MACROECONOMIC IMPACTS ON COMMERCIAL FARM INCOMES IN SOUTH AFRICA

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This paper examines the impacts of interest rates, exchange rates and money supply on real net farm incomes in South Africa from 1947-1994. A vector autoregression framework is used for the analysis which places minimal restrictions on the model so the true structure of the relationship can be observed. Long run relationships were established using cointegration and time varying parameters estimated to analyze the macroeconomic impacts at various stages of financial sector reform. The results indicate that the interest rate had the most significant effect on real net farm income which was exacerbated during the reform process. Exchange rates have played a role as a cost of production through imported inputs with the marketing boards being fairly successful at insulating farmers from external demand.

1. INTRODUCTION

The South African economy, as was common to most Sub-Saharan African countries, has been dominated by a highly regulated government controlled market. The tight protection against foreign competition, in conjunction with a controlled and largely monopolistic system of marketing boards, subsidies on inputs, favourable taxation and interest rate policy has contributed to distortions in agriculture. Price controls on many commodities which as a result of the marketing act of 1937, facilitated intervention varying from very severe types such as one-channel fixed-price schemes and quotas, to mild measures (Groenewald and Nieuwoudt, 1979)

Since the early 1980's, however, there has been a shift towards a more liberated political economy which included reforms in the financial and agricultural sector. The reforms in the agricultural sector came in the form of a reduction in the use of price controls on a number of commodities which gave way to a more market-based pricing system. Farmers also experienced higher interest rates, devalued exchange rates, declining budgetary allocation and a change in the favourable taxation policies thus redeeming the implicit subsidy on agriculture (Kirsten & Van Zyl, 1996). As a result of the Committee of Inquiry into the Marketing Act (1992) a total of eight marketing schemes and marketing boards were abolished (Sartorius von Bach *et al.*, 1994). Reform of interest rates and exchange rates resulted from the de Kock inquiry (1979) which recommended the replacement of direct controls with market-determined prices in monetary and exchange rate policy. These reforms towards a more market led economy will result in the agricultural sector becoming increasingly dominated by the level of effective demand, determined by the level of domestic growth and overseas markets. This study will attempt to add to the work of Dushmanitch and Darroch (1990) on the macroeconomic linkages in South African agriculture. Specific focus will be on the impacts of interest rates, exchange rates and money supply on real net farm incomes at different stages of financial an agricultural sector reform in South Africa.

2. THE MACROECONOMIC ENVIRONMENT

Interest Rates

Throughout most of the 1970's the real long-term interest rates have been low and subsidised which offered substantial incentives to borrow for purchases of durable equipment and fixed improvements. This was supplemented by short term off-shore borrowing in the early 1980's, ahead of the sharp falling exchange rate (World Bank Report, 1994). However, as a result of financial sector reforms the reserve requirements of the banking sector were changed making it impossible for the Land Bank to continue subsidizing farmers' interest rates (Vink, 1993). Figure 1 shows a weighted real interest rate for South Africa, this is a composition of the interest rate of the Land Bank, Co-ops and Commercial Banks. The data are from the Department of Agriculture and the IMF Annual Financial Statistics.

The real interest rate is fairly constant until 1960 thereafter declining, turning negative from 1973 until 1982 and again from 1985 to 1987 after which it rises. The sharp rise in 1983 coincides with de Kock's anti-inflationary emphasis relying mainly on monetary policy to control inflation. The low interest rate in 1986/87 was adopted by the Reserve Bank because under the foreign financial and trade sanctions business was so depressed that the risk of overstimulating the economy was remote (Goedhuys, 1994).

Exchange Rates

Exchange rate regimes in South Africa can be summarised as fixed (1947-71), pegged (1971-1978) and managed floating (1979-1994). These differing regimes are fairly apparent in figure 1. Between 1979 and 1994 the exchange rate was not entirely market determined and was used to help achieve changing objectives during the period under review. Apart from helping to stabilize the balance of payments, these objectives included the protection of gold mining (1979-88), the stimulation of exports and the reduction of inflation (1988-94), these objectives however often conflict with each other (Khan, 1992). As a significant proportion of inputs in the agricultural sector are imported (Le Clus, 1979) exchange rates play a significant role in the determination of input prices. Leibenburg *et al.* (1991) using quarterly data from 1973-1988 showed how the exchange rate had differing effects on input categories. Exchange rates also have implications for exports, with devaluations making South African products attractive on overseas markets. Exports and imports accounted for an average 29 and 24 percent of GDP respectively between 1980 and 1987 (van Zyl and Groenewald, 1988).

