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Capital Controls and Foreign Investor Subsidies Implicit in South Africa's Dual Exchange Rate System

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Abstract

Both in theory and practice, capital controls and dual exchange rate systems can be part of a country's optimal tax policy. We first show how a dual exchange rate system can be interpreted as a tax (or subsidy) on international capital income. We show that a dual exchange rate system, with separate commercial and financial exchange rates, drives a wedge between the domestic and foreign returns on comparable assets. As a borrower, the government itself is a direct beneficiary. Secondly, based on data from South Africa, we present empirical evidence of this revenue implicit in a dual exchange rate system; a revenue that amounted to as much as 0.1 percent of GDP for the South African government. However, this paper also shows that both the capital controls and the dual exchange rate system in South Africa gave rise to many perverse unanticipated effects. The latter may render capital controls and dual exchange rate systems unattractive in the end and, thereby, provides a rationale for the recent trend in exchange rate liberalization and unification. *Keywords*: Dual exchange rate systems, capital controls, emerging markets, financial repression, optimal tax policy *JEL classification*: H21.

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1 Introduction

Many countries today maintain capital controls. As of 2005, only ten out the IMF's 185 members are fully free of controls on capital account transactions.[1] It should be emphasized, though, that the most restrictive ones are to be found in developing countries. On the other hand, as of 2005, only eleven countries out of the IMF's 185 members are reported to have more than one exchange rate. Each of them is, again, a developing country.[2] Although this number seems small, it has only been so since a few years. At the end of 1993, as Kiguel, *et al.* (1997) point out, over 25% of the then 158 developing country members of the IMF had more than one exchange rate. South Africa (hereafter also SA), the subject of this paper, was one of them.

As, among others, Aizenman and Guidotti (1990), Giovannini and De Melo (1991) and Greenwood and Kimbrough (1985) argue, capital controls, often accompanied by various types of financial market restrictions, can have substantial fiscal implications. Moreover, as, among others, Bernstein (1950), Adams and Greenwood (1985), Aizenman (1986), and Frenkel and Razin (1989) argue, dual exchange rate regimes, as well, have long been recognized to be quasi-fiscal activities. In this paper we define a typical (standard) dual exchange rate system to be a system where one exchange rate is applied to current account transactions and another exchange rate is used for capital account transactions.[3] The former exchange rate is often fixed and labelled the commercial exchange rate, whereas the latter is often allowed to float and termed the financial exchange rate. A dual exchange rate system with, for example, a commercial exchange rate (for current account transactions) and a financial exchange rate (for capital account transactions), is, as we will show below, equivalent to a tax on foreign source income accruing to domestic residents if the commercial exchange rate is more appreciated than the financial exchange rate.

As a result of their fiscal implications, capital controls and dual exchange rate systems can especially be found in developing countries. That is, they both can have a useful role as part of a developing country's optimal tax scheme (see, for example, Aizenman (1986)). As a result of, for example, a taxation implicit in the dual exchange rate system on foreign source income accruing to domestic residents, the domestic interest rate could be set lower than the international interest rate. As a borrower, the government itself will be a direct beneficiary.

In this paper our focus is firmly on South Africa, a country we choose deliberately. First, South Africa is a key developing country. Second, despite the fact

[1] International Monetary Fund (2005 issue). These countries are: Guatemala, Israel, Luxembourg, the Netherlands, Panama, Paraguay, Peru, Spain, Zambia and Hong Kong SAR (*ibid.*, pp. 18-24)).

[2] These countries are: the Bahamas, Botswana, Cambodia, Guinea, Myanmar, Sierra Leone, Somalia, Nigeria, Suriname, the Syrian Arab Republic and Zimbabwe. The first seven have dual exchange rate systems and the last four have multiple exchange rates. (*ibid.*, pp. 18-24)

[3] Take note that there are also other types of dual exchange rate systems. See, for example, Kiguel, *et al.* (1997) for an excellent discussion on dual exchange rates.

that South Africa is a developing country, historically (and presently) it has a quite sophisticated and well-developed financial system. This makes it possible to obtain (reliable) data. Third, ever since the Sharpeville massacre in 1960 and the subsequent capital outflow, South Africa has been characterized by (some or other form of) capital controls. Fourth, over the period from 1960 until 1995 South Africa experienced five different exchange rate systems of which four were dual exchange rate systems. Only two of these periods, however, were characterized by a dual exchange rate system as defined above, making it possible for us to compare it with the other three. Finally, over the period under discussion the South African government almost exclusively borrowed from its own residents. This can be seen from figure 1 below.[4] In addition, from 1985 onwards (until 1994), South Africa was subject to international sanctions and was not allowed to borrow from the IMF or any other official agency. As a result, the above discussed issue of using capital controls and/ or a dual exchange rate system as part of the optimal tax scheme was therefore especially important for South Africa.

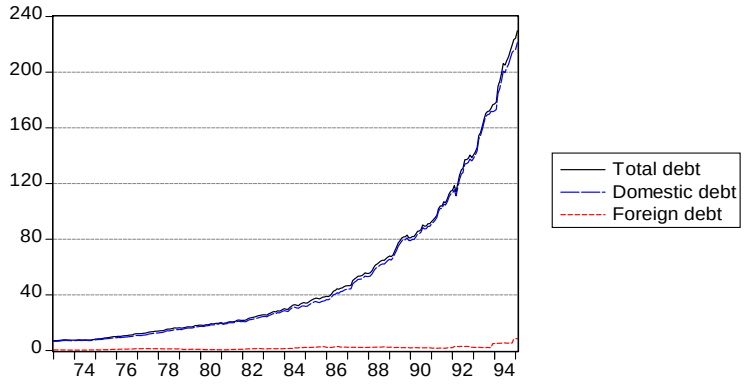

FIGURE 1. South African government debt (rand billion).

For a country that has a "normal", single exchange rate system without restrictions on capital flows, the uncovered interest rate parity (UIP) condition should, at least in theory, hold for comparable assets.[5] Below, in figure 2, the deviation from uncovered interest rate parity (for SA and the US) is given.[6]

[4] The data has been obtained from Thomson Datastream, where we used SADBTDLNA and SADBTFLNA for the domestic and foreign South African government debt, respectively. The total government debt was computed by adding these two.

[5] For a recent discussion of UIP see Lambelet and Mihailov (2006). Using a cross-section of trend growth rates of relevant variables for 18 OECD countries in the post-Bretton Woods/ pre-EMU floating rate period (1976-1988) and employing a variety of single-equation and system estimation methods, they present robust evidence that (what they label) the 'triple-parity law' (which combines UIP, PPP and real interest parity (RIP)) ultimately holds for large and diversified economies.

[6] For this make use of equation (2), which is given in the main text. Straightforwardly, we

Interestingly, in the 1970s there was an extended period (which we highlighted in the figure) in which UIP did fundamentally not hold. More specifically, although most of SA debt was held by SA residents (as indicated by figure 1), during the highlighted period the return for a non-resident (US) holder of South African debt was structurally in excess of the return on comparable assets in the United States (as indicated by the return differential over UIP). In what follows we will explain that this excess return was in fact equivalent to an investment subsidy, which in turn came about as a by-product of South Africa's dual exchange rate system that was employed at the time.

FIGURE 2. Excess return in South Africa (in perunages).

First, we show how a dual exchange rate system can be interpreted as a tax (or subsidy) on international capital income. We make use of previous work by Huizinga (1996). We will show that a dual exchange rate system gives a theoretical reason for a deviation from uncovered interest rate parity.

Second, we will discuss South Africa from 1973:01 until 1995:02. That is, we will give a detailed assessment of the historic development of South Africa's dual exchange rate system. For this we make use of previous work by Schaling (2005).[7] Interestingly, we show that exactly, and only, during that particular period in the 1970s (highlighted in figure 2), the South African government was able to influence the implicit subsidy.

Finally, we bring the issues to the data and do some empirical estimations for South Africa. By making use of a few straightforward estimating equations

calculated: $[(e_1/e_2)(1+i)]-(1+i^*)$. That is, for a non-resident (US) investor the deviation from UIP is equal to the return he would obtain in South Africa minus the return he would obtain on comparable, domestic (US) assets. Following UIP this return differential should be equal to zero. See the main text for a more elaborate discussion and, in particular, subsection 4.1 for a more elaborate discussion of the variables and its sources.

