiscal expansion, these shocks have been contractionary. The enduring impact of the Chinese shocks resulting from retention of the fixed exchange rate regime is summarised in Table 7. In this case, a return to full potential output would require the nominal wage to fall, so that the $SAS(W)$ curve would shift down. In the context of China's growing economy, it would mean keeping a lid on the nominal wage for a period. Given the recent state sector nominal wage rise, this could be politically difficult. Moreover, this would give rise to further deflation and the need for continued tight monetary policy in defence of the exchange rate (ensuring the conforming downward shift in the AD curve). If this does not happen and the growth of foreign reserves is resumed, a residual output shortfall of four per cent will occur, as indicated in Table 7. The result is dominated by the nominal wage rise and the autonomous savings increase. Both tend to reduce output, though they have offsetting effects on the real exchange rate.

A third scenario has China adopting a flexible exchange rate regime. Imagine that this flexibility is at least at the level that would prevail under a 'managed float' and that it is sufficient to provide some independence of monetary policy. Then it would be possible to set monetary policy so that the price level rises sufficiently to remove the overhang in the real wage. As indicated in the numerical analysis presented in Table 8, the result would be a substantial nominal depreciation and a smaller real depreciation as the $IS-BOP$ curve shifts upward and to the right with the now endogenous change in E . Again, this option appears to have low domestic political and economic cost, but the downside is principally the risk of retaliatory devaluations from neighbouring countries that compete in the same export markets.

Conclusion

The aim of this paper has been to show that useful insights into the effects on the Chinese economy of the Asian crisis and the policy issues that arise in its aftermath are available from an elemental, textbook macroeconomic model. The formulation adopted makes possible a simple graphical distinction between fixed and flexible exchange rate regimes along with easy comparative static simulations. It also enables the assessment of the role of crisis shocks external to the Chinese economy in relation to shocks that are primarily domestically driven. Even though the country runs did end at the Chinese border, the external shocks are shown to be quite important, explaining most of the shortfall of output below potential during the crisis period. For the most part, though, the contemporaneous

Table 7 If the crisis recedes and the fixed exchange rate is retained: the residual effects of the savings rise, the fiscal expansion and the nominal wage rise^a

Variable	Per cent change	Value before	Value after	Difference
<i>Expenditures on GDP</i>				
GDP, Y	-3.8	1000	962	-38
Consumption, C	-16.5	500	417	-83
Investment, I	8.1	370	400	30
Government spending, G	7.7	130	140	10
Exports, X	-1.6	160	157	-3
Imports, M	-4.2	160	153	-7
<i>Balance of payments</i>				
Private net inflow, S_{NF}	-13.9	30	26	-4
Change in official reserves, ΔR	0.0	30	30	0
Current account surplus, $X-M$		0	4	4
<i>Saving</i>				
Marginal propensity to save, $1-c^b$	35	0.20	0.27	0.07
Disposable income, Y_D	-3.5	880	849	-31
Tax revenue, T	-6.4	120	112	-8
Government saving, $T-G$	178	-10	-28	-18
Domestic private saving, S_D	13.6	380	432	52
Total private saving, $S = S_D + S_{NF}$	11.6	410	458	48
<i>Nominal money supply</i>				
Monetary base, B	-1.1	135	134	-2
Nominal money supply, M_S	-1.1	470	465	-5
<i>Interest rate</i>				
Home interest rate, r	-2.7	0.070	0.068	-0.002
Foreign interest rate, r^*	0.0	0.063	0.063	0.000
<i>Exchange rate</i>				
Real exchange rate, e_R	0.5	1.00	1.01	0.01
Nominal exchange rate, E	0.0	1.00	1.00	0.00
<i>Supply side</i>				
Real wage, $w=W/P$	4.5	4.5	4.7	0.2
Nominal wage, W	5.0	4.5	4.7	0.2
Employment, L	-8.3	100	92	-8
<i>Price level</i>				
Home price level, P	0.5	1.00	1.01	0.01
Foreign price level, P^*	0.0	1.00	1.00	0.00

Notes: a The shocks are to the marginal propensity to consume, c ; government spending, G ; and the nominal wage, W . The nominal exchange rate, E , is held constant.

b This is the marginal propensity to save from disposable income.

