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Number 3, November 1973

Die
Beleggings-
Navorsers
Tydskrif

Nommer 3, November 1973

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For investment analysts, 1973 will long be remembered as a year during which perspectives and dimensions, intimate to their professional activity, were changed in dramatic fashion. At the corporate level, two major mergers, in the industrial and financial sectors, gave notice that the trend to bigness in business, prompted by the search for the economies of operation or the desire to enhance competitive position and growth, is gathering a new momentum. At the international level, the October War in the Middle East and the oil crisis that has followed in its wake, not only raised the possibility of a major world recession but also reminded us that economic growth, as we have understood it until now, cannot continue unchecked without serious consequences for raw material reserves and the environment.

1973, however, will also be remembered for its developments in world money and capital markets and for a universal worsening of inflationary tendencies. For investment analysts, the sharp fluctuations in interest rate levels that occurred during the past twelve months, touch the very heart of their search for financial value; while inflation, not without its impact on interest rate levels, has confused the growth picture and threatened to make nonsense of conventional accounting procedures.

The persistence of inflation and technological change (with which it has become greatly confused in the post-war period) have compelled all concerned with corporate performance and control, to think again about the purpose profit and loss accounts and balance sheets are intended to serve. Should these faithfully and accurately reflect only what has happened in the past? Or should they be adjusted and changed so as to help as a guide to the future? The trouble is that an affirmative answer to either one of these questions often precludes an affirmative answer to the other.

Though it might seem that an accountant should limit his concern to the facts and, thus, preserve his impartiality in business matters, such an approach in a world of inflation and rapid technological change has serious limitations. Indeed, it runs the risk that the picture he presents to management might even encourage the taking of decisions detrimental to the interest and even survival of the enterprise entrusted to its care.

Unfortunately for us, these effects of inflation and changing technology are not limited solely to individual businesses. They have, too, a wider economic significance. Through their effect at the micro-level they also concern the macro-performance of the economy having a particular bearing on the quality and magnitude of total investment. They, thus, affect the very competitiveness of South African industry in export markets and the long-term health of the balance of payments.

It is for these reasons that an article on inflation and accounts has been included in this issue of the Journal. It is our hope that the article will not only draw attention to matters of technical interest but will also serve as a trigger to further discussion on a vitally important topic. Without such further discussion and the corrective

Beleggingsnavorsers sal 1973 lank onthou as 'n jaar waarin perspektiewe en dimensies eie aan hul professionele bedrywighede dramatiese veranderings ondergaan het. Op korporasievlak het twee belangrike samesmeltings in die nywerheids- en finansiële sektore die aandag daarop gevestig dat die neiging na groter omvang in besigheid, aangespoor deur die strewe na ekonomiese werking of die behoefte om posisie van mededinging en groei te bevorder, steeds besig is om momentum te verkry. Op internasionale vlak het die Oktober-oorlog in die Midde-Ooste en die daaropvolgende oliekrisis, nie alleen die moontlikheid van 'n belangrike wêreldresessie laat ontstaan nie, maar het dit ook by ons tuis gebring dat ekonomiese groei, soos ons dit tot dusver geken het, nie ongehinderd kan voortgaan sonder om 'n ernstige invloed op grondstofreserwes en die omgewing te hê nie.

1973 sal egter ook onthou word vir die ontwikkelings wat ondervind is op wêreldgeld- en kapitaalmarkte en vir die universiële verergering van inflasionêre neigings. Sover dit beleggingsnavorsers aangaan, het die skerp fluktuasies in rentekoersvlakke wat gedurende die afgelope twaalf maande voorgekom het, die kern van hul strewe na finansiële waarde aangeraak; terwyl inflasie, die invloed waarvan op rentekoerse nie uitgebly het nie, die beeld van groei verwar het en die bestaansreg van konvensionele rekeningkundige prosedures bedreig het.

Die volgehoue aard van inflasie en tegnologiese verandering (waarmee dit in die na-oorlogse jare grootliks verwar is) het almal betrokke by korporatiewe prestasie en beheer genoodsaak om heroerweging te skenk aan die doel wat wins-en-verliesrekeninge en balansstate dien. Behoort die rekeninge slegs ware en redelike weergawes te wees van wat in die verlede gebeur het? Of behoort aanpassings en veranderings aangebring te word wat sal dien as 'n gids vir die toekoms? Die probleem is dat 'n bevestigende antwoord op enige van die twee vrae gewoonlik 'n bevestigende antwoord op die ander uitsluit.

Hoewel dit mag voorkom of 'n rekenmeester hom slegs by die feite moet bepaal en dus sy onpartydigheid in sake van besigheid moet nhou, sal so 'n benadering in 'n wêreld van inflasie en snelle tegnologiese verandering, mank gaan aan ernstige gebreke. Inderdaad word die risiko geloop dat die beeld wat hy aan bestuur voorhou, die neem van besluite kan bevorder wat nadelig kan wees vir die belange van en selfs die voortbestaan van die onderneming aan wie dit toevertrou is, kan aantast.

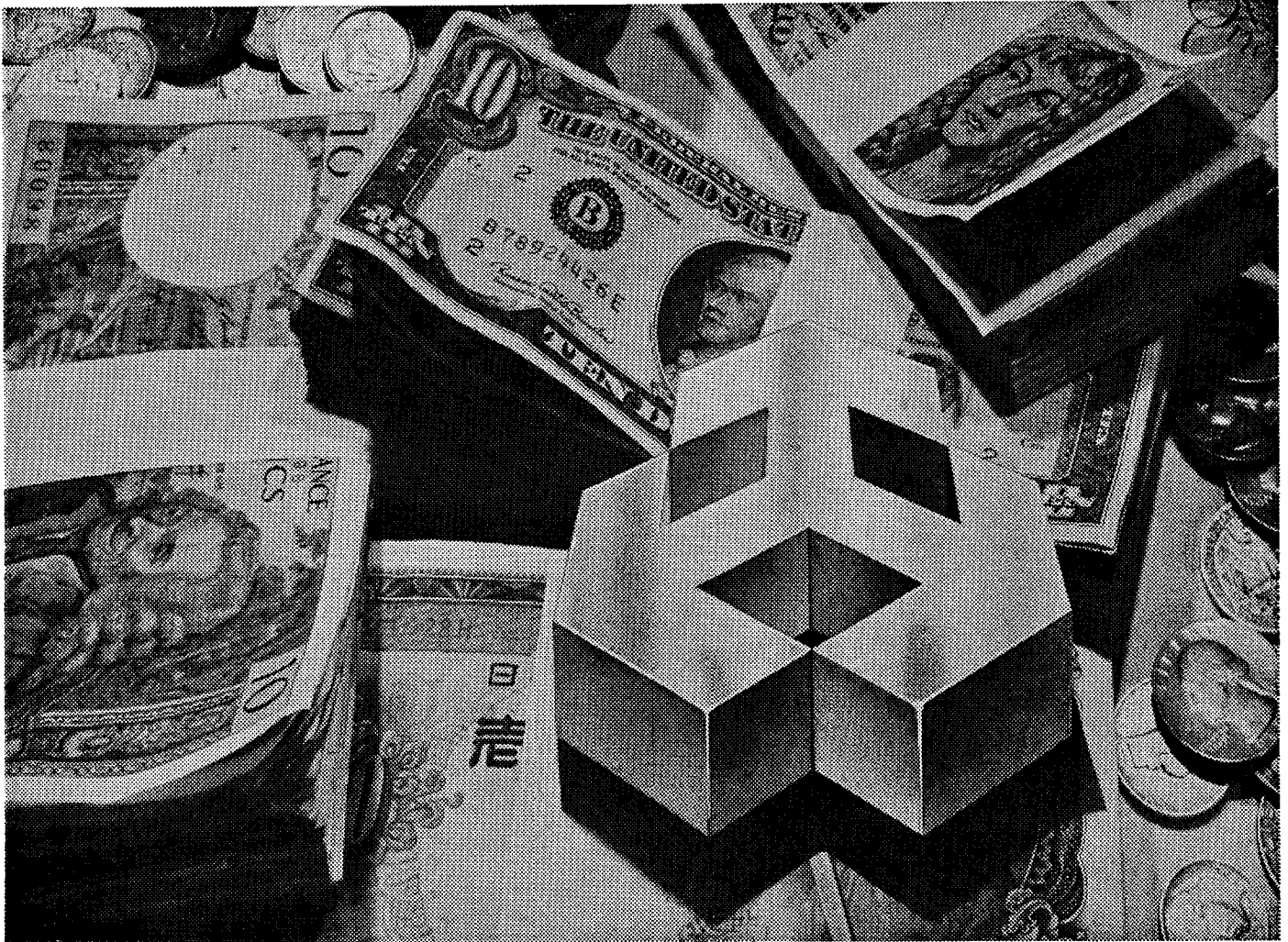
Dit is ongelukkig so dat die effek van inflasie en veranderde tegnologie nie alleen beperk is tot individuele besighede nie. Daar is ook 'n wyer ekonomiese betekenis. Deur die effek wat dit het op die mikro-vlak word makro-prestasie van die ekonomie geraak wat 'n besondere invloed het op die kwaliteit en omvang van totale investering. Sodoende word die mededingingsposisie van die Suid-Afrikaanse nywerheid in uitvoermarkte en die langtermyn-toestand van die betalingsbalans direk beïnvloed.

action it might help bring about, there is the grave risk that distortions already evident in our investment and financial decision-making processes will become exaggerated in the future with unfortunate consequences not only for individual investors but also for the long-term health of the whole of our economy.

The Editor

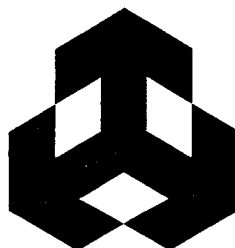
Om dié redes is 'n artikel oor inflasie en rekeninge in hierdie uitgawe van die Tydskrif ingesluit. Ons vertrou dat die artikel nie alleen die aandag sal vestig op sake van 'n tegniese aard nie maar dat dit ook sal dien as 'n aansporing tot verdere bespreking van 'n uiters belangrike onderwerp. Sonder verdere bespreking en die korrektiewe optrede wat daarop mag volg, bly die gevaar bestaan dat verbuigings wat alreeds waarneembaar is in ons investerings- en finansiële besluitnemingsprosesse, in die toekoms nog verder vererger sal word, met ongelukkige gevolge nie alleen vir individuele beleggers nie maar ook vir die langtermyn-welvaart van ons hele ekonomie.

Die Redakteur



We're more than money.

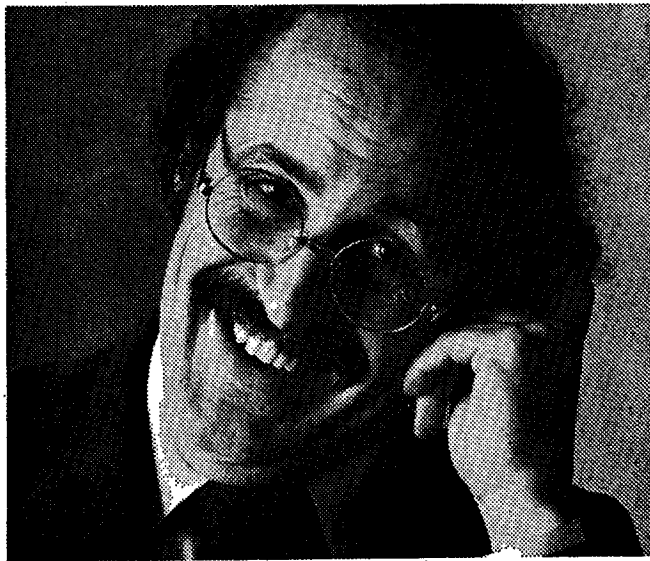
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And today his wife
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Inflation: Current accounting practice and the investment analyst

INTRODUCTION

After a continuous period of inflation over the last thirty years, criticism of the conventional form of financial reporting for failing to identify and isolate the effect of inflation has become increasingly vociferous. The disparity between book value and the related value placed on freehold property disclosed in recent take-over bids has brought forward the most recent suggestion that urgent reforms are needed in asset valuations and disclosure to shareholders.

