

A theory of the financial rand discount

PREAMBLE

When South African exchange controls on non-residents were removed in February and a unified rand established, foreign investors enjoyed an immediate appreciation in the value of their South African assets. Students of the financial rand mechanism had simultaneously to abandon some of their hard-earned intellectual capital. This capital is represented below in a paper written naturally before the exchange control reforms. The discussion of the financial rand below will no longer be of direct interest to participants in South African financial markets. However, the record of the way it worked will remain of interest to students of South African monetary history. It will also be of relevance to any other dual exchange rate system. The rate established by exchange rate expectations identified in our discussion remains of crucial importance for South Africa. As established in the paper, under the financial rand system, any deviation between the actual and expected commercial rand led to changes in the value of the financial rand and the financial rand discount. Thus, the value of the financial rand influenced interest rates in South Africa and the share market. Under the unified exchange rate, deviations between the actual and expected value of the rand will lead to changes in the prices of South African financial securities and capital inflows. These capital inflows will affect the money supply. Thus, unless market forces are allowed to equalise the expected and the actual value of the rand, interest parity will not hold and money supply control in South Africa will be prejudiced. Our paper on the financial rand can be regarded as a demonstration in a particular context of the importance for financial markets of exchange rate expectations.

1 INTRODUCTION

South Africa has a dual currency system; commercial rand, held almost entirely by South African residents, may be used for foreign trade and factor payments and is exchanged for foreign currency at the commercial rate of exchange; financial rand is deposits in South African banks, held by non-residents who may acquire or dispose of financial rand by selling or buying local assets, including securities on The Johannesburg Stock Exchange, or by direct conversion of foreign exchange into or out of financial rand. The exchange of financial rand for commercial rand, or vice versa, for the purpose of investment or disinvestment in South African assets, requires South African Reserve Bank approval.¹

The foreign exchange value of the financial rand, usually quoted in US dollars, is determined by the interaction of supply and demand by non-residents for South African securities and assets. The most common statistic used to illustrate the state of the financial rand market is the financial rand discount, which is the percentage gap between the commercial rand exchange rate and financial rand exchange rate at any point in time. The financial rand discount (FR_{dis}) may be formally defined as follows:

$$FR_{dis} = \frac{CR_x - FR_x}{CR_x} \cdot 100$$

where CR_x represents the foreign exchange (e.g. the US dollar) value of the commercial rand and FR_x , the foreign exchange value of the financial rand. All references in this paper to exchange rates are to the foreign exchange (e.g. US dollar) value of the rand.

The purpose of this paper is to develop a theory of the behaviour of the financial exchange rate and the financial rand discount. The discussion draws for support on the literature of dual exchange markets and on the asset market approach to flexible exchange rates.² The proposed theory is then tested for the South African case.

2 DUAL EXCHANGE RATE SYSTEMS – AN OVERVIEW

The exercise of exchange control by a central banking authority separates the domestic from the world's financial markets in an attempt to 'protect' the exchange rate by limiting the demand for foreign exchange and thus give rise to a more valuable commercial exchange rate. The financial rand market, previously named blocked rand or securities rand, is an adjunct of exchange control and emerged in the early 1960s when controls were imposed on transactions in securities between London and Johannesburg.³ The term 'financial rand' was used after January 1979 when the Reserve Bank formally adopted a policy of managing a float of the commercial rand.⁴

The main purpose of any dual exchange rate system is to isolate the commercial exchange rate from what are regarded as de-stabilising capital flows. Such systems as practised in the past in Belgium and Britain, differed in detail from the South African system, but all attached different prices to transactions affecting the current and capital accounts of the balance of payments with designated capital account transactions having to be conducted in financial currency and current account transactions in commercial currency.⁵

In the Belgian case, perhaps the best known of the dual exchange rate systems, all capital account transactions by residents and non-residents had to be conducted in financial Belgian francs. The central bank offset surpluses or deficits of foreign exchange, acquired through the current account of the balance of payments at the commercial exchange rate, with equivalent purchases or sales of financial Belgian francs. It is worth noting that in this system the financial Belgian franc could stand at a premium to the commercial franc,⁶ an outcome which is not possible if there exists an option to undertake capital account transactions in the commercial currency.

