

The Economic Opportunity Cost of Capital in South Africa

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Abstract

AN INVESTMENT PROJECT USUALLY LASTS FOR MANY YEARS. To determine if the project should be implemented, the net present value of the project is considered the most satisfactory criterion for use in its economic appraisal. This criterion requires the use of a discount rate in order to be able to compare the benefits and costs that arise in different time periods over the life of the investment.

The economic opportunity cost of capital (EOCK) is the appropriate discount rate to use when estimating the economic net present value of a project. This hurdle rate applies not only to investments financed solely with public funds but also to investments in the form of joint public-private ventures and the provision of fiscal incentives to private investment. If the economic net present value of the project is greater than zero, the project is potentially worth implementing. This implies that the project would generate more net economic benefits than if the resources had been used elsewhere in the economy. On the other hand, if the net present value is less than zero, the project should be rejected on the ground that the resources invested could be put to better use if they were left to be allocated by the capital market.

This paper describes an analytical framework that will enable us to estimate the economic cost of capital in South Africa.

Keywords: Economic Opportunity Cost, Capital, South Africa

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The economic opportunity cost of capital (EOCK) is the appropriate discount rate to use when estimating the economic net present value of a project.² This hurdle rate applies not only to investments financed solely with public funds but also to investments in the form of joint public-private ventures and the provision of fiscal incentives to private investment. If the economic net present value of the project is greater than zero, the project is potentially worth implementing. This implies that the project would generate more net economic benefits than if the resources had been used elsewhere in the economy. On the other

¹ The benefit cost ratio is often used as a decision criterion in an economic evaluation. However, the net present value criterion is widely understood to be more reliable than other criteria for both the financial and economic evaluation. For the financial appraisal, other criteria include the pay back period, debt-service ratio, and the internal rate of return. Each of these criteria has its own shortcomings.

² The theoretical arguments have been developed by Harberger (1972), Sandmo and Dreze (1971), and Sjaastad and Wisecarver (1977).

hand, if the net present value is less than zero, the project should be rejected on the ground that the resources invested could be put to better use if they were left to be allocated by the capital market.

This paper describes an analytical framework that will enable us to estimate the economic cost of capital in South Africa.

1. ANALYTICAL FRAMEWORK

The economic cost of capital can be practically measured by the economic opportunity cost of funds drawn from the various sectors of the economy as a result of borrowing from the capital markets to finance investments.³ This approach to the measurement of the EOCK has wide applicability as the ‘marginal’ source of funds for both the public and private sectors is mostly borrowing via the capital market.

When a project uses funds that are raised in the capital markets, interest rates will tend to rise. Because of the higher financing cost, some private businesses will either cut back or postpone their investment plans. On the other hand, private savers will save more because of the opportunity to earn a higher return on their savings.⁴ The EOCK can then be estimated as a weighted average of the rate of return on displaced private-sector investment (π) and the rate of return to private-sector savers (γ). That is,

$$\text{EOCK} = f_1 \bullet \gamma + f_2 \bullet \pi \quad (1)$$

where the weights (f_1 and f_2) equal the proportion of funds sourced from private-sector savers and private-sector investors. These weights can be defined as the reaction of savers and investors to a change in market interest rates brought about by the increase in

³ See, *e.g.*, Jenkins (1973, 1981), Harberger (1977), Burgess (1981), Jenkins and Kuo (1998), Belli, Anderson, Barnum, Dixon and Tan (2001).

⁴ In the economy as a whole, total annual gross savings should be equal to total annual gross capital formation, including public investment. Gross savings refer to savings inclusive of consumption of fixed capital. Savings in the government sector is assumed to be not affected by changes in interest rates because the government raises revenues mainly through taxation to finance its expenditures.

government borrowing:

$$\text{EOCK} = \frac{\gamma(\partial S_p / \partial i) - \pi(\partial I_p / \partial i)}{(\partial S_p / \partial i) - (\partial I_p / \partial i)} \quad (2)$$

where I_p is the total private-sector investment, S_p is total private-sector savings available in the economy, and i is the market interest rate. When expressed in terms of the elasticities of the demand for and supply of funds with respect to changes in interest rates, equation (2) becomes:⁵

$$\text{EOCK} = \frac{\gamma\varepsilon - \pi\eta(I_p / S_p)}{\varepsilon - \eta(I_p / S_p)} \quad (3)$$

where ε is the supply elasticity of private-sector savings, and η is the demand elasticity for domestic investment relative to changes in the interest rate.

South Africa is considered a small, open developing economy. In such an economy, private-sector savings include savings by domestic savers such as households and businesses, as well as foreign savers through capital inflows.⁶ That is, $S_p = \sum_i S_i$ where S_i stands for the amount of savings by the i th type of savers, i.e., household, domestic business, and foreign. The aggregate supply elasticity shown in equation (3) can be decomposed by category and written as $\varepsilon = \sum_i \varepsilon_i \cdot (S_i / S_p)$. Similarly, the aggregate elasticity of demand for investment can be written as $\eta = \sum_j \eta_j \cdot (I_j / I_p)$ where j stands for the amount of the j th group of private investors. Equation (3) can then be rewritten as follows:

$$\text{EOCK} = \frac{\sum_i \varepsilon_i (S_i / S_p) \gamma_i - \sum_j \eta_j (I_j / S_p) \pi_j}{\sum_i \varepsilon_i (S_i / S_p) - \sum_j \eta_j (I_j / S_p)} \quad (4)$$

⁵ See, *e.g.*, Harberger (1972).