The purpose of this article is to re-examine these criticisms, consider their validity and effect on financial analysts and the steps that are being taken to improve the position. It does not purport to present original thinking on the subject but merely provides a digest of recent views of authorities on the matter.

CRITICISM OF CURRENT ACCOUNTING PRACTICE

Criticism of current accounting practice may be summarised in the fact that conventional financial statements do not purport to present the current value of a business or of its underlying assets or liabilities, nor does the profit and loss account reflect the net increase or decrease in the proprietor's real wealth over the period of the financial statements. Generally accepted accounting practice favours, and in the United States enshrines, presentation of accounts prepared on the historical cost basis. These accounts are not normally adjusted in an attempt to compensate for any change in the purchasing power of money.

In a period of perpetual inflation this practice produces the following results:

1

General

History is distorted as the unit of account varies from year to year and the extent to which the past trend reflected by orthodox financial statements has been affected by inflation is not apparent. For this reason investment analysts may not place complete reliance on the past performance of an undertaking, as reflected by conventional financial statements, for predicting future trends.

2

Fixed assets

Fixed asset costs reflected in the balance sheets are usually based on an accumulation of costs in dissimilar rands.

Thus two concerns may own adjacent, and apparently identical, freehold land reflected in their accounts at

widely different values due to the different prices ruling in the periods in which they were purchased.

A further complication arises because fixed assets which depreciate must eventually be replaced in a going concern. Conventional accounting requires that such assets be written off over their estimated useful lives to the business: it does not insist that the estimated increased cost of replacement be set aside over such lives. (*See footnote.)

Theoretically, therefore, if an enterprise follows a policy of one hundred per cent dividend distribution, it may not have sufficient resources to replace a fixed asset at the termination of the useful life of its predecessor. It may thus be obliged to borrow merely to continue in business — a step usually associated with expansion.

3

Current assets

Any concern which holds trading stocks or sells the latter on credit must provide increased working capital in order to finance the same quantitative level of stock or debts.

Conventional accounting again enables a full distribution of profits to be made to shareholders without providing for the increased cost of replacement of such assets.

4

Foreign currency liabilities

Local accounting practice does not currently demand that the repayment period of long-term borrowings be set out in the accounts nor that details be given of the currency in which such borrowings are to be repaid.

In our current climate of floating exchange rates and variations in rates of national inflations this is a notable omission in our standard of financial reporting.

5

Financing

If a company finances its operations from internally generated funds part of the cost of such financing is the depreciation, in real terms, between the value of the rands held at the beginning and end of the period. This may be termed the 'cost of owning money'. Similarly, the cost of borrowing funds at fixed rates of interest is reduced by a similar 'gain in borrowing money'.

Conventional accounting ignores both these aspects.

*Current accounting practice is not alone in ignoring this aspect. Taxation authorities, including our own, largely ignore this problem and tend to levy taxation on conventionally calculated income. It is true that at present our investment allowances have a mitigating effect of between

four to ten percent of such increase in replacement price. This is largely coincidental and the introduction of such allowances tends to be timed to stimulate depressed economic conditions and not to relieve the inflationary effects of boom conditions.

IMPLICATIONS OF CURRENT ACCOUNTING PRACTICE ON FINANCIAL ANALYSTS

The drawbacks of current accounting practice outlined above tend to result in the reflection of enhanced profits in orthodox accounts. This overstatement effect is perpetuated in the historical ratios which financial analysts compute such as dividend covers, earnings yields and covers, and price-earnings ratios.

In addition, if fixed assets are held over a considerable period, or major liabilities are only refundable in the distant future, the balance sheet may become completely divorced from current values. The capital employed in the business thus becomes understated and the return on capital employed is overstated.

The extent to which any financial statements are affected by such distortions is not readily detectable from an examination of the statements. Some operations are affected more than others; more distortion is produced by some periods than others. Comparison of past performances of the results of different concerns and estimation of future investment potential thus becomes difficult.

REMEDIAL ACTION

In discussing remedial action accounting literature abounds with the terms 'general price-level restatement' and 'current value accounting' and it is as well to clarify the meaning of these terms at the outset. They are not mutually exclusive alternative remedies but may both be adopted in the same financial statements.

In essence, general price-level restatement is the accounting process of changing the standard used to compare varying resources from units of money to units of general purchasing power. This process is normally effected by means of selected indices: for example, current rands are changed to the purchasing power of rands at a standard date by the application of such indices.

Once the standard has been chosen with which to measure resources the relationship between the resources and the standard must be determined.

Four examples of such relationships are:

The quantity of the standard:

- 1 that is sacrificed to obtain the resource (historical cost);
- 2 that can be obtained in exchange for the resource (selling price);
- 3 that is required to replace the resource (replacement price);
- 4 that will be obtained in the future in exchange for the resource or its product (future net receipts).

The last three examples are all illustrations of current value accounting relationships.

Under current usage units of money are used as the standard and historical cost, the money sacrificed to obtain non-money resources, provides the normal relationship.

Thus the standard alone may be changed (general price-level restatement), only the emphasised relationship may be changed (current value accounting) or both may be changed simultaneously.

Having distinguished between 'general price-level restatement' and 'current value accounting' a more detailed examination of these proposed solutions to accounting in a period of changing price-levels is set out below.

GENERAL PRICE-LEVEL RESTATEMENT (GPA)

This method has been recommended by the American Institute of Certified Public Accountants (AICPA) in Accounting Principles Board Statement 3, and by the Accounting Standards Steering Committee of the Institute of Chartered Accountants in England and Wales (ICA) in their exposure Draft 8.

An attempt has not been made in either of the above pronouncements to introduce current value accounting — the historical cost basis has been maintained. Both pronouncements are concerned purely with isolating and measuring the effects of inflation: they do not purport to measure or isolate changes in real value arising from other causes.

Within this framework the main difficulty, as may be expected, is the choice of a suitable index with which to convert currency to units of purchasing power. The AICPA recommends the gross national product implicit price deflator index and the ICA the consumer price index. Neither index is ideal for universal usage and may produce anomalies: to restate the value of a motor vehicle because of the effect of potato blight on the consumer price index would not appear logical.

In addition both pronouncements recommend that financial statements incorporating these indices should be ancillary to the orthodox ones and should not supplant them.

This method of restatement of accounts, although suggested for some time, has not received universal support. A reason for this is an understandable reluctance on the part of individual firms to underline the proportion of their apparent progress which in fact is derived from the erosion through inflation of the value of the unit of measurement. Another factor is that the inappropriateness of indices in certain situations throws doubt on their universal applicability.

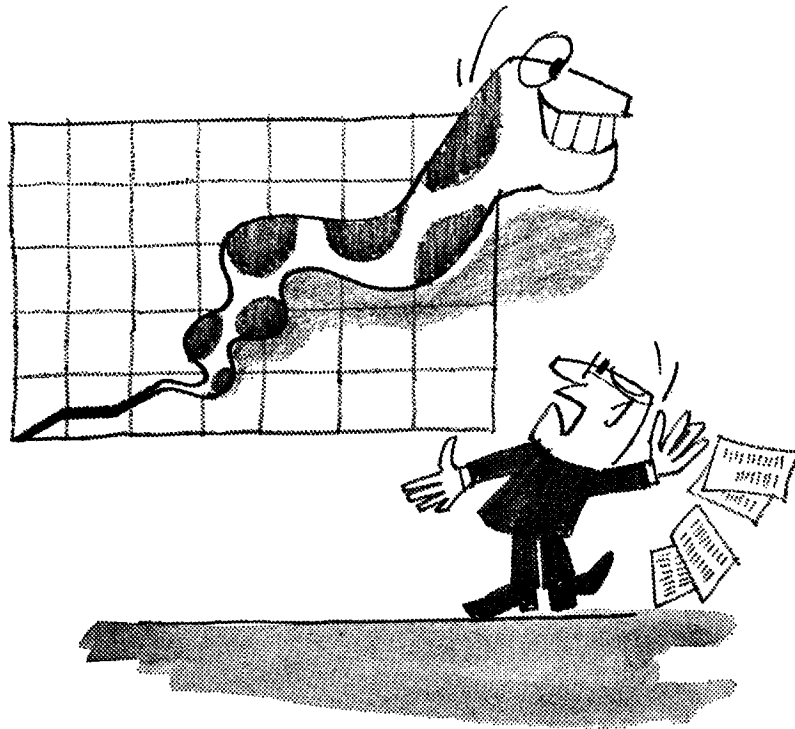
CURRENT VALUE ACCOUNTING (CVA)

The most usual and publicised variant of this manner of accounting is replacement price or replacement value: Philips of Holland is a well known advocate of it.

Other variants such as selling price or realisable value may be used. Such a variant is not often recommended as financial statements of most undertakings are prepared on the going concern basis: their continued existence is assumed. To restructure the statements on what amounts to a net realisable or scrap value basis would appear unrealistic, except in cases in which undertakings give indications of ceasing to trade. In addition, the true value of any article or combination of articles can only be determined by the price at which current agreement is reached between a willing buyer and a willing seller. Should such transactions not have taken place at a convenient time, any valuation becomes an expression of opinion which may or may not be reliable.

Only the replacement value variant of CVA is thus examined in this article. Under this variant the trading

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account is charged with the estimated cost of replacement of the articles consumed in production and subsequent sales and fixed assets are depreciated according to their estimated replacement value. In principle this appears simple: in practice it is fraught with difficulties such as:

- 1 Fixed assets are seldom replaced by identical units. This is particularly true in periods of rapid technological progress.
- 2 Stocks are not always replaced by identical units and their replacement price depends on the volume carried, the level of demand and the stock turnover ratio.

Apart from the above practical difficulties there are theoretical objections to this CVA approach as a means of arriving at true profit. True wealth is not necessarily maintained if there is no change in physical possessions: they may lose or gain value in exchange as much as money. Replacement value accounting attempts to measure true profits by substituting for the measure money only those commodities that the individual undertakings possess. By superimposing GPA on to the current rands used in the replacement value version of CVA the estimated inflation effect may be isolated. This procedure is, however, likely to be laborious and ineffective.

CONCLUSION

Conventional accounting with its reliance on the historical cost basis and comparison of currencies with dissimilar purchasing power distorts the true progress of a business. The effect of inflation is ignored and the financial statements in a period of continuous inflation tend to bear no relationship to current values.

Whilst this position exists financial analysts should be aware of this distortion and of the ways in which such distortion has affected, and may affect, two concerns in different ways.

Remedial action has been proposed by means of general price-level restatement (GPA) and current value accounting (CVA). GPA retains the historical cost approach and merely attempts to isolate effects of inflation by the use of indices: an attempt is not made to use any form of CVA.

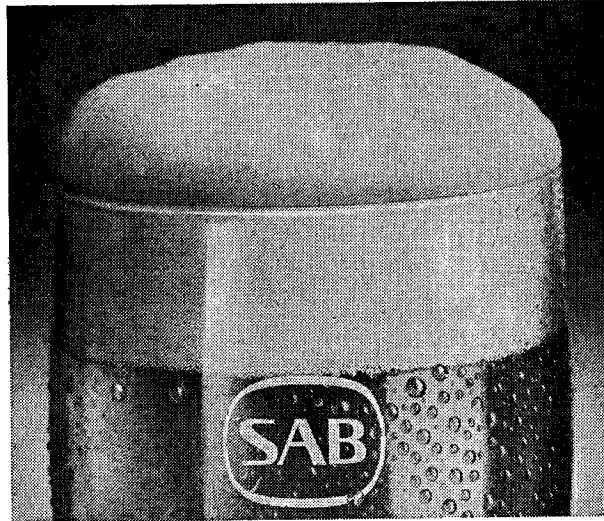
CVA, and particularly the most popular form of it: replacement value accounting, is a bolder attempt to restructure accounts on a basis designed to retain the reflection of current worth. CVA may be used in conjunction with GPA in an attempt to isolate the effect of inflation from other factors affecting the current value.