[7] Schaling (2005), on his turn, built further on Farrell and Todani (2004) and Gidlow (1979).

we find that the consequences of the implicit taxation and subsidy in a dual exchange rate are sizable and significant, and indeed only in that (highlighted) period. In addition, we calculate the fiscal implications of a dual exchange rate system for South Africa.

The remainder of this paper is organized as follows. The equivalence between financial taxation by way of taxes on cross-border capital flows and a dual exchange rate system is shown in section 2. Section 3, analyses each of the five (dual) exchange rate regimes in place in South Africa for the period 1973-1995 in more detail. Section 4 and 5 discuss the data and the econometric approach, respectively. In section 6 our empirical results are given, and we conclude in section 7.

2 The model

By making use of some straightforward arbitrage relationships, this section will discuss the characteristics of a standard dual exchange rate system. This section builds on the model and intuition in Huizinga (1996).

2.1 Arbitrage relationships

For comparison, let us first assume that the home country (South Africa) has a single unified exchange rate. Consider a two-period model, where in the first period one unit of currency is invested from the home country into the foreign country (the US). In the second period, both the interest and the principal are repatriated. More specifically, let i and i^* be the domestic and foreign interest rate in perunages. Let e_j be the exchange rate in period j, where subscript j = 1, 2. The exchange rate is fully convertible and defined as unit of domestic currency per unit of foreign currency (rand per dollar). A resident (SA) investor is indifferent between owning domestic (SA) and foreign (US) assets when the following arbitrage relationship holds

$$1 + i = \frac{e_2}{e_1}(1 + i^*) \tag{1}$$

In period 1, the resident (SA) investor can convert one unit of his domestic currency into $1/e_1$ units of foreign currency. In period 2, the interest and principal are repatriated at e_2. Analogously, a non-resident (US) investor is indifferent between owning domestic (US) and foreign (SA) assets when the following arbitrage relationship holds

$$1 + i^* = \frac{e_1}{e_2}(1 + i) \tag{2}$$

In period 1, the non-resident (US) investor can convert one unit of foreign currency into e_1 units of domestic currency. In period 2, the interest and principal

are repatriated at $1/e_2$. Note that equation (1) and (2) are the same[8] and use the well-known concept of uncovered interest parity (UIP); a classical topic in international finance and a building block of most of its theoretical models.[9]

Now let us discuss the more interesting case of a standard dual exchange rate system (hereafter DRS as opposed to a unified exchange rate system or URS). That is, we assume that there are separate exchange rates for current and capital account transactions in place (as we defined earlier). Consider again a two-period model, where in the first period one unit of currency is invested from the home country into the foreign country. In the second period, both the interest and the principal are repatriated. Let i and i^*, again, be the domestic and foreign interest rate. In addition, let e_j and f_j be respectively the commercial (official) and financial exchange rate in period j, j = 1, 2. As discussed above, e_j is then related to current and f_j to capital account transactions. The exchange rates are fully convertible. A resident (SA) investor is indifferent between owning domestic and foreign assets when the following arbitrage relationship holds

$$1 + i = \frac{f_2}{f_1} + \frac{e_2}{f_1} i^* \tag{3}$$

In period 1, the resident (SA) investor can convert one unit of his domestic currency into $1/f_1$ units of foreign currency. In period 2, the principal and the interest are repatriated at the financial and commercial exchange rates, f_2 and e_2, respectively.[10] Analogously, a non-resident (US) investor is indifferent between owning domestic and foreign assets when the following arbitrage relationship holds

$$1 + i^* = \frac{f_1}{f_2} + \frac{f_1}{e_2} i \tag{4}$$

In period 1, the non-resident (US) investor can convert one unit of foreign currency into f_1 units of domestic currency. In period 2, the principal and interest are again repatriated at the financial and commercial exchange rates, $1/f_2$ and $1/e_2$, respectively. Contrary to equations (1) and (2), equations (3) and (4) are not the same and do not equal UIP.[11] This is of utmost importance to this paper and its consequences will be discussed in more detail in the following two subsections.

[8] That is, equation (2) follows from rewriting equation (1) from the perspective of a non-resident (foreign) investor. In natural logs, for example, both equations can be written as follows

$$\hat{\imath}' = \hat{\imath}'^* + \hat{e}_2 - \hat{e}_1 \tag{1' = 2'}$$

where $\hat{\imath}' = \ln(1 + i_t)$, $\hat{\imath}'^* = \ln(1 + i_t^*)$ and $\hat{e}_j = \ln(e_j)$.

[9] As in the literature, also this paper assumes rational expectations. That is, we will assume that $e_{t+1} = E_t[e_{t+1}] + \varepsilon_{t+1}$, where $E_t[\varepsilon_{t+1}] = 0$.

[10] Interest, as other income from foreign investments, is documented in the current account. Conversely, the principal is documented in the capital account.

[11] In natural logs equation (4) becomes

$$\hat{\imath}'^* = \hat{\imath}'' - \left(\hat{f}_2 - \hat{f}_1\right) \tag{4'}$$

where $\hat{\imath}'^* = \ln(1 + i^*)$, $\hat{\imath}'' \equiv \ln(1 + i + si)$ and $\hat{f}_j = \ln(f_j)$, where $s \equiv \rho - 1$ and $\rho \equiv f_2/e_2$.

2.2 The need for capital controls

Generally, equations (1) and (2) are consistent. That is, under a "normal", single exchange rate system (URS) there is no need for capital controls. To check this one could substitute either one of the two formulas into the other. The result will be an expression stating that the returns abroad equal the returns at home, or *vice versa*. The difference between the two returns is zero. The arbitrage equations for a resident (SA) and a non-resident (US) investor are therefore consistent and will hold simultaneously. Consequently, it is not possible for an investor to reap excess returns[12] and there will be no need for capital controls.[13]

On the other hand, equation (3) and (4) are generally not consistent. In other words, when a standard dual exchange rate system is in place there is a need for capital controls. To check this, let us assume that equation (4) in fact holds so that non-resident investors are indifferent between holding domestic and foreign assets (as we will see below this was the case for South Africa). Contrary to the result we obtained under a "normal" exchange rate system, when we now substitute any of the two equations into the other we obtain an expression that states that the difference between the return at home and abroad could be different from zero

$$v = (f_2 - e_2)(1/f_1 - 1/f_2) \tag{5}$$

where v is the difference between the return at home and abroad. So, theoretically under a DRS there could be a deviation from UIP. As Huizinga (1996) points out, when equation (4) holds a non-resident (US) investor, for example, can achieve a higher return on foreign assets, i.e. $1+i < (f_2/f_1)+(e_2/f_1)i^*$, if equation (5) is positive. This holds if the financial exchange rate (f_j) depreciates, i.e., $1/f_1 > 1/f_2$, and the commercial exchange rate (e_j) commands a premium over the financial exchange rate (f_j), i.e. $f_2 > e_2$, or if both conditions are reversed. Any inconsistency of the arbitrage relationships (3) and (4) is a reflection of the fact that each of the two affects a resident (SA) or a non-resident (US) investor disparately. With (3) and (4) not holding simultaneously, capital controls need to be introduced to prevent some investors from reaping infinite gains.

Interestingly, equation (5) was indeed positive for South Africa over the 1973-1995 period; the period under discussion in our paper. Throughout this period,

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On the other hand, in natural logs equation (3) boils down to

$$i' = i''^* + \left(\hat{f}_2 - \hat{f}_1\right) \tag{3'}$$

where $\hat{i}' = \ln(1+i)$ and $\hat{i}''^* \equiv \ln(1+i^* - \tau i^*)$, where $\tau \equiv \rho - 1/\rho$ and $\rho \equiv f_2/e_2$. Take note that indeed, in contrast to 1' = 2', equation (3') $\neq$ (4'). We will discuss this in more detail below.

[12] Which here - in the absence of capital controls - would allow investors to reap infinite gains. This is shown below.