3. ARICULTURAL VARIABLES

Figure 2 shows indices of real net farm income per hectare and per farm and the real price of inputs and outputs. The output price is a divisia aggregate of the price of crops, horticulture and livestock. The input price is a divisia aggregate of wages, feed, dips, fertilizer, packaging, fuel and machinery from the Abstract of Agricultural Statistics and the South African Statistics yearbook. The real price of

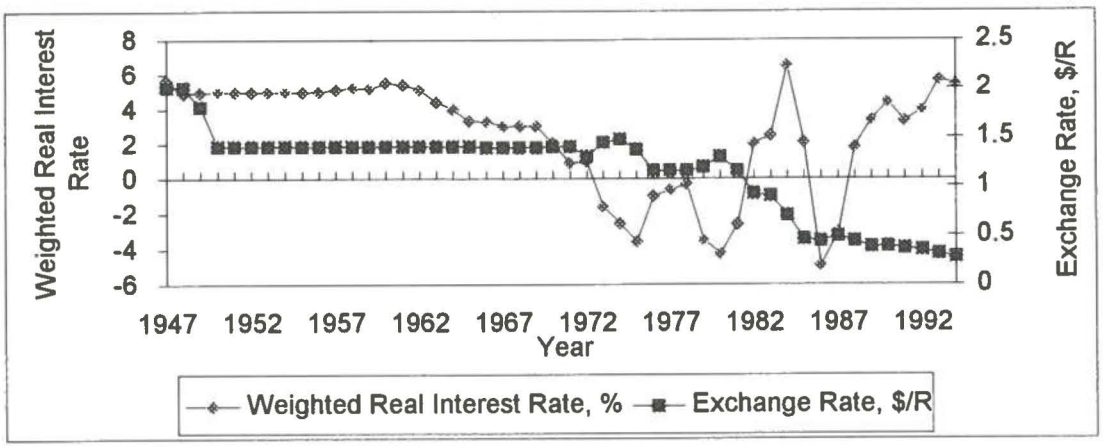

Figure 1: **Weighted Real Interest Rate and Exchange Rate for South Africa, 1947-1994**

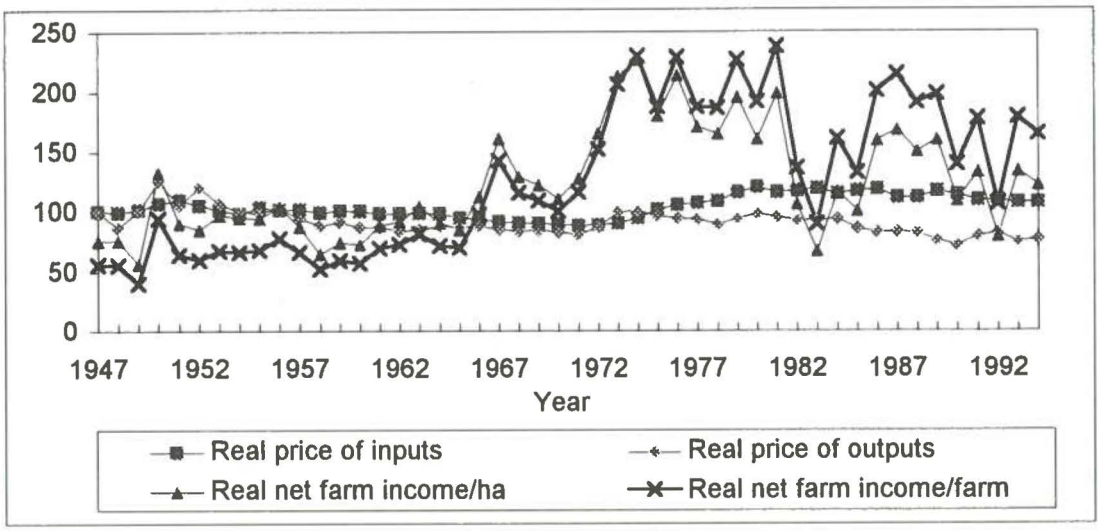

Figure 2: **Indices of real net farm income and the real price of inputs and outputs in South Africa**

inputs and outputs were highly correlated until 1971, the real output price then increased sharply to 1973 then gradually declined for the rest of the period. This is a reflection of the Marketing Boards pricing strategy in bringing domestic prices in line with lower boarder parity prices for most crops. The real input price increased gradually from 1971 to 1980 after which it remained relatively constant. The widening difference between the price of inputs and outputs has resulted in a cost squeeze on farmers indicated by the declining real net farm income since 1974. The sharp drop in real net farm income in 1983 corresponds with the severe drought. Due to the changing structure of agriculture, farm size increasing with the number of farms decreasing, the real net farm income per farm has declined at a slower rate than the real net farm income per hectare.