The use of CVA and GPA or a combination of both, has its drawbacks. Despite these drawbacks, however, their use provides considerable advantages over orthodox accounts, and financial analysts and the financial community as a whole should at least advocate the compulsory usage of GPA on an ancillary basis in financial statements presented in South Africa. Once historical information is regularly presented in this manner more attention may be paid to its use in the preparation of budgets and anticipation of future investment decisions.

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Leadership starts with a good head

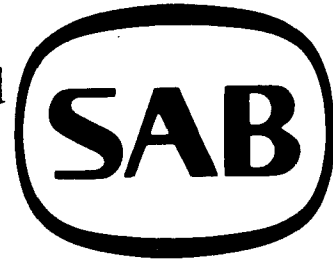


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It's amazing where a good head can lead you.



Aspects of the short-term money market in South Africa

A paper delivered to the Investment Analysts Society of Southern Africa, October 25, 1973

INTRODUCTION

The need for my talk may be in some doubt, for everyone here has expertise in the money market.

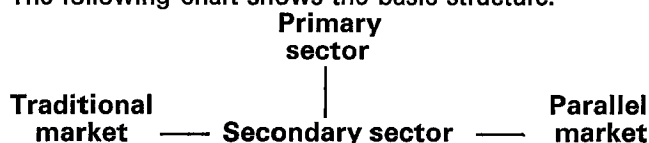
To reassure you, I would explain that I intend:

first, to review the composition and development of the South African domestic money market and to examine the investments which commonly are traded in that market and, **secondly**, to try to draw away the veil of mystery which for some surrounds the market and to encourage greater use of it.

To begin, let us review the **structure** and then the **composition and development of the SA short-term money market**. The South African banking system and money market has to a large extent been modelled on the English system and reference will be made where necessary to United Kingdom institutions and practice.

STRUCTURE OF THE MARKET

The following chart shows the basic structure.



The primary sector being understood as takers of deposits and creators of credit and the secondary sector being dealers in credit and in deposits taken by institutions in the primary sector but not creators of credit except in so far as institutions in the secondary sector tend to increase the velocity of circulation of funds.

In so far as some institutions carry out functions both of the primary and secondary sectors the categorisation must not be regarded too rigidly.

Discount houses which head the traditional market in the secondary sector accept deposits from banks, a primary function, and banks which form the bulk of the primary sector operate in the secondary market in so far as they trade in paper after issue and operate in the interbank market which falls into the parallel market classification.

Again, the finance houses which form part of the parallel market also carry out a primary market function in creating commercial paper.

To understand the market it is necessary to review the institutions comprising the market.

INSTITUTIONS COMPRISING THE MARKET

(a)

The Reserve Bank

The Reserve Bank is the country's central bank controlling the banking sector, foreign exchange movements and the supply of funds to the market. **First**, it

controls the traditional short-term money market, being the **lender of last resort**; that is to say, that when the discount houses (which must balance their books at the end of each business day) are having difficulty in doing so they can seek assistance from the Reserve Bank. The Reserve Bank will support the market by buying treasury bills from the discount houses or by making direct overnight loans to them. Alternatively the bank will buy short-dated RSA stock at market rates or, if the bank so decides, at penal rates.

Assistance is usually given at an interest rate higher than other ruling market rates (usually 2 per cent above bank rate) so that the houses are placed at a temporary disadvantage. The purpose is to avoid a seasonal or technical disruption (or shortage) in the market. Having accepted this assistance, the houses are said to be 'in the Bank'.

Secondly, the Reserve Bank is the channel through which Government monetary policy is relayed to the market. The Government can use the market as a channel for the injection or withdrawal of cash by the authorities into or from the banking system.

In this way, the Reserve Bank can control the amount, and to some extent the velocity of money in circulation. In terms of economic theory, the quantity and velocity of money in circulation governs the price of money.

Under the Banks Act, banks are required to hold a certain proportion of their loans in a highly liquid form. The proportions, and types of assets which may be regarded as liquid, can be varied by the authorities according to how much bank credit they believe is good for the economy.

Apart from adjustments to cash and liquid asset ratios (which affects the creation potential of the banks) and the lending assistance just mentioned, there are other methods of influencing the level of bank credits, such as open market operations. As the Bank buys treasury bills from the market, instead of making loans, so the traditional secondary market must reduce its holdings of bank acceptances and other instruments with the result that credit is restricted. I shall revert to these aspects later.

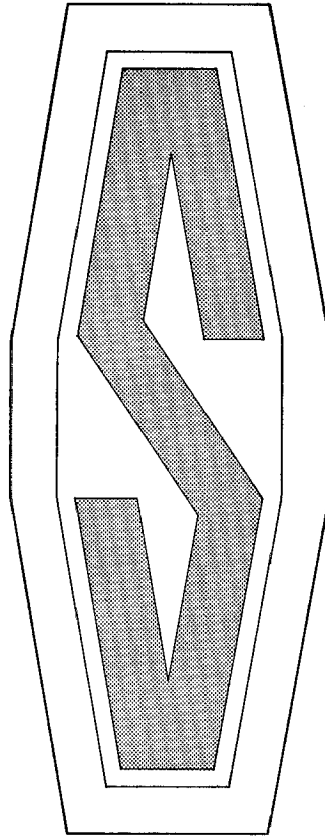
(b)

The National Finance Corporation

was established by Act of Parliament in September 1949¹:

- (i) to accept call deposits and pay interest on them
- (ii) to invest its funds in treasury bills and short and medium-term gilt-edged securities
- (iii) to deal in these securities.

During the year ended June 30, 1972, the average daily deposit level was R238 million with an annual turnover of R4 667 million.²



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These figures are, however, misleading because the NFC, having fulfilled its function of creating a money market has, with the rise of merchant banks and discount houses, become superfluous and the level of deposits flows from the Reserve Bank using it as the recipient for special deposits from the banks when it wishes to reduce the level of liquidity in the economy.

By requiring the banks to make special deposits the Treasury has been able to keep its own borrowing rates down and stem inflationary pressures by restricting the amount of money available in the banking system.

These special deposits by the banks, on which the NFC pays only a token rate of interest, have been used to finance most of the weekly treasury bill issues. In other words, the NFC has used these special deposit monies to tender for treasury bills at rates lower than those acceptable to other bidders, such as banks, discount houses or other institutions.

Although this provides cheap finance for Government, this practice greatly reduced private sector interest in treasury bills and their holdings fell accordingly.

In fact, at end March 1973, the NFC held 57,5% of outstanding treasury bills which amounted in total to R166 million.³

The monthly level of total outstanding treasury bills over the nine months period indicated below was as follows.⁴

30.6.72	R108 million
30.9.72	R149 million
31.12.72	R120 million
31.3.73	R166 million

Now that the authorities are introducing open market operations as an additional means of regulating credit, they are showing signs of pricing treasury bills closer to the dictates of market supply and demand and appear anxious to re-establish the treasury bill as the most important money market instrument.

(c) The Public Debt Commissioners

The Public Debt Commissioners operate in terms of the Public Debt Commissioners Act of 1969 which replaces the earlier Act of 1911.⁵

The commissioners administer and invest all trust and deposit funds in the hands of the Government, the Provincial Administrations and the Railways and Harbours Administration which are available for investment.⁶

The three commissioners (named in Section 2 of the Act) are:

- (i) The Minister of Finance (ex officio chairman) Dr N. Diederichs
- (ii) One of the Railways commissioners — Dr J. H. Botha
- (iii) A nominee of the State President — Dr D. G. Franzsen, Senior Deputy Governor, South African Reserve Bank.

Their department is run by civil servants although it is not officially part of the Treasury. They are by far the largest single investor in Government and quasi-Government debt.

As long-term investors they are generally net buyers of long-term stock and sellers of short-term stock and are enabled to buy any long-term issue of Government stock within the confines of the Treasury's own borrowing restraints from the Treasury at any time. At March 31, 1972, funds administered by them amounted to R3 540 million.⁷

As a quasi-Government trader in gilts and semi-gilts the Public Debt Commissioners were persuaded for a time to deal in these markets in such a way as to influence the level of credit in the banking system; they sold stock to reduce liquidity and became buyers to increase it. However, as these operations clashed with their function as long-term pension fund administrators, and were not altogether effective, they were stopped.

(d) The discount houses

(i) *The discount houses which are private enterprise institutions* are relatively new in South Africa. The first, Discount House of South Africa Limited (DHSA), which took over the outstanding acceptances and call deposits of UAL, having been established as recently as 1957.

There are now three houses, each of which is modelled on the London houses and numbers a London house amongst its shareholders.

The second to be established, in 1961, was National Discount House which is now the largest of the three.

The third, Interbank Discount House, commenced trading as recently as last year and has twenty-one shareholders.

(ii) *The primary function of the discount houses* is to bring together short-term institutional borrowers and lenders from both the private and public sectors, and to mobilise short-term money in the economy to take up surplus liquidity from the private sector. They act as principals (i.e. accept deposits and make their own investments) but also have in effect a large broking or intermediary function as do the finance houses or money brokers.

The houses deal primarily in what are as far as capital is concerned, risk-free assets i.e. treasury bills, short-dated Government, quasi-Government and Municipal stock and other evidences of debt which have a relatively short life to maturity, such as negotiable certificates of deposit (NCDs) and bank acceptances — that is bills of exchange which have been accepted or guaranteed by a bank.

The chief customers of the discount houses are the banks, and members of the public cannot deal directly with the discount houses otherwise than by way of purchase and sale of money market securities which I will refer to collectively as 'assets'.

(iii) *Capitalisation and assets held*

The total assets of the three discount houses as shown in recent accounts were about R464 million⁸ compared with a recent London figure of approximately £2 500 million⁹.

Shareholders funds, however, constitute only a small proportion of the total funds employed by the houses.

The houses are permitted a ratio of 50 : 1¹⁰ but the exact figure is not known because discount houses are exempt from revealing how much they place to hidden reserves. An indication of gearing can nevertheless be obtained by comparing the figure of published shareholders' funds with total assets. In the 1972 balance sheets of the three houses these amount to only R10,8 million giving a ratio of 35 : 1.

(iv) *Where do the profits of the discount houses really come from?*

As we have seen already, they rely on a very large turnover and high gearing with the result that both DHSA and NDH showed a return on total assets of only 0,4%.¹¹

Basically, a discount house's profits margin is the difference between the cost of money and the return on bills and bonds. Of major importance to this difference or margin are the fluctuations of short-term interest rates. Generally, discount houses benefit when interest rates are falling and suffer when interest rates are rising.

When interest rates are falling, the houses benefit substantially from wider profit margins as the cost of money falls faster than the predetermined return on bills and bonds yet to mature. In addition, the consequent rise in bond prices not only produces large capital profits, it also provides favourable opportunities to make considerable jobbing profits.

The secret of profitability, therefore, is that the houses like other investors should arrange their portfolios to reflect expected changes in interest rate trends.

(e)
The banks

Excluding discount houses, there are five categories of banks¹² in South Africa which are defined in the Banks Act.