The financial rand market, however, is probably closest in character to the market in investment dollars that preceded the recent removal of exchange controls in Britain.⁷ Under this system, residents were required to

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pay a premium on American dollar investments which was variable and determined by market forces. In June 1972, this investment premium was extended to South African securities held by British residents.⁸

3 THE DETERMINATION OF THE FINANCIAL RAND EXCHANGE RATE AND THE FINANCIAL RAND DISCOUNT

(i) The influence of political uncertainties

If it is assumed that South African and foreign owners of South African assets are equally well informed about the likelihood and implications of political disturbances in South Africa, then the path of expected earnings, for any given commercial rand exchange rate, is clearly the same for all. However, given a change in the degree of political uncertainty and because of exchange control, the return required by South African investors may change relative to the (risk adjusted) return required by overseas investors in South African securities. If so, the rand and US\$ prices of South African securities may not change equi-proportionately in response to a change in political risk and hence the financial rand discount may change.⁹

(ii) Taxation

It is important to note that non-resident holders of South African securities are subject to a tax on dividend income. Other things constant, this tax reduces the value of non-resident held South African securities relative to locally held securities. Thus, expectations of political instability, apart from the direct effects on earnings and the required rate of return, may affect expectations of tax changes. Such expectations again will also affect overseas prices relative to local prices and hence the financial rand discount. Without exchange control a tax which discriminated against non-residents would be difficult to administer. Foreign prices of South African securities held abroad and subject to additional taxation would stand at a discount to the local price. This, in turn, would encourage South Africans, uninhibited by exchange control, to buy securities in London, so eliminating the discount. Similarly, foreign owners of South African shares would arrange to receive income in South Africa and remit capital and accumulated income which, presumably, would, upon realisation of the investment, not be subject to discriminatory taxation.

(iii) The expected value of the commercial rand

Dividend or interest income earned by non-residents is received in the commercial currency. Thus the value of the financial rand or of South African securities held abroad depends upon the expected value of the commercial currency over the period of the investment. The interdependence of the value of the commercial and financial currency is implicit in the following equilibrium conditions for a dual exchange rate system, derived by A. Lanyi and also applied by R. P. Flood in their respective discussions of dual exchange rates.¹⁰ The equation is given below

$$i_w = i_h \cdot \frac{CR^\circ}{FR} + \frac{FR^\circ - FR}{FR}$$

where

i_w – represents the expected rate of return earned by a non-resident holder of a financial currency (the required world rate of return),

i_h – represents the rate of return earned by residents (the home rate of return),

CR° – represents the mean of the expected foreign

exchange value of the commercial currency over the times at which interest or dividend payments are received, i.e. the mean of the relevant forward exchange rates,

FR° – as above, except for the financial currency. A forward market may also be available in the financial currency.

Applying this equation to South Africa, over some time period, would give the following:

$$i_w = i_h \cdot \frac{CR_x^\circ(1-\tau)}{FR_x} + \frac{FR_x^\circ - FR_x}{FR_x}$$

where again

i_w – required world rate of return over the time period (that is the rate of return available to a non-resident holder of income yielding securities bought with financial rand),

i_h – required home (i.e. South African) rate of return established in the domestic money and capital markets over the time period,

CR_x° – mean of the expected foreign exchange values of commercial rand exchange rates over the times at which interest or dividend payments are received, i.e. mean of forward exchange rates (if quoted) at those times,

FR_x° – as above except for financial rand exchange rates,

τ – non-residents' tax as a fraction.

As indicated above, the total return to a non-resident holder of South African securities comes in two components. The foreign investor has an expectation of receiving an after tax interest or dividend yield of

$$\frac{i_h CR_x^\circ(1-\tau)}{FR_x} \tag{1a}$$

on his initial investment. The second term represents the expected increase or decrease in the capital value of the investment. It should be noticed that the equation (1) above represents the interest parity condition for a financial currency. For the non-resident investor in South African securities, the difference between the world rate of return (i_w) and the expected return for a South African investment (equation (1a) above) is equal to the expected increase (or decrease) in the financial exchange rate.

$$\frac{(FR_x^\circ - FR_x)}{FR_x} \tag{1b}$$

Such an interest parity condition will be maintained by arbitrage between the exchange and money markets of South Africa on the one hand and the outside world on the other.