4. A SYSTEM APPROACH TO MODELLING MACRO-LINKAGES

A Vector Autoregressive approach (VAR) was used to model the linkages of the macroeconomic variables and the agricultural variables, specifically with net farm incomes. This approach places minimal restrictions on the model so that the true structure of the relationship can be observed. In order to capture the long run relationships, cointegration between the variables was examined. The Dickey-Fuller (1981) and the Johansen (1988) approach were used to determine cointegration. Three cointegrating vectors and hence long run relationships were established within the system between real net farm income, real price of outputs and exports and the remaining variables in the model. With three cointegrating vectors at least three restrictions per cointegrating vector need to be imposed for exact identification of the long run relationship (Pesaran and Shin 1994). The relationship which this paper focuses on is the real net farm income vector and thus will be the only result reported.

The results in Table 1show the coefficient estimate and the corresponding t-statistics. The real net farm income variable is normalised to negative one to become the dependent variable. The coefficients are estimates of the long run relationships within the system. The coefficients can be treated as elasticities as they are in logarithms, except for the real interest rate.

The most significant variables in the real net farm income equation are the real price of inputs, the real interest rates and the money supply. An increase in both the real price of inputs and the interest rate has a negative impact with a 1% increase in the real price of inputs resulting in a 1.20% decrease in real net farm income. In addition to reducing real net farm income an increase in interest rates increases

Table 1: The results of the FIML estimates under just identifying restrictions for the real net farm income cointegrating vector

Variables in the VAR model	Coeffient estimates	t-Statistics
Exports	-	-
Real Net Farm Income	Normalised	-
Real Price of Outputs	0.52	1.4
Real Price of Inputs	-1.20	-2.4
Exchange Rate	-	-
Real Interest rate	-0.08	-5.8
Money Supply	0.14	3.5
Rainfall	0.34	1.2

the discount factor determining current assets and thus further reducing wealth. The positive sign on money supply indicates that a 1% rise in money supply will raise real net farm income by 0.14%. The real price of outputs had a positive but less significant effect than the real price of inputs on real net farm income with a 1% rise in the real price of outputs increasing real net farm income by 0.52%. The exchange rate variable was restricted to zero as one of the identifying restrictions. It did not have a significant direct effect on real net farm income but indirectly through the price of inputs. On the output side depreciation of the exchange rate has not been passed on to producers, through the Marketing Boards, as higher producer prices.

5. TIME VARYING MACROECONOMIC EFFECTS

This study so far has assumed that the long-run relationships between variables are invariant with time. To capture the possible effect of changing long run relationships during the reform process a time-varying parameter framework was used (Charemza, 1993). The cointegrating vectors were estimated in a 'rolling regression' manner with a window size of twenty five. The first regression was estimated using data from 1947 to 1971, the second regression with data from 1948 to 1972 and so on until the end of the sample (twenty four windows were estimated).

Tests for time varying cointegration of the three cointegrating vectors showed that the real net farm income cointegrating vector is stationary for most of the period. The time varying t-values of the net farm income relationship are shown in Figure 3. The real interest rate appears to have had the most significant effect on real net farm incomes. The effect becomes significant from 1982 to the end of the period peaking in 1983 which coincides with the peak interest rate (see Figure 1) and with the increase in the real debt burden. The real farm debt increased to a peak in 1985. The reason for this increase is due to land prices increasing relatively steadily from 1955 to 1981 which gave financial institution the perception of a never-ending land price increase. This resulted in public and private lenders allowing farmers to increase borrowings. However with the post 1981 land price decline, coupled with a sharp rise in the real interest rate, the debt burden of farmers increased dramatically. The negative effect on real net farm income resulted in adverse liquidity and solvency positions of farmers (Van Schalkwyk & Groenewald, 1993). The real price of output had a significant effect from 1971 to 1989. In 1983 the non-significant effect of the real price of outputs and money supply was due to the severe drought where incomes were effected more by output quantities than producer prices. The real price of inputs was significant until 1989 and like the real price of outputs was not significant for the remainder of the sample period. This could be a result of productivity increases having a greater effect on farm incomes as farmer face adverse pricing conditions. Including a total factor productivity index (from Thirtle *et al.*, 1993) in the net farm income equation suggested an increasing significance of productivity from

