Exchange rate adjustments as an element of a development strategy for South Africa

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1. Introduction

The challenge facing South Africa's policy-makers is to restore high economic growth and employment creation on a sustainable basis. Ideally, these objectives should be realised without jeopardising macro-economic and financial stability. Internationally, every case of successful economic development over the past thirty years or so has occurred within a context of relative macro-economic and financial stability. All these experiences also point towards an increased outward-orientation as the key to sustainable growth. The comparative performance of many developing countries confirms that an outward-orientated policy which emphasises export-led growth is likely to generate more employment than policies based on trade protection and import substitution.

The objective of this article is to determine, with the aid of a multi-equation dynamic model, the extent to which exchange rate adjustments, as part of an outward-orientated policy, can contribute to the growth of the South African economy. The paper is divided into six parts. The next section presents a brief overview of various approaches to economic development followed over the years since the early 1960s. It is shown that a strong outward-orientation and foreign trade expansion can be seen as essential preconditions for sound economic growth. The subsequent section is devoted to the specification and estimation of mathematical equations that describe the behaviour of importers and exporters in the South African economy. The implied price elasticities of the demand for imports and exports are derived in Section 4. This is followed by a short discussion of the linkages between the subset of foreign trade equations and a comprehensive macro-economic model which summarises the salient features of the South African economy. The penultimate section contains a description of various simulations with the complete model to establish the steps needed to improve the outward orientation of the economy. First, a currency depreciation is simulated without adjustments in monetary and fiscal policies to illustrate the impact of such a depreciation on growth, employment creation, inflation and the current account of the balance of payments. The simulation is then repeated, but this time the currency depreciation is accompanied by appropriate monetary, fiscal and wage policies to maintain financial and price stability and a competitive cost structure. The final section contains some concluding comments.

2. An overview of changing approaches to economic development

During the 1960s the view held by policy-makers and economists that higher government spending and shifts in government spending patterns could make a significant difference to growth and employment creation was accepted almost without question. The lack of success in meeting the stated policy objectives of these so-called demand-stimulating strategies only became apparent during the 1970s when numerous economies suffered from stagflation, i.e. slow growth coupled with high inflation.

During the 1980s the focus of policy shifted towards the supply-side of the economy. It was argued that the route to a rapidly expanding economy is through export growth and that a depreciation of the currency is permissible in order to move a country onto an export-led growth path. Once again, experience has shown that such an approach will not necessarily meet with the desired results unless certain complementary measures for ensuring stability are also taken.

Currency depreciations are usually followed by higher domestic inflation if no complementary macro-economic stabilisation policies are implemented. The competitive gains from a depreciation can be quickly eroded by increases in the domestic price level which may easily develop into a vicious cycle of successive depreciations and price rises. Nevertheless, the healthy and sustained growth of a number of East Asian economies has demonstrated that development strategies which focused on the promotion of tradable goods industries and the strengthening of international competitiveness, coupled with high saving ratios, invariably met with a fair amount of success. It also turned out that all successful and sustainable development strategies contain fiscal and monetary policies that are dedicated to achieving and maintaining macro-economic stability.

South Africa's trade policy has traditionally been aimed at import substitution and was mostly inward-looking, with strong elements of protectionism and intervention which inhibited the cross-border flow of goods. During the past few decades until recently, trade and financial sanctions also moved the country further towards a policy of self-sufficiency. Notwithstanding South Africa's highly protective trade policies and the imposition of trade sanctions, the share of the country's combined imports and exports of goods and services in the gross domestic product has persistently averaged about 60 per cent since the 1960s.

This high degree of openness not only left the economy vulnerable to exogenous shocks, but the high propensity to import imposed a balance of payments constraint on the economy's growth capacity. As soon as domestic spending starts to expand, the demand for imports increases, resulting in a widening deficit on the current account of the balance of payments. This disequilibrium soon becomes unsustainable and then compels the authorities to tighten domestic policies to prevent the balance of payments difficulties from changing into a major payments crisis. The tightening of policies then usually tends to cool the economy down cyclically.

Despite these caveats associated with the opening-up of an economy, there appears to be broad support (even from the proponents of greater government intervention) for liberalising foreign trade and reorienting trade policy away from import substitution towards export promotion. Such an approach requires the elimination of impediments standing in the way of the development of a dynamic export sector and is consistent with the objectives of efficient allocation of resources and absorption of unemployed labour. Since import and export prices are highly sensitive to changes in the exchange rate, and import and export volumes are supposed to respond to relative price changes, calls are frequently made on the South African authorities to allow a downward adjustment in the exchange rate of the rand to provide an incentive to invest for the export market.