In the particular case of South Africa, forward exchange to cover expected investment income would not normally be made available by the exchange control authorities nor is there a market in forward financial rands. The financial rand market, however, since it is subject to arbitraging opportunities will be 'efficient' in the technical sense of the term. Thus the statistical distribution of the value of the financial rand rate at time t may be adequately represented at time $t-1$ by:

$$\frac{\tilde{FR}_{x(t)} - FR_{x(t-1)}}{FR_{x(t-1)}} = e_o + \tilde{a}_t \tag{2}$$

where

\tilde{a}_t – is a white noise disturbance term,

e_o – is the capital appreciation expected over the period $t-1$ to t ,

\sim denotes the statistical distribution of the variable in question.¹¹

Now if we take our time interval to be very small, then:

$e_t = 0$ and thus taking expectations we have,

$$FR_{x(t)}^e = FR_{x(t-1)}$$

and so equation (2) reduces to:

$$\frac{i_w}{i_h} = \frac{CR_x^e(1-\tau)}{FR_x} + e \quad (3)$$

Thus if we consider a particular South African security with rand earnings E , and with earnings yields of i_w and i_h then

$$i_w = \frac{E \cdot CR_x^e \cdot (1-\tau)}{P_w} \quad (4)$$

where P_w is the price of the South African security in foreign currency on the world's capital markets, and

$$i_h = \frac{E}{P_h} \cdot CR_x \quad (5)$$

where P_h is the local South African price measured in foreign currency.

Then, after substitution in (3), we obtain the familiar relationship

$$\frac{P_h}{P_w} = \frac{CR_x}{FR_x} \quad (6)$$

As is well known, and may be easily observed, arbitrage between the financial rand and securities markets continuously maintains this relationship. Equation (3) demonstrates that the financial rand exchange rate is a function of the expected commercial rand rate, the required rates of return locally and overseas, and non-resident tax rates.

Figure 1

4/79 - 6/81

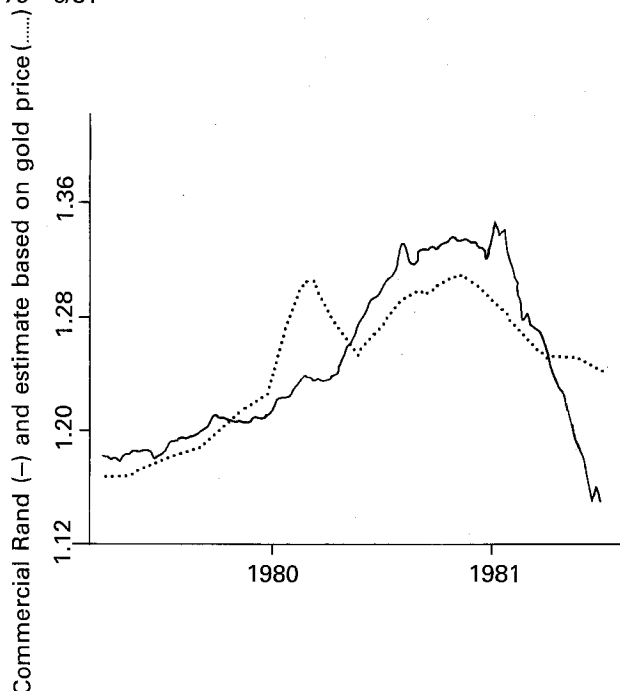


Figure 2

1/79 - 6/81

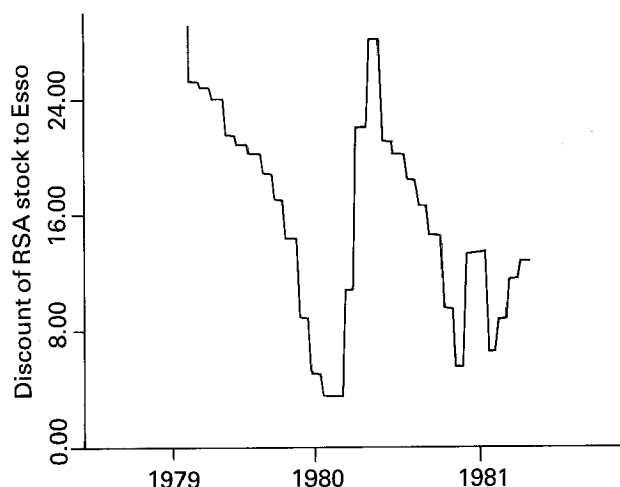
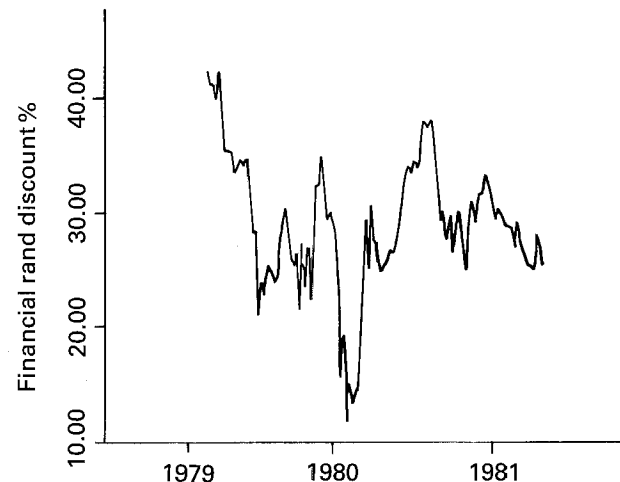