⁶ Examples of such an estimation for other countries include Canada by Jenkins (1973, 1981) and Burgess (1981), for the Philippines by Jenkins and Kuo (1998).

where γ_i and π_j stand for the economic rate of return on the alternative sources of funding. For example, π_j is measured by the forgone gross-of-tax return on domestic investments in the j th sector, γ_i is the after-tax rate of return to savers of the i th category and, for foreign savers, it is the value of the marginal cost of foreign capital.

2. EMPIRICAL ESTIMATION

Following equation (4), we can begin by estimating each variable of the equation. First, the economic return on domestic investment is the contribution of capital to GDP, which can be measured by the gross-of-tax return on capital. Taxes include any corporate income taxes, capital taxes (either asset taxes or property tax) as well as sales and excise taxes generated from the investment. However, if the sales tax is a consumption-type value-added tax, the tax is applied to the sales of goods and services at all stages of the production and distribution chain. At each stage, vendors are able to claim tax credits to recover the tax they paid on their business inputs, including capital goods. In other words, the value-added tax is not levied on capital. Ultimately it is a tax on the income to labour.

(a) *Estimation of the Gross of Tax Return to Capital (π)*

There are alternative ways of estimating the gross of tax return to a country's capital stock. Our approach is an aggregate and top down approach.⁷ Conceptually, we need to estimate the GDP net of the contribution made by labour, land and natural resources. To do this, we first estimate the total contribution of labour to the economy, which is the sum of wages and salaries paid by corporations and by unincorporated businesses. Since owners of unincorporated businesses are also workers and are often not paid

⁷ The methodology used for the estimation of the rate of return to non-governmental capital is outlined by Harberger (1977). A more recent approach of this basic methodology can be found in Poterba (1997).

with wages, the operating surplus of this sector thus includes returns to both capital and labour. The labour content of this mixed income was estimated at 35 per cent in South Africa for the period between 1995 to 1999.⁸ The 35 per cent figure is then assumed throughout the entire period from 1961 to 2000.

Second, land is a factor of production that makes a contribution to value added particularly in the agriculture and housing sectors. However, data are not available for the agricultural sector alone, but available only on a combined basis for agriculture, forestry and fishing. Due to the importance of agriculture in South Africa, it is assumed that the value added in the agricultural sector accounts for 95 per cent of the total value added in the agricultural, forestry and fishing sector combined. Also, the contribution of land is set equal to 1/3 of the total value added of the agriculture sector. This is consistent with what has been estimated in countries of a similar level of development.⁹ Regarding the housing sector, information is not available on the amount of value added produced by this sector nor is it available for the land component of the value added for the sector. Not incorporating this element in the calculation implies a slight overstatement of the rate of return on capital.

Third, mining such as gold, coal, platinum and diamonds play a very important role in the economy of South Africa. They have made a substantial contribution to employment, exports and GDP, especially when the prices of their products in world markets are high. These specific resources are non-renewable; with the help of fixed capital investment and improved technology, they can generate substantial resource rents. In a recent study, Blignaut and Hassan (2001) found that the resource rent from mining activity in South Africa amounted to R547.17 million in 1966, R709.08 million in 1970, R2,137.74 million in 1975, R3,050.89 million in 1978, R6,987.33

⁸ This estimate was obtained from officials of South African Reserve Bank in Pretoria. However, a sensitivity analysis is conducted later to determine the impact of this variable on the economic cost of capital.

⁹ See, *e.g.*, Robles (1997).

million in 1981, R7,573.87 million in 1984, R13,491.92 million in 1987, R15,766.27 million in 1990, and R13,539 million in 1993. These rents are calculated based on the assumption that the real rate of return to the rest of the capital stock in mining is only 3 per cent. The 3 per cent figure for the cost of capital is a clear underestimate for South Africa. A much higher real value (*e.g.* of 10 per cent) seems more appropriate for the resource sector, as we will see later from estimating the rate of return on total domestic investment. Hence, using a 10 per cent real rate of return on capital we recalculated the resource rents of the above years and extrapolated values for the rest of the years. The results, as shown in Appendix A, indicate that resource rents in South Africa are still substantial, especially prior to the 1990s.

Fourth, taxes such as sales tax and excises on products are part of the GDP at market prices, produced by capital and labour. In 1991 South Africa introduced a value-added tax at a rate of 12 per cent, which was reduced to 10 per cent in 1992 and subsequently raised to 14 per cent in 1993. As most countries with a value added tax, South Africa allows a full credit for the purchase of capital goods. Hence, the value-added tax is effectively levied on value added or, put differently, is borne entirely by the value added of labour. Therefore, the contribution of labour to GDP should include the value-added taxes and a portion of other sales tax and excise duties on a number of specific commodities. The amount of these taxes on labour's value added is estimated and subtracted from GDP in order to derive the return to capital alone. On the other hand, subsidies on products attributable to labour should be added back to GDP.

Finally, the contribution by productive capital is calculated as a residual by subtracting from GDP the contributions to total value added by labour, land, resource rents and the associated sales and excise taxes. The amount of return to capital is then divided by the total capital stock to arrive at its rate of return.