- (i) *Commercial banks* are the banks we meet in every day business. Their main function is to conduct cheque accounts. In common with all the other banks they are permitted to accept deposits from the general public — an activity which is far more severely restricted in South Africa than, for instance, in London. The commercial banks are the principal source of call monies for the money market and the principal channel through which the public's money reaches the market.
- (ii) *The general banks* do not normally run cheque accounts. They have largely superseded the hire purchase banks by reason of the latter having broadened the range of their activities and so being reclassified — e.g. UDC Bank. In turn Trust Bank and, more recently, Western Bank have broadened their activities into the field of commercial banking and it could be that ultimately there will be a distinction without a difference.
The category of general bank includes a number of the boards of executors established many years ago which have general banking licences.
- (iii) *Hire purchase*, and
- (iv) *Savings banks* are small categories of banks in the list and comprise those banks whose main activity

is the provision of the services which their names imply.

- (v) The first of the *accepting banks* (or merchant banks as they are commonly known) was UAL which was established in 1955. There are now nine merchant banks which, apart from granting acceptance credit facilities, provide a wide range of advisory and capital market services. These banks are becoming increasingly active in the money market and are the primary source of bills in the acceptance credit market.

(f)
Building societies

The function of the building societies is well known but it is important to remember that in order to preserve the short-term liquidity which is essential in the light of their obligations to the investing public, the societies are important customers of the money market.

Certain building societies are becoming much more market-orientated and the role that forward looking societies can play in the market can only be beneficial.

(g)
Municipalities and Government utilities

Local authorities and public corporations are important customers of the money market but do not form an integral part of its institutional composition. They are mainly medium to long-term borrowers and the capital market falls outside the scope of this paper.

(h)
Finance houses

Before looking at likely future development of the market in South Africa it is essential to consider the role of the finance houses and of the parallel market. For this purpose, the term finance houses should be understood to include money brokers in the London sense.

In recent years there has been rapid growth in the parallel market in this country and a number of finance houses and trust companies which do not form part of the traditional market have grown up alongside the discount houses. As a result, a greater element of competition has arisen which has the dual effect of fixing rates at which the banks can obtain funds as well as of improving rates available to the investor.

The removal of credit ceilings, coupled with excess liquidity earlier this year, had the effect of increasing the level of activity in this market which, like the secondary market as a whole, depends for volume on an adequate supply of funds.

Now in existence, the parallel market will undoubtedly develop further, and those of you who have watched the growth of the new markets in London over the last five years or so, will know that a hike in interest rates will not stem the activity.

For the purpose of this paper, the parallel market may be taken to include not only dealing in monetary instruments created by the 'primary' institutions, but also the commercial market which, in some respects, may itself be regarded as a primary market.

Already there is an active call money market among the larger companies. For many years the flour millers have used non-bank monies to finance normal business. This cheaper finance is a vital competitive factor in

export markets. Equally, the sugar companies in Natal actively pass call monies among one another.

Speed of communication and an awareness of the benefits to be gained are the central requirements needed by those who enter the market as well as a sensible approach to the assessment of risk. The risk factor can be negligible and no greater than the risk incurred in the bank market.

The growth of the market has produced a need for a more professional approach demanding time and skills. Efficient brokers can rapidly develop the inter-company market which does not conflict in any way with the real need to protect the general public from unscrupulous rogues.

OPERATIONS OF THE SHORT-TERM MONEY MARKET

A visitor to a busy dealing office may well think it to be the nearest thing to bedlam he has ever encountered and in fact, the memorable words of the producer of 'What's My Line?' when rejecting a candidate from the London money market for his programme were:

'Viewers wouldn't understand what you do. If they did, they wouldn't believe it.'

I cannot emphasise too strongly, however, the need to dispel from your mind the idea that operators in the market are an esoteric community of gnomes. Money dealers are no different from traders in any other commodity.

(a)

Use of short-term funds to finance floating Government debt and commercial needs

In essence, the money market borrows funds on a day-to-day basis mainly from the banks and finances floating Government debt by using this money to buy treasury bills or short-term Government stock and finances companies by buying commercial bills of exchange or negotiable certificates of deposit (NCDs). The commercial bills traded are essentially 'prime' bills of companies whose credit rating is undoubted.

(b)

Essential part which the market plays in the banking system

Neither the banks nor corporate treasurers need have funds for even one night without earning interest on them. Provided the market is broad enough, the fact that an individual transaction is for only a few days is of no importance.

Why do banks and companies want to borrow or lend such short-term funds?

The reasons will readily occur to you:

Companies may build up funds in their current accounts in anticipation of having to make tax payments to the Exchequer or pay dividends to shareholders, or to repay a long-term loan. These are the monies which should be lent to the money market at call.

Conversely, a corporate treasurer might be short of funds to meet dividend or tax payments and require a short loan from his bank. A number of such loans might mean that the bank has to borrow overnight from the money market.

The feature that distinguishes the money market quite

clearly from other credit or capital markets is the essential part it plays in the banking system.

Presently, banks are required by the Reserve Bank in terms of the Banks Act¹³ to hold in a highly liquid form certain of their liabilities.

They cannot, of course, afford to let large sums lie as idle cash, so they mainly lend it at call and use it to buy treasury bills, commercial paper and other paper from the market.

Prescribed investments

There are further regulations regarding the holding of certain paper known as prescribed investments which certain institutions are required to hold.

(c)

Assets traded (liquid, prescribed and NCDs)

The major assets held and the proportions in which they are held by the discount houses at March 31, 1973,¹⁴ were:

	R millions	%
Commercial or trade bills, promissory notes and acceptances (generally confined to prime acceptances)	164	35
Short-dated Government stock (gilts) and semi-gilts (Municipal and Public Corporation stock)	220	48
Treasury bills	52	11
The balance — other investments including NCDs	28	6
	464	100

(i) *The bank acceptance* is a bill of exchange endorsed by a bank — and, in practice, the houses will only buy prime trade bills, the definition of which for liquid assets purposes requires that they must have been issued in connection with the movement of goods and have been issued originally for a tenor (or period) of no more than 120 days.¹⁵

The discount rate for prime acceptances is informally agreed between the houses. The accepting or guarantee commission charged by the banks (and not the discount rate) shows greater variation from company to company — the agreed minimum commission is 1.8% p.a. which together with stamp duty has to be added to the amount of the discount to find the cost of the money to the end user.

It has been agreed between the Reserve Bank and the houses that no more than 40% of their total assets should be in bank acceptances. This means they can rediscount only a limited amount. Until recently, this amount was apportioned by the houses among their customers, by way of quotas and, as discounting bills is an extremely profitable business, larger quotas were almost always in demand.

Inevitably, some customers felt that their quotas were too small and that favouritism had crept into the apportionment of them. This grievance whether real or imaginary, was one of the reasons for the establishment of this country's third discount house.

If growth is the criterion nominate Nedbank.

Ten Year Financial Review.

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Assets and liabilities – R000's										
Issued Equity Capital (R1 shares)	6 600	8 000	8 000	10 000	10 044	12 555	12 555	12 555	12 601	14 516
Shareholders Funds	11 549	14 987	15 223	20 982	21 821	33 940	34 405	35 672	39 933	55 455
Total Shareholders Funds	11 549	14 987	15 223	21 895	22 823	35 349	42 535	53 770	60 429	79 187
Total Group Deposits	148 171	166 259	209 043	251 484	363 518	403 047	484 141	577 708	764 661	906 076
Total Group Advances	107 233	129 876	125 515	126 709	139 218	176 003	232 190	334 667	429 177	595 281
Total Group Advances as % of Total Group Deposits	72,4%	78,1%	60,0%	50,4%	38,3%	43,7%	48,0%	57,9%	56,1%	65,7%
Total Commercial Bank Assets	162 453	184 009	211 710	229 140	332 345	385 996	486 818	535 168	684 966	810 207
Total Group Assets	181 206	206 671	247 227	315 684	440 057	526 533	670 291	801 214	1 056 119	1 248 511
Results – R000's										
Commercial Bank Taxed Profits (including dividends)	1 095	1 255	1 389	1 605	1 963	3 076	3 711	3 993	4 818	6 590
Group Taxed Profits after Tax including Minority Interests	1 181	1 368	1 616	1 902	2 504	3 832	4 861	5 584	8 452	11 660
Taxed Profit available to Shareholders of Nedbank Limited	1 181	1 368	1 616	1 884	2 394	3 670	4 318	4 783	5 578	8 001
Profitability										
Group Taxed Profit as % of Total Group Assets	0,65%	0,66%	0,65%	0,60%	0,57%	0,73%	0,73%	0,70%	0,80%	0,93%
Taxed Profit available to Shareholders as a % of Shareholders Funds	10,2%	9,1%	10,6%	9,0%	11,0%	10,8%	12,5%	13,4%	14,0%	14,4%
Per share performance (Equity)										
<i>Unadjusted for Rights Issues</i>										
Profits	17,9c	17,1c	20,2c	18,8c	23,8c	29,2c	34,4c	38,1c	44,3c	55,1c
Dividends	10,0c	9,1c	11,0c	11,0c	12,0c	15,0c	16,5c	18,0c	21,0c	25,0c
Dividend Cover	1,8	1,9	1,8	1,7	2,0	2,0	2,1	2,1	2,1	2,2
<i>Adjusted for Rights Issues*</i>										
Published Profits	14,9c	15,9c	17,5c	18,2c	21,5c	28,4c	33,4c	36,9c	42,9c	55,1c
Dividends	8,3c	8,5c	9,5c	10,6c	10,8c	14,6c	16,0c	17,5c	20,4c	25,0c

*These figures measure performance from the viewpoint of a shareholder whose cash investment in Nedbank remained unchanged throughout the period illustrated. Historical data have been adjusted to comparability with the figures for 1973.



Invest with The Nedbankers

For the corporate treasurer watching short-term interest rate movements, the quotas meant that bank acceptance rates were not governed to the same extent by supply and demand factors as are rates such as those in the freer NCD market. The quota system itself is somewhat unsatisfactory in that the quotas introduced a major distorting influence in bank acceptance rates and it is to be welcomed that not all the houses continue to maintain the system: also from the point of view of the accepting banks it is an unsatisfactory system in that in tight conditions the houses tend not to fulfil quotas granted and offer to sell bills in the same market as the accepting banks themselves must then do.

(ii) *Short-dated gilts*

The most important investment in terms of holdings, short-dated gilts at R220 million¹⁶ represents as it were the tip of the iceberg. Total marketable Government stock with three years or less to maturity amounted at March 31, 1973, to R1,268 million or almost six times the holdings of the houses which are active dealers in this market.¹⁷ They trade the paper regularly and the holdings gives no indication of volume.

(iii) *Treasury bills* are 91-day bearer securities issued by the Treasury depending on the short-term Exchequer funding requirements, which reflect the timing of Government receipts and expenditure. Theoretically, the closer these coincide the less short-term Exchequer borrowing is necessary.

Only recently, however, has the treasury bill returned to prominence among the investments of the discount houses. Between September 1970 and May 1972, the treasury bill holdings of the houses amounted to no more than a token investment. At one stage, in December 1970, the level was only R600 000 and it remained at about R1 million for some months during that period.¹⁸

The main reason was that, in order to keep down its own short-term finance costs, the Government kept its official interest rates at levels far below those dictated in freer markets by supply and demand.

The Treasury was able to keep its own rates down because in its efforts to restrict credit and thereby stem inflationary pressures, it required banks to place special deposits with the National Finance Corporation which applied the funds to the purchase of treasury bills.

During the 1972/1973 Government financial year new financing of R312 million¹⁹ was raised by the issue of treasury bills. The planned new net issues of treasury bills for the 1973/1974 financial year are considerably less at R30 million²⁰. Pending full open market operations (discussed later) being implemented by the Treasury, it is difficult to forecast the effect of the contemplated smaller new issues of treasury bills.

(iv) *Negotiable certificates of deposit (NCDs)*

The review of the asset structure would be incomplete without adequate mention of negotiable certificates of deposit (NCDs) or CDs as they are generally known abroad. Trading in this instrument formed until recently a major portion of the activity of the money market.