[13] It should be noted that this is an obvious result because we already concluded in the previous subsection that equation (1) and (2) are the same.

as figure 3 below shows,[14] the financial exchange rate depreciated and the commercial exchange rate commanded a premium over the financial exchange rate. As we discussed, in this case capital controls will have to be introduced on resident (SA) investors. Consequently, arbitrage relationship (3) becomes irrelevant. This indeed happened in South Africa. As a result, the authorities are then free to choose an exchange rate policy consistent with the desired domestic interest rate, i, according to arbitrage relationship (4). As Schaling (2005) notes, the South African capital controls enabled the South African Reserve Bank to target domestic interest rates (and/ or the commercial exchange rate) via interventions in the (commercial) foreign exchange market. This result is of high importance.

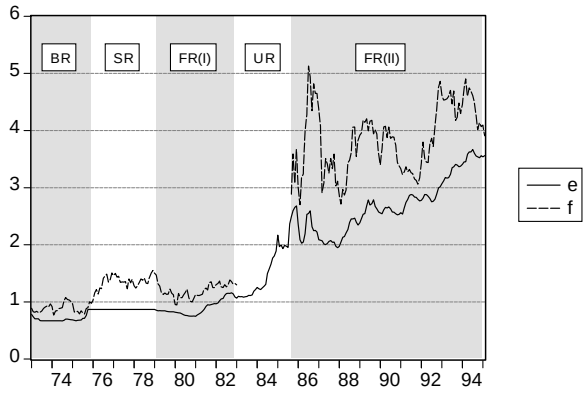

FIGURE 3. Commercial and financial rand exchange rates (R/$).

2.3 The exchange rate as taxation

Finally, this subsection will consider the tax treatment of interest (or other income from foreign investment) implicit in a standard dual exchange rate system. Before we continue, it is important to note that South Africa had five different (dual) exchange rate regimes over the 1960s-1995 period. Only two of them equaled the standard dual exchange rate system as defined above.[15]

First, let us obtain the subsidy and taxation implicit in a standard dual exchange rate system intuitively. Under such a system, a non-resident (say, US) investor holding domestic (SA) assets will receive $1/e_2$ rather than $1/f_2$ units of foreign currency for each unit of interest repatriated abroad. This implies that

[14] BR, SR, FR(I), UR and FR(II) are respectively the blocked rand- (1973:01 - 1976:02), the securities rand- (1976:02 - 1979:01), the first financial rand- (1979:01 - 1983:02), the unified rand- (1983:02 - 1985:08) and the second financial rand period (1985:08 - 1995:02). We will discuss this in more detail below.

[15] This will be discussed in more detail in the next section.

non-resident investors receive an additive subsidy s for each unit of interest equal to $\rho - 1$, where $\rho = \mathrm{f_2/e_2}$ is the gross financial rate premium over the commercial rate. We have that

$$s = (f_2 - e_2)/e_2 \tag{6}$$

or, for completeness, $s = \tau/(1-\tau)$,[16] where τ is the tax rate on repatriated interest earned by (SA) residents abroad.[17]

In addition, we can obtain the subsidy and taxation implicit in a standard dual exchange rate system in a more formal way. For this, let us rewrite equation (4), the arbitrage relationship under a standard dual exchange rate system for a non-resident (US) investor, to obtain[18]

$$1 + i^* = \frac{f_1}{f_2}(1 + i + si) \tag{4"}$$

where s is given by equation (6). The left-hand side, together with the first term on the right-hand side and the first two terms in the brackets on the right-hand side constitute the uncovered interest-rate parity condition (where we have substituted f for e) as obtained in subsection 2.1 (equation (4)). This is of importance and to see this we have to link the URS and DRS.

Let us make a general formula by rewriting equation (4) one more time to obtain

$$1 + i^* = \frac{f_1}{f_2} + \frac{f_2}{e_2}\frac{f_1}{f_2}i \tag{8}$$

where we have decomposed the second term on the right-hand side of equation (4) as the product of the (future or 'expected') financial rand discount $\mathrm{f_2/e_2}$ and the 'expected' rate of nominal financial rand appreciation $\mathrm{f_1/f_2}$. Under a standard URS, $\mathrm{f_j = e_j}$ and consequently equation (8) equals the standard URS for a non-resident (US) investor (equation (2)). We then have that UIP holds. However, things are different under a DRS. If we assume (as was the case for South Africa) that the financial rand trades at a discount *vis-à-vis* the commercial rand exchange rate, or $\mathrm{f_2/e_2} > 1$, then equation (8) does no longer equal equation (2). That is, under a DRS, the relevant arbitrage equation for a non-resident (US) investor does not equal UIP.

[16] We know from equation (7), which is given below, that $\tau = [(\rho - 1)/\rho]$. This can be rewritten as follows: $\tau = 1 - (1/\rho)$, $(1/\rho) = 1 - \tau$, $\rho = 1/(1-\tau)$, $\rho - 1 = 1/(1-\tau) - 1$, equalling $\rho - 1 = \tau/(1-\tau)$. Knowing that $\rho - 1$ is equal to s we obtain that $s = \tau/(1-\tau)$.

[17] The argument from the perspective of a resident investor is as follows. Under a standard DRS, resident (SA) investors holding foreign assets receive $\mathrm{e_2}$ rather than $\mathrm{f_2}$ units of domestic currency for each unit of repatriated interest. This implies that repatriated interest is taxed at the following rate

$$\tau = (f_2 - e_2)/f_2 \tag{7}$$

or, for completeness, $\tau = (\rho - 1)/\rho$, where $\rho = f_2/e_2$ is again the gross financial rate premium over the commercial rate. Since, SA residents were effectively prohibited from investing offshore we will focus on equation (6) and not on equation (7).

[18] See appendix (8.1) for the full derivation.

Now let us go back to equation (4"). We now know that the left-hand side together with the first term and the first two terms in the brackets on the right-hand side (where we have substituted f_j for e_j) constitute the uncovered interest-rate parity condition. However, contrary to a URS, under a DRS there is an additional term added to UIP. The third term in the brackets on the right-hand side of equation (4") is the subsidy for a non-resident investor that is implicit in the standard dual exchange rate system times the domestic interest rate (si), where s is given by (6). As expected the subsidy implicit in a standard dual exchange rate system has, for a non-resident (US) investor, a positive sign in equation (4"). As a result, we can conclude that for a non-resident (US) investor a dual exchange rate system gives a reason for a theoretical deviation from UIP. Secondly, we can conclude that, knowing that non-residents holding SA assets receive $1/e_2$ rather than $1/f_2$ units of foreign currency for each unit of interest repatriated abroad, a standard dual exchange rate system subsidizes capital inflows, i.e. it subsidized international lending to SA.[19]

3 South Africa

From June 1961 until March 1995, South Africa experienced a variety of different (dual) exchange rate systems. Below we will discuss each of them in more detail, where we take South Africa to be the home country.[20]

3.1 The blocked rand system (1961-1976)

As pointed out by Gidlow (1976), the blocked rand system was largely based on the measures taken after the Sharpeville massacre in March 1961 and the subsequent capital outflow and decline in the gold and foreign exchange reserves.

[19] Analogously, equation (3), the arbitrage relationship under a standard dual exchange rate system for a resident investor, can be rewritten (following similar steps as in appendix 8.1 but then using $\tau \equiv (\rho - 1)/\rho$ instead of $s \equiv \rho - 1$) to obtain

$$1 + i = \frac{f_2}{f_1}(1 + i^* - \tau i^*) \qquad (3")$$

where τ is given by equation (7). The left-hand side together with the first term and the first two terms in the brackets on the right-hand side constitute the uncovered interest-rate parity condition for a resident investor as we discussed in subsection 2.1 (where we have substituted f_j for e_j). Again, contrary to the uncovered interest parity condition, there is an additional term. The third term in the brackets on the right-hand side is the taxation for a resident investor that is implicit in the dual exchange rate system times the foreign interest rate (τi^*). As a result, we again obtain the result that a dual exchange rate system gives a reason for a theoretical deviation from UIP. As expected the taxation implicit in a standard dual exchange rate system has, for a resident investor, a negative sign in equation (3"). Since SA residents were effectively prohibited from investing offshore, in the main text we will focus on equation (4") instead.

