

The
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Die
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ontleiders
Tydskrif

Nommer 27 Mei 1986

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Contents

Die Beleggingsontleders Tydskrif

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Inhoud

This issue in brief

Investor information requirements and disclosure in annual reports

The availability of information is central to security evaluation and, hence, to the efficient functioning of financial markets. In South Africa, requirements for the disclosure of information by listed companies are set by statute, by the Accounting Practices Board and by the JSE. However, such requirements provide for minimum disclosure whereas in practice many companies exceed what is required of them in terms of official regulation. In this paper, Messrs Firer and Meth report on an investigation of the extent to which the non-statutory information requirements of investors are being met in this country. Their findings suggest that many listed companies need to revise their thinking about disclosure.

An investigation into the return distributions of ordinary industrial shares on The Johannesburg Stock Exchange

Risk has always been acknowledged as being important in investment analysis but its importance has changed with the development of modern portfolio theory. While previously its quantification related only to variations in the rate of discount in present value estimation, in MPT its quantification is concerned with the variability of an individual share's returns in relation to the returns of the market as a whole. Difficulties arise, however, in the measurement of such variability. This paper by W G Klerck and G S du Toit deals with particular problems relating to the skewness of JSE return distributions and how these problems may be overcome.

The valuation of call options on gilts and warrants in South Africa

Although the trading of options on European stock exchanges can be traced back to the seventeenth century, and although the first options were traded in South Africa as early as 1887, option trading in this country has been very limited until comparatively recently. However, since mid-1984, the situation has begun to change and dealing in put and call options in the gilt edged security market has increased considerably. This paper describes the current state of option trading in the Republic and the results of tests concerned with the local applicability of the Black-Scholes model.

Investor information requirements and disclosure in annual reports <i>C Firer and G Meth</i>	11
An investigation into the return distributions of ordinary industrial shares on The Johannesburg Stock Exchange <i>W G Klerck and G S du Toit</i>	19
The valuation of call options on gilts and warrants in South Africa <i>M le Plastrier, W Thomas and J Affleck-Graves</i>	23
Criteria for major investment decisions <i>G S Andrews and F Butler</i>	31
Inflation as an obstacle to job creation in South Africa <i>R W Bethlehem</i>	39
Investment basics XVIII Risk and return – part I <i>G T D Jones</i>	49

Criteria for major investment decisions

The objective of this paper is to report on an empirical study concerning capital budgeting methods used in South Africa by companies operating in a wide range of industrial sectors. Sophistication in investment decision-making is clearly important to corporate performance and the paper serves the purpose of showing the link between them. The study was part of a research project conducted at the Wits Business School.

Inflation as an obstacle to job creation in South Africa

The causal relationship between inflation and unemployment, if indeed it exists, is of considerable importance to economic policy in all countries because it defines the parameters within which policy has to be specified and executed. In the more advanced economies, most notably Britain and the United States, empirical investigation prior to the 1970s pointed to a distinct trade-off but this has become much less clear in more recent years and the trade-off has also been questioned on theoretical grounds. This paper deals with the relationship in South Africa focusing particular attention on its implications for economic growth and job creation, a matter of considerable political interest. The paper's conclusions are inconsistent with much of the conventional wisdom on the subject.

Investment basics XVIII – risk and return – part I

This article by G T D Jones is the first of a new series in our Investment Basics section and deals with the important ideas upon which modern portfolio theory is based. It spells out in straightforward terms what is meant both by risk and return, and makes difficult mathematical concepts understandable through the use of arithmetical illustration.

The following firms have, in addition to our advertisers, assisted in the financing of this issue of the journal and thanks are due to them for their kindness.

Bo en behalwe ons adverteerders, het die onderstaande maatskappye hulp verleen met die finansiering van hierdie uitgifte van die tydskrif en hulle bedank vir hulle vriendelikheid.

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The Investment Analysts Journal

Die Beleggingsontleders Tydskrif

Twenty-seventh issue
May 1986

As this issue of the Investment Analysts Journal goes to press, a new crisis has exploded over local financial markets and over the foreign exchange market in particular. It is too soon at this stage to say what the likely longer term consequences for security prices or the rand exchange rate will be of last week's military strikes against ANC bases in three neighbouring countries, but from the point of view of the country's negotiations with foreign bankers and of checking the haemorrhaging of capital outflows via the balance of payments, the strikes could not have happened at a more unfortunate time. It may be that the limited loss of life and other positive factors, when viewed against a heightened international concern about terrorism, will dominate, and that in a short period the dust of overseas indignation will settle. But the danger has to be faced that such a favourable outcome will not eventuate. The nervousness of the exchange market in the days immediately following the strikes is indication enough of the widespread concern of people involved with the economy.

It was, perhaps, inevitable that a National Party government in South Africa, committed to a policy of reform so very late in the day, should have found itself under an intensification of pressure from all sides in the conflict over apartheid. And it was, no doubt, inevitable also that controversy should have surrounded the sincerity of the Government's undertakings. After all, reform implies an admission that something is wrong in principle with an established order, and it is not unreasonable to suspect, when such a delayed turnaround in policy comes after such a protracted and sustained criticism, both within the country and abroad, that it comes not from conviction but from expediency. Certainly, the Government's own actions have given credence to the view, despite its protestations to the contrary, that it only yields when it has to. But sight should also not be lost of the substantial changes of a positive nature that the Government itself has initiated. In terms of the past, these can hardly be described as cosmetic, whatever the criticisms that may be levelled at the Government either because of their substance or its handling of the security situation, and their continuation, despite the erosion of support the Government has suffered within its own constituency, must be taken as a measure of its commitment. Mr P W Botha, on any objective evaluation, has acted with considerable courage, and this deserves acknowledgement, even by his opponents.

Given what has happened concerning reform, the question arises as to what has gone wrong. Why should reform have produced such a negative reaction not only amongst those committed to a revolutionary take-over or amongst those implacably set against any kind of change in the power structure, but also amongst more ordinary people whose real concerns are for stability and for getting on with their own lives? The answer to that question has much to do with the way in which reform has been approached and the Government's attitude to powersharing. While the President and members of his

Sewe en twintigste uitgawe
Mei 1986

Teen die druktyd van hierdie uitgawe van die Tydskrif vir Beleggingsanaliste het 'n nuwe krisis oor die binne-landse finansiële markte en oor die valutamark in die besonder losgebars. Dit is op hierdie tydstip nog te vroeg om te kan sê wat die moontlike langertermyngevolge van verlede week se militêre aanvalle op ANC-basisse in drie buurlande vir effektepnyse of vir die rand se wisselkoers sal wees, maar met die oog op die land se onderhandelinge met buitelandse banke, en om die uitvloeï van kapitaal via die betalingsbalans te stuit, kon die aanvalle nie op 'n ongelukkiger tydstip plaasgevind het nie. Dit kan wees dat die beperkte lewensverlies en ander positiewe faktore, as hulle teen die agtergrond van die groter internasionale besorgdheid oor terrorisme gesien word, sal oorheers en dat die stof van oorsese verontwaardiging sal gaan lê. Maar die gevaar bestaan dat so 'n gunstige uitslag nie werklikheid sal word nie. Die gespannenheid van die valutamark gedurende die dae net na die aanvalle is genoeg aanduiding van die wydverspreide besorgdheid van mense wat by die ekonomie betrokke is.

Miskien was dit onvermydelik dat 'n Nasionaleparty-regering in Suid-Afrika, wat hom op hierdie laat tydstip tot 'n beleid van hervorming verbind het, homself in die konflik oor apartheid van alle kante onder toenemende druk sou bevind. En dit was, sonder twyfel, ook onvermydelik dat daar meningsverskil sou wees ten opsigte van die opregtheid van die Regering se ondernemings. Hervorming impliseer per slot van rekening 'n erkenning dat daar in beginsel iets aan die bestaande orde haper, en wanneer so 'n vertraagde ommekeer in beleid na sulke uitgereikte en volgehoue kritiek, binne- sowel as buitelandse, plaasvind, is dit nie onredelik nie om te vermoed dat dit nie uit oortuiging nie maar uit gerief voortspruit. Die Regering se eie optrede het geloofwaardigheid aan hierdie gesigspunt verleen, ondanks sy protes tot die teendeel dat hy alleen toegee wanneer hy moet. Maar die aansienlike veranderinge van 'n positiewe aard wat die Regering self geïnisieer het, moet ook nie uit die oog verloor word nie. In vergelyking met die verlede kan dié veranderinge nouliks as kosmeties beskryf word, welke kritiek ook al na die Regering se hoof geslinger word, hetsy weens hulle inhoud of sy hantering van die veiligheidsituasie, en die voortsetting daarvan, ondanks die steun wat die Regering in sy eie geledere verloor het, moet as 'n maatstaf van sy verbondenheid gesien word. Mnr P W Botha het volgens enige objektiewe evaluering met groot moed opgetree en dit verdien erkenning, selfs van sy teenstanders.

Met die oog op wat daar ten opsigte van hervorming gebeur het, ontstaan die vraag wat nou eintlik verkeerd geloop het. Hoekom sou hervorming so 'n negatiewe reaksie uitlok, nie alleen by diegene wat hulle tot 'n rewolusionêre oornameword verbind het nie, of dié wat hulle onverbiddelik teen enige vorm van verandering in die magstruktuur verset, maar ook by gewone mense wat werklik oor stabiliteit besorg is en graag net met hulle dagtaak wil voortgaan? Die antwoord op dié vraag het

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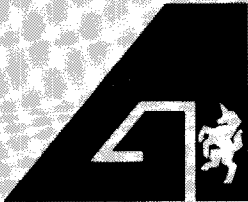
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Cabinet have made the point repeatedly that their goal is full participation for all in the political process irrespective of race but within structures that are protective of minority rights, and while they have repeatedly said that such structures must be the product of negotiation, no meaningful negotiation, certainly not with credible leaders in the black community, have yet been seen to take place. Even Chief Mangosuthu Buthelezi, whose antagonisms with the ANC and whose statements of support for a market economy one would have thought would have qualified him for consultation, appears to have been ignored. This is beyond belief given the need to create confidence not only in the Government's intentions but also in its ability to act effectively.

Nothing sums up the Government's attitude to power-sharing better than the maintenance of its exclusive control over the SABC. This is a corporation funded by public money and the public interest should best be served (assuming there to be a link between objective reporting and comment, and the public interest) by the preserving of its independence. Yet each time there has been a major reshuffling of top jobs at the SABC in recent years we have been reminded of this exclusive control by the near total absence of English names, not to mention the names of people of other population groups, in the appointments announced. Such a situation is extraordinary given the talent there is to draw upon in other communities, and one is driven to speculate about whether these communities are not sufficiently to be trusted with the shared control of so important a medium. The Government says it is willing to share power with blacks given agreement on the constitutional safeguarding of minorities, but the question remains as to whether, even within the white fold, it is willing to share power with other groups. And were the authorities to argue that this was a misleading or inaccurate reflection of their true attitude, it would still have to be said that it was a thoroughly accurate reflection of how their attitude is perceived, which is itself sufficient cause for disquiet.

There is a danger in making a point such as this because it is liable to attract accusations of prejudice. That, certainly, is not its intention, least of all in a journal which from its inception has observed a strict policy of being bilingual and non-discriminatory. But imagine the situation were a South Africa in 1910 to have had an English-speaking majority which proceeded to use its democratic leverage and imperial connection to keep Afrikaners out of high office in the public sector, and out of the top jobs of institutions, such as the universities, which were of direct cultural and educational concern to the Afrikaans community. After Lord Charles Somerset and Slagtersnek, can it be doubted that we would have been confronted, with an ANC of a different kind (an Afrikaner National Council perhaps) dedicated to the promotion of Afrikaner autonomy and dignity, and prepared even to use violence, after decades of frustration, to achieve its understandable political objectives.

While it has to be conceded that the English-language universities in South Africa have been largely left to English-speaking administration, that has not been the case with universities established specifically for Indians, coloureds and blacks. However, even the administration of the English-language universities has not been without compromise to its autonomy because of government tampering with academic freedom. In the case of the ethnic universities, principals have continued to be appointed from amongst people in the Government's own constituency with unfortunate consequences for the credibility of government policy. Such a situation can

heelwat te doen met die manier waarop hervorming benader word en met die Regering se houding ten opsigte van magsdeling. Hoewel die President en lede van sy Kabinet by herhaling gesê het dat hulle volle deelname vir almal aan die politieke proses beoog, ongeag ras, maar binne 'n raamwerk wat die regte van minderheids-groepe beskerm, en hoewel hulle dikwels gesê het dat sulke strukture die gevolg van onderhandeling moet wees, het sinryke onderhandeling tot dusver beslis nie met geloofwaardige leiers in die swart gemeenskap plaasgevind nie. Selfs Hoofman Mangosuthu Buthelezi, wie se antagonisme teenoor die ANC en wie se verklaarings oor steun vir 'n markeconomie hom seker vir onderhandeling geskik maak, is blykbaar oor die hoof gesien. Dit is ongelooflik weens die behoefte daaraan om vertroue te skep, nie alleen ten opsigte van die Regering se voornemens nie, maar ook ten opsigte van sy vermoë om doelmattig op te tree.