Figure 3

1/79 - 6/81



Thus, for example, if the commercial rand exchange rate was expected to increase, then, other things remaining constant, the financial rand exchange rate must increase for the equilibrium condition to hold.

4 DETERMINATION OF THE FINANCIAL RAND DISCOUNT

As demonstrated in (3), the financial rand exchange rate is directly related to the expected commercial rate of exchange. Considering the financial rand discount equation,

$$FR_{dis} = \frac{CR_x - FR_x}{CR_x} \cdot 100 \quad (7)$$

we get, by substitution of (3) in (7),

$$FR_{dis} = \frac{(CR_x - i_w CR_x^e (1-\tau))}{CR_x} \cdot 100 \quad (8)$$

Thus, for any given commercial rand exchange rate (CR_x), non-resident tax (τ), home rate of return (i_h), and world rate of return (i_w), the financial rand discount (FR_{dis}) would narrow if the expected commercial rand (CR_x^e) were to rise, and widen if CR_x^e were to fall.

5 THE DETERMINATION OF THE COMMERCIAL RAND EXCHANGE RATE

This reasoning would have to presuppose that the commercial rand exchange rate was not itself determined in an efficient market or else the short term future expectation of the commercial rand exchange would be equal to the actual commercial rand exchange rate. There are strong reasons for believing the commercial rand exchange rate is not determined in an efficient market since the rate is managed by the South African Reserve Bank.

The first five autocorrelations of first differences of the natural log of CR_x are given below in Table 1 for weekly data over the period 30/1/79 to 24/6/81 (124 observations). On statistical grounds one would therefore reject the hypothesis at the 1% level that the commercial rand exchange rate was determined in an efficient market.

Table 1

| Lags | 1 | 2 | 3 | 4 | 5 |
|---------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Autocorrelation estimates | 0,393 (4,37) | 0,359 (3,59) | 0,329 (2,92) | 0,245 (2,02) | 0,296 (2,37) |

t-statistics are provided in parentheses. $t_{120}^{1\%} = 2,358$ (one sided test)

The predominant forces that determine the managed commercial rand exchange rate seem to be the same as those that have governed exchange rate movements since the abandonment of fixed exchange rates in the early seventies. These are the state of the balance of payments and the level of foreign exchange reserves. The most important and readily available information about the prospects for the South African balance of payments is, of course, given by the gold price. As would be expected, there is a strong empirical relationship between the dollar gold price and the commercial rand exchange rate.

Table 2 gives the results of the two linear regressions of alternative specifications for the relationship between the commercial rand exchange rate and the price of gold, i.e. for the equation

$$CR_x = \alpha + \beta x_t + u_t \quad (9)$$

where x_t is the independent explanatory variable
 u_t is a white noise series

Table 2

| Period studied | x_t | $\hat{\alpha}$ | $\hat{\beta}$ | R^2 | DW |
|-------------------|--------------------------------------|--------------------|--------------------|--------|------------|
| 30/1/79 – 24/6/81 | contemporaneous gold price | 1,08739 (87,62) | 0,00031 (12,62) | 0,6734 | 0,892 (10) |
| 30/1/79 – 24/6/81 | 10 week moving average of gold price | 1,08866 (95,48) | 0,00033 (14,53) | 0,6921 | 0,732 (11) |

t – statistics of the regression estimates are given in parentheses below the parameter estimates

As may be seen, a moving average of the gold price (equation 11) provides a more satisfactory explanation of exchange rate changes than the contemporaneous gold price (equation 10). This is possibly because, in making its exchange rate adjustments, the South African Reserve Bank considers the average of the price of gold over some previous period rather than just a particular weekend price of gold.

It may also be seen that even though the equation is mis-specified to some extent in that the Durbin-Watson statistic is unsatisfactorily low, the gold price does give a statistically significant explanation of the commercial rand exchange rate.