[20] This section is largely based on Schaling (2005) and various issues of the World Currency Yearbook.

Stricter controls on capital outflows from South Africa were introduced in order to prevent the depletion of foreign reserves.

The most important measure taken at that time was the introduction of restrictions on the repatriation of funds earlier invested in South Africa by non-residents. Residents were already prohibited to transfer funds abroad. Farrell and Todani (2004) point out that, although non-residents could still sell domestic securities on the Johannesburg Stock Exchange (JSE) and interest and dividends could still be freely transferred to the country of origin of the investor, the proceeds of sales of South African assets were blocked within South Africa. These 'blocked rands' were deposited in blocked rand accounts in the name of the non-resident at a commercial bank.[21] Schaling (2005), in turn, points out that as a consequence the notional demand for foreign currency (supply of rand) did not materialize on the commercial market for rands. More specifically, only that demand induced by imminent liquidation of South African assets by non-residents materialized on the commercial rand market. As Schaling (2005) explains, the commercial exchange rate was therefore insulated from the selling pressures of South African securities by non-residents. As a result, the commercial exchange rate was likely to be substantially overvalued with respect to the hypothetical level of the exchange rate in the absence of the aforementioned controls.

The blocked rand balances could only be repatriated under certain conditions. Farrell and Todani (2004) summarize as follows:[22]

(i) Non-residents could use blocked rands to purchase shares quoted on the JSE. These shares could be endorsed, exported and sold outside South Africa, for example in London. If the new non-resident owner of the shares sold them in South Africa, blocked rands were again created;

(ii) The non-resident could use blocked rands to purchase government, municipal and public utility stocks with a maturity of five years or more. Once these had been held for at least five years, they could be repatriated at the commercial exchange rate;

(iii) The non-resident could use the blocked rands to take up special non-resident bonds with five year maturities issued by the government. These could again be repatriated at the commercial exchange rate on maturity.

As pointed out by Schaling (2005), and in line with (i), there was no restriction on a non-resident investor using his blocked rands to purchase local

[21] See Farrell and Todani (2004) and Gidlow (1976).

[22] Under a standard DRS the capital (principal) would enter (and leave) via the financial market, and the interest would leave via the commercial market in line with arbitrage equation (4) (applicable to non-residents). For more details on the blocked rand mechanism see Schaling (2005).

securities, then selling those securities to another non-resident for foreign currency and, subsequently, the sale of these local securities by the new non-resident owner in South Africa for blocked rands. As Schaling (2005) discusses, while individual non-residents could therefore disinvest from South Africa (if they found another non-resident willing to buy their South African financial assets), non-residents as a group could not.

As pointed out by Gidlow (1976), the fact that non-residents could use their blocked rands to purchase shares quoted on the JSE, which then could be endorsed, exported and sold outside South Africa again, enabled London stock brokers to make a market for blocked rands. In this market the relevant monies were freely transferred between non-residents using a method known as 'gilt-wash'.[23] Via this 'gilt-wash' method, a *de facto* second currency emerged. Farrell and Todani (2004) point out that, although this parallel blocked rand market could be characterized as legal, it was not officially recognized. As Schaling (2005) notes, this was because South Africa operated under the aegis of Bretton Woods, i.e. under a system of fixed exchange rates. A floating parallel exchange rate was an alien and probably unwelcome species at the time.

Under the blocked rand system a non-resident investor could invest in South African securities in two different ways,

(a) He or she could use the direct channel via the official foreign exchange market, that is to buy foreign currency on the official (commercial) foreign exchange market and exchange the latter for South African securities. Note that this route of investment is different from the route under a standard dual exchange rate system;

(b) Alternatively, he or she could use the indirect channel via the stock exchanges. That is, the non-resident could first buy South African securities listed in London with foreign currency, sell the securities in Johannesburg and get blocked rand in return in order to buy South African securities. Note that this route of investment is equal to the one under a standard dual exchange rate system.

It is important to note that the investor will end up with the same securities, i.e. South African securities. The only difference is the way they are obtained (either via route (a) or via route (b)). Of course, the non-resident investor would have made use of the direct (indirect) channel when the commercial rand exchange rate traded at a discount (premium) *vis-à-vis* the blocked rand exchange rate.

Owing to the fact that the blocked rand exchange rate traded at a discount *vis-à-vis* the commercial rand exchange rate, it was cheaper for non-residents

[23] An example can be found in Schaling (2005).

to invest in South Africa via the indirect channel. However, a non-resident investor could only invest into South Africa via the indirect channel (route b) if another non-resident, holding South African assets, was willing to disinvest from South Africa. Thus there could be no net investment into South Africa via the blocked rand market (the "closed pool" argument). As Schaling (2005) notes, this would be the case up to 1995 when the dual exchange rate system was abolished. Net investments, as a result, could only come into South Africa through the commercial market (route a). However that would only be attractive for non-resident investors in the counterfactual case of the blocked rate trading at a premium *vis-à-vis* the commercial rand exchange rate.

Let us combine the above information and summarize the blocked rand exchange rate system in a table. During the blocked rand exchange rate system, as during the other four exchange rate periods, resident investors were not allowed to invest abroad. Consequently, we left the case for a resident investor out of table 1 and all of the subsequent related tables (this is in line with the main text focusing on the arbitrage equations for non-residents only). Now, let us take e_j and b_j to be respectively the commercial and blocked rand exchange rate in period j, j = 1, 2. In addition, let (i), (ii), (iii) and (a) and (b) be the different routes of respectively repatriation and investment as discussed above. We obtain

TABLE 1.

	Invest principal:	Repatriate principal:	Repatriate interest:
Non-resident:	Via (a): e_1, or via (b): b_1	Via (i): b_2, or via (ii): e_2, or via (iii): e_2	e_2

3.2 The securities rand system (1976-1979)

As pointed out by Farrell and Todani (2004), although the possibility of abolishing the blocked rand exchange rate system was raised various times, changes were only announced in 1975. More specifically, changes in the exchange control regulations were made in order to boost non-resident investors' interest in South Africa. However, controls on capital outflows by non-residents as a pool remained very much the same. But, some details of the mechanism were changed, resulting in the introduction of the securities rand exchange rate mechanism in February 1976.

From February 1976 onwards, the term 'securities rand' (instead of blocked rand) had to be used to denote the domestic sale and redemption of South African securities, and other investments in South Africa, owned by non-residents. All non-resident accounts falling under this category had to be designated securities rand accounts.[24] In addition, as Schaling (2005) notes, the blocked

[24] Schaling (2005)

accounts of immigrants to South Africa who had not completed three years of residence also had to be designated securities rand accounts. However, emigrant's funds that were blocked in South Africa, as other accounts of emigrants designated as blocked rand accounts, continued to be referred to as blocked rands. Consequently, from February 1976 onwards the term 'blocked rand' had a more restricted meaning.

As pointed out by Schaling (2005), under the new regulations securities rand were bought and sold through brokers on the JSE. The idea was that by removing the necessity of dealing through the indirect (London) channel, blocked rands could be transferred more easily and more cheaply, and become more accessible to non-resident investors. In addition, under the new regulations, only those branches of authorized foreign exchange dealers who have been appointed as authorized banks may maintain securities rand balances. Consequently, the securities rand exchange rate system allowed for direct transfers between non-residents and for the trading of the securities rand through brokers on the JSE. Schaling (2005) explains that this was a major change with respect to the blocked rand exchange rate system. Allowing the latter would have granted official recognition of the blocked rand exchange rate, an action that the authorities deemed undesirable on an era of fixed exchange rates. However, as Schaling (2005) points out, in 1976 the era of irrevocable fixed exchange rates was over. South Africa now had a variable rand-dollar peg (the commercial rand) combined with the securities rand, that is combined with an extensive menu of capital controls on residents and non-residents.

Another reason for changing to the securities rand system was that securities rand would be bought and sold through brokers on the JSE, thereby relocating trade from London to Johannesburg.[25] Farrell and Todani (2004), though, point out that this did not materialize, primarily because of the dominance of London as the financial centre. The familiarity of non-resident investors with London, the technical superiority of the market and the operations of London dealers as principals in the blocked (and now the securities) rand market were all contributory factors.