Niks is 'n beter samevatting van die Regering se houding ten opsigte van magsdeling as die handhawing van sy uitsluitlike beheer oor die SAUK nie. Dit is 'n korporasie wat met publieke geld gefinansier word en die publiek se belange moet ten beste gedien word (in die veronderstelling dat daar 'n skakel tussen objektiewe verslagdoening en kommentaar en die openbare belang moet wees) deur die behoud van sy onafhanklikheid. Maar elke keer wanneer daar in die jongste tyd 'n herskommeling van topposte in die SAUK was, is ons aan die eksklusiewe beheer herinner deur die byna algehele afwesigheid van Engelse name, om nie eens van name van mense van ander bevolkingsgroepe te praat nie, wanneer die aankondigings bekend gemaak is. So 'n situasie is ongevoel met die oog op die talent wat daar in ander gemeenskappe is om uit te put, en 'n mens word daartoe gedwing om te wonder of dié gemeenskappe nie genoeg vertrou kan word met die gedeelde beheer van so 'n belangrike medium nie. Die Regering sê hy is gewillig om mag met swartes te deel indien hy ten opsigte van konstitusionele beskerming van minderheids-groepe 'n onderneming gegee kan word, maar die vraag bly steeds of hy, selfs binne die blanke geleedere, bereid is om die mag met ander groepe te deel. En hoewel die owerheid beweer dat dit 'n misleidende of onakkurate weerspieëling van sy ware houding is, moet daar steeds genoem word dat dit 'n deeglik akkurate weerspieëling is van hoe sy houding deur ander waargeneem word, en dit is op sigself 'n rede tot kommer.

Daar skuil gevaar in so 'n stelling omdat dit moontlik beskuldigings van vooroordeel kan uitlok. Dit is beslis nie die bedoeling nie, allermens in 'n blad wat van sy begin af 'n streng beleid van tweetaligheid en geen diskriminasie nie gevolg het. Maar stel die situasie voor indien Suid-Afrika in 1910 'n Engelssprekende meerderheid sou gehad het wat sy demokratiese mag en imperiale verbintenis sou gebruik het om Afrikaners uit hoë poste in die openbare sektor en uit die beste betrekkings in instellings, soos byvoorbeeld universiteite, sou hou wat van regstreekse kulturele en opvoedkundige belang vir die Afrikaanse gemeenskap was. Kan daar na Lord Charles Somerset en Slagtersnek twyfel bestaan dat ons gekonfronteer sou word met 'n ANC van 'n ander soort ('n "Afrikaner National Council" miskien), toegewy aan die bevordering van Afrikaner-outonomie en -waardigheid, en wat na dekades van frustrasie selfs bereid sou wees om geweld te gebruik ten einde sy begryplike politieke oogmerke te bereik?

Hoewel daar toegegee moet word dat die Engelstalige universiteite in Suid-Afrika grotendeels deur Engelssprekendes geadministreer word, is dit nie die geval met uni-

become intolerable for the groups concerned for it leaves them subject to the rule of others, and it is this, surely, from which we have to get away. In a country of truly shared responsibility, where all identified as South Africans first, it would not matter, beyond the consideration of an individual's professional qualifications, who got the job.

What is understandable for Afrikaners must also be understandable for others. At present we are being confronted by a concerted attempt by black activists to redress injustices that they feel, but which others also perceive. It is an attempt, in its crudity, which is taking on ugly dimensions that are not without very grave possible consequences for the future. In an endeavour to establish their control in three specified areas, namely, in the townships, in the area of organised labour and in black education, a reign of terror has been begun. It is not possible to say where the terror is going to end but its cost, in lives and to the economy, is already proving too high, and if it is allowed to continue, could prove catastrophic.

Reigns of terror are the dreadful companions of revolutions but they inevitably, through their excesses, lead to the defeat of the ideals which the poets and the philosophers of the revolutions have attempted to promote. The damage done by terror during the French Revolution did not end either with the dictatorship of Napoleon or with the exhaustion of the French public after the blood and violence it involved. The damage continued even beyond the passing of the generation that had perpetrated the killing. It may be argued by some that France has never really fully recovered from its consequences.

The main concern of all in South Africa today must be the speedy ending of the violence that is engulfing the black townships. If the violence is not ended, it will overflow inevitably (indeed, has already begun to overflow) into other areas. It is a violence, furthermore, which is threatening economic growth, and it is such growth alone which offers hope for meeting the challenges of a demographic transformation of dramatic scale which is going to occur between now and the end of the century. During the first half of the present decade, real GDP in South Africa increased at an average rate of approximately 1,1 per cent per annum, substantially less than the average increase in the total population of around 2,5 per cent per annum or the increase in the black population of over 3 per cent per annum. The failure of growth is not acceptable because it means that jobs are not being created fast enough, and unemployment (particularly black unemployment) is rising dangerously.

Dispossessed and desperate people have an answer to the postponement of the solving of their problems, and this we have had demonstrated in South Africa in no uncertain terms over the past eighteen months. In the cruelty and destructiveness of its violence it is a mindless answer, and it elicits a mindless response from others who, in different circumstances, would prefer to deal with social matters in an orderly and rational way.

An orderly and rational way out for South Africa from its present tragic difficulties remains possible, but it requires both of the Government and of its opponents that they submerge their immediate party interest to the greater interest of the country as a whole. The problems of the present crisis are too great for the National Party, on its own admission, or any other ideologically controversial and constrained body, to solve alone. On a purely clinical evaluation, they are of a magnitude only a government of national unity, comprising the country's best

versiteite wat spesifiek vir Indiërs, kleurlinge en swartes gestig is nie. Weens die inmenging van die Regering met akademiese vryheid was selfs die administrasie van die Engelstalige universiteite nie sonder kompromie met betrekking tot hulle outonomie nie. In die geval van die etniese universiteite is prinsipale nog altyd aangestel uit mense uit regeringsgeledere, met ongelukkige gevolge vir die geloofwaardigheid van regeringsbeleid. So 'n situasie kan vir die betrokke groepe ondraaglik word omdat dit hulle onderworpe stel aan regering deur ander, en dit is sekerlik iets waarvan ons moet wegkom. In 'n land van werklik gedeelde verantwoordelikheid waar almal in die eerste plek Suid-Afrikaners is, sal dit nie saak maak nie, en slegs die professionele kwalifikasies van die persoon wat die pos moet vul, hoef oorweeg te word.

Wat vir Afrikaners begryplik is, moet ook vir ander verstaanbaar wees. Tans word ons gekonfronteer met die gesamentlike optrede van swart aktiviste om onbillik-hede reg te stel wat hulle voel, maar wat ander ook waarneem. Dit is 'n poging, wat in sy ruheid lelike afmetings aanneem en in die toekoms moontlik bra ernstige gevolge kan hê. In 'n poging om hulle beheer op drie spesifieke gebiede, naamlik in die swart dorpsgebiede, georganiseerde arbeid en swart onderwys te vestig, is 'n skrikbewind begin. Dit is nie moontlik om te sê waar die terreur gaan eindig nie, maar die koste daarvan, aan lewens en vir die ekonomie, blyk reeds te hoog te wees, en indien dit toegelaat word om voort te gaan, kan dit rampspoedig wees.

Skrikbewinde is die afgryslike meelopers van rewolusies, maar weens hulle buitensporigheid lei hulle onvermydelik tot die vernietiging van die ideale wat die digters en die filosofe van die rewolusies beoog het om te bevorder. Die skade wat tydens die Franse Rewolusie deur terreur aangerig is, het nie met of die diktatorskap van Napoleon of met die aftakeling van die Franse publiek geëindig, ná die bloed en geweld wat dit meebring het nie. Die skade het gebly, selfs na die verdwyning van die geslag wat die moorde bedink het, en daar kan wel aangevoer word dat Frankryk nooit heeltemal van die gevolge herstel het nie.

Die hoofbesorgdheid van almal in Suid-Afrika moet tans die spoedige beëindiging van die geweld wees wat die swart woongebiede verswelg. Indien die geweld nie beëindig word nie, sal dit onvermydelik tot ander gebiede uitbrei (trouens, dit is reeds die geval). Origens is dit 'n geweld wat ekonomiese groei bedreig, en dit is dié groei wat hopelik die uitdagings van 'n demografiese transformasie van dramatiese omvang, wat tussen nou en die einde van die eeu gaan plaasvind, die hoof sal bied. Gedurende die eerste helfte van die huidige dekade het die reële BBP in Suid-Afrika teen 'n gemiddelde tempo van ongeveer 1,1 persent per jaar toegeneem, aansienlik minder as die gemiddelde toename in die totale bevolking, ongeveer 2,5 persent per jaar, of die vermeerdering in die swart bevolking van meer as 3 persent per jaar. Die onvermoë om te groei, is onaanvaarbaar omdat dit beteken dat werksgeleenthede nie vinnig genoeg geskep word nie, en werkloosheid (veral swart werkloosheid) gevaarlik toeneem.

Ontvreemde en desperate mense het 'n antwoord vir die uitstel van oplossings vir hulle probleme, en ons het gesien hoe dit gedurende die afgelope 18 maande op geen onsekere wyse in Suid-Afrika gedemonstreer is nie. Weens die wreedheid en vernietigende aard van die geweld is dit 'n sinnelose antwoord, en dit lok 'n sinnelose reaksie van ander uit wat in ander omstandighede

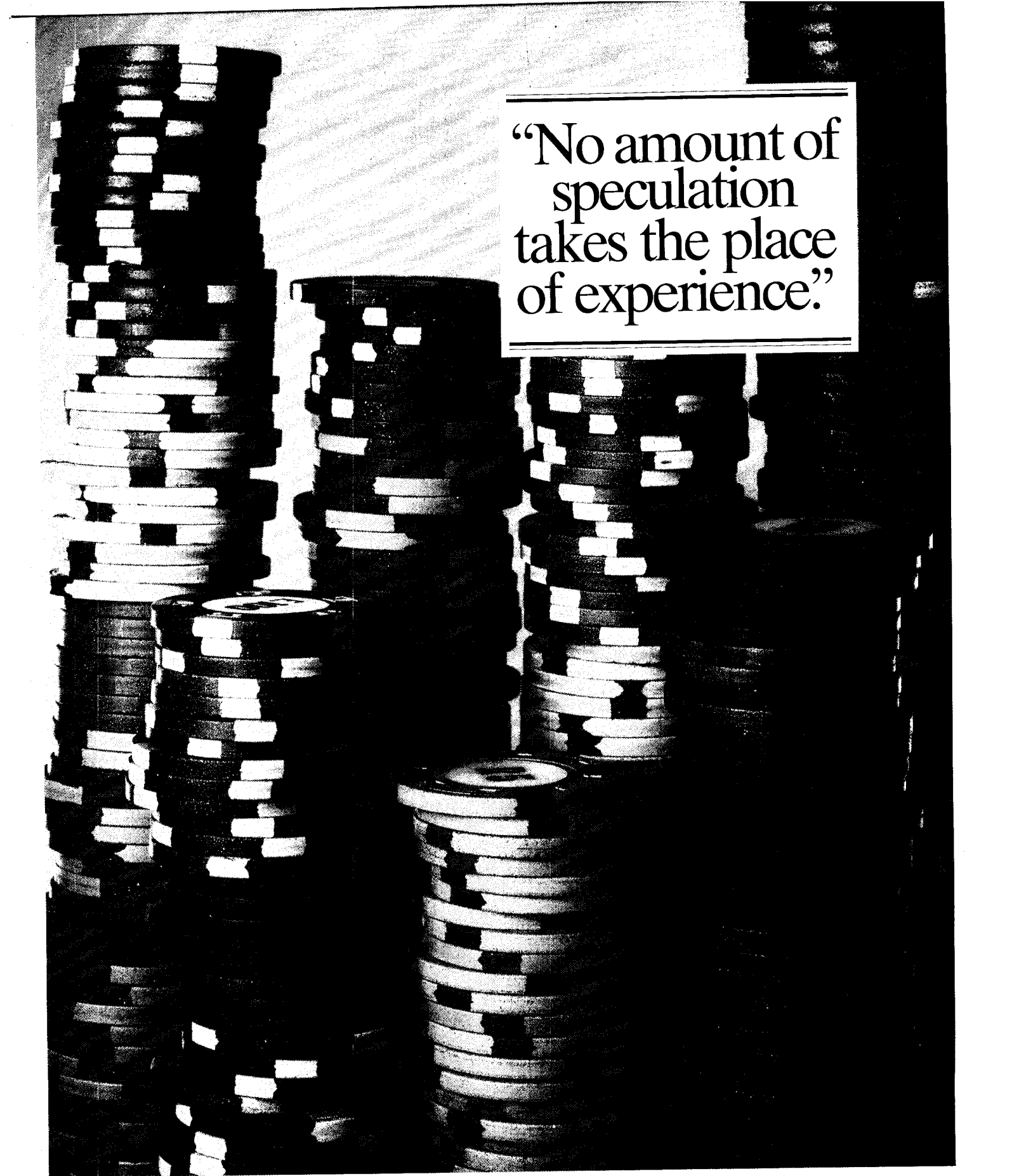
talents, could properly handle. The call for such a government has been made. It is a call we can only hope will be heeded.