Source: Simulations using the model discussed in the text.

Table 8 If the crisis recedes but the exchange rate is flexible: the residual effects of the savings rise, the fiscal expansion and the nominal wage rise ^a

Variable	Per cent change	Value before	Value after	Difference
<i>Expenditures on GDP</i>				
GDP, Y	0.0	1000	1000	0
Consumption, C	-11.8	500	441	-59
Investment, I	11.6	370	413	43
Government spending, G	7.7	130	140	10
Exports, X	1.9	160	163	3
Imports, M	-1.9	160	157	-3
<i>Balance of payments</i>				
Private net inflow, S_{NF}	-20.0	30	24	-6
Change in reserves, ΔR	0.0	30	30	0
Current account surplus, $X-M$		0	6	6
<i>Saving</i>				
Marginal propensity to save, $1-c$ ^b	35	0.20	0.27	0.07
Disposable income, Y_D	0.0	880	880	0
Tax revenue, T	0.0	120	120	0
Government saving, $T-G$	101	-10	-20	-10
Domestic private saving, S_D	15.5	380	439	59
Total private saving, $S = S_D + S_{NF}$	12.9	410	463	53
<i>Nominal money supply</i>				
Monetary base, B	5.4	135	143	7
Nominal money supply, M_S	5.4	470	495	25
<i>Interest rate</i>				
Home interest rate, r	-3.9	0.070	0.067	-0.003
Foreign interest rate, r^*	0.0	0.063	0.063	0.000
<i>Exchange rate</i>				
Real exchange rate, e_R	-0.6	1.00	0.99	-0.01
Nominal exchange rate, E	-5.4	1.00	0.95	-0.05
<i>Supply side</i>				
Real wage, $w=W/P$	0.0	4.5	4.5	0.0
Nominal wage, W	5.0	4.5	4.7	0.2
Employment, L	0.0	100	100	0
<i>Price level</i>				
Home price level, P	5.0	1.00	1.05	0.05
Foreign price level, P^*	0.0	1.00	1.00	0.00

Notes: a The shocks are to the marginal propensity to consume, c ; government spending, G ; and the nominal wage, W . The nominal exchange rate, E , is held constant.

b This is the marginal propensity to save from disposable income.

Source: Simulations using the model discussed in the text.

domestic shocks have also been contractionary. This is particularly true of the autonomous rise in the private savings rate and hence the fall in private consumption. It is also true of one apparent policy response to this—the decision to raise the wages of government workers and the minimum wage of all workers. Contrary to its stated objective, this wage increase reduces private consumption, though it does apply upward pressure to the price level and hence retards the post-crisis deflation.

The choice of China's exchange rate regime in the aftermath of the crisis is highlighted. Numerical analysis using the model suggests that the maintenance of fixed parity with the US dollar since the onset of the crisis has been costly to the Chinese economy, because it has brought about the post-crisis deflation, along with its associated real wage rise and slower employment growth. In this comparative static context, the transition to a managed float appears to avoid this domestic cost, since it enables the redirection of monetary policy to prevent deflation. Indeed, the numerical analysis indicates that a nominal depreciation of seven per cent would have been sufficient to avoid any contraction relative to the trend during the crisis period.

Though some of these insights are fundamental and intuitive to the trained observer, the elemental model used here clarifies and quantifies the basis for that intuition. Useful though its insights are, a complete analysis does require a less elemental model. The downward rigidity of nominal wages in the short run is probably incomplete in China. Its accurate representation requires a more disaggregated model. Perhaps more importantly, proper account needs to be taken of the downsides to exchange rate flexibility in China's case. These include, first, the possibility that exchange rate volatility may be 'excessive', causing insolvencies that have serious real effects while domestic institutions are sluggish in transferring property rights. Second, the loss of the 'nominal anchor' raises the risk that domestic price stability may be lost. Finally, the prospect of retaliatory devaluations in neighbouring economies is foreshadowed, raising the prospect of another round of 'country runs'.

Notes

¹ This view is put by Zhang (1999) and borne out in the form of a policy reaction function estimated by L.L. Song (1999).