The mis-specification of the relationship is, however, understandable given the mechanics of exchange rate management. The Reserve Bank would not wish foreign exchange dealers to profit from an ability to predict short-term changes in the commercial rand exchange rate. Furthermore, the gold price is clearly not the only determinant of the foreign exchange reserve position or the exchange rate. However, other influences on the balance of payments, for example money supply developments, can only be observed with long lags.

6 THE DETERMINATION OF THE EXPECTED COMMERCIAL RAND EXCHANGE RATE (CR_x^e)

It would seem appropriate to presume that expectations of the commercial rand exchange rate would be determined rationally. Rational expectations are expectations based upon all the relevant information and are equivalent to the predictions of economic theory. Thus it would be rational for economic actors affected by changes in the commercial rand exchange rate to expect the Reserve Bank to alter the commercial rand exchange rate in response to actual and expected developments in the balance of payments accounts, as it has done in the past. Rational expectations would rely, therefore, on a model of the forces influencing the balance of payments and of the Reserve Bank's exchange rate policy reactions to them. Any such model would have to include, as an important force, fluctuations in the price of gold, and as has been indicated, changes in the price of gold can account for a large proportion of changes in the commercial rand exchange rate.

A number of such rational expectations models of market determined exchange rates have been constructed.¹² Prominent among the forces specified to influence the balance of payments and therefore the exchange rate in such models are the supply and demand for domestic money. Flood adopted such a model to explain the behaviour of the financial exchange rate in a dual exchange rate system. In Flood's model, as in the case of the Belgian system, the commercial exchange rate is assumed fixed and surpluses or deficits in commercial transactions across the balance of payments lead to equivalent purchases or sales of financial currency by the central bank. Thus, in the Flood model, the expected value of the financial currency depends upon the expected state of the current account of the balance of payments, as influenced by money supply developments.¹³

7 CALCULATION OF THE EXPECTED COMMERCIAL RAND EXCHANGE RATE (CR_x^e)

In order to forecast the commercial rand exchange rate, a rational speculator having regard for the current price of gold might use the estimated relationship (equation (11)) to form an expectation of the commercial rand exchange rate. The relationship between the expected commercial rand exchange rate on the basis of the time series of observed gold prices using equation (11) and the actual commercial rand exchange rate is illustrated in Figure 1. It may be seen that the commercial rand exchange rate was, in this sense, overvalued over the period May 1980 to February 1981 and between April 1981 to June 1981 appeared substantially undervalued for the realised gold

price. This undervaluation became even more marked over July and August 1981, when increases in the dollar price of gold brought very little change in the commercial rand exchange rate.

8 TEST OF THE THEORY OF THE FINANCIAL RAND DISCOUNT BEHAVIOUR

It has been established above, in equation (8), that for any fixed non-residents' tax and required returns, locally and abroad, the financial rand discount will narrow and widen as the commercial rand exchange rate is expected to appreciate or depreciate. The major factor that would influence the prices of South African assets held abroad, independently of domestic prices, would be changes in taxes expected to be applied to dividends or interest paid to non-resident security holders. Expectations of such changes would be associated with political disturbances regarded as pointing to a change in government and therefore a change in tax policy with respect to foreign asset holders.¹⁴

In order to test the validity of equation (8) and its implication which is that the financial rand discount anticipates movements in the commercial rand exchange rate, it is necessary to isolate this other influence.

A measure of political risk is available that is independent of changes in the financial rand discount. South African government bonds denominated in US\$ are traded in Euro-capital markets, and changes in the yields on such bonds relative to other bonds can be taken to indicate the influence of changes in political risk. When South Africa is regarded as more or less risky, yield differences will widen or narrow.

In order to remove the effect of the variable political risk the financial rand discount was regressed on pure political risk in the form of the discount on the yields of ESSO dollar bonds to the yields on RSA dollar bonds traded on the Euro-capital markets (see Figure 2). The behaviour of the residuals of this regression can be regarded as representing the behaviour of the financial rand discount independently of political risk.

The regression of the financial rand discount with the effect of political risk removed, against the percentage deviation of the commercial rand exchange rate from its expected value was then performed and taken as a test of equation (8). After the removal of the political risk effect, the ratio $\frac{i_h}{i_w}$ is assumed to be constant over the period of the test.

The following equation was thus estimated.

$$FR_{dis} | \text{political risk} = \alpha + \beta \left(\frac{CR_x - CR_x^e}{CR_x} \right) + u_t \quad (12)$$

where

$FR_{dis} | \text{political risk}$

is the vector of residuals of the regression of financial rand discount against political risk as described above.