The detailed computations for the estimation of the rate of return on domestic investments are presented in Appendix A. For the past 40 years, the average real rate of return on investment in

South Africa has been about 19.71 per cent in 1961-70, 17.21 per cent in 1971-80, 15.22 per cent in 1981-90, and 15.70 per cent in 1991-2000. The rate of return was relatively high in early years because of monopolies and high profitability in certain sectors such as mining in which we assume the real rate of return on capital is 10 per cent. In the last two decades, the rate of return on capital has been somewhat reduced. As the economy becomes more open and capital becomes more internationally mobile, one would expect the rate of return on capital to decline over time. For the purpose of this analysis, we use 15 per cent as the value of π for the estimation of the EOCK. It is an average real rate of return on investment.

(b) Estimation of the Cost of Increased Household Savings

The rates of return to household savers can be measured by the real net-of-tax rate of return on savings.¹⁰ This also reflects the cost of forgone consumption because of additional saving. Thus, the social opportunity cost of additional household saving can be expressed as:¹¹

$$\gamma_1 = \frac{[i_d(1 - t_p) - gP^d]}{1 + gP} \quad (5)$$

where i_d represents the nominal interest rate, gP^d the domestic inflation rate and t_p the marginal personal income tax rate. In 2000, the nominal interest rate on negotiable certificates of deposits for a period of 12 months was about 11.50 per cent. The inflation rate is measured by overall consumer price inflation for metropolitan and other urban areas excluding changes in mortgage bond rates, and was about 7.5 per cent.

¹⁰ There is another aspect affecting household's behavior because of government borrowing. When additional government borrowing increases interest rates, there is a negative impact on borrowers of consumer loans and the demand for consumer credit. In this case, the consumer credit will be demanded at a higher interest rate. This is not considered here because of lack of data.

¹¹ See, e.g., Harberger (1972).

The personal income tax system in South Africa is progressive in nature. In 2000, there were six income tax brackets in which the tax rate ranges from 18 per cent to 42 per cent. We assume that the marginal personal income tax rate for savers is approximately 30 per cent. For the purpose of this study, we use an 11.5 per cent nominal rate of return on household savings with an inflation rate of 7.5 per cent. This is reflective of the nominal rates of interest paid on savings and inflation rates in 2000. Based on equation (5), the real net-of-tax rate of return on household savings or, alternatively, the rate of time preference for forgone consumption, is approximately 0.51 per cent. It may be noted that the real after-tax rate of return on deposits is rather low in South Africa. Nevertheless, it is still positive because of high nominal interest rates and the recent slowing of inflation. In fact, during the 1980s and early 1990s real after-tax interest rates were negative because of high inflation rates and high marginal income tax rates.¹²

This estimate of the return on savings (or the time preference for marginal changes in consumption) is biased downward because it does not include the cost of consumer borrowing. Many people borrow from the consumer loan market to augment their current levels of consumption. The real interest rates charged on these consumer loans are substantially greater than the return received on savings. When additional borrowings are carried out in the capital market we would expect that the cost of consumer lending would be affected as well as the volume of consumer loans demanded. As consumer loans require real resources to supply them to the market, there is both a cost of forgone consumption and a saving from the reduced resource costs used to supply these loans whenever the quantity of consumer loans is decreased. We would expect the net effect to be substantially larger than the real interest rate earned by savers.

In the estimates made above we do not include the impact of capital market operations on the consumer loan market; hence, we

¹² For a historical analysis, see Prinsloo (2000).

create a slight downward bias in our estimate of the EOCK.

(c) *Domestic Business Savings*

For business savers, the rate of return may be estimated by the real after-tax return on equity. An increase in interest rates raises the real cost of borrowing and lowers the financial returns for the equity holder. Although the reduction in returns may be smaller than generally expected because the higher cost of financing also reduces business income tax liabilities, the adverse effect of higher interest rates on equity is clear. It is, however, not clear if higher interest rates would affect the amount of savings. For the purpose of this study, we assume that the amount of business saving is independent of interest rates and therefore there is no need to estimate the real rate of return on business saving.

(d) *Marginal Economic Cost of Foreign Financing (γ_3)*

When interest rates go up, foreigners will be able to obtain a higher rate of return on loans made to South Africa and thus capital inflows or additional foreign borrowing will likely increase. This implies greater foreign debt and greater exposure of the country in terms of increased repayment risk on existing debt. As a result, interest rates on the existing debt would likely increase if they are variable. At the margin, the economic cost associated with incremental foreign borrowing is measured by the interest expense on the incremental borrowings plus the marginal change in the cost of foreign borrowing times the quantity of the stock of foreign debt negotiated with variable interest rates.¹³ This can be estimated in the following way:

$$\gamma_3 = MC_f = r_f \cdot (1 - t_f) \cdot \left[1 + k \cdot \left(\frac{1}{\varepsilon_f} \right) \right] \quad (6)$$

where r_f is the real interest rate charged on the foreign loan prevailing in the markets, t_f is the withholding tax rate on foreign

¹³ For a complete discussion of the marginal economic cost of foreign funds, see Edwards (1986) and Harberger (1976).

borrowing, k is the ratio of the total stock of foreign borrowing that bears an interest rate which is responsive to the total stock of foreign capital inflows, and ε_f is the supply elasticity of the stock of foreign funds. Using nominal interest rates with the adjustment for the foreign inflation rate, equation (6) can be re-written as:

$$\gamma_3 = MC_f = \left[\frac{i_f \cdot (1 - t_f) - g^{Df}}{1 + g^{Df}} \right] \cdot \left[1 + k \cdot \left(\frac{1}{\varepsilon_f} \right) \right] \quad (7)$$

where i_f is the nominal interest rate, and g^{Df} is the GDP deflator in the U.S. if the foreign borrowing is denominated in U.S. dollars.