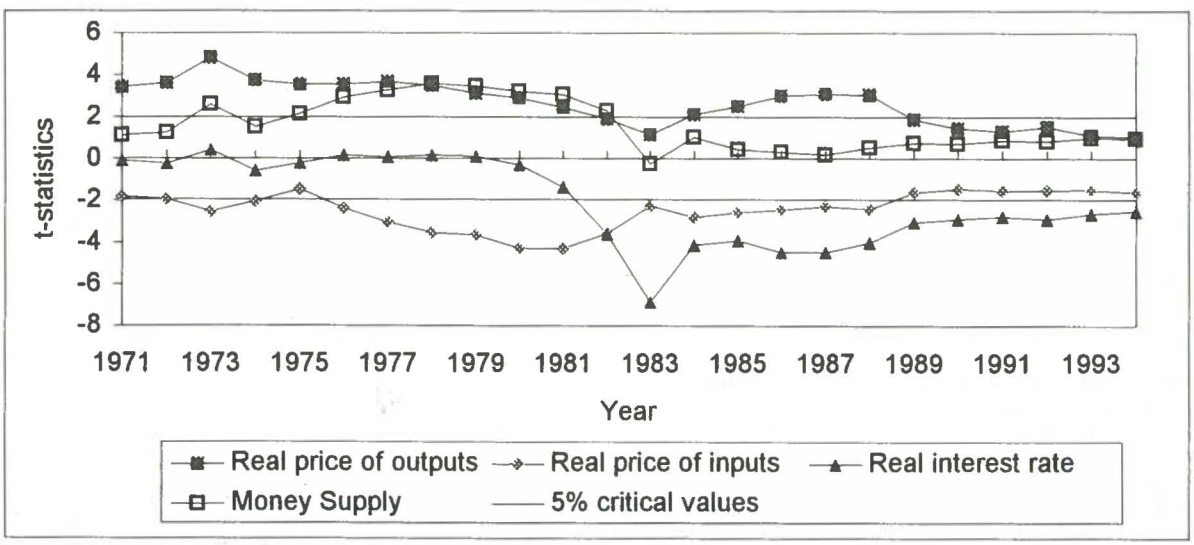

Figure 3: Time varying t-values of the variables cointegrated with real net farm income

1987 to the end of the sample period.

6. CONCLUSION

The effect of macroeconomic policy reform in terms of the exchange rate and interest rate, initiated by the de Kock commission (1979), altered the economic environment in which agriculture operates and applied pressure on agricultural reform. A change in the reserve requirements of the banking sector made subsidised farm interest rates impossible which resulted in the interest rate becoming a highly significant cost of production. This cost was magnified by the level of real farm debt resulting from public and private lenders increasing borrowings based on expected land price increases. The negative effect of real interest rates on real net farm income peaked in 1983 which coincided with the sharp anti-inflationary interest rate increase. The level of real farm debt has resulted in a stricter lending requirement by the Land bank which has resulted in a gradual reduction in the significant negative effect of the interest rate on real net farm income.

The marketing boards appear to have been successful at insulating producers from external demand through insulating exchange rate effects on producer prices. The decrease in real output prices towards the end of the period is in part a result of policies bringing domestic prices in line with lower boarder parity prices. Real input price did not follow a similar trend suggesting that liberalization in recent years has effected input prices less than output prices, resulting in a cost squeeze for farmers. With reform in both the monetary and agricultural sector, specifically on interest rate, exchange rate and price supports the financial position of farmers has deteriorated. Even though there is a reduction in subsidies to agriculture investment is vitally important, such a research and development expenditure, to improve productivity and efficiency.

It is also important to have consistency of macroeconomic instruments such as the exchange rate and the real interest rate which has not always been the case. The large depreciation in the mid-1980's resulted in imported inflation while at the same time trying to control inflation with higher interest rates. This has increased the financial burden on small enterprises like agriculture. With the increasing significance of macroeconomic variables on the farming sector it is essential that flexibility be developed to allow farmers to maintain a favourable financial position.

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