The editor

sou verkies het om maatskaplike aangeleenthede op 'n ordelike en rasionele manier te benader.

'n Ordelike en rasionele uitweg is steeds vir Suid-Afrika uit sy huidige tragiese probleme moontlik, maar dit verg van die regering sowel as van sy teenstanders dat hulle hul onmiddellike partybelange ondergeskik moet stel aan die groter belang van die land as geheel. Die probleme van die huidige krisis is te groot vir die Nasionale Party, volgens sy eie erkenning, of enige ander ideologiese kontroversiële en beperkte liggaam, om dit alleen op te los. Aan die hand van 'n suiwer kliniese evaluering is hulle van 'n omvang wat slegs 'n regering van nasionale eenheid, wat uit die land se beste talent bestaan, behoorlik kan behartig. 'n Oproep om so 'n regering is reeds gedoen. Ons kan slegs hoop dat daaraan gehoor gegee sal word.

Die redakteur



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Investor information requirements and disclosure in annual reports

Abstract

This study investigates the extent to which the non-statutory information requirements of investors are being met by current disclosure practices in the annual reports of South African companies. A disclosure index was developed to establish South African investors' information requirements. As was the case in a number of overseas studies, little correlation was found between the investors' information requirements and the disclosure of such information in annual reports.

Introduction

When making the decision to buy, sell or hold equities, investors use diverse information sources which may include annual reports, press coverage, stockbrokers, advisory services and friends. Studies have been undertaken to rank the various information sources^{1,2,3}. While not all studies have shown the annual report to be the single most important information source, it is both an important primary source of information and also an important secondary source.

The importance of investors as an annual report user group was highlighted in an early review of the relevant literature by Carsberg, Hope & Scapens⁴, published in 1974, and also by The Corporate Report⁵ which identified equity investors as one of seven user groups. It follows, therefore, that the extent to which investor related information items are disclosed in annual reports is important to that user group.

The price investors will pay for a share is dictated by their expectations of future cash flows. The riskier these flows are perceived to be, the higher the return that investors will require and the lower the price they will be prepared to pay.

The more information investors have at their disposal at the time the investment decision is made, therefore, the lower should be the risk they perceive. It could, thus, be argued that, within the bounds of that information which it may be considered prudent for a company not to release to its competitors for strategic reasons, the more information investors have, especially with respect to future prospects, the higher they would set the company's share price.

As minimum levels of disclosure in annual reports are governed by statute and other regulations, a number of approaches could be used to establish whether or not investor information requirements were being met. One could either ask investors (in some suitable manner) for their total information requirements (inclusive of minimum disclosure items) or ask them for their additional information needs given the minimum disclosure requirements. In either case, these information requirements would then be compared to actual disclosure practices.

In South Africa, disclosure is regulated by the Companies Act, No 61 of 1973, as amended, by Statements of Generally Accepted Accounting Practice issued by the Accounting Practices Board and by rulings of The Johannesburg Stock Exchange. Of course, the amount of information

provided voluntarily by companies does vary widely, and is often well in excess of that required by law or regulation. Research has been undertaken in a number of countries (eg Canada⁶, New Zealand⁷, the UK^{8,9} and the US^{10,11}) with a view to measuring the extent of this voluntary disclosure, and the type of information investors seek in annual reports.

This paper addresses the question of whether or not the needs of the investor user group is being met by the current disclosure practices in the annual reports of listed South African companies.

Disclosure index

As part of this research, a disclosure index was developed which was designed to measure the level of voluntary disclosure of relevant investor information in annual reports. In the context of the study, a disclosure index may be defined as a weighted list of voluntary information items which reflect the perceived importance by investors of the disclosure of such information items in a firm's annual report.

It follows that the information items comprising the index should be considered relevant for making an investment decision and that the disclosure of the information items should be appropriate in the firm's annual report. Information items would be excluded from the index where their disclosure in annual reports is required in terms of statute or other regulations.

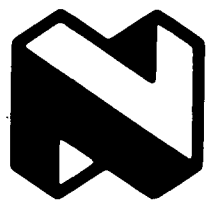
In order to take into account the fact that all items are not necessarily of equal importance a numerical weighting is attached to each item. The weighting is based on the weights allocated to each information item by a sample of investors.

In order to obtain a suitable list of voluntary disclosure items, award winning South African corporate annual reports were studied. In addition, the relevant literature (eg Amernic⁶, Barret¹², Buzby^{10,13}, Chandra¹⁴, Choi¹⁵, Firth^{8,9}, McNally et al⁷ and Singhvi and Desai¹¹) was reviewed and a list constructed of possible investor related information items which could appear in annual reports. The final list of 49 information items was established after:

- Eliminating all the information items required to be disclosed in firm annual reports in terms of the Companies Act, Statements of Generally Accepted Accounting Practice or The Johannesburg Stock Exchange rules, applicable during the period 1979 to 1983.
- Eliminating the information items common to less than 3 of the 10 indices examined.
- Eliminating those information items which would be considered inapplicable to companies whose activities included a significant proportion of manufacturing.
- Including all the information items which comprised the Firth index⁸.

As the index was to be composed of voluntary information items, it was necessary to exclude all those items

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normally disclosed in annual reports in terms of the various regulations. An information item covering depreciation was included in the list since Statement AC 106 (Depreciation Accounting) issued under the authority of the Accounting Practices Board only became effective on 1 January 1983. The five-year restriction was necessary as this research was part of a larger study, one of the objectives of which was to establish changes in the voluntary disclosure practices of firms over the period 1979 to 1983.

Eliminating information items from the list which had been included in some earlier indices but where there had been limited consensus amongst the researchers as to their inclusion enabled the number of information items to be reduced to a manageable number.

In order to render the results comparable with previous studies, which had focused on manufacturing orientated companies, items which were not relevant to such companies were eliminated.

As a significant proportion of the published literature in this field is by Firth^{8, 9, 16, 17, 18}, all the items in his index, which are not statutory requirements in South Africa, were included in the list of items. Also, the wording used by Firth for the common information items was retained so as to facilitate the comparison of the results of the two studies.

A questionnaire consisting of the 49 information items was drawn up and was sent under a covering letter to a sample of annual report users, with a request that they weigh each of the items appearing in the questionnaire on a 5 point scale. The aim of the scale was to establish how important investment analysts thought it was that the information items should appear in company annual reports. The scoring ranged from 1 to 5, where 1 meant that the information item was relatively unimportant while 5 meant that the item's inclusion in the annual report was very important. This method of scoring the information items for their importance was similar to the methods used by Buzby¹⁰, Chandra¹⁴, Firth⁹ and McNally et al⁷.

The selection of a group of users of corporate annual reports was facilitated by the Investment Analysts Society of Southern Africa which consented to the use of its mailing list for the purposes of this research.

The questionnaire was sent to all 395 members of the Society resident in South Africa. The response rate of 35% (representing 137 usable replies) was acceptable and similar to the response rates of 26%, 38% and 44% obtained by Buzby¹⁰, Firth⁹ and McNally et al⁷ to their questionnaires

In order to test whether the results obtained were biased due to the respondents and non-respondents belonging to different populations, the test suggested by Oppenheim¹⁹ and previously used in similar surveys^{7, 9, 10} was applied. This test uses late respondents to the questionnaire as surrogates for non-respondents and compares their responses to the individual questionnaire items with the responses of the early respondents¹⁹.

Two test means were calculated for the responses to each information item. Firstly, one using the 12 earliest replies and, secondly, one using the 12 latest. These two means for the responses to each information item were compared for significant differences (at the 0,05 level) using a t-test.

An analysis of the t statistic signs revealed 23 positive t statistics, 22 negative and 4 zero. In addition, there was a significant difference between the test means for only

one information item. These results indicate the lack of a significant non-response bias and it was, therefore, felt that the results of the survey could be generalised at least to the population of South African investment analysts.

Selection of sample of annual reports

The 1983 annual reports of all 36 firms which satisfied the following selection criteria were evaluated. The selection criteria being:

- Since an objective of the overall study was to measure changes in disclosure levels of corporate reporting over a five-year time period, the firm should have been listed on the JSE throughout the five-year period. This would eliminate any possible bias arising from changes in disclosure practices due to changes in listing status.
- The volume of shares traded in each of the years 1979 to 1983 should exceed 250 000²⁰. Trading efficiency was necessary to perform any future beta-related tests on the data.
- One of the main activities of the firm should be manufacturing. Mining, finance, retail, insurance and property firms were excluded.
- Reliable betas for the shares should be available as it was proposed to extend the study by attempting to correlate risk and disclosure.

Data analysis

The weight to be assigned to each information item was obtained by calculating the arithmetic mean of the responses of the 137 respondents. This approach was similar to the methods used by Buzby¹⁰, Chandra¹⁴, Firth⁹, and McNally⁷.

The annual reports of each firm were evaluated using a mark sheet drawn up from the questionnaire sent to the investment analysts. The items on the questionnaire fell broadly into three categories:

- Category 1 consisted of those self contained items whose presence or absence in the annual report could be easily ascertained, such as the allowance for doubtful debts.
- Category 2 were those items where different degrees of disclosure were possible and an element of judgement was necessary to evaluate the precise level of disclosure. For example, a specific forecast of the following year's profit or EPS would receive a full credit. However, a general indication of the direction of the following year's profit or EPS would receive only a partial credit.
- Category 3 were those items which could be analysed into sub-sets of information. The firms received full credit where all the sub-sets of the item were disclosed. A proportional credit was, however, allocated for less than full disclosure.

A problem arises in that not all items in the index are relevant to each firm in every year. For example, details of mergers and acquisitions would not be applicable where no such event had occurred during the particular financial year examined. To cater for such situations two scores were calculated, the first measuring the maximum level of disclosure which could be made and the second measuring the actual disclosure.

The extent to which each information item was disclosed in the annual reports was measured by the percentage of the actual to the maximum potential score for firms dis-

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closing that particular item. A score of 100 would mean that all firms fully disclosed the item whereas a 0 would mean total non-disclosure.

Comparison between actual and desired disclosure

Table 1 lists the index items in order of 1983 disclosure level together with their rankings in terms of perceived investor importance. These two lists of rankings were tested for association using the Spearman rank correlation coefficient. The result of 0,13 indicates little positive correlation between the actual and desired disclosure of individual items. Similar conclusions were drawn by Buzby¹⁰, Firth⁹ and McNally⁷.

The areas of agreement in terms of a relatively high level of disclosure and a high investor ranking included a description of major products/services, discussion of the firm's results for the past year with reasons for changes, discussion of the major factors which will affect the next year's results and information on mergers and acquisitions.

The assigning of a score to items such as "description of major products/services" was rather subjective and it is felt that, in retrospect, the high score achieved by the sample companies in this area may have been due to the setting of too low an evaluation standard.

Areas where disclosure was limited and the item was deemed to have little importance, included inflation related information and statements concerning taxation.

High disclosure but low importance was attached to the functional responsibilities of senior management, the historical summary of the price range of ordinary shares, the number and type of ordinary shareholders and the names and salaries of senior management (while no annual report disclosed the salaries of its senior management, the disclosure of names was extremely high). Since equal weight was given to each part of the item, ie to the names and the salaries, the relatively high level of disclosure of the items was in fact somewhat misleading.

Low disclosure but relatively high importance was attached to cash projections and a statement of transactions in foreign currency.

These observations bear out the finding that there was little correlation between the level of disclosure of items and their perceived relative importance. The preparers of the financial statements, therefore, did not seem to be meeting the non-statutory informational requirements of investors.

This situation, which is certainly not unique to South Africa^{7, 8, 9, 10}, has a number of possible causes. Firth⁸ studied the perceived importance, in the eyes of various groups, of information item disclosure in annual reports in the United Kingdom. He found that the importance rating by finance directors and auditors was similar. Also, the ratings by financial analysts and bank loan officers were similar. There were, however, significant differences in the importance ratings of the above two groups. The preparer and user groups of financial statements were, therefore, at odds with different perceptions as to what was important with regard to disclosure.

A second reason is the competitive advantage to be gained/maintained by not revealing information to existing or potential competitors. The belief is that the less information these parties have the less effective will be their competition.

Thirdly, there are direct costs associated with providing additional information in the annual report. Where the information items can be culled from internal management

reports, the costs are likely to be relatively insignificant. However, for other items, it is believed that the costs of accumulating the data can vary enormously. For example, accumulating the information for a historical summary of the share price or the number and type of ordinary shareholders would be relatively inexpensive, while the valuation of a firm's fixed assets could be costly.