² This accorded with the strategy advocated by Corden (1993).

³ Here the real interest rate is approximated by the concurrent difference between the state bank lending rate and the rise in the CPI. The state bank lending rate is, of course, available to 'privileged' customers only. The source for both is IMF (1999).

⁴ Here, also the source is IMF (1999). These government spending statistics apparently ignore subsidies to state-owned enterprises. Such subsidies are large, though they probably take the form of transfers rather than spending on goods or services or public investment.

⁵ The extent of underestimation is moderated, however, by the disguised employment amongst these workers. Because they retain generous allowances and payments in kind, which are denied to workers who take new jobs, when new employment is attained these workers rarely concede it to officialdom. See Meng (1999).

⁶ That China is not 'small' has been emphasised by others, including Dornbusch (1999). Nonetheless, measured at current exchange rates, it produces only a few per cent of the world's output (IMF 1998).

⁷ The assumption that the capital stock is exogenous is examined in a fully dynamic context by McCallum and Nelson (1997:6–10), who find it does not impair the model significantly for short run or cyclical analysis.

⁸ More realistically, consumption might distinguish between the demand for home produced goods, C_H , and imported goods, M , so that $C = C_H + M$. These two components both depend on the real exchange rate (the ratio of the prices of home to imported goods) but with opposing signs. For the sake of this elemental analysis, we assume that these two effects just cancel out, leaving total consumption, C , independent of the real exchange rate.

⁹ In spite of earlier criticisms of *IS* formulations of this traditional type (such as by Blanchard and Fischer 1989:532), McCallum and Nelson (1997) find that they can perform well against more complete dynamic models with optimising agents. The traditional formulation is strongest where the issues hinge, as they do here, on the distinction between real and nominal variables. Where they depend on the details of dynamic behaviour this remains true so long as per capita income has a constant future value.

¹⁰ The shape of the $SAS(W)$ curve depends on the value of b . The labour share embodied in the GTAP general equilibrium database for China is $\beta = 0.45$ (McDougall et al. 1998) and this value does yield the shape shown.

¹¹ Both ΔR and r^* also shift the *AD* curve positively. A rise in ΔR raises outflows on the capital account, reduces the quantity of saving directed to the domestic economy and raises r . Imagine that output is fixed in a clearing labour market. At a higher r , money market equilibrium is only attained at a lower real money supply. Since the nominal money supply is exogenous, the result must be a higher price level and hence an upward shift of the curve. Similarly, if r^* rises, or if the interest premium demanded of investments in China rises, saving directed to the home economy falls and r rises. Again, at constant output, a higher r will only find equilibrium in the money market at a lower real money supply and hence a higher equilibrium price level.

¹² Because parity is fixed only against the US dollar, the appropriate measure here is the weighted average of the ratio P^*/E , which declined by roughly the above proportion in the 1996–98 interval.

¹³ There is, however, considerable anecdotal evidence to suggest that the deflation in China through 1998 was larger than the recorded 0.8 per cent.

¹⁴ Smaller price level and therefore GDP changes would require larger trade elasticities. For such a short run analysis, those listed in Table 2 already seem large.

¹⁵ Because of realignments amongst the major currencies, nominal parity with the US dollar has not prevented changes in the effective exchange rate. As indicated earlier, these are allowed for in the numerical analysis but ignored in the graphics.

¹⁶ The monetary implications of the change in ΔR cannot be fully represented in this comparative static framework. The contraction in the nominal money supply, M_s , implies a corresponding contraction in the monetary base, B , but this is relative to some positive trend. Only in a fully dynamic framework would the precise change in B be clear. Then, any difference between it and what is left of ΔR would imply a compensating change in the level of domestic credit and the nature of the implied sterilisation would be revealed.

¹⁷ Note that the decline in the home price level after the wage shock (Table 6) is less than that due to the reference shocks (Table 3). Song, L. (1999) sets out the reasons for concern that deflation has contractionary effects of its own in China. If the deflation is unexpected, there is a transfer from debtors to more thrifty creditors. If it is expected, real interest rates are raised, reducing investment. Finally, rational consumers delay consumption in anticipation of lower prices.

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