For a policy of currency depreciation to have the desired outcome, a number of preconditions have to be satisfied. The successful implementation of a policy of currency depreciation rests on the reaction of export and import volumes to the change in relative prices, i.e. the success of such a policy depends on the price elasticities of the demand for exports and imports. According to the Marshall-Lerner condition, the balance on current account will only improve if the sum of the export and import price elasticities is greater than unity. There are, however, a number of other factors which influence the eventual outcome of a currency depreciation. It is necessary that resources on the supply side must be available and sufficiently mobile to be reallocated from other, non-export, sectors of the economy to industries producing tradable goods for exportation. Of course, reasonably accessible foreign markets are also required. Most importantly, offsetting domestic price rises following in the wake of a currency depreciation must be avoided. A depreciation increases the cost of imported goods, which pushes domestic production costs and the aggregate price level higher. This in turn can easily force rises in money wages, necessitating further depreciations to maintain international competitiveness. Eventually, the gains obtained from an initial depreciation of the currency could be nullified once a spiral of rising domestic production prices and successive depreciations of the currency gets under way. The end result under such circumstances could be lower growth, lower employment, higher inflation and lower international competitiveness than would have been the case had the exchange rate not been adjusted in the first place.

The remainder of this paper is devoted to the quantification of the effects of a currency depreciation under various assumptions of likely policy responses in the context of a dynamic macro-economic model of the South African economy. The model involved was developed by the South African Reserve Bank to forecast economic developments and to generate scenarios which serve as a useful analytical tool for the evaluation of alternative policies. As with most large-scale economic models, this model is in the Keynesian tradition and is therefore driven by changes in aggregate demand. However, supply-side constraints are included in the model and exert upward pressure on domestic prices once a critical level of capacity utilisation is exceeded. The labour market, the public sector and the financial sector are also represented by various equations in the model.

3. Description of the equations in the trade sector of the model

This section describes the specification and estimation of the subset of equations which explain the behaviour of importers and exporters in the South African economy. The equations were estimated by means of ordinary least squares (OLS) estimation techniques, using seasonally adjusted quarterly data as calculated and published by the South African Reserve Bank. Where applicable, autocorrelation in the successive unexplained residuals was removed by using the Cochrane-Orcutt method. The period of estimation is from the first quarter of 1985 to the fourth quarter of 1994.

3.1 Volume of imported goods

The volume of imported goods is disaggregated into two categories, i.e. imports of oil and imports of non-oil merchandise goods. As a sizable portion of South Africa's crude oil requirements during the sample period was imported for strategic purposes and was not always related to the changes in aggregate domestic final demand, the importation of crude oil is assumed to be a predetermined or exogenous variable. Non-oil goods, on the other hand, are explained as the outcome of the interplay of various economic forces and are described in the model by a behavioural equation.

The theory of demand was used to formulate the function for imports of non-oil goods. Income or economic activity and relative prices are the main

explanatory variables in this function. The dependent variable z represents the imports of non-oil merchandise goods at constant 1990 prices. The variable y represents an income variable, calculated as a weighted sum of the components of gross domestic expenditure. The weights attached to the expenditure components were computed from the 1988 input-output table on the basis of their respective import intensities.

The relative price variable p represents a weighted moving average of the ratio of the prices of imported goods to the prices of locally produced goods. The variable used for the prices of imported goods is the derived deflator for non-oil merchandise imports, including the price-raising effects of customs duties and import surcharges. The measure for domestic prices is the derived deflator for the gross value added by the non-agricultural private sector, excluding the gold-mining industry. The exchange rate does not enter the function explicitly, but its influence is exerted through the effect of exchange rate changes on the prices of imported goods.

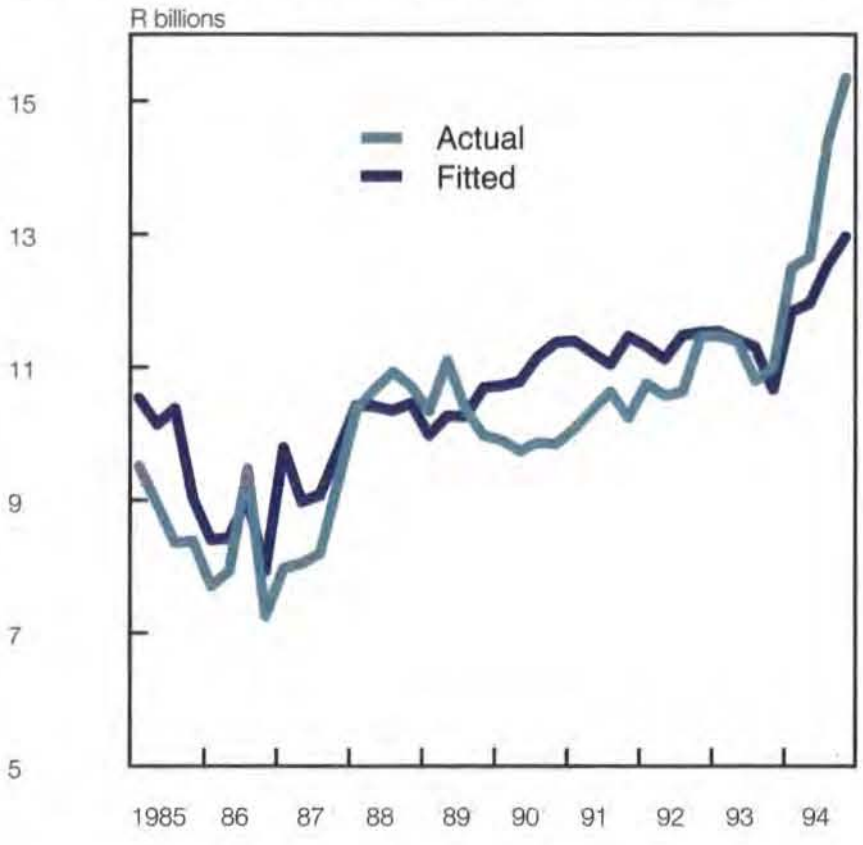
The variable u serves as a measure for domestic capacity utilisation and is computed as the difference between the potential output[1] and the actual gross domestic product in the private non-gold-mining sector, expressed as a percentage of potential output. Rising capacity utilisation, i.e. a declining value for u, signals increased pressure on domestic resources and consequently a higher demand for imported goods. Hence the algebraic sign attached to the coefficient of the variable u is expected to be negative. A dummy variable d was added as explanatory variable during the period when South Africa was still subject to trade sanctions.