Alternatively, some might argue that the lack of correlation could arise from the possibly unrealistic underlying assumptions of disclosure indices. Dhaliwal²¹ has criticised these assumptions and two of his arguments could have a bearing here. First, it is possible that analysts are unable to perceive the relative importance of the different information items. This argument is probably only applicable to those items of lesser importance as a relatively high level of consensus (ie low standard deviations) was found amongst the investors for those items considered most important. Second, the relative importance of the disclosure of a particular item may be related to the disclosure/non-disclosure of other items. This problem is to some extent limited by the careful selection of items for inclusion in the index and by requesting the analysts to weigh the items bearing in mind that the inclusion of each additional item in the annual report requires extra costs on the part of the company.

Finally, it is possible that some firms are merely ignorant of, or indifferent to, investors' information requirements.

Since modern financial theory associates value with the present value of expected future cash flows, one may anticipate that investors would rate highly items of information which have a direct bearing on the assessment of future cash flows. The items which fit into this category are:

- Discussion of major factors which will influence next year's results including an indication of the firm's relationship to its industry and the economy.
- Statement of future dividends/dividend policies.
- Forecast of next year's profits or EPS.
- Capital expenditure – narrative and quantitative data on expenditure in past year and planned expenditure.
- Statement of rate of return required by the company on its projects.
- Cash projections, one to five years.

This is, in fact, the case with all six items in this category being ranked in the top third of the index. The average ranking of these items was 6,5 as perceived by the investors, yet only 24 in terms of actual disclosure.

It is difficult to explain the relatively low level of actual disclosure of these items in terms of either the costs associated with capturing the information, or their strategic importance to competitors. It may, of course, be the result of the reluctance of management to commit themselves to a forecast of the future because of the potential for error. However, management should be in a better position than any investor to make a future projection and one could, therefore, recommend to companies that efforts be made to increase disclosure in these areas. This should result in a meaningful impact on investor uncertainty and, thus, market value.

Conclusions

The objective of this study was to examine the extent to which the non-statutory information requirements of investors was being met by current disclosure practices in the annual reports of listed South African companies.

While the results of this survey cannot be statistically applied to all the industrial firms listed on the JSE (the annual reports of all firms satisfying the selection criteria were analysed rather than those of a random sample of firms) it is, nevertheless, believed that the conclusions reached regarding the extent of voluntary disclosure are probably applicable to all such firms.

A disclosure index was developed to establish South African investors' information requirements. The extent to which this information was disclosed in firms' annual reports was measured and compared to a sample of investors' perceptions as to the importance of the information.

As in other countries, it was found that there was little positive correlation between investor information requirements and the disclosure of such information in annual reports. Possible causes highlighted were a difference in perceptions regarding the importance of information items, competitive strategies and the cost of providing information.

Table 1: The rankings of information items in terms of firm disclosure and by investors

Index items	Firm disclosure	Investor ranking
Description of major products/services	1,0	9,0
Discussion of the firm's results for the past year with reasons for changes	2,0	1,0
Functional responsibilities of senior management	3,0	42,0
Group structure	4,5	17,5
Discussion of the major factors which will influence next year's results	4,5	2,0
Historical summary of price range of ordinary shares	6,5	48,0
Information on major industry trends	6,5	15,0
Historical summary of important operating and financial data	8,0	19,0
Number and type of ordinary shareholders	9,0	40,0
Information on mergers and acquisitions	10,0	7,0
Statement of value added/wealth created	11,0	33,0
Names and salaries of senior management	12,0	49,0
Statement of objectives	13,0	9,0
Capital expenditure – narrative/quantitative/past/planned	14,0	5,5
Current resale value/valuation/insurance value of fixed assets	15,5	20,0
Depreciation method used and rates or useful lives of assets	15,5	21,5
Information on corporate social responsibility	17,0	46,0
Statement of future dividends/dividend policy	18,0	3,0
Directors' functional responsibilities and major outside affiliations	19,0	39,0
Breakdown of earnings by major product lines, customer classes and geographic locations	20,0	12,0

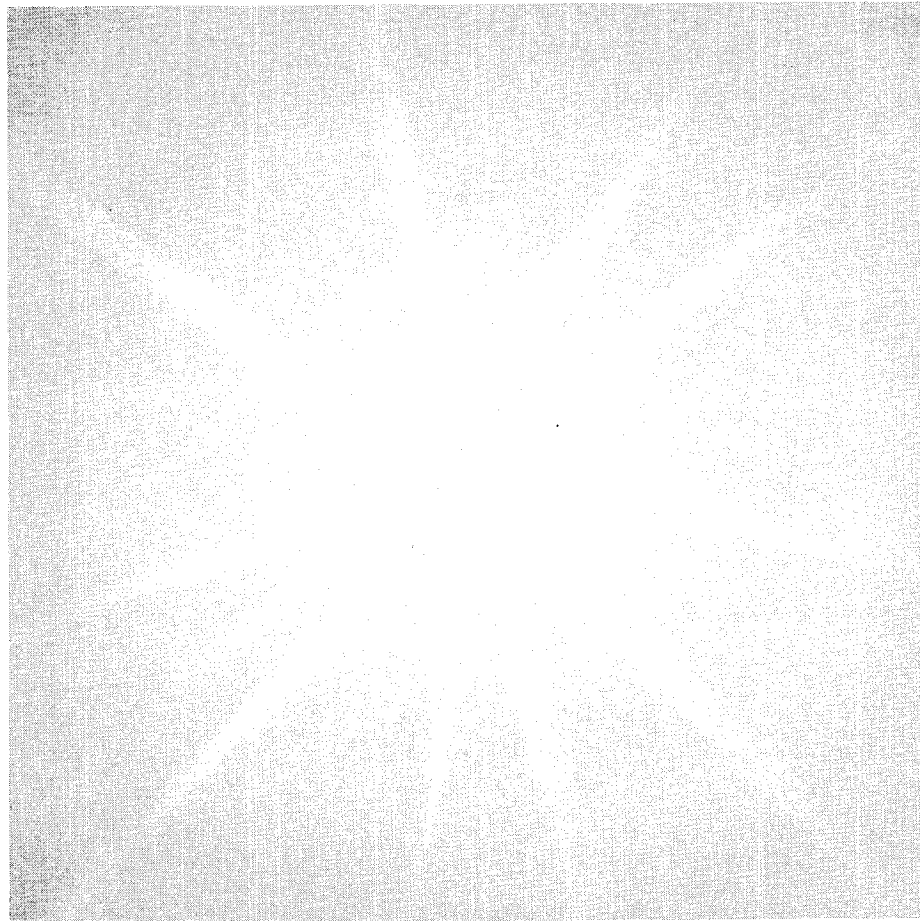
Index items	Firm disclosure	Investor ranking
Forecast of next year's profits or EPS	21,0	4,0
Inflation adjusted accounts as supplementary statement	22,0	32,0
Breakdown of sales revenue by major product lines, customer classes and geographic locations	23,0	16,0
Indication of employee morale	24,0	34,0
Brief narrative history of the firm	25,0	44,0
Discussion of the impact of inflation on the financial results	26,0	29,0
Expenditure on human resources	27,0	45,0
Description of major plants/warehouses/properties	28,0	37,0
Measure of physical level of output and capacity utilisation	29,0	17,5
Money value of firm's order backlog	32,0	21,5
Allowance for doubtful debts	32,0	27,0
Number and type of employees	32,0	43,0
Research and development	32,0	26,0
Description of marketing network for finished goods	32,0	41,0
Extent of dependence on major customers	35,0	13,0
Share of market in major product/service areas	36,5	9,0
Index of quantity of sales	36,5	31,0
Advertising and publicity	38,0	47,0
Index of sales prices	40,5	36,0
Index of raw material prices	40,5	35,0
Statement of rate of return required by the firm on its projects	40,5	11,0
Statements concerning taxation, etc	40,5	38,0
Cost of goods sold	46,0	25,0
Breakdown of expenses into fixed and variable components	46,0	24,0
Market value of inventory	46,0	23,0
Statement of transactions in foreign currency	46,0	5,5
Summary of the age of debtors at the balance sheet date	46,0	28,0
Amount and detailed breakdown of expenses	46,0	30,0
Cash projections one to five years	46,0	14,0

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An investigation into the return distributions of ordinary industrial shares on The Johannesburg Stock Exchange

Abstract

The research presented in this paper confirms the presence of asymmetry in the return distributions of a substantial number of shares quoted on The Johannesburg Stock Exchange.

In an attempt to overcome the problems which the presence of skewness creates when, for instance, a risk measure such as standard deviation is used, the effect of different variables on skewness was determined. It was found that the normality of share returns can be improved significantly when calculating returns over intervals of 3 and 6 months and an horizon of five years.

Introduction

Portfolio theory based on the normative theory developed by Markowitz¹ has largely replaced the general hypotheses that investors should maximise expected discounted returns. Its use by investors can mainly be attributed to the fact that it provides the portfolio manager with a workable method of relating risk and return. The risk reducing impact of diversification, as specified by this theory, basically reduces the investment problem to a mathematical compilation of portfolios.

A fundamental assumption of portfolio theory and asset pricing models on this basis is that the distribution of share returns approximates a normal distribution. This type of distribution, also known as a Gaussian distribution, is a symmetrical bell-shaped frequency curve which is completely determined once its mean and standard deviation are known. It also implies that return distributions above and below expected values are identical. Any measure of downside risk is, therefore, adequately described by the standard deviation or the variance which are measures of the total dispersion around the expected value. When share returns conform to a normal distribution, standard deviation can be regarded as a complete risk measure and a probability distribution of returns is fully described by expected returns and standard deviation.

Empirical evidence by Osborne², Moore³ and Kendall⁴ in support of the Gaussian distribution was, however, questioned by Mandelbrot⁵ who concluded that departures from normality were neglected in these studies and he suggested that share returns were better presented by a distribution which he referred to as Stable Paretian.

In contrast to the normal distribution, four parameters are needed to describe a Paretian distribution, namely:

- a location parameter;
- an indication of scale;
- an index of skewness; and
- a measure of the height of the extreme tail areas of the distribution.

The last two parameters in particular have very definite implications for the application of modern portfolio theory. Whereas returns are assumed to be symmetrically distributed in a normal distribution, the Paretian

hypothesis provides for a measure of skewness. The presence of skewness implies that downside risk differs from the risk of doing better than expected and variance or standard deviation can, therefore, not be used as risk measures.

The last parameter, which can vary between zero and two, is of particular interest in that it is a measure of the total probabilities contained in the extreme tails of the distribution. If equal to two, the distribution conforms to a normal distribution so that the normal distribution is in fact a special case of the Paretian distribution. For any value smaller than two, the total probabilities contained in the extreme tails exceed those of the normal distribution and variance becomes infinite. Any statistical test based on variance or standard deviation will, therefore, result in erroneous or misleading results which limit the applicability of available statistical tools to Paretian distributions.

In order to overcome this problem, the purpose of the research presented in this paper was, therefore, to establish whether a better conformation of a normal distribution could be obtained by changing variables such as:

- the interval over which returns are calculated;
- the total period over which returns are calculated (the horizon);
- the trading volume of shares;
- the number of shares included in a portfolio.

Literature review and research design

Research by Fama⁶ on shares quoted on the New York stock exchange indicated more observations in the extreme tails of the distribution than would be expected in a normal distribution. He found, however, that these distributions were symmetrically distributed which indicates that share returns approximate normal returns despite the higher probabilities contained in the tails of the distribution. Fama concluded that share returns fall into a more general category of returns which he referred to as Symmetrical Paretian distributions.

Fielitz and Smith⁷, based their research on the return distributions of two hundred companies. They rejected the Symmetrical Paretian distribution as an appropriate descriptor of share returns because non-trivial degrees of skewness existed in the return distributions which they examined. This result was substantiated by Fischer and Lorie⁸ who also found degrees of skewness. Westfield⁹, in a study on the effect of diversification on skewness, observed that moderate diversification reduces skewness but that asymmetry reappears when the extent of diversification increases.

Research in other countries also reports rather conflicting results. On the Australian stock exchange, for instance, Praetz¹⁰ found share returns to be normally distributed whereas Stokie¹¹ found significant departures from normality.

*Respectively, School of Business Leadership, University of South Africa and Department of Business Economics, University of South Africa.

Bethlehem¹², as part of an investigation into the efficiency of the money and capital markets in South Africa, found that the return distributions of the major indices are generally more peaked and have longer tails than a normal distribution, but could not draw any firm conclusions on skewness because of irregularities in the results.

In view of the conflicting results and the absence of research on the effect of variables such as the extent of diversification on the normality of share returns, this research is firstly designed to determine whether significant degrees of skewness or non-departures from normality can be reduced by varying parameters such as interval, horizon, portfolio size or by the selection of shares on trading volume.

Two hundred and fifty-eight industrial shares quoted on The Johannesburg Stock Exchange were selected for this study. Returns were calculated by using the following formula:

$$X_{jt} = 1n P_{jt} - 1n P_{jt-1}$$

where

X_{jt} = the return of share j over interval t

P_{jt} = the price of share j in period t

P_{jt-1} = the price of share j in period t - 1

Prices were adjusted to include dividends and all capital changes were taken into account. The investigation covers the period 1969 to 1981. The total period was also subdivided into sub-periods of five years in order to investigate the effect of different horizon lengths. The various sub-periods are:

- 1969 to 1973
- 1974 to 1978
- 1977 to 1981.