The real marginal cost of foreign borrowing for South Africa can be measured according to equation (7). In 1999, long-term debts were mostly dominated in U.S. dollars, Japanese yen, and Deutsche mark, with dollars accounting for 89.7 per cent, Yen 7.5 per cent and Deutsche Mark 2.8 per cent (World Bank, 2001). The coupon rate of the Japanese bond tends to be very low because of the low interest rate policy in Japan. The interest rates charged by the US institutions are much higher reflecting market conditions including the country risk in South Africa. As of December 31, 2000 and March 31, 2001, the coupon rate for the next 12 months ranged from 8.375 per cent to 9.125 per cent for US dollar bonds, which are much higher than the 3.35 per cent for Japanese yen bonds.¹⁴ The rate for borrowing from the World Bank by South Africa is in the range between 6.19 per cent and 7.62 per cent. For this exercise, it is assumed that the average borrowing rate from abroad is about 8.5 per cent per annum. The GDP deflator in the U.S. was 2.50 per cent in 1995, 1.97 per cent in 1996, 1.96 per cent in 1997, 1.15 per cent in 1998 and 1.43 per cent in 1999. For this study, we assume the GDP deflator will remain low at 2.50 per cent. Hence, the average real cost of foreign borrowing would be 6.00 per cent. Furthermore, there is no withholding tax in South Africa on interest paid to non-residents.

Since the relevant economic cost of foreign borrowing is

¹⁴ See African Reserve Bank (2001).

valued at its marginal economic cost, not the interest rate paid for the funds, the proportion of the total stock of foreign debt that is responsive to the prevailing market cost of funds is a key variable. It is interesting to observe that the percentage of long term loans outstanding with variable interest rates declined from 69.91 per cent in 1994 to 33.77 per cent in 1999, while the proportion of short term loans in total foreign debt has increased from 37.25 per cent to 57.04 per cent in the same period.¹⁵ In this study, we assume 40 per cent for the ratio (k). The supply elasticity of the stock of foreign funds (in terms of the stock of foreign investment) is assumed at 1.5, but a sensitivity analysis was performed to determine the sensitivity of the estimate of the marginal cost of foreign funds to changes for this. Using these parameter values, the real marginal cost of foreign borrowing is estimated to be about 7.41 per cent.

(e) Estimating the EOCC

Since 1982, the government budget in South Africa has been in deficit. Government expenditures appeared to have even increased faster than revenues from 1992, thereby creating the need for large public sector borrowing by as much as 25 per cent to 50 per cent of the annual gross capital formation in the economy.¹⁶ Therefore, most of the gross capital formation has been financed by the private sector.

As mentioned in the previous section, our main concern is to examine the effect of additional government borrowing on private-sector savings and investment. On the savings side, Appendix B shows that gross corporate saving accounts for more than two-thirds of the financing of the private-sector gross capital formation from 1961 to 2000, although they had fluctuated significantly from year to year. Households and foreigners finance the remaining capital formation. In this study, we assume the average shares of total private-sector savings are 20 per cent for

¹⁵ This figure was obtained from the World Bank (2001).

¹⁶ See South African Reserve Bank (1999).

households, 65 per cent for businesses, and 15 per cent for foreigners.¹⁷

On the investment side, we take into account historical trends in private-sector investment and public-sector investment in the economy. Appendix C shows that private-sector investment as a percentage of private-sector gross savings ranges from 47 per cent to 62 per cent over the past forty years. For the purpose of this study, we assume that the ratio of (I_p/S_p) is equal to its average of 54 per cent.¹⁸

Using a number of international empirical studies, we set the long run supply elasticity of the stock of personal savings at 0.5,¹⁹ the supply elasticity of the stock of foreign funds at 1.5, and the demand elasticity for private sector capital in response to changes in the cost of funds at -1.0.²⁰ With these assumptions, one can derive the proportions of funds diverted to finance the investment project in question. The proportions are 11.56 per cent from household savings, 26.01 per cent from foreign capital, and 62.43 per cent from displaced or postponed domestic investment. Substituting these data into the equation (4), one obtains an estimate of the economic opportunity cost of capital for South Africa of 11.35 per cent. The parameters used to make this estimation are representative of the values for South Africa as of the year 2000.

¹⁷ This is another sensitive area. The lower the average share of household and foreign savings, the greater is the economic cost of capital. For example, if their average shares of the total private sector saving were 15 per cent and 10 per cent, respectively, the economic cost of capital would have been 13.15 per cent if the supply elasticity of foreign capital is 1.5.

¹⁸ This estimate is a simple average of the two extreme ratios over the past 40 years.