The introduction of NCDs in South Africa was the most important development in the market after the establishment of the discount houses. This instrument made its appearance in 1964 which was incidentally four years earlier than the introduction of Sterling CDs to the London market in October 1968. Dollar CDs were introduced on a large scale in the United States in early 1961 but into the United Kingdom only in May 1966, a point which should be borne in mind by those who are inclined to suggest that the local market is behind the times.

A CD is a document issued by a bank certifying that a deposit has been made with it, repayable to the holder upon surrender of the certificate at maturity. The certificate also states the rate of interest, the date on which the deposit will mature and the amount of capital plus interest, that is the maturity value, payable on the maturity date.

Generally, certificates are issued in bearer form and as such are negotiable by simple delivery.

There is no minimum amount or period required but, to promote marketability, certificates which are issued at par, should be purchased to mature on a month end in round amounts of not less than R50 000 or preferably R100 000.

CDs are not eligible as security for advances by the Reserve Bank to the discount market, neither is the Reserve Bank prepared to discount them. CDs are not liquid assets as defined in the Banks Act and banks may not repurchase before maturity certificates which they have, themselves, issued.

CDs have proved, however, to be most attractive both to issuing banks and to holders.

The following are the main **attractions to the issuing banks**:

- (i) They are a useful way of raising large sums at a fixed rate of interest and for a fixed period.
- (ii) They enable the banks to improve or adjust their liquidity position without, possibly, having to sell certain assets in an unfavourable market.
- (iii) This market allows a mutual arrangement of liquidity positions between banks experiencing surpluses and shortages of liquidity respectively — an aspect which appeals more to the banks than to the authorities.

For the holder, the **advantages of investing in NCDs** are:

- (i) The rate of interest is comparable with that obtainable on a fixed deposit.
- (ii) In case of need, liquidity can be regained before maturity through sale in the secondary market at ruling market rates.
- (iii) There is greater flexibility of choice as to the desired date of issuance and maturity.
- (iv) NCDs issued by banks have the quality and safety required.
- (v) The anonymity between the ultimate lender and borrower, may also be an advantage.

A further benefit flowing from the fact that CDs do not qualify as liquid assets, is that rates of interest in the NCD market, which can vary from hour to hour, reflect fairly accurately the supply and demand for funds.

The popularity of the market can be gauged by the

outstanding amount of NCDs having increased from R3 million in 1965 to more than R520 million towards the middle of 1970. Of this figure, R335 million (or three-fifths of the total) were held by non-banks, that is by building societies, insurers, pension funds, investment companies, mining houses, local authorities as well as commercial and industrial companies generally. *²¹

Well-developed markets in interbank funds and CDs must strengthen the system as a whole by improving its ability to mobilise funds quickly in response to unforeseen demands.

METHODS OF TRADING

(a)

The treasury bill tender

The weekly treasury bill tender for bills of 91 days was established in 1958, prior to which the bills were offered sporadically to certain financial institutions and municipalities at predetermined discount rates for 3 to 6 month periods.

The weekly tender replaced this method with authorised tenderers being invited to apply for 91 day bills issued in multiples of R5 000, the minimum tender being set at R50 000. The houses have been accustomed to agree their rate of tender and the introduction of the tender was an important development as a bill rate arrived at through competitive tender more closely reflects the liquidity position of the banks and makes the whole system more sensitive to the authorities' monetary policies. Unfortunately, however, the authorities through the rigidity of their rate pattern have not allowed this particular aspect of the money market to develop as it could have done.

Apart from helping to finance Government's floating debt by tendering for the weekly offering of treasury bills, another important function is the market's operations in short-dated Government stock. As stock market jobbers increase the marketability of shares by being prepared to buy and sell them at prices reflecting their own evaluation of market trends, so the secondary market widens the market in short-dated gilts. The higher the market turnover in these securities, the closer is the matching of demand for and supply of varying maturities and the more attractive they become as investments.

(b)

Acceptances

Acceptances do not, as is customary for NCDs, necessarily mature on the month end and it is common to find paper in odd denominations which gives a useful flexibility to the investor.

It should be noted that the method of pricing is to take the maturity value and deduct the amount of interest at the purchase rate agreed. The result is that the yield is always slightly higher than the discount rate quoted.

It should be noted that both here and in London the market ignores the existence of a 366 day year.

Acceptances can be purchased direct from banks or from the secondary market. There is an advantage, of

course, in purchasing from the secondary market in that the seller will generally repurchase the paper on demand although naturally, the rate will depend on the state of the market at the time.

(c)

Negotiable certificates of deposit

are probably the other asset most likely to be dealt in by the corporate treasurer and here it should be noted that the rate quoted is the true yield on the price which will have to be paid for the period from date of purchase to maturity.

The consequences of this are that:

- (i) if the paper is held to maturity there can be no risk of reduction in yield;
- (ii) if the rates in the market fall there is the possibility of realising the investment earlier and passing on a lower yield to the purchaser — so improving the return on the investment for the period during which it has been held. In times of falling rates such profits can be substantial and it will pay to purchase an NCD, or other stock, with a maturity later than that actually desired;
- (iii) if the rates in the market rise, early realisation will naturally produce losses.

(d)

Buy backs

In view of the fact that it is not always possible to find paper for sale of exactly the maturity required, both the traditional and the parallel markets make full use of what are known as 'buy backs'.

Secondary market dealers will agree to sell money market instruments on the specific understanding that the same securities will be resold to them prior to maturity at a price calculated to give an agreed yield to the temporary holder. Similarly, agreements can be made whereby the temporary holder can, at his option, require the seller to repurchase the asset on giving an agreed period of notice. By so doing, the holder protects himself against the vagaries of the market with which he may feel himself to be insufficiently familiar and assures himself of a minimum yield as well as, on a call buy back, obtaining an option to improve it should the market move in his favour.

(e)

Forward dealing

has been a feature of the London market and has taken two forms. The **first** occurs where a bank wishes to take long-term money but the purchaser is reluctant to hold long dated paper which could be difficult to sell. The rate is fixed by the parties at the outset for the whole period — say three years — but the certificates are issued for a shorter term — say one year on the understanding that a new certificate will be issued at the same rate for a further year at the end of the first and second year.

The **second** form of forward dealing occurs where either the primary or secondary market dealers enter into contracts to buy or sell certificates at a future date when the parties concerned foresee in their own situa-

* At the instance of the tax authorities, NCDs are not issued to private individuals — Editor's note

tion a surplus or shortage of funds. Forward dealing can provide a hedge against changes in interest rates and can also involve considerable risks for the operators. With the very substantial rise in short-term rates in London the forward market has, understandably, contracted considerably and many are nursing badly burnt figures.

RATE PATTERNS

Some influences in the short-term market are:

- (a) the level of confidence in the stock market which in turn generally seems to follow the balance of payments position;
- (b) the level of Government spending;
- (c) seasonal inflows/outflows arising from the distribution of gold premiums, sale of crops and tax payments. The latter always seems to give rise to money shortages in January and July pending the return to the market of taxes paid in December and June;
- (d) As most of the money in the market inevitably comes from the banks, a shortage in the secondary market is usually a reflection of a trend towards a general shortage of funds among the banks. A high call money rate of the Houses then has an immediate multiplying effect on the cost of short-term credit throughout the banking system;
- (e) It also has to be remembered that some limitation is also placed on the liquidity of the secondary market by the agreement on their asset structure which the discount houses have with the Reserve Bank;
- (f) Apart from the technical factors mentioned, investors look for a return on investment to offset the effect of inflation and consideration must be given to the returns which may be earned on alternative investments outside the money market which in turn depends on the overall present and foreseeable level of economic activity requiring new investment.

THE CORPORATE TREASURER — HOW MONEY MARKET DEALING CAN HELP HIM

Each employee in an industrial or commercial undertaking should regard himself as a potential profit earner for his employer. Few employees have the opportunity available to the corporate treasurer.

The corporate treasurer's job includes control of the daily balances of his company's funds. The efficient treasurer will invariably cover his needs either through overdraft or other credit facilities and in times of surplus he will never leave funds idle in current account waiting for the next lean period.

Unfortunately, it is true to say that in practice funds often remain uninvested for long periods. This may arise through lack of familiarity with the market or the absence of adequate discretion from the company's board.

The corporate treasurer who spares a few moments each day to contact his broker can operate in the short-term money market and in this way increase the overall investment income of his company quite substantially. Daily bank balances should be analysed and where

surpluses appear likely the treasurer's duty is to invest these at the best available rates commensurate with security.

It is not difficult to appreciate the potential benefit to be had from paying attention to what is no more than a simple operation.

Today, most corporate bodies do formulate annual cash projections. The proper analysis of cash flows will usually bring to light the possibility of surplus funds being available for investment over periods longer than call. The longer the period the better the return and it is fair to assume that by placing money for three months the rate earned may be expected to rise another 1%.

The treasurer should be in regular contact with his broker, merchant bank and banker. A few calls a day will keep him in touch with the market and where he can obtain the best rates.

The function of the broker is to know which of the prime companies is a borrower or lender and to produce a safe, speedy and efficient service. The more sophisticated treasurer will analyse rate patterns and when, in a falling market, rates look attractive he may well deal forward rather than wait for the surplus to mature.

DEVELOPMENTS

The advent to South Africa of the parallel market performing a useful, efficient and complementary service to the traditional money market has brought with it a more flexible approach to financing. What other developments can be expected?

(a)
Amendments to Banks Act (Franzsen Commission)
The strongest influence on the money market in 1973 has been the important amendments to the Banks Act which in terms of the Financial Institutions Amendments Act came into force on November 1 last year.

Most of the amendments were first mooted in the **third report of the Franzsen Commission**.

The two recommendations of the Franzsen Commission with the greatest effect on the money market are likely to be:

- (i) That monetary control through cash reserve and liquid asset ratios alone — a principle enshrined in the 1965 Banks Act — be re-introduced but that the Reserve Bank be given power to adjust the ratios with greater speed than it could under the Banks Act then in force.
- (ii) The second important recommendation stemmed from the realisation that neither a credit ceiling nor variable cash reserve and liquid asset requirements were, on their own, keys to an effective monetary policy. The Commission recommended the better co-ordination of Government finance and other policies, Reserve Bank rediscount and balance of payment policies and public debt management as well as the introduction of open market operations.

The Commission then suggested that the technical committee, which was due to review the Banks Act, should investigate the possibility of narrowing the definition of liquid assets.²²

Let us take a look at liquid assets and then at open market operations.

5 SEPTEMBER 1972. SPITZ WINS 7 OLYMPIC GOLD MEDALS



News Photo : Courtesy United Press International.

The will to win.
Can a man succeed without it?

When 22-year-old Mark Spitz hauled himself from the water after his last race in Munich, he became the first man to win 7 Olympic Gold Medals. The idol of the Games. And the finest swimmer the world has ever known.

The will to succeed can carry a man a long way. But there are other things as well . . . Knowledge. Experience. Application.

Without them – particularly in the field of Portfolio Management – you could find yourself out of your depth.

Now, we can't show you any Gold Medals. But we can show you factual proof of the successes we have scored for our clients.

We don't take risks with money. But nor do we bury it like a talent in the ground. And since we know almost instantly what is going on, our quick-thinking decision-makers are in a position to use their vast experience and knowledge to take advantage of Market trends and movements.

Our services include the administration of Trusts, Estate Planning, Mortgage Participation Bonds, Property Development and Investment, Tax advice and returns, and all other aspects of

financial administration.

And in the field of Institutional Portfolio Management, our team is there to establish the best possible returns at the least risk to Pensions Funds, Insurance Companies and private investment companies.

So. Don't jump in the deep end. See us first.

Metboard

Peace of mind in a changing world

(b) Liquid assets

At present liquid assets are defined in the Banks Act²³. While most of these assets have indeed an intrinsic liquidity such as call deposits and self-liquidating trade bills — there are also among them those that have been defined by the authorities deliberately to provide a cheap source of funds as for example, the Land Bank and IDC securities.