Shorter sub-periods were not examined since an horizon of five years contains the minimum number of observations for a statistically meaningful application of the data.

The following three statistical tests were used to identify return distributions which deviated from a normal distribution:

- the standardised measure of skewness, b_1 ⁽¹⁾
- kurtosis, b_2 ^{(2), (3)}; and
- the studentized range⁽⁴⁾.

The studentized range was included to verify the result produced by b_1 and b_2 . It was found, however, that a classification of a distribution as non-normal on the studentized range agreed in all cases with the result obtained with b_1 and b_2 .

Portfolios consisting of five, ten, twenty and thirty shares were generated by selecting shares randomly and by assigning equal weights to all shares.

The effect of trading volume was determined by selecting the hundred shares with the highest trading volumes and comparing these with the total sample of shares.

Two-factor analysis of variance was used to determine whether any of the above variables had any effect on the normality of share returns.

(1) $b_1 = M_3^2/M_2^3$

(2) $b_2 = M_4/M_2^2$

where

M_j is the jth moment around the mean

(3) For example, with sizes of less than fifty observations, b_2 was replaced by a

where

a = mean deviation/standard deviation

(4) The following formula was used to determine the studentized range:

(maximum return - minimum return)/standard deviation.

Results

The normality of return distributions

The return distributions of a large number of shares were found to deviate from a normal distribution. Although some of the non-normal distributions were symmetrical, a large percentage was found to be skewed. The result of this initial investigation is presented in Table 1 which indicates that on average 53% of the return distributions was non-normally distributed and 36% of the total distributions investigated was found to be skewed.

Table 1: Distribution of share returns: Monthly intervals

Period	Normal	Non-normal	Skewed		Total
	(1) (%)	symmetrical (A)	(B)	(2) A + B	
1969-1981	41	19	40	59	100
1969-1973	51	16	33	49	100
1974-1978	51	16	33	49	100
1977-1981	45	16	39	55	100
Average	47	17	36	53	100

On the basis of this result, the investigation was expanded to incorporate other variables such as trading volume, varying intervals and the compilation of portfolios of different sizes in order to determine whether larger percentages concerning normal return distributions could be obtained by changing these variables.

The effect of horizon and interval length

The following two hypotheses were formulated to determine the effect of varying interval and horizon length on the return distributions of shares:

h_0' : Horizon has no effect on the distribution of share returns.

h_0'' : Interval has no effect on the distribution of share returns.

These hypotheses were to be rejected if f_1 and f_2 exceeded the critical F-value of 4,75 at a 95% confidence level.

Table 2: Analysis of variance: Horizon and interval

Source of variation	Sum of squares	Degrees of freedom	Mean square	Computed F
Horizon	5 402	1	5 402	$f_1 = 85,4$
Interval	4 356	1	4 356	$f_2 = 68,8$
Interaction	3 306	1	3 306	

It is clearly evident from Table 2 that both hypotheses had to be rejected since both f-values exceeded the critical F-value of 4,75. The implication of this result is that higher percentages of normally distributed returns can be obtained by calculating returns over different intervals and horizons.

This result is in conflict with the characteristics of stable Paretian distributions as discussed by Fama¹² where one of the conditions for stability is that the form of the distribution of price changes is independent of the differing interval over which changes are computed.

The results of a further investigation to determine optimal interval and horizon lengths are presented in tables 3 and 4.

Table 3: Distribution of returns: Varying intervals

Interval (months)	Normal ¹ a(=)mean	Non-normal symmetrical (A)	% Skewed (B)	Total ² A & B	Total 1 + 2
1	33	8	59	67	100
3	78	3	19	22	100
6	80	8	12	20	100

Table 4: Distributions of returns: Varying horizons

Period years	Normal (1) %	Non-normal symmetrical (A)	% Skewed (B)	Total (2) A & B	Total 1 + 2
13	33	8	59	67	100
5	78	6	16	22	100

The results in tables 3 and 4 indicate that the highest percentage normal returns can be obtained by using an horizon of 5 years and intervals of 3 and 6 months.

Portfolio size and trading volume

The following hypothesis was formulated to test the effect of portfolio size and tradeability on the return distributions of shares.

H₀: The trading volume has no influence on the normality of share returns.

The results of the investigation into the influence of portfolio size and trading volume on the distribution of returns are presented in Table 5.

Table 5: Analysis of variance: Portfolio size and trading volume

Source of variation	Sum of squares	Degrees of freedom	Mean square	Computed f-values
Portfolio size	208 009	3	69	f ₁ = 0,09
Trading volume	1 496	3	1 496	f ₂ = 1,98
Interaction	428	3	143	
Error	17 349	23	754	

The results in Table 5 indicate that neither hypothesis can be rejected as both the computed f-values are less than the critical F-values of 3,03 and 4,28.

Higher percentage normal returns can therefore not be obtained by changing the size of portfolios or by selecting shares on the basis of their tradeability.

5 Conclusion

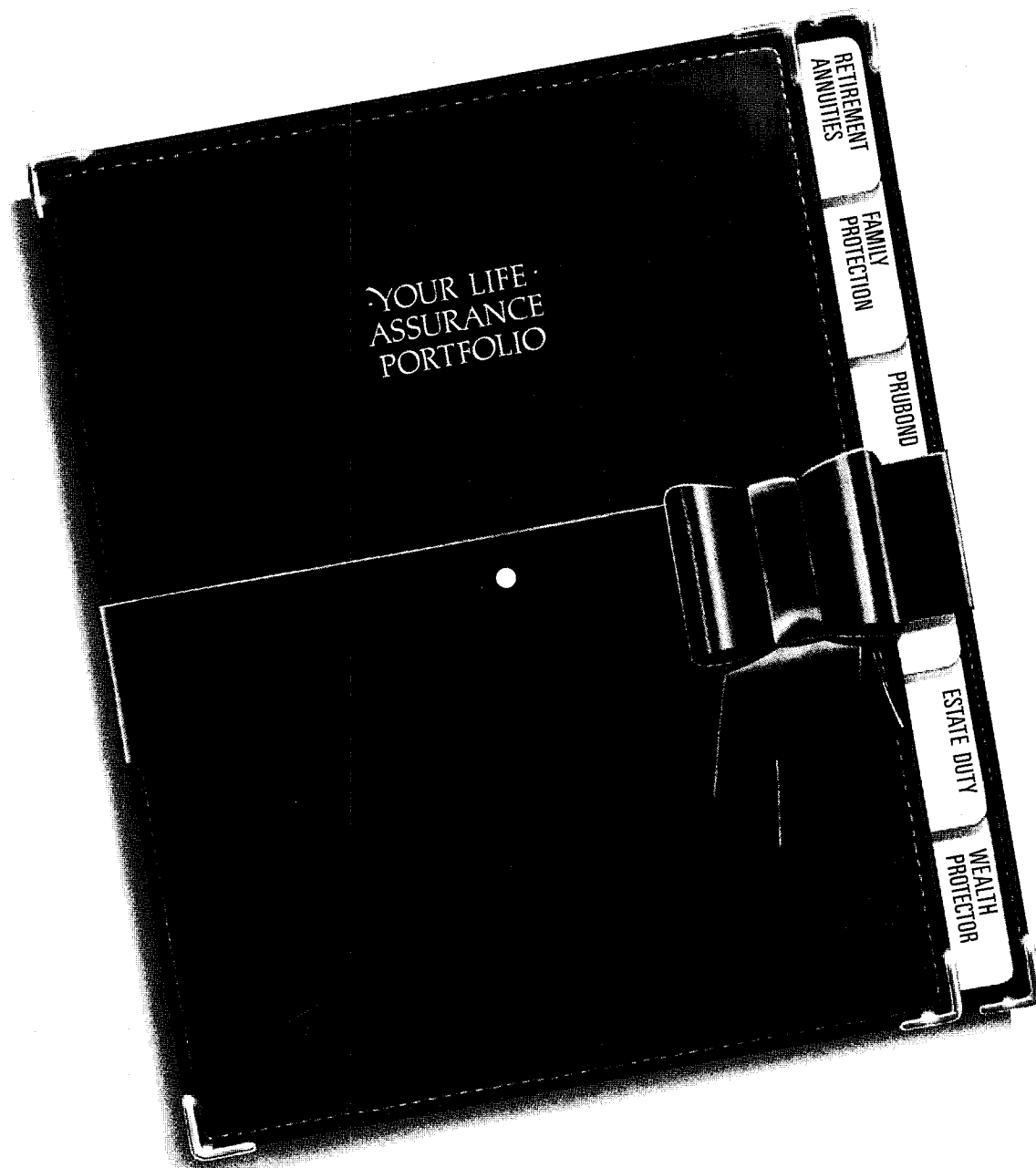
The research presented in this paper indicates that skewness is present in the returns of a substantial

number of shares quoted on The Johannesburg Stock Exchange. This problem can be alleviated by choosing intervals of 3 or 6 months and a total period or horizon of 5 years when calculating share returns. This result is in conflict with the additive characteristic of a Stable Paretian distribution and implies that share returns are neither normally distributed nor do they conform to the Stable Paretian distribution.

Although not central to the purpose of this research, this last result is very important and it has far reaching implications for testing any hypothesis on the process of return generation. These implications were clearly identified by Boshoff¹³ who suggested that any investigation into the return-generating process be limited to tests which are not based on the distribution of returns.

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The valuation of call options on gilts and warrants in South Africa

Introduction

In July 1984, three banks opened up Reuters' screens offering call and put options on South African gilts. This was a major step in the development of options markets in South Africa, and it is part of the world trend, which began over a decade ago in Chicago, towards more diverse options markets to serve the growing need for flexibility in managing investment portfolios.

Trading of options in Amsterdam and London may be traced back to the last two decades of the seventeenth century¹ and it is thought that the first options were traded in South Africa very soon after the founding of The Johannesburg Stock Exchange in 1887². In South Africa there has been little development of the market, with most of the limited trading being in the over-the-counter market. In addition, although a number of warrants are traded on The Johannesburg Stock Exchange, the volume of trading is very small. However, interest in the formation of options markets of various types has grown and the Reserve Bank has recognised a need to help co-ordinate the actions of the interested parties. It is likely that the first institutional options markets will arise from these discussions.

The objectives of this paper are to describe the current state of the share and gilt options markets in South Africa and to test the applicability of the Black-Scholes options valuation model to selected warrants and gilt options.

Data and methodology

Data for warrant prices over a number of years, together with the prices of the underlying shares, were obtained from The Johannesburg Stock Exchange. The warrants for which data were sought were AMIC options, East Daggafontein options, ERPM options, Frasers options, Lucem options, Omnia options, Sage options and Western Deep Levels options. Of these only AMIC, East Daggafontein, ERPM and Western Deep Levels were finally analysed because of the sparsity of the data and thinness of trading of the others.

Data on gilt and gilt option prices were obtained from a number of banks, while weekly data for long and short-term gilts and for Treasury bills, for use as surrogates for the risk free rate, were obtained from the Financial Mail.

Black and Scholes³ developed a model for the valuation of options and this model has formed the basis for most subsequent work in the field of options. The model may be expressed as follows⁴:

$$c = S.N(d1) - Xe^{(-r_f T)}.N(d2)$$

where

$$c = \text{value of a European call option}$$

$$d1 = \frac{\ln(S/X) + r_f T + \sigma^2 T/2}{\sigma \sqrt{T}}$$

$$d2 = d1 - \sigma \sqrt{T}$$

$$S = \text{price of the underlying asset}$$

$$X = \text{the exercise price of the option}$$

$$\sigma^2 = \text{the instantaneous variance of the returns of the underlying asset}$$

T = the time to maturity of the option

r_f = the risk free rate

$N(\cdot)$ = the cumulative probability for a unit normal variable

The price of a European put option, P , can be found by the principle of put-call parity, viz

$$c - P = S - Xe^{(-r_f T)}$$

It should be noted that the basic Black-Scholes equation does not apply to securities paying dividends. To take account of dividends a simple, though non-exact, adjustment may be applied⁵. The present value of all dividends expected during the life of the option are deducted from the price of the underlying security before entering that value into the equation. So S in the above formula is replaced by:

$$S - \sum e^{(-r_f t_i)} \cdot D_{t_i}$$

where

D_{t_i} = dividend after a period of time t_i .

For ease of use in the analysis of the warrants this formula was extended to the hypothetical case where dividends are paid continuously. In that form, the equation requires only that a single dividend payment and an assumed dividend growth rate be entered into the model⁶.

Certain problems arise when trying to apply the Black-Scholes formula to the valuation of warrants. Firstly, the life of a warrant is usually years rather than months, and the variance of the return on the share is likely to change substantially during that period. Secondly, warrants are usually issued on dividend-paying shares and hence the dividends expected to be paid during the life of the warrant must be estimated, especially for long-term options. Thirdly, the exercise price of a warrant sometimes changes on specified dates so that it may pay to exercise a warrant just before its exercise price changes. Another problem is that the exercise of a large number of warrants may result in a significant increase in the number of shares issued. An adjustment for this dilution of the equity is therefore necessary⁷. For the special case where the warrants are issued at no price as an accompaniment to another security, as is the case with all the warrants analysed in this paper, the value of the warrant as calculated by the direct application of the Black-Scholes equation must be multiplied by the ratio of the number of shares in issue before exercise of the warrants to obtain the true value of the warrant.