Finally, Gidlow (1976) points out that, by allowing non-resident balances to be transferred freely and to officially recognize the blocked (now the securities) rand discount, the South African Reserve Bank (SARB) had now the ability to enter the market for securities rand as well. Hence, the South African Reserve Bank could now intervene in the securities rand market. This paper will show that this move by the South African government was of utmost importance for the financial implications of the dual exchange rate system. We will get back to this in section 6.

[25] Farrell and Todani (2004). Gidlow (1979) points out that psychologically such a move looked beneficial. For those investors not fully acquainted with existing blocked rand procedures, the announcement making blocked rand balances officially transferable may have created a favourable impression.

Finally, let us again summarize the exchange rate system in a table. We take e_j and s_j to be respectively the commercial and securities rand exchange rate in period j, j = 1, 2. In addition, if we again take (a) to be the commercial rand market route and (b) to be the securities rand market route for investment into South Africa we obtain the following table[26]

TABLE 2.

	Invest principal:	Repatriate principal:	Repatriate interest:
Non-resident:	Via (a): e_1, or Via (b): s_1	s_2	e_2

3.3 The financial rand I (1979-1983)

Asked by the government to investigate exchange rate arrangements in South Africa, Gerhard de Kock, later to be governor of the South African Reserve Bank, published its relevant interim report in January 1979.[27] The report included both short-term and long-term recommendations. Farrell and Todani (2004) summarize it in the following way. In the longer-term, on the assumption that the pressures on the capital account of the balance of payments would ease over time, the report proposed a unified rand exchange rate system subject to a managed-float, with limited exchange controls being applied only to residents. In the shorter-term, the commission considered a formal dual exchange rate system with a managed, market determined rate for an independent and flexible 'commercial rand' and a more freely floating rate for a 'financial rand'.

As pointed out by Farrell and Todani (2004), the changes included extending the uses which non-residents could make of the currency, as well as allowing certain resident transactions to take place via the (securities rand) market. This widening of the market was in order to remove the imbalance between the supply and demand for securities rand, that is lowering the securities rand discount. Equity investment and disinvestment by non-residents, as well as transfers from deceased estates to non-residents and immigrant funds, became 'financial rand' transactions. Residents' use of the financial market was to be expanded gradually and would require approval, although not necessarily on an individual basis for small applications.

As Schaling (2005) points out, the gradual expansion of residents' and non-residents' use of securities rand was equivalent to an increase in the demand for securities rand. It is important to note that restricting the supply was not an option [Schaling (2005)]. Restricting the supply of securities rand would have been possible only if controls on outflows were relaxed.

[26] Note that the case for a non-resident investor, when investing via s_j and repatriating the principal and interest at respectively s_j and e_j, equals a standard dual exchange rate system as discussed in section 3.

[27] De Kock (1979)

So, balance of payments items associated with capital inflows that were previously channelled through the commercial market were now directed through the financial market. But, as pointed out by Farrell and Todani (2004), the financial rand exchange rate system did not channel all current account transactions through the commercial rand and all capital account transaction through the financial market, as would be the case under a standard dual exchange rate system (as discussed in section 3). All loan funds were to be transferred via the commercial market, that is both the principal and the interest. Loan funds included: bank loans, syndicated loans, private and public bond issues, debenture issues, mortgages, parent company current accounts and shareholder loans.

As Farrell and Todani (2004) note, there were three important reasons for loan funds to be transferred through the commercial market. First, with the financial rand likely to be at a discount to the commercial rand, it was considered 'unfair' to expect resident (SA) borrowers to repay at the financial rate existing loans originally contracted at the official rate. Second, it was difficult to distinguish loans and trade credit. A final reason was that Gerhard de Kock argued that in a period of rapid economic growth the commercial exchange rate would need the support of the net inflow of loan funds. As Schaling (2005) explains, growth in South Africa would suck in imports, especially of capital goods, which tend to increase the demand for foreign exchange and would place pressure on the commercial rand exchange rate. If loan funds increase at such times, diverting them through the commercial rand market would increase the supply of foreign exchange in this market, offsetting the excess demand for foreign currency.

In addition to the widening of the market, Gerhard de Kock proposed that intervention by the Central Bank was allowed as part of a coordinated policy of intervention in the commercial and financial markets.[28] As Schaling (2005) points out, this measure was taken in order to smooth sharp movements in the exchange rate, although it was anticipated that intervention in the financial rand market would be infrequent and of limited magnitude.

Finally, let us summarize the financial rand system in a table. If we take e_j and f_j to be respectively the commercial and financial rand exchange rate in period j, j = 1, 2. If, in addition, we take (a) to denote the commercial rand market route and (b) the financial rand market route we obtain

TABLE 3.

	Invest and repatriate principal:	Invest principal of loan funds:	Repatriate interest and repatriate principal and interest of loan funds:
Non-resident:	e_1	e_1	e_2

[28] Farrell and Todani (2004)

3.4 The unified rand (1983-1985)

In February 1983 the financial rand regime was abolished and was succeeded by a single unified exchange rate system (a 'URS' as opposed to a DRS). That is, it was replaced by a system equal to the one as discussed in subsection 2.1. The unified rand was of short duration, though. Farrell and Todani (2004) point out that the timing of the unification was a 'disaster', among others due to the relatively high discount of 17% of the financial rand *vis-à-vis* the commercial rand (or in logs, f_t - e_t) at that time. Although controls on non-resident investors were effectively removed at this time, those on capital transfers by resident investors remained largely in place. The apparatus for registering non-resident ownership of securities was also retained.

Let us again summarize the exchange rate system in a table. If we take e_j to be the commercial rand exchange rate in period j, j = 1, 2, we obtain the following table[29]

TABLE 4.

	Invest principal:	Repatriate principal:	Repatriate interest:
Non-resident:	e_1	e_2	e_2

3.5 The financial rand II (1985-1995)

As pointed out by Farrell and Todani (2004), the financial rand exchange rate system was re-introduced on 2 September 1985, as part of the response of the South African Reserve Bank to South Africa's debt crisis. This crisis was largely triggered by political events. Notably, the Rubicon speech on 15 August 1985, by then State President P.W. Botha, triggered large scale capital flights out of South Africa. Prior to the speech expectations arose that political reforms of the apartheid system would be made to appease foreign bankers. In his speech, given to the Natal Congress of the ruling National Party, P. W. Botha effectively destroyed this expectation. As a response, the Government suspended trading on the JSE and the foreign exchanges through to 2 September.

Further events, prior to the Rubicon speech, that helped building the crisis were that the South African government declared the State of Emergency on 20 July 1985, the French government's announcement of restrictions on investment in South Africa and the circulating rumors that international banks would not renew loans to South Africa, which were falling due at the end of August.[30] More specific, as Farrell and Todani (2004) explain, the 1985 debt crisis was preceded by the refusal of US banks to roll over loans to South Africa. In

[29] Note that this table indeed equals the case for a single unified exchange rate system as discussed in section 2.

[30] Farrell and Todani (2004)

August, Chase Manhattan Bank made the decision to call in all its outstanding loans to South Africa and other banks followed suit.

As a response, on 1 September 1985, an emergency package of measures was announced that included a moratium on debt re-payments (the so-called 'stand-still arrangement') and the re-introduction of the financial rand exchange rate system. Both were put in practice the following day. It was not until 13 March 1995, that the latter was abolished. From this date onwards non-residents were able to invest and repatriate funds, and transfer capital and current gains, without restriction.[31] Farrell and Todani (2004) note that, following the abolition of the financial rand, the gradual liberalization of exchange control has proceeded smoothly until the present time.[32]

Finally, if we again summarize the financial exchange rate system we obtain table 3.

4 Data and variables

All data series were collected (or computed) for the period 1973 until 1995. More specifically, we make use of data from 1973:01 until 1995:02. The observations have a monthly frequency and therefore total 266. In addition, the estimations, which are described in the next two sections, make use of the following time series:[33]

- The interest rate for South Africa (domestic) and for the United States (foreign) is taken to be the three-month treasury bill rate (as perunages). The source is Thomson Datastream, with data labels: SAGBILL3 and USGBILL3, respectively. We obtained daily observations, but we will make use only of the day that is closest to the end-of-the-month. These variables are denoted as: i_t and i_t^*, respectively.