The estimated equation is as follows[2]:

$$
\begin{array}{lcl}
z & = & 6823 + 1{,}06^{*}y - 87{,}76^{*}p - \\
 & & \quad (2{,}3) \qquad (5{,}1) \qquad (7{,}0) \\
 & & \\
 & & 97{,}59^{*}u - 609{,}50^{*}d \\
 & & \quad (2{,}3) \qquad (2{,}9)
\end{array}
$$

$\bar{R}^2 = 0{,}65$
D-W = 1,74
RHO = 0,80
Estimation period: 1985Q1 - 1994Q4

Graph 1: Imports of non-oil merchandise goods



The hypothetical import volumes based on the estimated equation and actual import volumes are compared in Graph 1.

3.2 Volume of exported goods

Gold exports from South Africa are assumed to be determined essentially by the supply of gold by domestic producers. Gold output, in turn, is mainly determined by the availability of gold-bearing ore and the gold content of known ore reserves[3]. For these rather technical considerations, the production of gold, and therefore also the exports of gold, are assumed to be a predetermined variable which is not explained by the interaction of macro-economic forces as described by the model. Non-gold exports are modelled by two separate equations, namely one for the exports of manufactured goods and the other for the exports of primary commodities and minerals. Generally, the exportation of goods is modelled as a demand equation and is a function of international economic activity or income, and relative prices.

3.2.1 Exports of manufactured goods

The dependent variable x_m represents the exports of manufactured goods at constant 1990 prices and the

[1] For a description of the calculation of the potential gross domestic product, see de Jager, B.L. and Smal M.M.,: "The potential gross domestic product of South Africa", *Quarterly Bulletin* of the South African Reserve Bank, December 1984.

[2] t-statistics are reported in brackets immediately below the estimated coefficients.

[3] In the short run other factors, such as labour unrest, unscheduled holidays, a declining work ethic, and so forth, may have an influence on gold output.

explanatory variable y_f the weighted sum of the combined index of the import volumes of South Africa's five major trading partners. This latter variable represents international economic developments and changes in the international demand for South African manufactured goods. The variable p_m symbolises relative prices, calculated as the ratio of the price deflator for the dependent variable to a weighted average of international production prices measured in South African currency. It is often suggested that exporters in South Africa tend to increase export volumes when the domestic market is unable to absorb local production. This assertion was tested by including a variable y_d representing aggregate domestic demand. The estimated coefficient of this variable turned out to be significantly non-zero and has a negative sign, thereby confirming the hypothesis that South African manufactured export volumes tend to rise when domestic demand is slack.

The estimated export equation for manufactured goods resembles a demand function and was estimated as:

$$x_m = \underset{(3,2)}{4340} + \underset{(8,1)}{39,10}*y_f - \underset{(4,7)}{28,70}*p_m - \underset{(2,2)}{0,23}*y_d$$

$\bar{R}^2$ = 0,68
D-W = 1,78
RHO = 0,25
Estimation period: 1985Q1 - 1994Q4

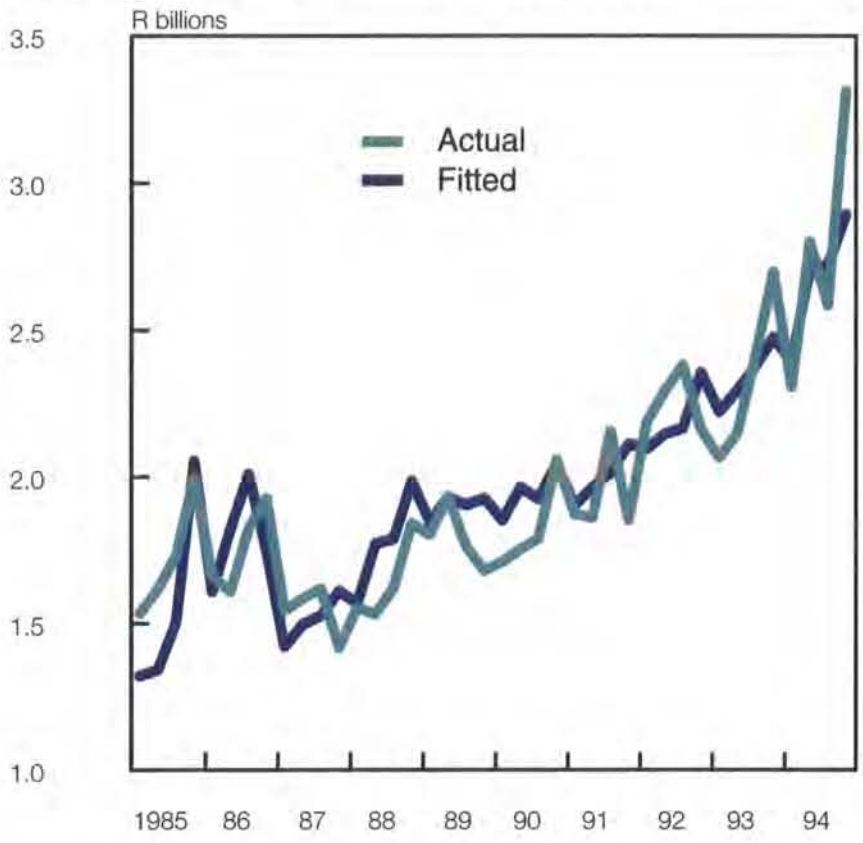
The export volumes calculated by means of the estimated equation and the actual data are shown in Graph 2.