Gilt options are also options on "dividend"-paying securities, although the dividends in this case are certain. The discrete form of the dividend correction was applied in the analysis of these options.

The gilt cum price includes all accumulated interest on the gilt, whereas the clean price reflects no interest. As a result, the cum price follows a saw-tooth path with respect to the clean price of the gilt. To divorce the option from this saw-tooth effect, gilt options in South Africa are traded on the clean price of the underlying gilt or on the gilt spot rate.

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When a gilt call option is exercised, the seller of the gilt receives the full cum price for the gilt based on the clean exercise price previously agreed. Thus, the seller of the option effectively receives a dividend which must be accounted for in the option price valuation. If, for example, the option is bought on the day after coupon payment and exercised on the day before the next coupon payment, the exerciser of the call option will have to pay the seller the full accumulated interest (the cum price). This situation is described in Figure 1 below. Similar logic will apply to an option period straddling a coupon payment period.

Volatility (the σ term) plays an important role in the Black-Scholes equation. It is, theoretically, the annualised standard deviation of the instantaneous rates of return of the underlying security. In practice, it is calculated from periodic data either as the annualised standard deviation of the period-on-period returns of a security or as the annualised standard deviation of the continuously compounded returns of the security where:

$$\text{period-on-period return} = \frac{S_i}{S_{i-1}} - 1;$$

$$\text{continuously compounded return} = \ln \frac{S_i}{S_{i-1}};$$

and S_i = security price in period i .

The standard deviations of the returns are annualised by applying a factor to the standard deviations calculated directly from the return data as follows:

$$\sigma^2_{\text{annual}} = f \cdot \sigma^2$$

where $f = 365,25$ for daily data;
 $f = 260,9$ for daily data excluding weekends;
 $f = 52,2$ for weekly data; and
 $f = 12$ for monthly data.

The option price calculated using the Black-Scholes equation is very sensitive to the volatility used, especially if the option is out of the money, and it is, therefore, important to estimate volatility accurately. In practice, the volatility of a share is not constant over time and it may not be appropriate to use historical volatility as an estimate of future volatility. In the case of a long-term option like a warrant, this is particularly so. After preliminary testing of the data for this study, it was considered that a 26 week volatility was appropriate for warrants (using weekly data) and a thirteen-week volatility was appropriate for gilt options (using daily data).

It is worth noting that every actual option price has implicit in it a volatility which will satisfy the Black-Scholes formula for given values of the other variables. This implicit volatility is a useful measure as it can be looked at over time and used to help predict the volatility to use in the formula when valuing options.

During discussions with local market participants, it was noted that the risk free rate to be used in the Black-Scholes equation is a matter of some debate, with the suggestion being made that an opportunity cost rather than a true risk free rate should be used. However, the theory is clear that it is the risk free rate that should be used as this is the rate that will enable a perfect hedge to be achieved by selling options on shares held^{3, 6}. This rate will also be a universal rate devoid of any business specific risk. Hence, the risk free rate that should be used is the interest rate on a very low risk note that matures at the time the option expires⁸.

The effect of the interest rate on the calculated value of an option is relatively larger on a long-term than on a short-term option. Thus, in general, warrants are quite sensitive to the risk free rate used while gilt options are not. In this study, the short-term bond rate was used for warrants and the Treasury bill rate for gilt options.

Results for South African warrants

The objective of this study was to determine the extent to which warrant prices quoted on The Johannesburg Stock Exchange over a period of time may be explained by the Black-Scholes option valuation model suitably adjusted for dividends and dilution of equity. AMIC options, East Daggafontein options, ERPM options and Western Deep Levels options were selected for study.

Data were analysed using a computer program developed for the purpose. A weekly closing share price over the period of study was used and matched against a weekly average warrant price, no weekly closing warrant prices being available. The historical risk free rate relevant in each week was used for the required risk free rate in the formula. In addition, the calculated option value, the volatility and implicit volatility corresponding to each data point were calculated. The means and standard deviations of the errors between the actual warrant price and calculated value, and between implicit volatility and actual volatility, were calculated and subjected to a t-test to determine whether the errors were significantly different from zero.

Table 1 summarises, for each of the options, the result that gives the closest agreement between calculated and actual option values over the period studied.

Table 1: Summary of results

	AMIC	E Dagma	ERPM	W Deep
Option value corrected for	Divs	Nil	Nil	Dil+Div
Mean of % error in option price	18%	9%	48%	-2%
SDev of % error in option price	23%	15%	31%	28%
t-test (option price)	7,4	3,5	21,5	0,7
Mean of % error in volatility	-18%	-26%	-74%	7%
SDev of % error in volatility	21%	41%	48%	84%
t-test (volatility)	8,0	3,5	21,3	0,8

Note

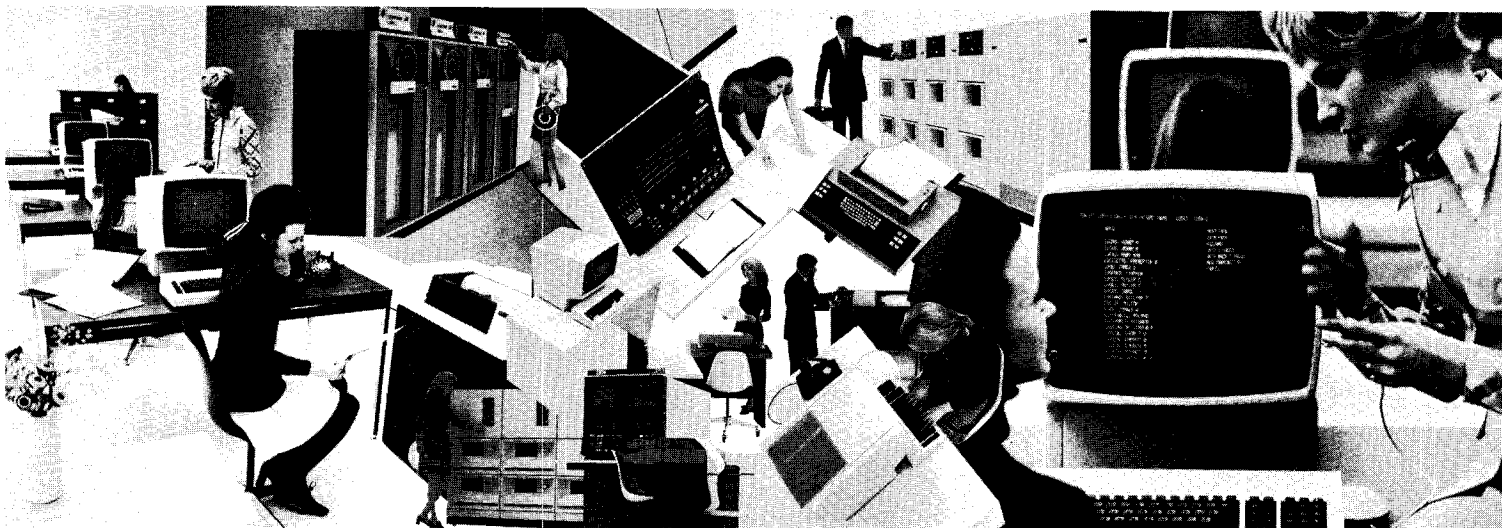
- 1 No dividends are expected from East Daggafontein and ERPM during the currency of the warrants.
- 2 Correction for dilution made no significant difference to the above values (see Figure 2).

Western Deep Levels options are the only warrant for which the error between actual and calculated value could not be said to be statistically different from zero.

Figures 2 and 3 show graphically the results of the analysis of AMIC and Western Deep Levels options. Figure 2, in particular, demonstrates the relatively small effect of a dilution correction and the relatively large effect of a dividend correction on option value.

A number of conclusions can be drawn from this study:

- The standard deviations of the errors in option price and volatility are large under all circumstances. This implies that the uncertainty in any individual calculated option value is high even though the model may on average give good results.



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- The correction for dilution is usually small and has a relatively small effect on the valuation of the option. For three of the four warrants studied, a slightly better result was obtained by not correcting for dilution than by correcting for it. This is almost certainly due to the fact that the number of warrants in issue is usually very small relative to the number of shares in issue.
- For warrants on shares paying dividends it is essential to include a dividend correction, otherwise the warrant will be considerably overvalued by the model.

The long period of currency of a warrant leads to a number of problems in its valuation. The valuation becomes very sensitive to the risk free rate used and also to the assumption made about future dividends to be paid during the currency of the option. It is, therefore, hard to determine a definite reason for the discrepancy between market price and calculated value. The reason may not lie wholly in the problems of applying the Black-Scholes equation. Warrants are thinly traded as a rule and it is possible that the market itself is valuing them incorrectly. The large standard deviation of the error in option price seen above supports this contention. If this is the case, there is an opportunity to make abnormal profits by buying or selling incorrectly valued warrants. As the exercise date approaches, and the intrinsic value starts to predominate over time and volatility considerations, the market valuation is likely to be more accurate, and it may then be possible to realise profits. It is also likely that option valuation methods will become more widely known in the near future, and the market may then start to reflect values obtained through use of these techniques, in a self-fulfilling way.

Results for gilt options

Gilt options appear to be the most heavily traded options in South Africa at present with total daily turnover of underlying gilt stock estimated at between R40 million and R150 million.

A set of 85 actual call option contracts were studied. Unfortunately, no report can be made on put options as insufficient data were available to form a representative sample. The data were evaluated using the Black-Scholes option valuation formula to determine a "model" price and implied volatility and these results are compared with actual prices and volatilities in figures 4, 5, 6 and 7 below. These tests were performed using volatility rates based on 26 weeks, 13 weeks and 6 weeks of daily data as well as an exponentially smoothed 6 week volatility rate.

The results of these tests indicate a 0,98 correlation between calculated prices and actual option prices using a 13 week volatility rate. The correlation for the 26 week and 6 week volatility rates is 0,97 and 0,95 respectively.

Generally, the 13 week (or similar) volatility rate is a better predictor of the actual option price. The average percentage error between calculated and actual option prices is 0,38% with a standard deviation of 25%. (Six-week volatility rate figures are -2,58% and 34% respectively.) The above results are further supported by using a paired difference Student t-test on the results. The low resultant t-values indicate that there is no statistical difference between the actual and calculated option price even at the 20% significance level.

From the above it is suggested that the Black-Scholes option valuation model is a valid model to be used in the pricing of gilt options in South Africa. This result may well have been expected as the present market makers use this model as a basis for their option pricing.

However, the prices offered on the Reuters' screens often vary significantly from the Black-Scholes valuation, whereas actual prices are well represented by this valuation. This indicates that most, if not all, traders use the Black-Scholes (or similar) valuation model to calculate option prices.

Conclusion

The current interest in options is unprecedented and it seems likely that development of options markets will be rapid. Gilts have taken the lead at present under the sponsorship of the banks.

Major questions about the application of the Black-Scholes equation revolve about the volatility and risk free rate to use, and in the case of gilts about the use of clean or cum values and the treatment of coupon payments.

The results of this study indicate that while the effects of dilution on warrant prices is usually small, it is essential to include a dividend correction otherwise the warrant is considerably overvalued by the model. It was found further that the most reliable volatility measurement to use for warrants was based on 26 weeks of weekly share price data. The risk free rate to be used is the interest rate on a very low risk note that matures at the same time the option expires.

Based on the above assumptions, the model gives good results on average. Large discrepancies do exist, however. These may be caused by the thin trading of the warrants or it is possible the market itself is valuing them incorrectly.

Gilt options are generally well valued by the Black-Scholes model. Tests indicate that a volatility rate based on 13 weeks (or similar) of daily data gives good results. The risk free rate to be used is the Treasury bill rate. All calculations should be based on the clean gilt price and the effect of the coupon payment as a "dividend" must be accounted for in the option price calculation.

Options have a place in the range of investments available to the investor. They can be used for speculative and hedging purposes and so give him a great deal of flexibility in managing his portfolio. However, to be effectively utilised, they must be properly valued. This paper has shown that, provided the necessary adjustments are made, the Black-Scholes model can be used to value both warrants and gilt options.