- The commercial and financial rand exchange rates (defined as unit of domestic currency per unit of foreign currency) have been obtained from the South African Reserve Bank. The observations were obtained as end-of-the-month. Note that during one of the five periods a unified exchange rate regime was in place. Consequently, we only have the financial rand exchange rate for four periods.[34] These variables are denoted as: e_t and f_t, respectively.

[31] Farrell and Todani (2004)

[32] For more details on - and a critique of - the latter period, with special emphasis on the so-called 'asset-swap' mechanism see Schaling (2005).

[33] Our CEPR discussion paper (DP6347) gives a more elaborate discussion on the variables. That is, in our discussion paper we also give a figure and the descriptive statistics for each of the variables. In addition, in our discussion paper we also test for stationarity. We find that the variables that we will use in the estimations are all stationary. Finally, the data for all the time series can be obtained at http://www.petervanderwindt.eu/publications.

[34] Take note that we previously also named the financial rand (f_j) the blocked (b_j) and securities (s_j) rand. This does not matter as each of them define the "parallel" exchange rate.

- Then we computed the four variables that we will actually use in our estimation (for this see the next section). First, we computed the following variables: $\ln(i_t)$ and $\ln(i_t^*)$, which we denote respectively as: $\hat{\imath}_t$ and $\hat{\imath}_t^*$.

- We also computed the following variable: $\Delta\hat{f}_{t+1}$, which we computed as follows: $\hat{f}_{t+1} - \hat{f}_t$, where $\hat{f}_{t+1} = \ln(f_{t+1})$ and $\hat{f}_t = \ln(f_t)$.

- Finally, we computed the implicit subsidy: $\ln(s_t)$, which we will denote as: $\hat{s}_t$. Again, s_t is given by equation (6) or, more specifically, $s = [(f_{t+1} - e_{t+1})/e_{t+1}]$.

5 Econometric specification

In this section we will discuss the equation to be estimated. The results will be discussed in the next section. As was noted in the previous section, we take the relevant investment to be a three-month government bond that will be held for the life of the bond. Before we start it is important to summarize the arbitrage relationships for a three-month government bond. We do this because of the unequal treatment of different assets in South Africa's (dual) exchange rate systems.[35]

5.1 Summary for the three-month bond

In section 3, we discussed the different (dual) exchange rate systems that were in place in South Africa from 1960 until 1995. Below we give a summary for a three-month bond by making use of the elementary arbitrage relationships that were introduced in section 2. Again, we do not discuss the case for a resident investor. As resident investors were not allowed to invest in the foreign country their arbitrage relationships are irrelevant.[36] Moreover, as we extensively discussed in section 3, and as can be seen from figure 3, the financial rand exchange rate traded at a discount *vis-à-vis* the commercial rand exchange rate. Consequently, we will only discuss the indirect channel for investment into South Africa.

For the blocked rand (1961 - 1976) and the securities rand (1976-1979) periods we therefore obtain the following arbitrage relationship

$$1 + i^* = \frac{f_1}{f_2} + \frac{f_1}{e_2} i \tag{9}$$

where the non-resident investor invests and repatriates the principal at the financial rand exchange rate (f_1 and f_2, respectively), whereas he/she repatriates

[35] To give an example, the arbitrage relationship for a non-resident investor under the blocked rand system would be different if the period of ownership was longer than five years. That is, the principal would be repatriated at e_2 instead of at b_2.

[36] Note that only considering the non-resident investor does not jeopardize the generality of any of the questions asked in this paper. For, as Schaling (2005) points out, a subsidy is equal to a negative tax.

the interest at the (managed) commercial exchange rate (e_2).[37] Arbitrage relationship (9) should look familiar as it is equal to equation (4). That is, it is equal to a standard dual exchange rate system as we discussed in section 2. As was extensively discussed in subsection 2.3, this arbitrage relationship contains an implicit subsidy. This result is of high importance.

The arbitrage relationships under each of the two financial rand regimes (1979-1983 and 1985-1995) are identical. We obtain the following arbitrage relationship

$$1 + i^* = \frac{f_1}{f_2}(1 + i) \tag{10}$$

Under each of the two periods, the non-resident investor would have invested the principal at the financial exchange rate and would have repatriated both the principal and the interest at the financial exchange rate.

Finally, for the unified rand period (1983-1985) we obtain the following arbitrage relationship

$$1 + i^* = \frac{e_1}{e_2}(1 + i) \tag{11}$$

Under this regime, the non-resident investor would have invested the principal at the commercial exchange rate and would have repatriated both the principal and the interest at the commercial exchange rate. Take note that equation (11) equals equation (2). The latter, as we showed in section 2, is equal to the uncovered interest parity condition.

For completeness, we summarize the relevant arbitrage relationships for a non-resident investor, holding a three-month South African government bond under a DRS, in table 5 below.

TABLE 5. Summary for the three-month bond

Period:	Blocked rand (1961-1976)	Securities rand (1976-1979)	Financial rand (1979-1983 and 1985-1995)	Unified rand (1983-1985)
Relevant arbitrage equation for a non-resident:	Eq. (9)	Eq. (9)	Eq. (10)	Eq. (11)
Huizinga (1996)-type DRS:	Yes	Yes	No, as interest is repatriated at f_2.	No, it equals a URS

[37] Again, take note that the financial rand (f_j) was previously named the blocked (b_j) and securities (s_j) rand. This does not matter as each of them define the "parallel" exchange rate. In addition, note that no SARB intervention in the blocked rand market was possible prior to official recognition of this parallel exchange rate via the securities rand mechanism.

5.2 Estimating the impact of the implicit subsidy

Now, we are ready to test whether the subsidy implicit in South Africa's dual exchange rate system was of significance. For this we go back to the model and results we obtained earlier in this paper. That is, we will make use of equation (4") that we obtained in section 2. Let us rewrite equation (4") as an equation that can be directly estimated. In order to do this, we rewrite (4") in terms of the domestic (SA) interest rate and take natural logs, so that we obtain[38]

$$\hat{\imath}_t = \alpha + \beta_{11}\hat{\imath}_t^* + \beta_{12}\Delta\hat{f}_{t+1} + \beta_2\hat{s}_t + \varepsilon_t \tag{12}$$

where $\hat{\imath}_t = \ln(i_t)$, $\hat{\imath}_t^* = \ln(i_t^*)$, $\Delta\hat{f}_{t+1} = \hat{f}_{t+1} - \hat{f}_t$, where $\hat{f}_{t+1} = \ln(f_{t+1})$ and $\hat{f}_t = \ln(f_t)$. In addition, $\hat{s}_t = \ln(s_t)$ where $s_t = [(f_{t+1} - e_{t+1})/e_{t+1}]$. The left-hand side is the domestic (South African) interest rate. The right hand side now includes the subsidy implicit in a dual exchange rate. It should be obvious now for the reader to see where we are going. The main aim of this paper was to see what influence the subsidy implicit in South Africa's dual exchange rate system had on the domestic (SA) interest rate. Our argument is that a dual exchange rate system contains an implicit subsidy and that this implicit subsidy would lead to a lower interest rate in South Africa. In equation (12), the parameter β_2 indicates how much the domestic (South African) interest rate ($\hat{\imath}_t$) would increase in percentage points if the subsidy ($\hat{s}_t$) is increased by one percent.