Inadequate statistics prevented the testing of a hypothesis that official export-promotion incentives provided a meaningful boost to the country's export effort. Quarterly data relating to export promotion are not readily available. However, according to the functional classification of expenditure of the Consolidated National and Provincial Budgets compiled by the Central Statistical Service, an amount of R2,2 billion was budgeted for export trade promotion in the 1994/95 fiscal year. This amounted to about 11 per cent of the actual value of the exports of manufactured goods in that year.

3.2.2 Exports of commodities and minerals

The estimated equation for the exports of primary commodities and minerals is not a pure demand function because it is also dependent on combined agricultural and non-gold-mining output. It is therefore possible for South African exports of commodities and minerals to increase because of favourable domestic agricultural and non-gold-mining output conditions.

Graph 2: Exports of manufactured goods



The dependent variable x_c represents the exports of primary commodities and minerals at constant 1990 prices and the variable y_{am} the real value added in the agricultural and non-gold-mining sectors. The variable y_f describes a weighted sum of the combined index of the imports of South Africa's five major trading partner countries and reflects movements in the international economy and the resulting international demand for South African goods. The variable p_c represents relative prices, calculated as the ratio of the price deflator for the dependent variable and a weighted average of international production prices measured in rand. The inclusion of the relative price variable tests the hypothesis that a rise in South Africa's production costs relative to international prices is set to curb commodity exports, and that international commodity prices rising relative to South Africa's output costs are set to boost commodity export volumes from South Africa.

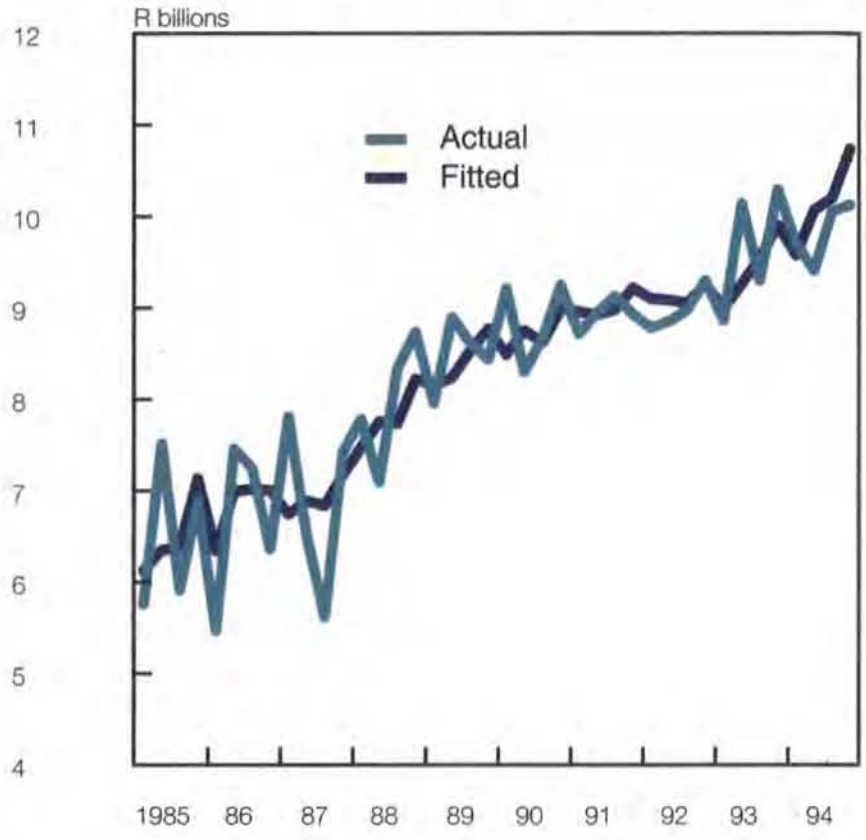
The estimated export function for commodities and minerals is as follows:

$$x_c = \underset{(2,3)}{3077} + \underset{(1,9)}{0,25}*y_{am} + \underset{(11,8)}{67,20}*y_f - \underset{(3,0)}{26,40}*p_c$$

$\bar{R}^2$ = 0,95
D-W = 1,75
RHO = 0,12
Estimation period: 1985Q1 - 1994Q4

The goodness-of-fit of the estimated equation is illustrated in Graph 3.