As we have seen, the extent to which a bank can lend is dependent on its liquid asset base. Hence, these liquid assets are nearly always in demand and can command a relatively lower rate of interest than other evidences of debt.

The commission's guidance to the Technical Committee was that the list of liquid assets should be restricted. Alternatively, it was agreed that liquid assets be divided into two parts, some of which would be rediscountable at a more stringent rate than the others.

While incorporating most of the Franzsen recommendations into the revised Act, the Technical Committee rejected this liquid asset guideline. Instead, it stipulated that only 20% of bank acceptances and trade bills holdings will qualify as liquid assets — a none too ingenious compromise.

The effect of this decision will be to inhibit the desirable swapping of genuine trade finance from overdrafts into selfliquidating bills and perpetuate an overdraft system which, because banks never know when an overdraft facility is going to be used, forces them to hold an unnecessarily high level of liquid assets. Although they charge a commitment fee, the banks claim that this does not compensate for their loss of flexibility.

The introduction of open market operations could however, have counteracted this and, indeed, lead to the more intensive use by the market of available liquid assets. This has not turned out to be the case, at any rate initially.

(c) Open market operations

Open market operations occur when the authorities at their own discretion, inject money into the financial system by buying securities from the market or withdraw money by selling securities to the market.

The primary object is to keep the system primed in accordance with long-term monetary objectives while a secondary object is to iron out temporary money market fluctuations caused mainly by agricultural crop financing and tax payments to the Exchequer.

Open market operations are a form of indirect control used with great success in the United States. They were also introduced in Britain where for some time they were of limited effect because of the reluctance of the authorities to see large swings in the price of Government debt. Since September 1971, however, withdrawal of support for the London gilt market other than in special circumstances, has had a dramatic effect. It is no longer inconceivable that undated gilts there may yield over 12%.

In September 1971, an inter-departmental committee was set up to investigate the practicalities of introducing open market operations in South Africa.²⁴

The prerequisites of this operation are that there is a visible and sensitive market in which the authorities can operate, an acceptance on their part of relatively wide swings in interest rates, and the ability to read market trends correctly.

It was thought, however, that initial open market operations here would have in view only the secondary object of ironing out temporary money market fluctuations. The initial impact here appears to have been quite the reverse!

There are quite a number of problems to sort out. For instance, in choosing the securities in which the authorities are going to deal, the authorities must aim to ensure that action on the total amount of liquid assets is forthcoming and that not just a change in the structure of liquid assets is achieved.

The Reserve Bank may be faced with the situation, too, of having at times to act contrary to the short-term interest of Treasury funding.

There may also be times when wide fluctuations in interest rates cause political problems as well as Treasury funding problems.

The Reserve Bank will have to maintain a closer day-to-day contact with the money market and steps will have to be taken so that the effect of these operations is not nullified by the operations of the NFC and Public Debt Commissioners.

It will be clear from recent acute money market shortages that the nature and extent of open market operations can have a profound effect. Exactly what will be the effect in the long run, it is too early to forecast with any accuracy.

(d) Longer term developments

The longer term development of the money market here will depend on the ingenuity, far-sightedness and courage of the institutions involved in it and of the authorities.

Some avenues to consider are:

(i) *Local authority yearling bonds*

First, there is a case for investigating the implementation of a short-term market in local authority yearling bonds. Municipalities could play a much larger part in the money market. It is to be hoped that the provincial authorities will permit municipal treasurers and that they in turn will in fact look seriously at the possibility of issuing short-dated bearer bonds which in an active market could command finer rates than bank instruments. The potential is considerable.

(ii) *Wider marketing of gilts*

The potential for Government bonds is considerable. Not being bound by the statutory investment requirements applicable to banks and insurance companies, very few corporations in South Africa trade this stock. Whether it is cause or effect, I am not sure, but few specialist dealers are available even within the pension funds or insurance companies. There is however ample opportunity for the authorities to attract money by efficient marketing rather than by the imposition of required reserves.

(iii) *Commercial paper*

With some success, steps have already been taken within the legal confines of our Banks Act and Exchange Control Regulations to get off the ground a parallel market in prime commercial paper. Properly handled this market can be of great advantage to the economy.

(iv) *Wider use of overseas markets*

There is absolutely no reason why South Africa cannot in the future mobilise short-term capital far beyond its own borders. Certainly, in times of low interest rate structure abroad our balance of payments would, subject to exchange risks, benefit from the invisible earnings.

Government controlled industry (ESCOM and ISCOR) and more recently the Post Office have been the leaders in what must become an ever increasing sophistication in international borrowing and it is a pity that, largely on account of the Treasury's attitude towards overseas borrowing, corporations have generally been unable to follow suit.

Ladies and Gentlemen,

I hope that you have found this address interesting and I should like to thank you for your attention.

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An analysis of an international set of share indices

INTRODUCTION

It is often suggested in investment circles that the performance of overseas stock markets has a significant bearing on the trend of share prices in South Africa and that the price performance of the different sections of the local market are interrelated. Indeed, technical analysts base their prediction of future share prices on the statistical analysis of historical auto- and cross price associations and have built up a formidable folklore about them. Thus, it is believed, for example, that the Dow Jones Industrial average leads the South African and other industrial markets and that the Dow consistently moves in the opposite direction to gold shares. How valid, however, are these assumptions?

The purpose of the exercise described in this paper was to provide an answer to this question.

STATISTICAL ANALYSIS

In order to assess various index relationships, especially with regard to their predictive capabilities, a multiple regression and correlation analysis was carried out firstly on a set of weekly index values and secondly, on the set of weekly changes in those index values. For example, a sequence from the first set of data might take the form RDM = 250, 255, 253, 258 . . . ; the corresponding sequence from the second set of data would then take the form RDM = +5, -2, +5, The first set of data was used to determine predictive capabilities and interrelationships with respect to the overall level or trend of the various indices, whilst the second set was used to analyse week-to-week index changes.

The data comprised 389 weekly observations of the following six share indices, covering the seven and a half year period from January 1966 to June 1973:

- 1 Dow-Jones Industrial Average (DJ)
- 2 Financial Times (UK) Industrial Index (FT)
- 3 Eurosyndicat (EUR)
- 4 Financial Mail West Wits Gold Index (GOLD)
- 5 Financial Mail Mining Finance Index (MF)
- 6 Rand Daily Mail '100' Industrial Index (RDM)

An index lagged by a certain number of weeks is denoted by the index abbreviation, accompanied by a subscript referring to the number of weeks' lag, e.g. DJ lagged by two weeks is denoted DJ₂.

For investment analysts, the main point of interest lies in the predictive capability of the various indices. The indices of lag zero weeks were, therefore, regarded as dependent variates in the analysis and were excluded from use as predictors of one another. In order to obtain as general a prediction as possible, all indices at all the different lags (excluding lag zero) were considered as possible predictors of the indices at lag

zero. Thus, if any one index could be of significant use in predicting its own value or the value of some other index weeks in advance, this would be reflected in the regressions.

It was decided initially in the exercise to consider lags of one, two and three weeks only. This was done in order to prevent the possibility of indulging in unnecessary and uninformative additional computation and also because prior inspection of the data had suggested that these lags seemed the most appropriate for investigation. Had the subsequent results indicated a trend of increasing association the greater the lag considered, the exercise would have been continued using progressively larger lags for each new computation. But in the event, such a trend was disproved and so it was deemed pointless to continue the exercise using larger lags.

Using all lagged indices as possible predictors, the following were the regressions on the set of weekly index values that were found to be statistically well-established:

-
- 1 DJ = 0,96985 DJ₁
 - 2 FT = 0,99979 FT₁ - 0,03051 RDM₃
 - 3 EUR = 0,97482 EUR₁ + 0,00691 FT₁
 - 4 GOLD = 0,84898 GOLD₁ + 0,17277 GOLD₂
 - 5 MF = 0,98263 MF₁ + 0,24967 FT₁ - 0,21050 FT₂
 - 6 RDM = 0,69795 RDM₁ + 0,27035 RDM₂ + 0,02738 FT₁
-

The following statistically well-established regressions were generated on the set of weekly changes in the indices:

-
- 1 EUR = 0,03581 RDM₃
 - 2 GOLD = 0,13754 GOLD₁
 - 3 MF = 0,22249 FT₂ + 0,20802 RDM₂
 - 4 RDM = 0,58212 EUR₃ - 0,26967 RDM₁
-

By substituting into the derived regression equations appropriate values for the independent variates, it is possible to obtain the most accurate prediction possible based on the data used of the value of the dependent variate, namely the index at zero lag.

For example, consider the hypothetical case of a derived regression equation of the form:

$$\text{RDM} = 0,2 \text{ MF}_3 + 0,4 \text{ FT}_2$$

Suppose that the FT is currently standing at 450 and that the MF one week ago was standing at 500. It follows that the most accurate prediction for the value of the RDM two weeks hence is:

$$\text{RDM} = 0,2 \times 500 + 0,4 \times 450 = 280$$

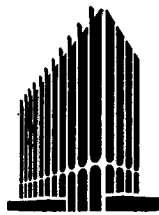
The same principle holds for the regressions on the set of weekly changes in the indices. For example,



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suppose that the FT has fallen by 9 points during the week just elapsed and that the MF had risen by 3 points during the previous week. It follows that if the derived regression equation for the weekly changes in the RDM is of the form

$$\text{RDM} = 0,2 \text{MF}_3 + 0,4 \text{FT}_2$$

then the most accurate prediction for the change in the RDM during the second week from now over its value at the end of the coming week is:

$$\text{RDM} = 0,2 \times 3 + 0,4 \times -9 = -3$$

The correlation matrices obtained on the two sets of data are shown in Table I and Table II respectively.

The values obtained in the correlation matrix represent measurements of the degree and sign of associations that exist between the indices at different time lags. The values of the measurements can lie anywhere between -1 and 1. A value close to 1 implies a near-perfect positive association; a value close to -1 implies a near-perfect negative association; a value of 0 implies that there exists no association whatsoever between two sets of indices. For example, when with respect to Table I, the correlation between MF and DJ (=0,37) is compared with that between MF and EUR (=0,86), it is found that MF and EUR follow the same trend to a far greater extent than MF and DJ. On the other hand, a comparison of the correlation between MF and GOLD (=0,65) with that of MF and DJ (=0,01) regarding the week to week index changes (Table II) reveals a close association between mining financial and gold share price movements but little connection between changes in MF and DJ. As an additional example, it is interesting to note the value of -0,26 found for the correlation between the weekly changes of RDM and RDM₁. This suggests a slight tendency for industrial shares to change direction of movement from one week to the next.

CONCLUSIONS

Important individual observations to be made from the analysis were as follows:

- 1 There appears to be a general economic force that governs the long-term trend of all share prices, but no such generalisation can be made about short-term price fluctuations.
- 2 DJ is rather independent of other share indices.
- 3 EUR has a remarkably high correlation of trend with MF and RDM.
- 4 MF and GOLD are highly correlated in respect of trend but in the case of week to week fluctuations their correlation is outstanding particularly when compared with the week to week correlations of other indices.
- 5 The trends of RDM and MF are highly correlated but those of RDM and GOLD are not.

In addition, the following two general observations made from the regressions are of particular interest to investment analysts:

- 1 Most of the indices display a tendency to return to trendlines or other functions some time after having departed from them. This suggests that investment

strategy based on technical analysis is fully justified. Based on the same line of reasoning, the notion of random walk is necessarily rejected; the notion of random walk is associated with the idea that successive changes in the values of the indices are determined in completely random fashion so that historical data are of no use whatsoever in determining future values. Acceptance of the notion of random walk would, therefore, have implied that there is no tendency for values to return to some sort of trendline after having departed from it, with the corollary that technical analysis is of no use in predicting future values.