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Figure 1: Gilt prices

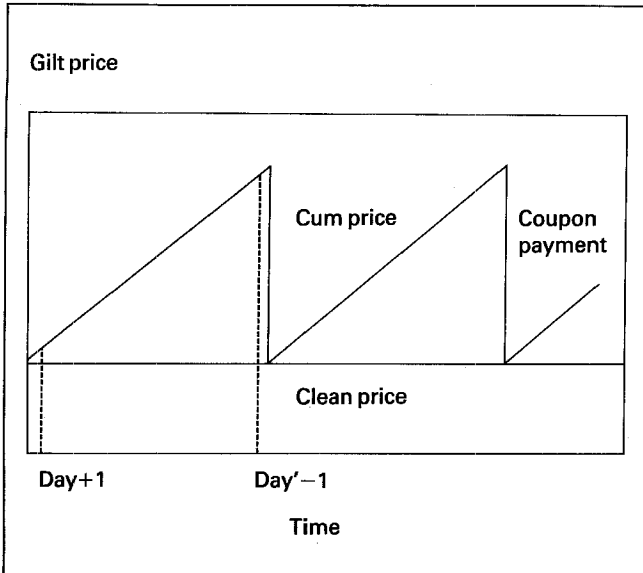


Figure 3: Western Deep Levels options

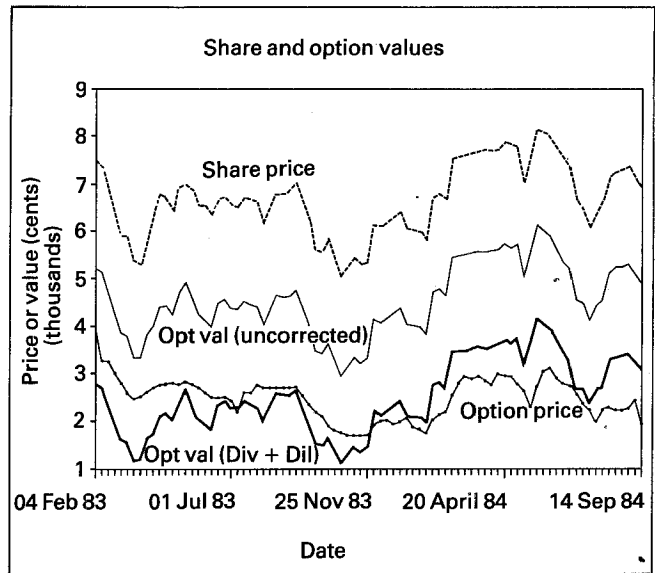


Figure 2: AMIC options

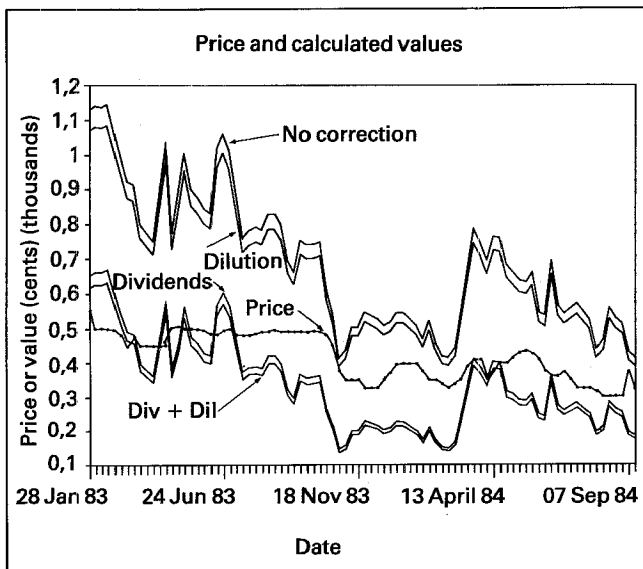


Figure 4: Gilt option prices

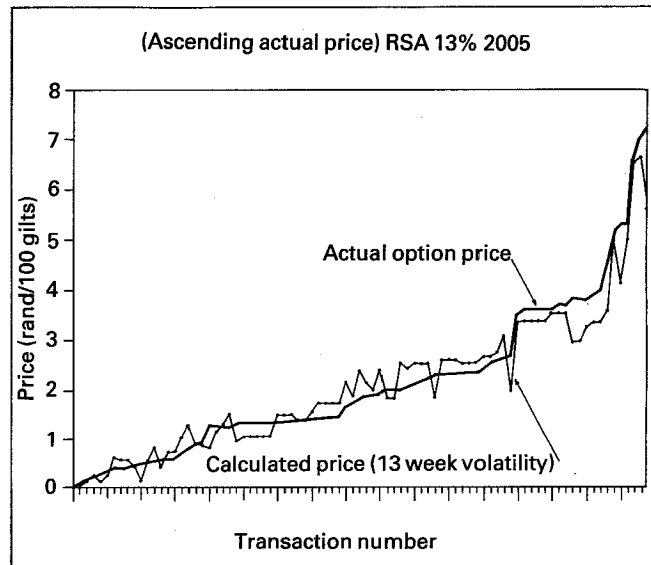


Figure 5: Gilt option prices

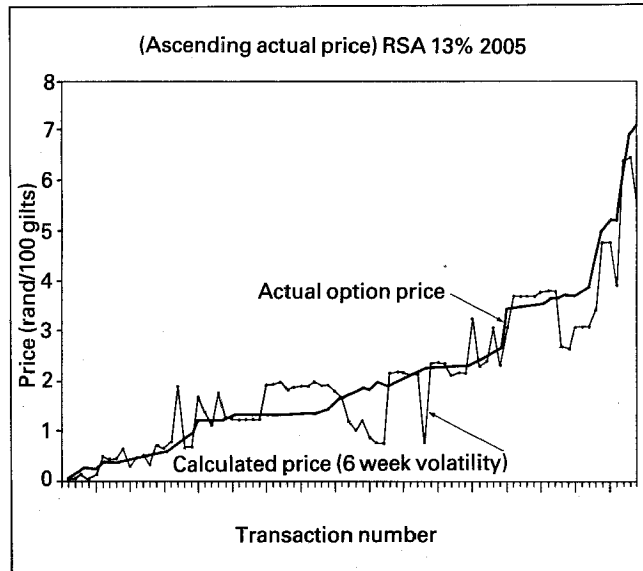


Figure 7: Gilt options

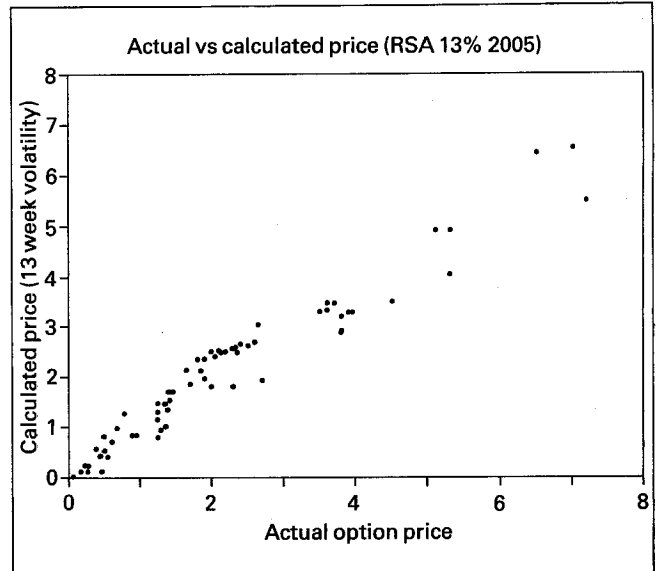
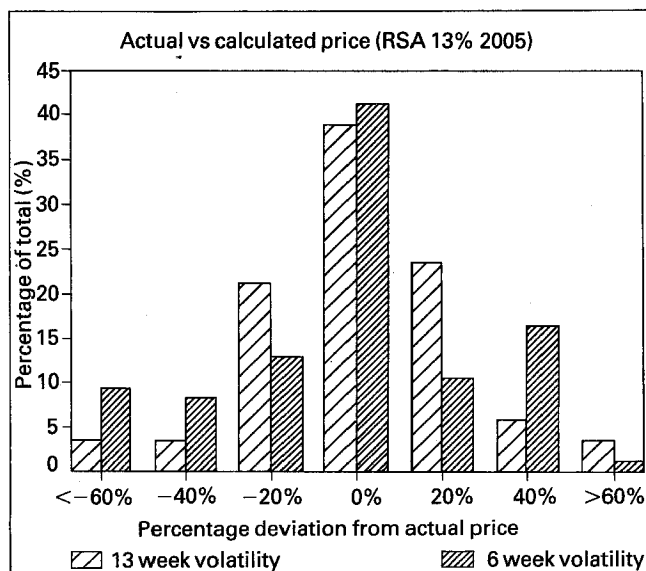


Figure 6: Gilt option frequency graph



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Criteria for major investment decisions

Abstract

This article surveys the quality of capital investment decision-making of leading South African firms. The results, based on 132 responses suggest that, while some firms are advanced, one firm in twenty did not use any of the required capital budgeting techniques for decisions. In addition, the findings provide interesting information on the methods used by firms to assess the impact of inflation on cash flows and the assumptions made with respect to reinvestment rates of cash inflows and, risk and non-financial criteria. The findings suggest that larger firms employ more sophisticated techniques and that high levels of analytical quality are positively correlated with corporate growth rates and profitability.

Introduction

In every business, several functional areas of management, eg, production, marketing, data processing and personnel, combine in the taking of decisions on major investment proposals. All these need to be integrated formally into the evaluation process and are vitally affected, in turn, by capital budgeting decisions.

All executives, no matter what their primary responsibility, must be aware of how major investment decisions are made and must provide data and information from their own sphere of operations.

Investment decisions make a commitment to the future – once made, the decision influences a firm for years to come. Major investments are an integral part of a firm's long-term strategy. A serious effect is the loss of flexibility when resources are allocated.

If the firm over-invests, profitability is reduced. On the other hand, if it under-invests, equipment may rapidly become uncompetitive due to a loss of relative technical sophistication or capacity, and this may lead, ultimately, to the loss of share in a growing market. Regaining market share is normally associated with vigorous marketing effort, price competition and further investment in fixed assets as capacity constraints are reached. These combined activities may place additional stress on the firm's resources.

The complexity of the strategic investment process, based as it is on the combined input from different functional areas within the firm, where objectives, philosophies, rewards and cultures vary dramatically, requires that decision-making be relatively rigorous and that the criteria used to evaluate proposals be understood by the managers involved in the commitment of large amounts of cash over extended time horizons.

The financial executives making major investment decisions have a wide variety of capital budgeting tools from which to choose. Each have their own assumptions, strengths, weaknesses and degrees of complexity. In order to assess the methodology of the capital investment process, a survey was undertaken which sought to answer the following questions:

- How advanced are South Africa's financial decision-makers in the using of the tools available?
- Is there significant correlation between the sophistication of the capital budgeting techniques adopted by firms and their economic variables?

This paper reports on the results of the survey and also puts forward guidelines to assist managers involved in the capital budgeting function.

Outline of the research

Methods used in capital budgeting in South Africa can arbitrarily be divided into two categories, namely, those commonly used by financial managers and those involving more exotic extensions of established techniques.

This research concentrated on the first of these. The more common of the techniques considered were:

- (i) Payback period.
- (ii) Accounting rate of return.
- (iii) Net present value.
- (iv) Profitability index.
- (v) Internal rate of return.

Using a questionnaire, data were gathered from investment decision-makers in some of South Africa's largest industrial and mining corporations in respect of such issues as:

- Which of the techniques were employed?
- When were the techniques introduced?
- How were such complicating factors as inflation, risk and mutually exclusive alternatives dealt with?

The subject of research considered here has been of interest for some time to American and European firms. This study into the South African situation followed an approach similar to that adopted by Fremgen, Klammer, Petry and Schall et al^{7, 9, 14, 15}. The questionnaires were mailed to the chief financial officers of 500 of South Africa's major mining and industrial companies. 132 replies were received.

The respondent sample as a percentage by industry sector is given in Table I. Respondents were not asked to identify themselves or their firms. However, they were asked to indicate economic characteristics such as total assets, capital budget size, growth and profitability to assist in categorisation.

Table I: Sample as a percentage by industrial sector

Industry class	Percentage
Mining	4,8
Wood, pulp and paper	6,4
Primary metals and fabrication	5,6
Petroleum and chemicals	13,6
Food, beverage and tobacco	16,8
Electrical and electronic products	4,0
Automotive products	8,0
Miscellaneous manufacturing	16,0
Industrial equipment	2,4
Construction	4,0
Department supermarkets and variety stores	4,0
Household and personal products	9,6
Other	5,6

Analysis and interpretation of the data

(a) Methods in actual use

Respondents to the questionnaire were asked which capital budgeting methods they used in evaluating the

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profitability of a proposed major investment. Table II shows that the most popular method used is the payback period – rated in theory ²(p 42) as being unsophisticated and definitely a poor technique for use as the sole means of evaluating investments. However, the discounting methods (internal rate of return, net present value and profitability index) received considerable support. It will be noted that the percentages total far more than one hundred per cent. As usage of several methods was common – the average number of techniques used per firm was 2,31. The firms were asked if they used any technique aside from those tabled and several "other" techniques were listed. The CAPM, MAPI and assessment of dividend and earnings yield were the most common mentioned in this section. Table II indicates that

time-weighted criteria play a more important role in firms with larger capital budgets. No definite trend is discernible in the data regarding the other methods surveyed.

The respondents were also asked what their primary method of evaluation was at present, and had been 5 and 10 years ago respectively. The findings appear in Table III. What is illustrated is a trend, with time, away from the less sophisticated methods of payback period and accounting rate of return to the more sophisticated time-weighted methods of internal rate of return (IRR) and net present value (NPV). The sample revealed that 57,3% use time-weighted methods as the most important basis for evaluation.