Graph 3: Exports of commodities and minerals



4. Elasticities of the demand for imports and exports

The long-term price and income elasticities were calculated at the arithmetic mean of the appropriate variables and the dependent variable, i.e.

$$\varepsilon_{y \cdot x} = (\delta y/\delta x)^{*}(\bar{x}/\bar{y})$$

where δ indicates changes in the associated variable. The price and income elasticities are reported in Table 1.

The long-term price elasticity of the demand for non-oil merchandise imports is 0,85, which means, *ceteris paribus*, that for every one per cent increase in the relative price of imported goods, the volume of non-oil imports is expected to decline by 0,85 per cent. This relatively low price sensitivity can partly be the result of the protectionist policy followed during most of the estimation period and the drive towards self-sufficiency in the supply of strategic materials and goods in the 1980s. The extremely strong response of non-oil imports to domestic activity is noteworthy. The income elasticity of the demand for non-oil merchandise imports is 1,47, which means that imports are highly sensitive to changes in aggregate income in South Africa. When domestic income increases, the percentage change in imports is considerably larger than the change in domestic income.

The long-term price elasticity of the export demand for manufactured goods was computed at 1,40, which means that the volume of manufactured exports will change by 1,40 per cent for every one per cent change in the relative price of manufactured goods. It can therefore be concluded that South Africa's exports of manufactured goods are price sensitive. Furthermore, a value of 1,88 was computed for the income elasticity. When income changes by a certain percentage in South Africa's trading partner countries, the change in the export of manufactured goods will be higher. As can be expected, South Africa's exports are therefore sensitive to changing international business conditions.

Table 1. Import and export elasticities and the Marshall-Lerner condition

Dependent variable	Price elasticity	Income elasticity
Import of non-oil merchandise goods.....	0,85	1,47
Export of non-gold merchandise goods.....	0,58	1,04
Export of manufactured goods	1,40	1,88
Export of commodities and minerals.....	0,31	0,76
Marshall-Lerner condition ..	1,43	

The price elasticity of the demand for South African commodities and minerals was calculated as a relatively small 0,31. Any given change in relative prices will result in a smaller than proportionate change in the volume of the exports of agricultural commodities and minerals. The income elasticity was computed as 0,76, which shows that South Africa's exports of commodities and minerals are not as sensitive to international income changes as the export of manufactured goods[4].

The above-mentioned price elasticities of the demand for the two types of exports show that manufacturing exports are price elastic, whereas

[4] Changes in the production of agricultural commodities and minerals usually occur gradually. New explorations and investments to increase capacity take time. In the case of agricultural products one has to wait for the next planting season before the production of a particular crop can be altered, and even then weather conditions could influence the eventual outcome.

exports of commodities and minerals are price inelastic. This result indicates that increased price competitiveness of South African manufacturers should lead to a comparatively large increase in the volumes of merchandise exports from the country, and higher total export earnings (in rand) from these merchandise exports.

The question is whether or not a depreciation of the rand could be advantageous to the balance of trade. The Marshall-Lerner condition can be used to make such an evaluation. According to this condition, a country's trade balance, measured in domestic currency, will improve by a depreciation of the exchange rate if the absolute sum of the price elasticities of the country's demand for imports and exports exceeds unity.[5]

The price elasticity of the demand for non-oil imports was computed as 0,85 and the elasticities of the demand for South Africa's non-gold exports were calculated as 1,40 for manufactured goods and 0,31 for commodities and minerals. The export of manufactured goods contributes approximately 25 per cent to merchandise exports, i.e. total exports of goods excluding gold. The total price elasticity of merchandise exports is equal to 0,58. The sum of the price elasticities is 1,43, which indicates that a depreciation is likely to improve the balance of trade.

The calculated income elasticities indicate that South Africa's income elasticity of imports is higher than the income elasticity of the countries importing from South Africa. This implies that South Africa's trade balance will deteriorate in the long run if the economic growth rate in South Africa corresponds with that of the country's trading partners.[6]

5. Linkages to the main model

Fluctuations in the foreign trade sector not only influence domestic production, but also employment levels, inflation and other variables (see diagram 1). Increases in export volumes stimulate domestic production, which, after some time delay, results in higher employment levels. Any change in domestic income is accompanied by an adjustment in domestic expenditure. This change in expenditure, in turn, has further repercussions in that the demand for foreign goods varies with changes in the domestic spending pattern.

Fluctuations in the balance on the current account of the balance of payments tend to alter the circumstances in the money and capital markets. Interest rate behaviour, as determined by the demand for and supply of funds, conforms to these changes in the financial markets[7]. The interest rate changes are channelled through to domestic expenditure by means of changes in private consumption expenditure and gross domestic investment expenditure. Government consumption expenditure is also affected by changes in the payments of interest on government debt.

Price changes in the model are partly driven by changes in the exchange rate through changes in the prices of imported goods. Changes in domestic prices are further influenced by price expectations and productivity developments as well as changes in wages, in which the unemployment rate, as represented by the gap between potential and actual output, plays an important part.