¹⁹ See Prinsloo (2000). A general consensus among researchers is a low supply elasticity of household saving. However, there is an additional issue in the empirical studies whether the supply elasticity of household saving is properly estimated by researchers because of neglecting a potential impact of interest rates on consumer loans. See Jenkins (1981).

²⁰ See, *e.g.*, Jenkins and El-Hifnawi (1993).

3. SENSITIVITY ANALYSIS

The above empirical results depend on the values of several key parameters such as the elasticity of supply of foreign capital, the average rate of return on domestic investment, the opportunity cost of capital in the mining sector, and the labour content of the mixed income for unincorporated businesses. We undertook a sensitivity analysis to determine the impact of changes in the value of these key variables on our estimate of the economic opportunity cost of capital.

(i) The Elasticity of Foreign Capital

If we assume a value of 1.0 instead of 1.5 for the elasticity of supply of the stock of foreign capital to South Africa, the share of financing from foreign funds becomes smaller but the marginal cost of foreign funds is increased.²¹ As a consequence, the economic opportunity cost of capital increases to 11.87 per cent as shown in Table 1.

Table 1. Estimates of the Economic Opportunity Cost of Capital Assuming Different Supply Elasticities for Foreign Capital (percentage)

Supply Elasticity of Foreign Funds	Shares of Sources of Funds			Economic Cost of Capital
	Household Saving	Foreign Funds	Domestic Investment	
1.0	12.66	18.99	68.35	11.87
1.5	11.56	26.01	62.43	11.35
2.0	10.64	31.91	57.45	10.91

The resultant estimate is 0.52 of one percentage point higher than that derived earlier for the base case. On the other hand, if the supply elasticity of foreign capital is increased to 2.0,²² the economic cost of capital would be 0.44 of one percentage point lower.

(ii) The Rate of Return on Domestic Investment

If the average rate of return on domestic investment is 0.5

²¹ The marginal cost of foreign funds would be 8.20 per cent according to equation (7).

²² The marginal cost of foreign capital would be 7.02 per cent.

percentage point lower than the case presented earlier, it would imply a real value of 14.5 per cent instead of 15 per cent. With this value the economic opportunity cost of capital for South Africa is about 11.04 per cent, 0.31 of one percentage point lower than that for the base case. Although this parameter appears to be quite sensitive, there is no reason to believe that the true rate of return on domestic investment for South Africa would be far from 15 per cent.

(iii) The Opportunity Cost of Capital in the Mining Sector

If the opportunity cost of capital in the mining sector is 15 per cent real rather than 10 per cent assumed earlier, we can re-estimate the resource rents which would now be smaller than our previous estimates. Accordingly, the real rate of return on domestic investment would be higher by approximately 0.25 of a percentage point. This suggests that the economic cost of capital would be higher by 0.15 of one percentage point.

(iv) The Labour Content of the Mixed Income for Unincorporated Business

If the labour content of the mixed income for unincorporated businesses is 50 per cent instead of the 35 per cent assumed earlier for the period from 1961 to 2000, the rate of return on capital would be lower than the previous estimates. Expressed as a percentage of the total capital stock, the real rate of return on domestic investment would become 18.19 per cent in 1961-70, 16.25 per cent in 1971-80, 14.61 per cent in 1981-90, and 14.75 per cent in 1991-2000. The figures are lower than previous estimates by approximately one percentage point, ranging from 1.6 percentage points in 1961-70 to 0.6 percentage point in 1981-90.

In this sensitivity analysis, we assume the value of π to be 14 per cent instead of 15 per cent. One can then calculate that the economic opportunity cost of capital for South Africa would be 10.73 per cent - 0.62 of one percentage point lower than was the situation with the base case.

From the above sensitivity analyses, we find that the economic cost of capital ranges from 10.73 per cent to 11.87 per cent. We conclude that a conservative estimate of the economic

opportunity cost of capital in South Africa would be a real rate of 11 per cent.

4. CONCLUDING REMARKS

The discount rate used in the economic analysis of investments is a key variable in applying the net present value or benefit-cost criteria for investment decision-making. Such a discount rate is equally applicable to the economic evaluation, as distinct from a financial analysis, of both private as well as public investments. If the net present value of either type of project is negative when discounted by the economic cost of capital, the country would be better off if the project were not implemented. Estimates of the value of this variable for a country should be derived from the empirical realities of the country in question. Of course, the results of such an exercise are only as good as the underlying data and projections made of the benefits and costs for the project.

This paper has described a practical framework for the estimation of the economic opportunity cost of capital in a small open economy. The model considers the economic cost of raising funds from the capital market. It takes into account not only the opportunity cost of funds diverted from private domestic investment and private consumption, but also the marginal cost of foreign borrowing.

The methodology is applied to the case of South Africa. One of the unique features of estimating this variable for South Africa is the significant amount of natural resource rents that need to be taken out of the estimates of the returns to capital. The results of these estimations suggest that the real economic opportunity cost of capital to be used in the discounting of the economic values of the benefits and costs of investments over time should be at least 11 per cent for South Africa. The 11 per cent real rate of return on capital may appear to be high as compared to real interest rates prevailing in South Africa. However, the market interest rate does not include the taxes paid on the income from capital. These taxes are part of the economic opportunity cost of these funds.