- 2 Predictions relating to any given share index should use the historical data of that index. The cross-association between different indices is, however, significant only at zero time lag. In other words, the indices move in step with one another, and this means that for predictive purposes the association is not of use.

Note

For a more detailed consideration of the statistical and economic aspects of the above analysis, the reader is referred to an article by the same authors that will appear in the March 1974 edition of the South African Journal of Economics.

TABLE I

Correlation matrix of the indices themselves

	DJ	FT	EUR	GOLD	MF	RDM
DJ	1,0					
FT	,63	1,0				
EUR	,34	,65	1,0			
GOLD	,50	,52	,51	1,0		
MF	,37	,65	,86	,75	1,0	
RDM	,29	,52	,76	,30	,77	1,0
DJ ₁	,97	,62	,35	,51	,38	,31
FT ₁	,62	,99	,66	,53	,67	,54
EUR ₁	,33	,64	,99	,51	,86	,76
GOLD ₁	,51	,52	,52	,99	,75	,30
MF ₁	,35	,64	,86	,73	,99	,77
RDM ₁	,27	,50	,75	,28	,76	,98
DJ ₂	,95	,61	,36	,51	,38	,32
FT ₂	,62	,98	,67	,53	,69	,55
EUR ₂	,31	,62	,98	,50	,85	,75
GOLD ₂	,51	,52	,51	,98	,74	,31
MF ₂	,34	,62	,86	,72	,98	,77
RDM ₂	,24	,48	,75	,27	,75	,97
DJ ₃	,92	,60	,36	,52	,39	,33
FT ₃	,61	,97	,68	,54	,70	,56
EUR ₃	,28	,61	,97	,50	,85	,75
GOLD ₃	,52	,51	,52	,98	,74	,32
MF ₃	,32	,60	,85	,71	,98	,77
RDM ₃	,22	,46	,74	,26	,74	,96

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TABLE II

Correlation matrix of weekly changes in indices

	DJ	FT	EUR	GOLD	MF	RDM
DJ	1,0					
FT	,19	1,0				
EUR	,38	,19	1,0			
GOLD	-,15	,03	-,07	1,0		
MF	,01	,12	,07	,65	1,0	
RDM	,13	,13	,22	,06	,27	1,0
DJ ₁	,01	,01	,01	,07	,11	,04
FT ₁	,07	-,02	,06	-,10	-,02	,04
EUR ₁	,00	-,03	,07	,04	,09	,04
GOLD ₁	-,02	-,02	,07	-,14	-,05	,00
MF ₁	,01	,02	,08	-,08	-,06	,05
RDM ₁	-,06	,05	,04	-,02	,01	-,26
DJ ₂	-,06	,07	,05	-,10	-,02	,08
FT ₂	,01	,09	,05	,11	,21	,08
EUR ₂	,04	,07	,04	,03	,10	,13
GOLD ₂	,00	-,03	,02	,03	,00	-,03
MF ₂	-,05	-,03	,07	,05	,14	,07
RDM ₂	-,01	,00	-,04	,03	,19	,07
DJ ₃	-,04	,00	,08	-,03	,02	,06
FT ₃	,03	,11	,04	-,04	,05	,05
EUR ₃	-,03	-,02	,09	,00	,05	,01
GOLD ₃	-,01	,03	-,01	,10	,04	,02
MF ₃	-,02	-,02	,04	,00	,00	,11
RDM ₃	,09	-,02	,15	-,02	,00	,07

The re-investment assumption in capital budgeting examined

Capital budgeting is gaining an increasingly prominent place in investment analysis. The many assumptions that it introduces are often overlooked or not fully appreciated. This article sets out to examine a few of them. It begins by demonstrating that both the net present value method and the internal rate of return method (sometimes referred to as the discounted cash flow method) give identical answers for acceptance-rejection decisions on single projects. The apparent conflict between these two methods in comparing mutually exclusive projects is then examined. It is shown that this conflict arises from assumptions regarding the re-investment of funds generated by the project. Analysis by calculation of terminal values is suggested to enable the restrictions imposed by these assumptions to be removed. The article closes with a fairly detailed example of a terminal value calculation, which is free of implicit assumption.

Van Horne (1971) suggests that 'in general, the present value and internal rate of return of methods lead to the same acceptance or rejection decision' in capital budgeting proposals. However, 'when two investment proposals are mutually exclusive, so that we can select only one, the two methods may give contradicting results.' The reason for this he ascribes 'to different assumptions with respect to the re-investment rate on funds released from the proposal.' (pp. 61-63.) As these assumptions are important to the decision as to which proposal to choose and seem not to be well understood, this note seeks to analyse them in some detail.

We start with a simple acceptance-rejection decision involving a project whose benefits are constant for simplicity's sake. This last does not affect our analysis in any way. The internal rate of return which we wish to calculate is that rate which will discount the benefits to the initial cost of the project. If we take as our example a project costing R23 616 and yielding R10 000 a year for four years this rate is 25% as can easily be verified, where 0,8 is the annual discounting factor for 25%.

TABLE I

Year	Balance carried down	Receipt on last day of year	Year end balance	Discounted balance
4	0	10 000	10 000	8 000
3	8 000	10 000	18 000	14 400
2	14 400	10 000	24 400	19 520
1	19 520	10 000	29 520	23 616

In other words the present value of R10 000 received at the end of each year for four years is equal to R23 616 if the discount rate is 25%. If we now assume that our required rate of return is 10% we should accept this proposal.

It should be obvious that if the required rate of return is less than the internal rate and if this required rate is used to discount the benefits, a positive present value must result. Consider our second table where 0,9091 is used as the appropriate discounting figure for a required rate of 10%.

TABLE 2

Year	Balance carried down	Receipt on last day of year	Year end balance	Discounted balance
4	0	10 000	10 000	9 091
3	9 091	10 000	19 091	17 356
2	17 356	10 000	27 356	24 869
1	24 869	10 000	34 869	31 699
				Less 23 616
				R8 083

This last is the normal net present value calculation where the so called cost of capital is assumed to be 10%. The internal rate of return is merely that rate of interest that makes the net present value equal to zero. In a sense it is a special case of the general net present value calculation. Provided the cost of capital used to calculate the net present value is less than this internal rate, the discounted benefits must exceed the initial cost and the net present value must be positive. On both methods the decision is identical — accept. If the cost of capital were greater than the internal rate we would reject the proposal. If we calculated the net present value we would find it negative and again reject the proposal. Thus in straight acceptance-rejection decisions the methods give identical results.

We now turn to the question of re-investment of the benefits from a project which as Van Horne states create conflicts when two projects are compared one with the other. When we speak of re-investment we are viewing the project from the front, so to speak, as opposed to the discounting calculations where we can be said to be working backwards. In effect we are saying that if our internal rate of return is 25%, then the initial capital outlay invested at 25% must result in the same terminal value as the accumulated receipts from the project. This is seen most clearly in the two tables that follow. Table 3 shows the effect of investing R23 616 at 25% over four years while Table 4 accumulates the benefits at the same rate of interest.

The re-investment assumption in capital budgeting examined

TABLE 3

Year	Balance at start of year	Interest at 25%	Balance at end of year
1	23 616	5 904	29 520
2	29 520	7 380	36 900
3	36 900	9 225	46 125
4	46 125	11 531	57 656

TABLE 4

Year	Balance at start of year	Interest at 25%	Receipt at end of year	Balance at end of year
1	0	0	10 000	10 000
2	10 000	2 500	10 000	22 500
3	22 500	5 625	10 000	38 125
4	38 125	9 531	10 000	57 656
		17 656	40 000	

To re-state our results — if we invest our outlay on the project at 25% our accumulated sum at the end of four years will be the same as the accumulated benefits received from the project when re-invested at 25%.

To achieve this result we re-invested the entire benefits from the project at 25%. But, and this is the point often overlooked, re-investment is not an inherent assumption of the discounting model. It is done only to compare it with the usual compound interest calculation. We can quite easily drop this assumption and allow full or part consumption of the benefits and arrive at the same terminal value as the compound interest model, provided we apply the same consumption policy there. For instance let us assume that R5 000 is consumed annually. Our two tables will now appear as follows.

TABLE 5

Year	Balance at start of year	Interest at 25%	Consumption at end of year	Balance at end of year
1	23 616	5 904	5 000	24 520
2	24 520	6 130	5 000	25 650
3	25 650	6 413	5 000	27 063
4	27 063	6 766	5 000	28 829

TABLE 6

Year	Balance at start of year	Interest at 25%	Receipt at end of year	Consumption at end of year	Balance at end of year
1	0	0	10 000	5 000	5 000
2	5 000	1 520	10 000	5 000	11 250
3	11 250	2 813	10 000	5 000	19 063
4	19 063	4 766	10 000	5 000	28 829

Any other amounts may be re-invested or equally consumed in each case yielding the same terminal values. We can allow for full consumption of the benefits too, in which case the terminal values would be zero. Thus re-investment *per se* is not inherent in the

discounting model. The only assumption made is that whatever part of the benefits are re-invested, they must be re-invested at the rate of interest being used for the project. This assumption is made purely to enable a direct comparison with the compound interest model which itself contains this assumption.

A clear appreciation of this point enables one to understand far more clearly the implications of the various techniques for evaluating capital projects. Let us consider by way of contrast a second project which costs the same i.e. R23 616 but yields one benefit only — an amount of R48 970 in the fourth year. If we calculate its net present value with a cost of capital of 10% we will find it is R9 831. This is higher than the first project which was R8 083 (see Table 2), and suggests that the second is to be preferred. However, if we calculate the internal rate of return of this new project we find that it is 20% only, as opposed to our earlier 25% which suggests that the first is to be preferred.

If the previous analysis was clear it should be apparent how the conflict has arisen. Let us calculate terminal values for the second project using the internal rate of return and compare this with Table 4.