6. The simulated effects of a currency depreciation

An econometric model, including the subset of foreign-sector equations, was employed in a simulation exercise in order to assess what impact a currency depreciation is likely to have on the South African economy. Two simulations were performed. In the first one, a currency depreciation was simulated without any macro-economic policy responses to offset potential inflationary impulses. In the second simulation, it was assumed that steps would be taken to contain any continuous price rise that may result from a weakening of the exchange rate.

As with all policy simulation exercises based on structural models, the so-called Lucas critique[8] is applicable. Lucas argued that economic behaviour changes when the economic policy regime is adjusted and that macro-economic models, being estimated from past behavioural patterns, cannot detect these changes. The usefulness of structural models as a mechanism to evaluate policy choice may thus be questioned. For the purpose of this article, it was assumed that the behaviour of economic agents, and hence the structural parameters of the model, would remain unchanged with a change in the exchange rate

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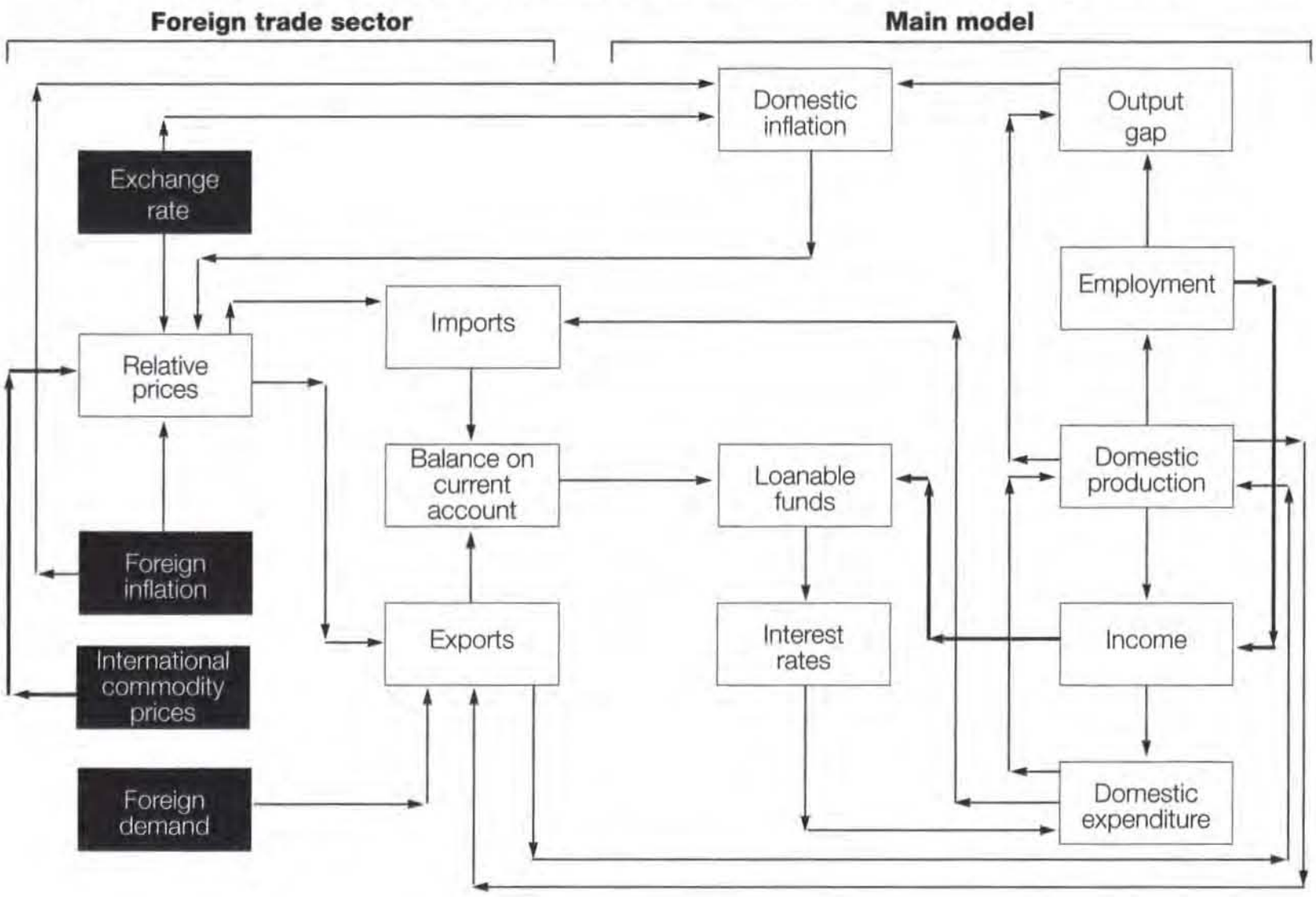
[5] If there were a large negative trade balance to start with, i.e. the value of imports is much larger than that of exports, then the rand value of imports may increase more than the rand value of exports, leading to a further deterioration in the trade balance, although the sum of the demand elasticities is larger than unity.

[6] It should be kept in mind that this conclusion is based only on the rate of growth in aggregate demand. It does not take into account any effects on the supply of different types of goods.