The 11 per cent discount rate for South Africa is very compatible with estimates carried out for other developing countries in broadly similar circumstances. For example, the rate estimated for Argentina was 11 per cent (International Institute for Advanced Studies, Inc., 1998), for Uruguay 11 per cent (Barreix, 2003); and as expected, it is slightly higher than the 10 per cent estimated for Canada (Canada, Treasury Board, 1976).

APPENDICES

Appendix A: Return to Domestic Investment in South Africa, 1961-2000

Appendix B: The Proportion of Financing of Gross Capital Formation by Category

Appendix C: The Private and Public Investment in South Africa

Appendix A: Return to Domestic Investment in South Africa, 1961-2000 (millions of Rands)

Year	Expressed in Current Prices											Expressed at 1995 Prices					
	Net Operating Surplus							Subsidy on Products	GVA in Agriculture	Resource Rent	Income to Capital	GDP Deflator Index	Real Income to Capital	Capital Stock	Rate Of Return	10-Year Av. Return	
	GDP	Labour Income of Incorp.	Total	Incor-porated	Unincor-porated	Total Labour Income	Taxes on Products										Value Added Tax
	(millions of Rands)	(millions of Rands)	(millions of Rands)	(millions of Rands)	(millions of Rands)	(millions of Rands)	(millions of Rands)	(millions of Rands)	(millions of Rands)	(millions of Rands)	(millions of Rands)	(millions of Rands)	(millions of Rands)	(millions of Rands)	(%)	(%)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)		
1961	5,535	2,937	1,703	739	964	3,274	285	-	23	608	251	1,654	2.98	55,487	308,058	18.01	
1962	5,898	3,118	1,821	849	972	3,458	311	-	28	622	283	1,786	3.00	59,533	318,579	18.69	
1963	6,539	3,431	2,063	1,100	963	3,768	346	-	30	678	314	2,051	3.10	66,180	332,790	19.89	
1964	7,197	3,785	2,244	1,242	1,002	4,136	402	-	34	646	346	2,288	3.15	72,594	351,736	20.64	
1965	7,859	4,231	2,361	1,313	1,048	4,598	418	-	40	687	378	2,433	3.17	76,837	375,515	20.46	
1966	8,568	4,698	2,462	1,297	1,165	5,106	455	-	45	774	409	2,552	3.37	75,821	397,727	19.06	
1967	9,559	5,091	2,908	1,345	1,563	5,638	522	-	58	950	441	2,891	3.44	83,961	419,824	20.00	
1968	10,340	5,645	2,979	1,376	1,603	6,206	579	-	57	863	472	3,059	3.60	84,855	424,509	19.99	
1969	11,654	6,194	3,451	1,806	1,645	6,770	748	-	65	907	504	3,672	3.81	96,483	469,241	20.56	
1970	12,791	7,016	3,507	1,730	1,777	7,638	852	-	81	861	535	3,855	3.89	99,013	501,183	19.76	
1971	14,136	7,926	3,619	1,577	2,042	8,641	961	-	97	1,033	801	3,805	4.08	93,237	536,965	17.36	
1972	15,953	8,863	4,124	2,249	1,875	9,519	1,029	-	97	1,147	1,067	4,413	4.65	94,826	574,657	16.50	
1973	19,740	10,381	5,886	3,325	2,561	11,277	1,176	-	93	1,352	1,333	6,047	5.36	112,824	613,867	18.38	
1974	24,277	12,472	7,694	4,329	3,365	13,650	1,343	-	22	1,995	1,599	7,674	5.99	128,058	655,474	19.54	
1975	27,323	14,722	7,496	4,736	2,760	15,688	1,579	-	164	1,985	1,865	8,285	6.66	124,391	702,038	17.72	
1976	30,848	17,075	7,526	4,704	2,822	18,063	1,920	-	254	1,968	2,111	9,020	7.52	119,899	745,293	16.09	
1977	34,261	18,717	8,124	4,752	3,372	19,897	2,346	-	266	2,269	2,357	10,002	8.59	116,378	781,850	14.88	
1978	39,416	20,645	9,872	6,293	3,579	21,898	2,890	-	326	2,478	2,603	12,607	9.64	130,800	813,879	16.07	
1979	47,100	23,991	12,400	8,701	3,699	25,286	3,450	-	325	2,626	3,826	15,360	11.13	138,027	846,936	16.30	
1980	62,730	29,656	20,328	15,912	4,416	31,202	4,227	-	469	3,654	5,049	23,334	13.57	171,900	890,503	19.30	
1981	72,654	37,492	19,687	15,253	4,434	39,044	5,169	-	555	4,392	6,272	23,300	14.56	159,989	938,722	17.04	
1982	82,462	44,749	17,882	13,197	4,685	46,389	6,891	-	614	4,339	6,285	24,592	16.99	144,734	981,840	14.74	
1983	94,350	50,465	21,271	16,484	4,787	52,140	7,708	-	915	3,873	6,297	30,641	20.13	152,180	1,019,145	14.93	
1984	110,584	59,572	24,416	17,429	6,987	62,017	9,711	-	1,151	4,902	6,310	35,501	22.11	160,591	1,052,752	15.25	
1985	127,598	66,534	28,953	19,334	9,619	69,901	11,791	-	1,536	6,091	6,323	43,337	26.57	163,105	1,078,799	15.12	
1986	149,395	77,157	32,747	21,340	11,407	81,149	13,946	-	1,814	6,831	8,964	49,946	31.01	161,058	1,089,676	14.78	
1987	174,647	90,550	39,145	22,617	16,528	96,335	16,141	-	2,146	8,994	11,605	55,467	35.27	157,267	1,098,376	14.32	
1988	209,613	105,802	48,728	27,152	21,576	113,354	20,936	-	2,241	11,149	12,269	69,360	40.75	170,220	1,111,789	15.31	
1989	251,676	126,610	57,256	29,892	27,364	136,187	26,505	-	2,375	12,332	12,933	84,209	47.78	176,242	1,129,543	15.60	
1990	289,816	148,844	65,252	31,998	33,254	160,483	29,153	-	2,488	12,184	13,596	95,617	55.20	173,232	1,145,173	15.13	
1991	331,980	171,441	78,351	36,987	41,364	185,918	31,096	18,792	2,523	13,825	12,578	104,320	63.88	163,315	1,155,647	14.13	
1992	372,227	195,097	90,080	39,790	50,290	212,699	33,190	17,506	4,519	13,056	11,560	119,416	73.18	163,170	1,162,869	14.03	
1993	426,133	218,158	108,603	58,221	50,382	235,792	41,611	25,449	6,320	16,284	10,541	143,257	82.76	173,094	1,167,572	14.83	