The expected commercial exchange rate (CR_x^e) was calculated using equation (11) of Table 2. Again, it is stressed that this measure of CR_x^e , based as it is only on the gold price, is only one of a number of formulations which could have been used to model the determination of the CR_x^e .

The results are given in Table 3 below:

Table 3

| Studied | α | $\hat{\beta}$ | R ² | DW |
|---------------------|-------------------|-------------------|----------------|-------|
| 30/1/79– 24/6/81 | 0,02206 (0,08) | 0,19637 (3,89) | 0,3451 | 1,821 |

t statistics are indicated in parenthesis

The relationship, although not a very strong one, in terms of the R² obtained is highly significant statistically. The null hypothesis that β is zero is rejected and the null hypothesis that α is zero is accepted at the 1% level. The null hypothesis that there is no first order autocorrelation in u_t is accepted at the 5% level.¹⁵

CONCLUSION

Drawing on the literature of dual exchange rate systems, equation (8) provides a theory of determination of the financial rand discount. The evidence supports the implication that the financial rand discount changes in response to the market expectation of movements in the commercial rand exchange rate. The statistical test reveals that the data supports the relationship predicted by the theory in a statistically significant manner.

Footnotes

- 1 For a description of the South African exchange control system, see *Exchange rates in South Africa – Interim report of the Commission of Inquiry into the Monetary System and Monetary Policy in South Africa*, Government Printer, Pretoria, 1978, RP 112/1978. (The De Kock Commission Interim Report.)
- 2 See Anthony Lanyi. Separate Exchange Markets for Capital and Current Transactions. Staff papers, IMF, 22, 1975. pp.714-749. See also: B. Decaluwe & A. Steinherr. A Portfolio Balance Model for a Two-tier Exchange Market. *Economica*, 43, 111-125; and V. Barattieri & G. Ragazzi. An Analysis of the Two-tier Foreign Exchange Market. *Banca Nazionale del Lavoro, Quarterly Review*, No. 99, December 1971, pp.354-72; and J.M. Fleming. Dual Exchange Markets and Other Remedies for Disruptive Capital Flows. Staff Papers, 21 (March 1974), pp.1-27; and J.M. Fleming. Dual Exchange Rates for Current and Capital Transactions: a Theoretical Examination. In his *Essays in International Economics* (Harvard University Press, 1971), pp.296-325.
- 3 For a history of the development of the financial rand market, see R.M. Gidlow. Exchange Control and the Blocked Rand Mechanism *South African Journal of Economics*, 44, No. 1, March 1976, pp.84-94.
- 4 See Gerhard de Kock. New Developments in Monetary Policy in South Africa. *South African Journal of Economics*, Vol. 49, No. 4, December 1981, p.331.
- 5 See A. Lanyi, op. cit., for a description of alternative dual exchange rate systems.
- 6 See A. Lanyi, op. cit., p.726.
- 7 See *Bank of England Quarterly Bulletins*, Vol. 19, September and December 1979.
- 8 See R.M. Gidlow, 1976, op. cit., p.86.
- 9 See R.M. Gidlow. Developments in the Securities Rand Market, 1976-1979. *South African Journal of Economics*, Vol. 47, No. 3, September 1979, especially Section 3, pp.261-265, for an alternative explanation.
- 10 See A. Lanyi, op. cit. pp.734-740; and R.P. Flood. Exchange Rate Expectations in Dual Exchange Markets. *Journal of International Economics*, Vol. 8, 1978, pp.65-77.
- 11 See Eugene F. Fama. *Foundations of Finance*. Basic Books, New York, 1976; especially Chapter 5 on the nature of efficient capital markets.
- 12 See J.A. Frenkel. A Monetary Approach to the Exchange Rate: Aspects and Empirical Evidence. *Scandinavian Journal of Economics*, 78, No. 2, May 1976, pp.200-221. Reprinted in J.A. Frenkel & H.G. Johnson. *The Economics of Exchange Rates: Selected Studies*. Addison-Wesley Publishing Co., Reading Massachusetts, 1978.
- 13 See R.P. Flood, op. cit.
- 14 See Section 3(1) and (2) above.
- 15 The 0,1% significance point for R² with 120 degrees of freedom equals 0,086 (under the null hypothesis that the population efficient of determination squared is zero). For the Durbin-Watson statistic for 120 sample points $d = 1,65$ and $d_U = 1,74$ at the 5% level.