[7] Of course, interest rates are also influenced by monetary policy.

[8] Lucas, Robert E.: *Economic policy evaluation: A critique.* in K. Brunner and A. Meltzer, ed., Carnegie-Rochester Conference Series on Public Policy, Vol.1, New York, North Holland, 1976, pp. 19-46.

DIAGRAM 1
FLOW CHART OF THE MAJOR LINKAGES OF THE FOREIGN SECTOR TO THE MAIN MODEL



Dark areas indicate predetermined assumptions

policy. As a consequence, the results reflect the change in relative prices and not so much behavioural changes based on expectations, which could lead to the creation of more export capacity through increased investment expenditure. It is reasonable to expect that the magnitude of the reported results could be boosted by these behavioural changes and expectational effects.

6.1 Depreciation without financial policy reaction

A baseline simulation was prepared by solving the model over the five-year period from 1990 to 1994, using the known values of the exogenous variables. In a further simulation the exchange rate of the rand against the US dollar was arbitrarily fixed at a level 20 per cent below its level in the baseline simulation.[9] All other exogenous variables were fixed at their baseline values and wages and prices were allowed to respond to this exogenous shock in accordance with the structural parameters of the model. The multiplier effects of the depreciation of the rand are shown in Table 2.

From the table it appears that the level of the real gross domestic product in the alternative scenario is higher than in the baseline simulation throughout the simulation period, but that the growth in real income is not consistently stronger than in the baseline simulation. Although the growth rate in the real gross domestic product is initially higher in the alternative scenario, it ultimately drops below the growth rate of the baseline simulation. Furthermore, there is only a small net gain in the average growth rate. During the simulation period the average level of employment increased by 65 570 jobs.

[9] In the South African foreign exchange market, the exchange value of the rand is essentially determined by market forces. When deemed necessary, the Reserve Bank may intervene in the market to ensure orderly exchange rate adjustments or to "smooth out" excessive short-term fluctuations. In the simulations performed for the purpose of this paper, the technical problems involved in effecting an exchange rate depreciation were ignored. Nevertheless, such simulations justify attention, for they illustrate the effects of a presumably more competitive economy on income growth, employment creation and the balance of payments.

Table 2. The effect of a twenty per cent depreciation in the nominal rand/dollar exchange rate. (Comparison between the alternative simulation and the baseline simulation)

Year	Level of real gross domestic product*	Growth rate in real gross domestic product#	Employment in the non-agricultural sector#	Inflation rate#	Balance on the current account#	Real wages in the non-agricultural sector#
	Per cent	Percentage points	Number	Percentage points	R millions	Percentage points
1	+0,9	+0,9	+67 580	+4,5	+9 320	+2,0
2	+1,0	+0,1	+58 500	+4,0	+11 240	+0,8
3	+0,9	-0,1	+69 760	+4,6	+12 670	+0,0
4	+0,8	-0,1	+67 790	+5,4	+14 310	+0,0
5	+0,7	-0,2	+64 220	+6,4	+15 440	+0,0
Average	**+0,9**	**+0,1**	**+65 570**	**+5,0**	**+12 596**	**+0,6**

* Calculated as the percentage difference between the alternative and baseline simulation.
\# Calculated as the difference between the alternative and the baseline simulation.

The impact of the nominal depreciation on the inflation rate is strong. The inflation rate immediately rises by 4,5 percentage points in the alternative simulation. This impact gradually increases over the simulation period and the inflation rate is on average 5 percentage points higher in the alternative scenario. On average, the balance on the current account of the balance of payments shows a meaningful improvement of more than R12 billion per year. The real wages in the non-agricultural sector also increase. This upward movement in real wages subsequently is a major factor in bringing about a rise in the inflation rate.

In short, a depreciation in the domestic currency leads to a higher level of real income, an improvement in employment and a substantial improvement in the balance on the current account of the balance of payments. However, the results also indicate a substantially higher inflation rate and there appears to be almost no gain in the average medium-term economic growth rate. The advantages obtained from the depreciation of the rand are therefore likely to be wiped out by the higher rate of inflation over time. Behavioural changes may even further shorten the benefits of the changes in the relative prices of tradable to non-tradable goods.

6.2 Depreciation with conservative financial policy reaction

The exercise described in the previous section was repeated, but in addition to the 20 per cent depreciation in the nominal value of the rand against the US dollar, monetary and fiscal policies were tightened to maintain macro-economic stability. The tightening of monetary policy was simulated by assuming that Bank rate would adjust by more than the acceleration in the consumer price inflation, i.e. the real Bank rate was increased in the alternative simulation. All inflation-induced additional government consumption expenditure was also prevented from materialising. This was done by fixing real government consumption expenditure in the alternative simulation at a lower level than in the baseline simulation. It was further assumed that wage and salary demands would be moderated and that all employees would be prepared to accept a smaller increase in their real remuneration in the alternative simulation than in the baseline simulation.[10] All other exogenous variables were again fixed at their baseline values. The multiplier effects of this scenario are illustrated in Table 3.