So, what results could we expect? First, for the period in which a DRS was in place we expect β_2 to be significant. On the other hand, for the period in which no DRS was in place (and so no implicit subsidy existed) we do not expect β_2 to be significant. Second, following our definition of $\hat{s}_t$, a higher implicit subsidy (a higher s_t) leads to a higher $\hat{s}_t$. Our argument is that, and this is the whole argument of the paper, a higher $\hat{s}_t$ then leads to a lower SA (domestic) interest rate ($\hat{\imath}_t$). More formally, $(\partial\hat{s}_t/\partial s_t)(\partial\hat{\imath}_t/\partial\hat{s}_t) < 0$, where $\partial\hat{s}_t/\partial s_t > 0$ and $\partial\hat{\imath}_t/\partial\hat{s}_t < 0$. So, because we expect the South African interest rate to be lower with a higher subsidy (again, this is the whole argument of our paper), we expect β_2 to be negative in the period where a dual exchange rate system was in place. Finally, what magnitude of β_2 could we expect? To answer this it is important to note that β_2 can also be interpreted as the probability that a non-resident (US) investor gets the subsidy in the next period (period t+1). In other words, β_2 can be interpreted as the probability that the DRS system is still in place in the next period. To see this note that f_t can take either one of two values in period t+1. If the DRS is still in place it will be f_{t+1}; and we should obtain $\beta_2 = -1$. However, if the DRS is abolished f_{t+1} will be equal to e_{t+1}; and as a result we should obtain $\beta_2 = 0$. So, if there is a probability that the system is abolished, we expect β_2 to be between 0 and -1.

[38] See appendix (8.2) for the full derivation.

6 The results

This section will report the results of the estimating equation we discussed in the previous section. That is, we have a look at the sign, the significance and the magnitude of the subsidy implicit in a dual exchange rate system.

6.1 The implicit subsidy

We estimated equation (12) over the period 1973:01-1983:01 with three lags. We chose the latter by making use of the Ljung-Box Q-statistics and the Breusch-Godfrey Lagrange multiplier test.[39] First we regressed equation (12) by separating the periods where a standard dual exchange rate system was in place, or not. That is, we included a dummy for the blocked and the securities rand exchange rate periods (BR&SR) and for the first financial rand period (FR(I)). The results are given in table 6 in the column under regression 1.

TABLE 6. Estimates of the implicit subsidy.

	Dependent variable: $\hat{\imath}_t$	
Regression	1	2
Equation	(12)	(12)
$\hat{\imath}_t^*$	0.0538^{***}	0.0613^{***}
	0.0196	0.0213
$\Delta\hat{f}_{t+1}$	0.0848	0.1062^{*}
	0.0547	0.0576
$\hat{s}_t$: BR&SR	-0.0048	-
	0.0079	-
BR	-	-0.0122
	-	0.0084
SR	-	-0.0479^{**}
	-	0.0227
FR(I)	0.0171	0.0052
	0.0117	0.0134
# Observations	113	113
R^2	0.9829	0.9831
Durbin-Watson	1.7034	1.7140

Notes: ***(**)[*] significant at the 1% (5%) [10%] significance level. Newey-West standard errors in parentheses. BR&SR, BR, SR and FR(I) denote the: blocked- and securities rand combined, the blocked-, the securities- and the first financial rand exchange rate system, respectively.

All of the variables have the sign that we expected. The coefficients of the variables $\hat{\imath}_t^*$ and $\Delta\hat{f}_{t+1}$ are positive as expected. In addition, the coefficient of the implicit subsidy ($\hat{s}_t$) is negative during the period where a dual exchange rate system was in place and, strongly supporting the argument of this paper,

[39] In addition, for completeness, we checked the robustness of our results. Our results do not fundamentally change when additional lags are added or substracted.

this coefficient is non-negative when no dual exchange system was in place. So, it seems as if an increase in the subsidy leads to a decrease in the domestic interest rate when a DRS is in place; indeed confirming the argument of this paper. Moreover, as expected, we obtain a β_2 (the coefficient on the dummy variable BR&SR) that is between 0 and -1. However, although the signs of the variables and the magnitude of β_2 are as expected none of the variables, with the exception of $\hat{i}_t^*$, is significant; a seemingly disappointing result.

We estimated equation (12) again. But now we also distinguished among the two periods where a standard dual exchange rate system was in place. We do this to see whether there was a different effect of the implicit subsidy in these periods. Our results are surprising. As can be seen in the column under regression 2 in table 6, the variables have again the expected sign. Now, however, we obtain the result that the implicit subsidy is significant during the securities rand period but not during the blocked rand period. How is this possible? First, note that the fact that the implicit subsidy was not significant during the first financial rand period is to be expected, as no standard dual exchange rate system existed at the time and, consequently, no implicit subsidy existed. But why was the implicit subsidy not significant during the blocked rand system? We showed above that in that period, just as during the securities rand period, a standard DRS was in place.

The answer is interesting and has strong implications. Let us fully write out, and for one more time rewrite, equation (4) to obtain

$$i = i^* + \left(\frac{f_2 - f_1}{f_1}\right) - \left(\frac{f_2 - e_2}{e_2}\right) i \tag{13}$$

where the third term on the right hand side is again the implicit subsidy payment (si). Indeed, an increase in the subsidy leads to a decrease in the domestic (South African) interest rate. As we can see from figure 3, which was given earlier, the commercial rand (e_j) was very stable during the blocked rand and the securities rand period. The reason is that until 1979 the exchange rate was essentially fixed, being pegged to various currencies.[40] Consequently, over these two periods the South African government was not able to influence e_2. As a result, the implicit subsidy could only be increased - and therefore the domestic interest rate decreased - by engineering an increase in f_2.

Now, in section 3 we have argued extensively that although during the blocked rand period the parallel market could be characterized as legal, it was never officially recognized by the South African government.[41] However, as was also extensively discussed in section 3, in February 1976 the securities rand exchange rate mechanism was introduced. Under the new regulations securities rand were bought and sold through brokers on the JSE.[42] As Gidlow (1976)

[40] World Currency Yearbook (various issues)
[41] See Farrell and Todani (2004)
[42] See Schaling (2005)

pointed out, by allowing non-resident balances to be transferred freely and to officially recognize the blocked (and now the securities) rand discount, the Central Bank had now the ability to enter the market for securities rand as well. Hence, the Central Bank could now intervene in the securities rand market. This result is of high importance. That is, it could influence f_2 in equation (13). As a result, it was only during the securities rand that the South African government via its central bank (the SARB) could actually influence the implicit subsidy and thereby lower the domestic interest rate. This was therefore the reason that the implicit subsidy was only of economic and statistical significance during the securities rand in our estimation. In addition, this now also provides the reason why Figure 2 indicates that only the securities rand regime implied a structural deviation from uncovered interest rate parity (remember: the highlighted part in figure 2).

As noted above, and as can be seen in the column under regression 2 in table 6, the variables again have the expected sign. An increase in the interest rate in the United States and an expected depreciation of the financial rand each have a positive effect on the domestic (SA) interest rate. In contrast to our previous regression, now both variables are significant. Finally, note that the magnitude of β_2 (the coefficient on the dummy variable SR) is again, as expected, between 0 and -1. In other words, during the securities rand period the market took into account the probability that the DRS could be abolished. That this sentiment was present in the market is illustrated in Figure 2, where the return for a non-resident (US) holder of South African debt in excess of the return on comparable assets in the United States (the investment subsidy, which in turn came about as a by-product of South Africa's dual exchange rate system) decreased markedly before 1979:02; that is, before the securities rand was actually abolished in 1979:02.

The question that then remains is, to what extent could the South African government actually decrease the domestic interest rate? According to equation (13) this influence was likely too be quite limited. If the South African authorities would increase the implicit subsidy by raising f_2 they then also increased the second term in equation (13); namely the implied depreciation of the rand exchange rate. As a result, we have that the South African government had a lower domestic interest rate during the securities rand only thanks to the level effect of the premium that the commercial rand commanded over the financial rand (indeed, see the jump in the premium by inspecting figure 3). From month to month, however, the South African government had little power to decrease their domestic interest rate by means of increasing the implicit subsidy as it would have led to a depreciation of the rand exchange rate.