1994	482,120	242,165	126,461	64,331	62,130	263,911	48,373	29,288	6,400	20,252	9,523	165,379	90.70	182,331	1,176,748	15.49
1995	548,100	274,664	145,700	78,890	66,810	298,048	53,644	32,768	5,898	19,317	8,504	193,741	100.00	193,741	1,191,972	16.25
1996	618,417	309,064	169,191	84,222	84,969	338,803	58,185	35,903	5,746	23,721	7,486	218,814	107.72	203,128	1,225,100	16.58
1997	683,744	338,776	189,868	93,777	96,091	372,408	63,713	40,096	5,387	25,325	6,468	245,897	116.25	211,532	1,246,589	16.97
1998	735,086	371,760	192,826	87,914	104,912	408,479	70,656	43,677	5,953	24,453	5,449	256,926	125.41	204,877	1,270,929	16.12
1999	795,575	398,581	209,156	91,390	117,766	439,799	77,000	48,330	4,672	24,555	4,431	280,646	135.44	207,211	1,285,966	16.11
2000	873,637	423,713	243,991	107,899	136,092	471,345	84,453	54,000	4,809	25,375	3,413	321,620	149.98	214,442	1,299,681	16.50
																15.70

Sources: For the period from 1961 to 1995, South African Reserve Bank, South Africa's National Income Accounts 1946-1998, (June 1999)

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Notes:

GDP deflator is assumed at 8% in 1999 and 10% in 2000.

Columns (1), (2), (3),(4),(7),(9),(10),(13) and (15) are obtained from South Africa's National Accounts

Column (8) is obtained from National Treasury, Republic of South Africa, Budget Review 2001

Column (11) is obtained from Blignaut and Hassan by assuming the opportunity cost of capital at 10% real.

Column (5) = (3) - (4).

Column (6) = (2) + 0.35*(5).

Column (12) = (1) - (6) - (8) - 0.95*(1/3)*(10) - {(6)/[(1)-(7)+(9)]} * [(7)-(8)-(9)]-(11).

Column (14) = (12)/(13)

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Appendix B. The Proportion of Financing of Gross Capital Formation by Category