Table 3 shows that the level of the real gross domestic product is increasingly higher in the alternative scenario than in the baseline simulation over the entire simulation period. The growth rate in the real gross domestic product in the alternative scenario exceeded the growth rate of the baseline simulation in every year of the simulation period. There was an average gain of 0,3 percentage points in the economic growth rate. The average employment level was raised by 86 527 job opportunities.

The initial impact of the nominal depreciation on the inflation rate is about half that of the initial impact in

[10] Although real remuneration is lower in the alternative simulation than in the baseline simulation, the change in real remuneration is still positive, i.e. wages increase by more than the inflation rate.

Table 3. The effect of a twenty per cent depreciation in the nominal rand/dollar exchange rate with a tightening in monetary and fiscal policy, supported by a moderation in wage claims. (Comparison between the alternative simulation and the baseline simulation)

Year	Level of real gross domestic product*	Growth rate in real gross domestic product#	Employment in the non-agricultural sector#	Inflation rate#	Balance on the current account#	Real wages in the non-agricultural sector#
	Per cent	Percentage points	Number	Percentage points	R millions	Percentage points
1	+1,0	+1,0	+74 410	+2,3	+9 160	-0,1
2	+1,1	+0,2	+70 620	+1,0	+10 720	-1,4
3	+1,2	+0,1	+85 780	+0,2	+11 400	-0,9
4	+1,3	+0,1	+93 700	-0,7	+11 700	-0,8
5	+1,4	+0,1	+108 120	-1,5	+10 980	-0,7
Average	**+1,2**	**+0,3**	**+86 527**	**+0,2**	**+10 792**	**-0,8**

* Calculated as the percentage difference between the alternative and baseline simulation.
\# Calculated as the difference between the alternative and the baseline simulation.

the first alternative simulation. This impact then eases off rapidly and from the fourth year of the simulation period the inflation rate is lower than in the baseline simulation. The inflation rate is, on average, only 0,2 percentage points higher in the second scenario compared with the baseline simulation. The improvement in the balance on the current account of the balance of payments is on average almost R11 billion. Real remuneration per employee falls in the second alternative to below its level in the baseline simulation. This still translates to an increase in the average real remuneration per worker in the non-agricultural sector of about 1 per cent.

Based on these simulations, it can be concluded that a depreciation of the domestic currency supported by tighter monetary and fiscal policy and assisted by wage restraint is likely to increase the real gross domestic product as well as its rate of growth on a sustainable basis. Employment levels are raised significantly and the balance on the current account of the balance of payments is likely to be in a much healthier state. Provided that the necessary steps are taken to contain a sustained rise in the price level, inflation is not expected to worsen on account of a depreciation. As noted earlier, the model does not provide for a change in the behavioural patterns of economic agents. Assurances of nominal wage restraint are likely to result in more capital flows into the country and more investment expenditure to expand export capacity, resulting in a higher economic growth rate and employment creating capacity than currently indicated by the model's results.

7. Summary and conclusions

The set of equations describing South Africa's trade relations with the rest of the world is explained in this article. These equations are linked through various channels with the multi-equation econometric model of the Reserve Bank. The complete model is designed in such a way that it allows the simulation of the likely outcome of adjustments in a number of variables which are assumed to be under the control of the authorities.

The income and price elasticities of the demand for imports in the domestic economy and of the demand for exports from South Africa were derived from the estimated structural equations. The calculated elasticities duly bear witness to the observation that the volume of imported goods is likely to react strongly to an increase in aggregate domestic demand. At the same time, the demand for exports of manufactured goods from South Africa is highly sensitive to changes in the aggregate income level of the country's trading partners. The demand for manufactured exports from South Africa also turned out to be highly price elastic. This allows the sum of the price elasticities of the demand for imports and exports to exceed the value of unity, i.e. to meet the so-called Marshall-Lerner condition for a currency depreciation to improve the balance of trade.

Simulations with the complete model demonstrate that a depreciation of the exchange rate of the rand against the US dollar is likely to have a beneficial effect on the current account of the balance of payments. Other benefits appear to be small, particularly in view of

the disadvantages that higher inflation would bring about in the long term.

A further simulation brought to light that a currency depreciation supported by an orthodox tightening of monetary and fiscal policies, along with the containment of real wage growth, will boost income and employment levels on a sustainable basis, while strengthening the current account of the balance of payments with a much less inflationary effect than a currency depreciation on its own.

A comparison of the simulations reveals conclusively that most of the macro-economic benefits derived from the various hypothetical policy packages, except of course the improvement on the current account of the balance of payments, resulted more from the conservative financial and wage policies than from the depreciation of the currency. Higher income levels, faster economic growth, greater job creation and a lower rate of inflation can thus be achieved by combining a policy of relative exchange rate stability with an orthodox monetary and fiscal policy approach. The major challenge in implementing such a strategy is to overcome the likely resistance of wage and salary earners to accept a lower real wage in order to foster export-led growth. Some meaningful community consensus on the distribution of income between factors of production could ensure that a depreciation does not translate into a vicious cycle of wage and price increases, leading to financial instability and a loss of the price competitiveness obtained by the initial depreciation. These temporary sacrifices will contribute in the long term to increased investment, improved prospects for growth and job creation as well as the delivery of social services and infrastructure.