6.2 Benefits to the South African government

South Africa's capital inflow subsidy has lowered the domestic cost of borrowing to the advantage of domestic borrowers, including the South African govern-

ment. The budgetary effect of a lower domestic interest rate can be calculated at follows. First, let us assume that the non-resident investors are the marginal investors. We then calculate how much higher the (long-term) government debt yield would have to be if the implicit interest subsidy to non-residents were taken away, on the assumption that the rates of depreciation of the dual exchange rates remain unchanged.[43] This simply equals the implicit subsidy payment as calculated by equation (6) times i_t. The calculated government debt yield differential multiplied by the stock of domestic government debt (net of any government debt held by monetary authorities) yields an estimate of the debt-service savings on account of the dual exchange rate system. Take note that this is the theoretical maximum of debt-service savings; i.e. it would be true only when $\beta_2 = -1$. From the previous subsection, however, we know that $\beta_2 = 0.0479$. Then, by multiplying the theoretical maximum debt-service savings by this amount (0.0479) we obtain the debt-service savings for South Africa on account of the dual exchange rate system. These debt-service savings are illustrated, as a percentage of GDP, in figure 3 below.[44]

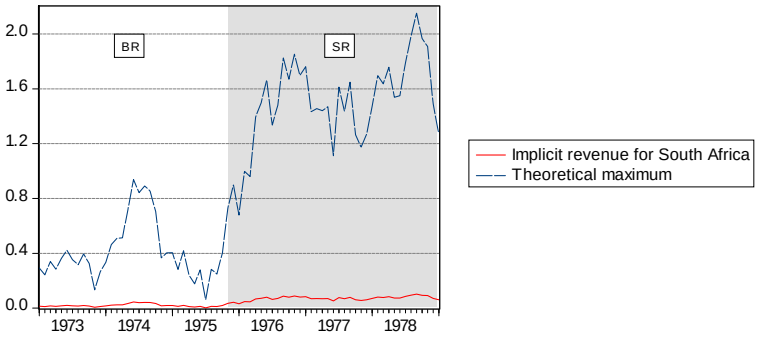

FIGURE 4. SA government's debt-service savings (% of GDP).

The figure indicates that the financial implications of a dual exchange rate system can be substantial. More specifically, the computed debt-service savings due to a dual exchange rate system reached a high of 0.1 percent of South Africa's GDP in September 1978 as then the actual government yield and the financial rate premium were both relatively high. Theoretically, it could have been as a high as 2.15 percent of GDP. On average, over the securities rand period, the debt-service savings amounted to 0.07 percent of GDP (theoretical

[43] As Huizinga (1996) notes, the rate of depreciation of both exchange rates in the end reflect exchange fundamentals such as money growth.

[44] The data for GDP was taken from Thomson Datastream, with data label: SAI99B.CB. We obtained quarterly observations at current prices in millions of rand. As a result we used each observation for three months.

maximum: 1.46). Whereas, over the blocked rand period the debt-service savings amounted to 0.02 percent of GDP (theoretical maximum: 0.41). Take note that indeed the implicit revenue is substantially higher during the securities rand than during the blocked rand exchange rate period.

7 Conclusion

A dual exchange rate system with separate commercial and financial exchange rates drives a wedge between the domestic and foreign returns on comparable assets. This paper showed, by building further on Huizinga (1996), that the arbitrage relationships linking the returns on domestic and foreign assets for resident and non-resident investors are therefore generally inconsistent. This implies that capital controls have to be an integral part of a dual exchange rate system. Furthermore, it was shown how a dual exchange rate system can be interpreted as a border tax or subsidy on international capital income flows. We did this by rewriting the above mentioned arbitrage relationships and singling out the implicit tax or subsidy.

This paper then presented empirical evidence on the aforementioned implicit tax or subsidy. First, it is shown that a subsidy implicit in a dual exchange rate system is a significant determinant for the deviation from uncovered interest parity. That is, it is shown that a dual exchange rate system makes it possible for a government to (substantially) decrease its domestic interest rate. In addition, we calculated that the overall debt-service savings from this lower domestic rate can be substantial, thereby providing a rational for having a dual exchange rate with capital controls as part of a country's optimal tax policy.

This paper, though, also discussed in detail the historic development of South Africa's (dual) exchange rate systems. We showed, by building further on previous work by Schaling (2005), that South Africa's dual exchange rate system was the unintended consequence of the imposition of controls on capital outflows in 1960 after the Sharpeville massacre and the subsequent capital outflow. Furthermore, again by building further on Schaling (2005), we point out that the dual exchange rate system led to many perverse unanticipated effects. Severely limiting capital inflows was one of them.

As a result, the apparent benefits of using capital controls and/ or a dual exchange rate system as part of a governments tax policy may be limited. The theoretical need to combine dual exchange rate systems with capital controls and their potential perverse unanticipated effects, *prima facie* render dual exchange rate systems unattractive. Furthermore, and not yet discussed, dual exchange rate systems are relatively nontransparent, as the implicit tax rates have to be calculated from exchange rate data. In addition, taxing capital income through the exchange rate system further introduces undesirable uncer-

tainty to the extent that the exchange rates are variable.[45] Finally, the link between administrative exchange rates and capital controls and taxation also may give rise to opportunities for favoritism and abuse. These arguments imply that a dual exchange rate system may be a rather inept way to impose a tax or subsidy on cross-border capital income flows. Thereby providing a rationale for the recent trend in exchange rate liberalization and unification.

8 Appendix

8.1 From equation (4) to (4")

Rewriting

$$1 + i^* = \frac{f_1}{f_2} + \frac{f_1}{e_2} i \tag{4}$$

gives

$$1 + i^* = \frac{f_1}{f_2} \left(1 + \frac{f_2}{e_2} i \right) \tag{14}$$

If we define $\rho \equiv f_2/e_2$ (see section 2.3), add and substract $(f_1/f_2)\, i$ on the right-hand side, and define $s \equiv \rho - 1$ (see section 2.3), we obtain

$$1 + i^* = \frac{f_1}{f_2} (1 + i + si) \tag{4"}$$

8.2 From equation (4") to (12)

Rewriting

$$1 + i^* = \frac{f_1}{f_2} (1 + i + si) \tag{4"}$$

gives

$$i = \left[(1 + i^*) \left(\frac{f_2}{f_1} - 1 \right) \right] \frac{1}{(1 + s)} \tag{15}$$

Now what are the comparative statistics of this expression? We obtain

$$\frac{\partial i}{\partial s} < 0, \; \frac{\partial i}{\partial i^*} < 0, \text{ and } \frac{\partial i}{\partial \left(f_2/f_1 \right)} > 0 \tag{16}$$

This suggest the following linear regression equation, which we have generalized over time

$$\hat{i}_t = \alpha + \beta_{11} \hat{i}_t^* + \beta_{12} \Delta \hat{f}_{t+1} + \beta_2 \hat{s}_t + \varepsilon_t \tag{12}$$

where the variables are defined as in the main text. Of course, we then expect to find that β_{11} and $\beta_{12} > 0$ and $\beta_2 < 0$.

[45] Take also note, however, that an important reason to institute a DRS is their ability to insulate domestic prices from short term changes in the parallel exchange rate. In brief, this is achieved by fixing the official exchange rate and keeping this rate as a nominal anchor for prices. See, for example, Marion, *et al.* (1982) for a more complete discussion.

8.3 From equation (4) to (13)

Rewriting

$$1 + i^* = \frac{f_1}{f_2} + \frac{f_1}{e_2} i \tag{4}$$

gives

$$i^* = i + \left(\frac{f_1 - f_2}{f_2}\right)\left(\frac{f_1 - f_2}{f_1}\right) + \left(\frac{f_1 - f_2}{f_1}\right) + \left(\frac{f_1 - e_2}{e_2}\right) i \tag{17}$$

where the second term on the right-hand side is negligible (small times small is very small). Rewriting gives

$$i^* = i - \left(\frac{f_2 - f_1}{f_1}\right) + \left(\frac{f_1 - f_2}{e_2}\right) i + \left(\frac{f_2 - e_2}{e_2}\right) i \tag{18}$$

where now the third term on the right-hand side is negligible (small times small is very small). Then, after rewriting equation (18), we obtain

$$i = i^* + \left(\frac{f_2 - f_1}{f_1}\right) - \left(\frac{f_2 - e_2}{e_2}\right) i \tag{13}$$

The left-hand side together with the first two terms on the right-hand side (where we have substituted f_j for e_j) equal UIP. Note that this is a different way of writing down UIP than equation (2); especially many elementary textbooks on international economics write it like (13) because of the ease to understand this particular formulation. As we see from (13), when a dual exchange rate system is in place (so $f_j \neq e_j$), UIP does not hold and we have a deviation from UIP equal to the implicit subsidy (taxation) times the South African interest rate (si for nonresident investors and τi for resident investors).

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