Year	Amount at Current Prices (millions of Rands)						Proportion in Percentage (%)			
	Savings by Private Sector						Savings by Private Sector			
	Saving by Public Sector	Saving by Household	Corporate Saving	Consumption of Fixed Capital	Foreign Investment	Total	Saving by Household	Gross Saving by Business Saving	Foreign Investment	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1961	146	478	113	602	(196)	997	47.94	71.72	-19.66	100.00
1962	56	606	143	643	(308)	1,084	55.90	72.51	-28.41	100.00
1963	276	542	149	690	(149)	1,232	43.99	68.10	-12.09	100.00
1964	276	392	267	757	102	1,518	25.82	67.46	6.72	100.00
1965	239	436	230	845	366	1,877	23.23	57.27	19.50	100.00
1966	184	586	227	956	102	1,871	31.32	63.23	5.45	100.00
1967	416	659	180	1,050	266	2,155	30.58	57.08	12.34	100.00
1968	401	813	211	1,138	11	2,173	37.41	62.08	0.51	100.00
1969	446	633	335	1,248	342	2,558	24.75	61.88	13.37	100.00
1970	386	588	225	1,415	919	3,147	18.68	52.11	29.20	100.00
1971	184	1,208	247	1,637	1,061	4,153	29.09	45.36	25.55	100.00
1972	285	1,384	375	1,932	143	3,834	36.10	60.17	3.73	100.00
1973	887	836	839	2,263	169	4,107	20.36	75.53	4.11	100.00
1974	1,115	1,268	1,113	2,757	979	6,117	20.73	63.27	16.00	100.00
1975	638	1,501	950	3,545	1,766	7,762	19.34	57.91	22.75	100.00
1976	149	1,121	1,339	4,446	1,654	8,560	13.10	67.58	19.32	100.00
1977	106	2,655	1,538	5,144	(209)	9,128	29.09	73.20	-2.29	100.00
1978	359	2,009	2,401	6,089	(949)	9,550	21.04	88.90	-9.94	100.00
1979	125	3,325	4,129	7,242	(2,504)	12,192	27.27	93.27	-20.54	100.00
1980	1,558	4,100	7,003	8,624	(2,554)	17,173	23.87	91.00	-14.87	100.00
1981	989	1,418	6,939	10,399	4,176	22,932	6.18	75.61	18.21	100.00
1982	(890)	1,359	3,633	12,850	3,557	21,399	6.35	77.03	16.62	100.00
1983	(1,196)	1,095	7,815	15,201	428	24,539	4.46	93.79	1.74	100.00
1984	(2,841)	3,934	6,545	17,252	2,517	30,248	13.01	78.67	8.32	100.00
1985	(2,945)	8,485	4,841	21,003	(5,208)	29,121	29.14	88.75	-17.88	100.00
1986	(4,307)	5,090	7,585	26,348	(6,328)	32,695	15.57	103.79	-19.35	100.00
1987	(6,714)	7,097	7,667	29,823	(6,708)	37,879	18.74	98.97	-17.71	100.00
1988	(5,179)	8,494	9,589	34,521	(3,383)	49,221	17.26	89.62	-6.87	100.00
1989	(6,173)	10,338	11,272	40,978	(3,467)	59,121	17.49	88.38	-5.86	100.00
1990	(6,776)	4,964	11,063	45,990	(5,322)	56,695	8.76	100.63	-9.39	100.00
1991	(10,162)	5,722	15,857	50,251	(6,244)	65,586	8.72	100.80	-9.52	100.00
1992	(27,249)	13,226	20,283	54,227	(5,551)	82,185	16.09	90.66	-6.75	100.00
1993	(28,593)	12,436	27,656	58,575	(4,868)	93,799	13.26	91.93	-5.19	100.00
1994	(28,330)	8,479	36,749	64,500	(338)	109,390	7.75	92.56	-0.31	100.00
1995	(23,128)	6,212	35,656	71,827	7,992	121,687	5.10	88.33	6.57	100.00
1996	(30,613)	6,975	42,448	78,923	8,125	136,471	5.11	88.94	5.95	100.00
1997	(32,362)	6,570	37,712	87,155	10,426	141,863	4.63	88.02	7.35	100.00
1998	(25,635)	3,417	32,452	94,781	12,867	143,517	2.38	88.65	8.97	100.00
1999	(20,811)	1,358	32,679	103,272	3,398	140,707	0.97	96.62	2.41	100.00
2000	(15,868)	2,386	33,390	112,633	3,050	151,459	1.58	96.41	2.01	100.00

Source: For the period from 1961 to 1995, South African Reserve Bank, South Africa's National Accounts 1946-1998, (June 1999).

For the period from 1996 to 2000, South African Reserve Bank, Quarterly Bulletin, (March 2001).

Notes:

Columns (1),(2),(3),(4) and (5) are obtained from South Africa's National Accounts.

Column (6) = (2) + (3) + (4) + (5).

Column (7) = (2)/(6).

Column (8) = [(3)+(4)]/(6).

Column (9) = (5)/(6).

Appendix C. The Private and Public Investment in South Africa

Year	Investment By Private Business Enterprises	Private-Sector Gross Savings	Percentage Share of Private Investment as compared to Gross Private Savings
	(millions of Rands)		(%)
1961	588	997	58.98
1962	581	1,084	53.60
1963	707	1,232	57.39
1964	921	1,518	60.67
1965	1,067	1,877	56.85
1966	1,081	1,871	57.78
1967	1,140	2,155	52.90
1968	1,193	2,173	54.90
1969	1,415	2,558	55.32
1970	1,742	3,147	55.35
1971	1,956	4,153	47.10
1972	2,127	3,834	55.48
1973	2,544	4,107	61.94
1974	3,118	6,117	50.97
1975	3,891	7,762	50.13
1976	4,332	8,560	50.61
1977	4,519	9,128	49.51
1978	4,921	9,550	51.53
1979	5,782	12,192	47.42
1980	8,110	17,173	47.23
1981	10,938	22,932	47.70
1982	12,750	21,399	59.58
1983	14,222	24,539	57.96
1984	15,535	30,248	51.36
1985	16,011	29,121	54.98
1986	16,471	32,695	50.38
1987	18,557	37,879	48.99
1988	26,216	49,221	53.26
1989	31,490	59,121	53.26
1990	35,267	56,695	62.20
1991	36,646	65,586	55.87
1992	38,805	82,185	47.22
1993	43,755	93,799	46.65
1994	53,259	109,390	48.69
1995	63,534	121,687	52.21
1996	72,475	136,471	53.11
1997	80,635	141,863	56.84
1998	83,039	143,517	57.86
1999	83,840	140,707	59.58
2000	93,509	151,459	61.74
Average			53.88

Source: For the period from 1961 to 1995, South African Reserve Bank, South Africa's National Accounts 1946-1998, (June 1999). For the period from 1996 to 2000, South African Reserve Bank, Quarterly Bulletin, (March 2001).

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