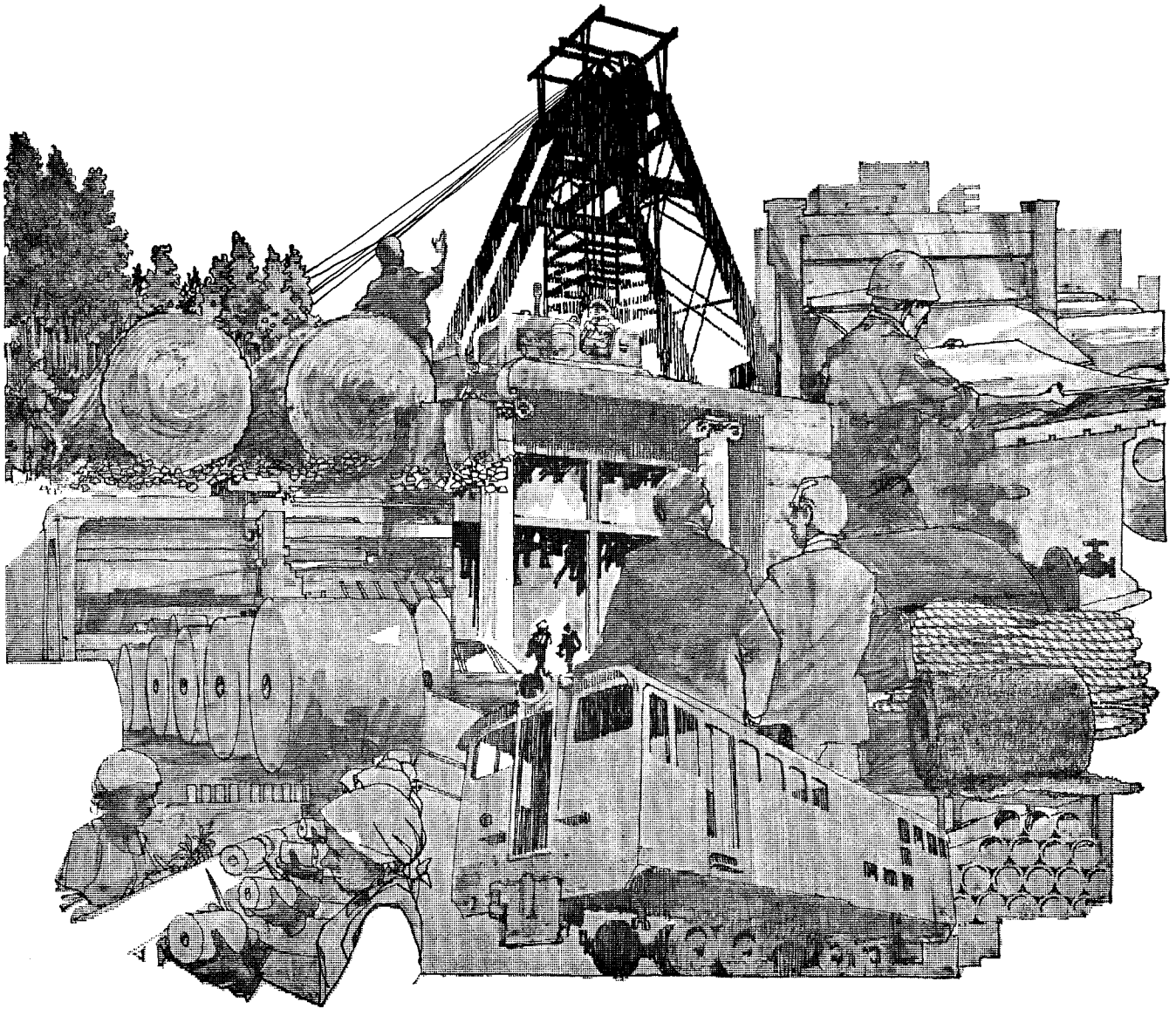
TABLE 7

Year	Balance at start of year	Interest at 20%	Receipt at end of year	Balance at end of year
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	48 970	48 970
		0	48 970	48 970

The difference between the two is startlingly obvious. Receipts from operations in the first (see Table 4) were only R40 000 compared to R48 970 for the second (see Table 7), but in the first these were re-invested to produce R17 656 in interest or further benefits (see Table 4 again), while in the second no such extra benefit accrued. The question of re-investment and the benefits that result is therefore crucial to the choice of an investment. It is this that leads to the conflict between the two methods since in the net present value method we are effectively using a rate of interest of 10%. If we re-invest our benefits at this rate we find that the interest earned is not sufficient to outweigh the added receipts from operations. This is clearly seen in the next table when interest on the first project now totals R6 410.

TABLE 8

Year	Balance at start of year	Interest at 10%	Receipt at end of year	Balance at end of year
1	0	0	10 000	10 000
2	10 000	1 000	10 000	21 000
3	21 000	2 100	10 000	33 100
4	33 100	3 310	10 000	46 410
		6 410	40 000	



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We are now in a position to draw our initial conclusions together. These may best be set out in point form where NPV and IRR are used as abbreviations for the net present value method and the internal rate of return method respectively.

- 1 Neither method makes any assumption regarding the actual quantity of funds re-invested.
- 2 Both methods assume that whatever funds are re-invested are invested at the rate of return used in the calculation, and that this rate is constant over the life of the project.
- 3 NPV and IRR give identical results for a simple accept-reject decision.
- 4 The IRR will tend to favour the project which generates funds early as these may be re-invested at the relatively high IRR rate. By contrast the NPV will tend, with its generally lower rate, to favour the project which produces the greatest overall inflow of receipts from operations.
- 5 NPV is the more conservative as it assumes re-investment of benefits at a generally lower rate than the IRR.

We are also in a position to state quite strongly that the timing of the cash flows from a project must be carefully analysed. This has been said many times in connection with ensuring a steady flow of cash to meet dividend and/or interest payments, but is not realised sufficiently in regard to the actual evaluation of a project. It is quite possible for example to analyse the purpose to which the benefit will be put and to calculate the amount that will be consumed and the rate of interest that will be earned on the balance. A terminal value may then be calculated and compared with another project. For instance let us assume that given our first project we could re-invest its entire proceeds at 20%. Our new terminal value would be as follows.

TABLE 9

Year	Balance at start of year	Interest at 20%	Receipt at end of year	Balance at end of year
1	0	0	10 000	10 000
2	10 000	2 000	10 000	22 000
3	22 000	4 400	10 000	36 400
4	36 400	7 280	10 000	53 680

We have used in effect the assumptions of Table 7 here i.e. a re-investment rate of 20%. The result is that the first proposal is preferable.

By calculating the terminal value of a project we are seeking to establish the wealth that it will generate at a point in time. In the words of Ezra Solomon, 'The valid comparison is not simply between two alternative courses of action. The ultimate criterion is the total wealth that the investor can expect from each alternative by the terminal date of the longer lived project . . .' (quoted in Cairns and Taylor, 1965). To stress the obvious, if two projects have different lives, it is necessary to extend the analysis of the shorter project to the end of the life of the longer project to make the wealth comparisons meaningful.

The concept of calculating future wealth is one that is easily understood and interpreted. There is no difficulty

in altering the re-investment ratio from year to year — one does not therefore assume a fixed re-investment policy. Equally, there is no difficulty in altering the interest rates earned by those portions of the funds re-invested. It would thus appear that wherever mutually exclusive projects are compared, the calculation of terminal values is the most preferable of the three methods considered in this paper.

Let us, to close, use our first example again. We assume that 100% of the first year's funds are re-invested at 25%. 75% of the second year's funds are re-invested at 20% and 50% of the third year's funds are re-invested at 10%. Our calculation would then appear as follows:

TABLE 10

Year	Balance at start of year	Interest rate	Interest	Receipt at end of year	Con- sumption at end of year	Balance at end of year
1	0	—	—	10 000	0	10 000
2	10 000	25%	2 500	10 000	2 500	20 000
3	20 000	20%	4 000	10 000	5 000	31 500
4	31 500	10%	3 150	10 000	7 500	37 150

Our investment of R23 616 has led to wealth of R37 150 at the end of four years. This implies an effective average rate of return of some 12% which is above our cost of capital.

The above examples indicate that where the investment problem involves the acceptance or rejection of a single project, either an NPV or IRR evaluation would be acceptable. With mutually exclusive projects, however, evaluation on the basis of terminal values has much in its favour. The ease with which terminal values can be calculated and the minimum of rigid assumptions they involve is apparent from the cases given.

References

- Cairns T. and Taylor I. R.
Planning for Capital Expenditure — Capital Budgeting Decisions, Paper presented to Institute of Cost and Works Accounts, 1965
- Van Horne J. C.
Financial Management and Policy, 2nd ed. Prentice-Hall, 1971



Fowler Construction Limited

Profit Announcement

The following are the audited group results for the year ended 30th June, 1973 together with comparative figures for the past five years.

All figures in R000's	1969	1970	1971	1972	1973
Profits					
Before taxation	171	305	372	1 237	2 717
Net profit after taxation (adjusted)	101	181	279	664	1 574
Dividends paid	50	75	100	200	400
<hr/>					
Dividend cover	2	2,4	2,79	3,3	3,9
<hr/>					
Financial position					
Current assets	1 136	2 226	3 434	4 996	5 868
Fixed assets	1 421	2 517	4 128	4 807	6 156
Total capital employed	2 557	4 743	7 562	9 803	12 024
Current liabilities	936	1 985	5 320	5 337	6 253
Long-term liabilities	305	1 187	224	1 750	1 883
Outside shareholders' interest	—	127	139	100	110
Shareholders' equity	1 316	1 444	1 879	2 616	3 778

T. C. Heffer
Secretary

Private Bag 4—Kempton Park
6th October, 1973

A note on the rule of 72 or how long it takes to double your money

Many investors are no doubt familiar with this rule which can be used for quick mental calculations. The rule states:

For any amount which is compounding periodically at a fixed growth rate, the number of periods required for that amount to double can be estimated by dividing the percentage growth rate into 72.

For example, if R100 is invested at an interest rate of 8% per annum compounding annually, how many years will it take for the investment to double in value?

$$\text{Number of years} = \frac{72}{\text{interest rate}} = \frac{72}{8} = 9 \text{ years}$$

The aim of this note is to comment on the accuracy of this calculation.

Mathematical derivation

For a principal investment P, invested at a compound interest rate of r% per period, the amount A after n periods is given by:

$$A = P\left(1 + \frac{r}{100}\right)^n$$

For the principal investment to double, i.e. A = 2P,

$$2 = \left(1 + \frac{r}{100}\right)^n$$

Taking the natural logarithm of both sides of the equation

$$\log_e 2 = n \log_e \left(1 + \frac{r}{100}\right)$$

$$\text{i.e. } n = \frac{\log_e 2}{\log_e \left(1 + \frac{r}{100}\right)}$$

From natural logarithm tables $\log_e 2 = 0,693$.

Applying a power series expansion to $\log_e \left(1 + \frac{r}{100}\right)$ this is:

$$\log_e \left(1 + \frac{r}{100}\right) = \left(\frac{r}{100}\right) - \frac{1}{2}\left(\frac{r}{100}\right)^2 + \frac{1}{3}\left(\frac{r}{100}\right)^3$$

for $-100 < r \leq 100$

$$\begin{aligned} \text{Thus } n &= \frac{0,693}{\frac{r}{100} - \frac{1}{2}\left(\frac{r}{100}\right)^2 + \frac{1}{3}\left(\frac{r}{100}\right)^3 \dots} \\ &= \frac{69,3}{r\left(1 - \frac{r}{200} - \frac{r^2}{30\,000} \dots\right)} \quad 1 \end{aligned}$$

As shown below, for low values of r this may be approximated by

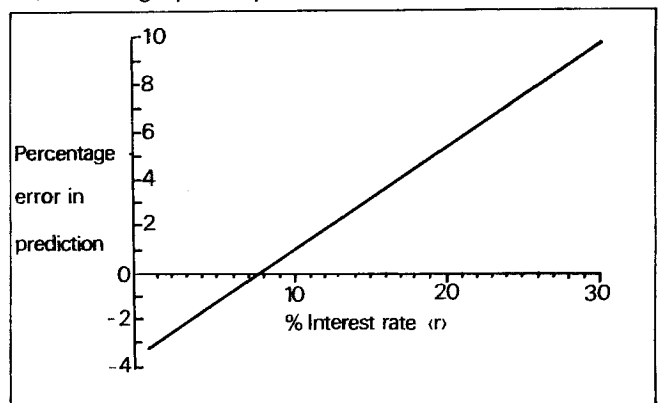
$$n = \frac{72}{r} \quad 2$$

72 is chosen as it is easily divisible by most numbers for mental calculations. It will also, as shown below, give the correct relationship at an 8% interest rate.

Comparing some values predicted by the rule — equation 2 — with the true values as obtained from equation 1, we get the following:

Rate % per period	Predicted number of periods (eq. 2)	Actual number of periods (eq. 1)
1	72,0	69,7
2	36,0	35,0
4	18,0	17,7
8	9,0	9,0
16	4,5	4,7

Or, for the graphically minded:



In the case of continuous compounding, the amount is given by:

$$A = \frac{r}{Pe} \frac{n}{100}$$

For the principal to double, i.e. A/P = 2, the equation becomes:

$$2 = \frac{r}{e} \frac{n}{100}$$

$$\text{or } n = \frac{\log_e 2}{r/100} = \frac{69,3}{r}$$

Thus if the rule of 72 is used for continuous compounding, there is a constant error for all values of r, viz:

$$\% \text{ error using rule} = \frac{72-69,3}{69,3} \times 100 = 3,9\%$$

Reference

Abromowitz, M. and Segun, I. A. 'Handbook of Mathematical Functions', Dover Publications, Inc., New York, 1965