Table II: Capital budgeting methods in use in South Africa

Size of annual capital budget	Technique employed					
	Internal rate of return (IRR)	Net present value (NPV)	Profitability index (PI)	Payback period (PB)	Accounting rate of return (ROR)	Other
Over R50 million	40,9%	81,8%	9,1%	72,7%	45,2%	0,0%
R25 million – R50 million	80,0%	46,7%	13,3%	66,7%	46,7%	20,0%
R10 million – R25 million	63,2%	42,1%	15,8%	68,4%	47,4%	10,5%
R5 million – R10 million	68,7%	37,5%	12,5%	93,7%	43,8%	12,5%
R2 million – R5 million	63,2%	36,8%	26,3%	84,2%	42,1%	5,3%
Below R2 million	36,6%	31,7%	12,2%	51,2%	34,1%	4,9%
All respondents	59,5%	39,7%	14,1%	68,6%	41,3%	8,3%

Table III: Historical analysis of most important capital budgeting method in use

Capital budgeting method	Year		
	1982	1976	1971
Internal rate of return	45,3%	37,3%	27,0%
Net present value	7,7%	6,6%	5,4%
Profitability index	4,3%	3,3%	6,8%
Payback period	26,5%	27,5%	32,4%
Accounting rate of return	15,4%	24,2%	27,0%
Other	0,8%	1,1%	1,4%
Totals	100,0%	100,0%	100,0%

Of particular interest is the fact that although the payback period was used by 68,6% of the respondents, only 26,5% used it as the prime method of evaluation.

In comparison with American usage in the early 1970s^{7,9}, the payback period was more popular in South Africa in 1982, both as a primary and combined evaluation technique. As regards a primary evaluation technique, more of the South African respondents used a discounting method (52,7%) than Fremgen's American sample in 1972 (42%).

Analysis of the use of multiple methods reveal that South African respondents used slightly more techniques on average than respondents in the early and mid-1970s findings of Fremgen and Petry¹⁴ but less than the 2,56 average found among respondents in the study by Schall et al¹⁵ (1978). As in Fremgen's sample, the firms with larger capital budgets were more likely to employ several techniques – ranging from a 2,99 average for those with capital budgets of greater than R50 million to 1,70 for those with capital budgets of less than R2 million per annum.

The type of investment to which South African firms employed modern budgeting techniques was investigated. Over 40% said they used the techniques for all investment decisions and 43% said that they restricted their use to investment purposes over a set amount. The average value of this amount was R148 546 with a standard deviation of R259 672. This value was, thus, extremely wide, ranging from R100 up to R1 000 000. Of the remaining respondents, 5,9% claimed they did not use capital budgeting techniques for any investment decision! Given that the firms sampled are regarded as leading firms, this finding is surprising. The fact that one out of 20 of the leading firms relies totally on intuition is alarming. The remaining 10% said that they only employed capital budgeting techniques for certain types of investment. Among those names were investments for new products, major expansions, take-overs and capital used in the production of income. One comment was that capital investment analysis and budgeting was not necessary in strategic decisions!

Table IV summarises the findings.

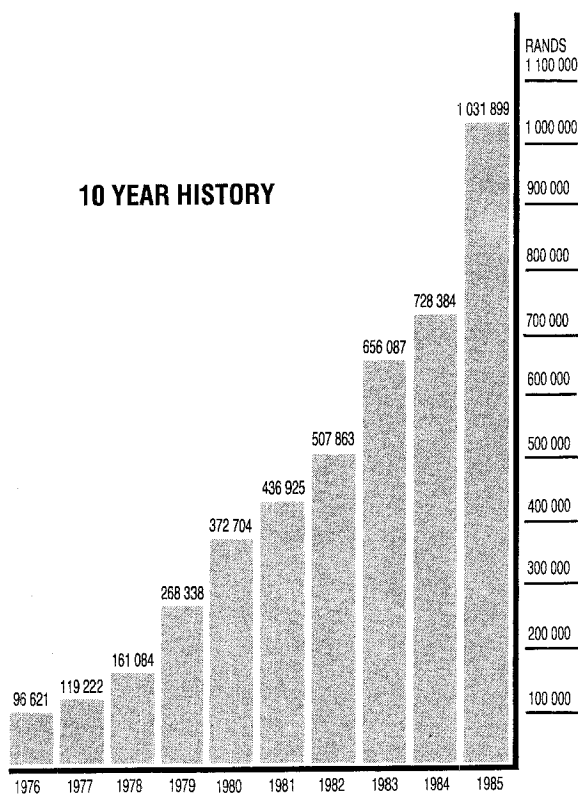
Table IV: Types of investments where capital budgeting methods are employed

Type of investment	Percentage of respondents using capital budgeting methods
All	40,7%
None	5,9%
Restricted to over a certain amount	43,2%
Restricted to certain types of investment	10,2%
Total	100,0%

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(b) Treatment of risk and uncertainty

A far more demanding problem than projecting a return on a given set of assumptions is analysing the impact of changes in the assumptions themselves. Each assumption involves its own degree of uncertainty and often this is relatively high. Integrating all the uncertainties into a model can multiply effects into an overall degree of uncertainty of excessive proportions⁸.

Of the firms responding, 76,8% made some explicit adjustment to account for risk and uncertainty. Hence, nearly a quarter of the firms are ignoring a critical factor in assessing major investments and, another quarter of the firms are using subjective judgement alone to cater for risk. A summary of the findings appears as Table V.

Table V: Adjustments made for risk and uncertainty

Risk adjustment method	Percentage of firms using methods
Requirement of higher-than-normal index of profitability	37,5%
Requirement of shorter-than-normal payback period	31,7%
Adjustment of cash flow by probability factors	14,2%
Purely subjective non-quantitative adjustment of cash flows	27,5%
No adjustment made	24,2%
Other methods	2,5%

The techniques specified under "Other methods" were stochastic models, break-even analysis of the cash flows and attempts to apply the capital asset pricing model.

When compared to results in American research, the South African firms appear to be lagging in terms of sophistication regarding risk adjustment.

(c) The effects of inflation

The respondents were also required to indicate what methods they used to take account of inflation. Findings are presented in Table VI.

Table VI: Adjustments made for inflation

Inflation adjustment method	Percentage of firms using method
No allowances made for inflation	42,4%
All items in cash flow inflated at an agreed rate	48,0%
Inflated at an agreed rate for a certain number of years	4,8%
Some other method	3,2%

An analysis of the effects of inflation on cash flows provides a theoretical basis which makes it obvious that it is essential that cash flows be adjusted for the effects of inflation when assessing major investments – yet over 40% of the respondents make no such allowances. Several firms inflated items in their cash flows for a specific number of years and then continue cash flows uninflated for the remainder of the life of the project. The average period of inflation allowance for these firms was 6,75 years – the shortest being 2 years and the longest 10 years with a standard deviation of 3,95 years.

Almost one-half of the respondents inflated all items in the cash flow but some listed other methods such as viewing current economics and subjecting the payback calculation alone to inflation.

(d) Rate of return on reinvestment

The use of time value of money methods entails an implicit assumption that cash flow from any investment will be reinvested at some rate implied specifically by the model being used.

For example, the IRR measures the relative profitability of investments by identifying the return on the declining balance of funds invested. Inherent in the technique is the assumption that immediate cash flows generated in each period are reinvested at the IRR. In contrast, the NPV, which uses a particular discount rate, assumes reinvestment of cash flows generally at that rate of return.

The use of the IRR will maximise net worth if the actual attainable reinvestment rate is equal to or greater than that rate of discount which equates the present values of project cash flows with the investment outlay.

Thus, a "reinvestment rate problem" arises because the mathematical models used by the discounted cash flow techniques assume a single reinvestment rate as well as magnitude, duration and pattern of the cash flows. From a practical point of view, the policies and circumstances faced by a particular firm will almost certainly invalidate such an assumption.

Respondents to the survey were asked whether they made any explicit assumption about the rate of return to be earned on reinvested funds. Only 17% of those who answered the question made an assumption regarding reinvestment rates of return. In most cases, this was their cost of capital rate which is implicitly assumed in the NPV model in any event.

Fremgen, in his study of American firms in 1971, found that a substantially higher percentage, namely 29% of firms, made explicit assumptions on the models they used. This provides further evidence that South African firms lag behind their American counterparts in terms of investment sophistication.

(e) Choice between mutually exclusive alternatives

When faced with mutually exclusive alternatives there are several potentially troublesome areas, from a theoretical point of view. The literature is generally in agreement, however, ⁴(p 21) that these should be analysed by the use of incremental cash flows, ie subtracting the cash flows associated with one alternative from those related with another. The survey of current practices by South African firms shows only 31% of the responding firms apply this technique. Most of the respondents (54,9%) stated that they decide on the alternative that gives the best rating as determined by the index of financial attractiveness they regularly use. In many cases, this technique will give the same decision as the incremental cash flow technique, but this cannot be relied upon.

Several other methods were proposed by the sample – many of them non-financial. When looking at the supply of machinery or plant, the reliability of the supplier, service, availability of spares and location were considered key aspects.

(f) Non-financial criteria

The American researchers cited several examples where non-financial criteria were used in the investment decision process. These related to governmentally required projects such as projects for safety or pollution control and projects concerned with employee morale.

From the South African sample, respondents totalling 93% said they accepted projects that were non-economi-

cally motivated. The South African firms seem less concerned with employee safety or comfort than their 1971 American counterparts and also show, wisely, less propensity to maintain uneconomic existing programmes or product lines. The findings appear in Table VII.

Table VII: Non-financial criteria used in major investment decision

Non-financial criteria	Percentage of firms applying criteria	
	South Africa	USA (1971) Ref 7
Investments never accepted on non-financial grounds	7,2%	—
Safety of employees or the public	61,6%	92%
Necessity of maintaining existing programmes or product lines	51,2%	79%
Employees' convenience or comfort	48,0%	77%
Social concern or enhanced community relations	40,0%	69%
Pollution control	57,6%	10%
Legal requirements	58,4%	7%
Unmeasurable long-term potential (such as R and D programmes)	30,4%	5%
Contractual commitments	19,2%	2%
"Seat of Pants" judgement	16,0%	—

Sophistication in investment decision-making

Although American researchers in several instances refer to sophistication in capital budgeting techniques, none attempted to find a tangible integrated measure for this. Great difficulties occur in assessing a firm's sophistication in terms of its understanding and application of capital budgeting techniques, the assumptions made and its knowledge and understanding of the difficulties, advantages and disadvantages of the techniques concerned. In order to obtain a basis for comparison between firms, a subjective indexing system was developed.

With the co-operation of a panel of knowledgeable financial analysts, five key factors in a firm's investment decision practice were rated ²(p 124). These were:

- most important capital budgeting method used;
- risk assessment method;
- allowance made for inflation;
- analysis of mutually exclusive alternatives;
- technique for dealing with reinvestment of cash flow.

Ratings for each factor produced scores between 0 and 10, with 0 indicating a low level of sophistication and 10 a very high level of sophistication. Using weighting factors agreed upon by the financial analysts, the ratings were combined into a single Sophistication Index.

The fact that a wide variation in sophistication exists is indicated by high standard deviations and relatively low correlation coefficients. Apart from endogenous characteristics producing this wide variation, several technical reasons can be postulated that would explain it.

Table VIII: Sophistication in capital budgeting by industry category

Industry sector	Mean Sophistication Index	Standard deviation
Coal, petroleum and chemical industries	90,1	30,6
Supermarkets, department and variety stores	88,8	29,1
Automotive products	78,9	30,7
Mining	77,1	33,7
Miscellaneous manufacturing	75,0	36,5
Food, beverage and tobacco	74,4	30,2
Other	71,5	38,5
Primary metals and fabrication	68,6	28,3
Wood, pulp and paper	65,0	29,8
Electrical and electronics	64,5	41,9
Construction and industrial equipment	52,0	47,9
Household and personal products	49,7	37,8

The mean Sophistication Index and its standard deviation by industrial sector appear in Table VIII. The listing is arranged in descending order of sophistication.

"Petroleum and chemical industries" and "Automotive products" rank near the top of the list in line with the findings of Petry and Schall et al in their investigations. Being capital intensive with medium to long-term planning horizons, these industries will benefit more than most from a high level of sophistication in capital budgeting. The high degree of sophistication shown by South African supermarkets, department and variety stores is somewhat surprising – possibly an indication of the successful trend to hyper-stores which need careful financial planning and investment decision-making.

"Electrical and electronic products" and "Wood, pulp and paper" do not show high sophistication and this is in keeping with Petry's findings. However, the samples from these industries was not large (see Table I) and the large standard deviations indicate a wide variation within these samples.

Linear regressions of the Sophistication Index against the net asset size, capital budgets size, growth rate and profitability of the respondent firms provide interesting correlations.

The "best fit" relationships and some parameters of the correlations are given in Figure 1.

In general the sample reveals:

- (i) Larger firms are more sophisticated in capital budgeting techniques than smaller firms.
- (ii) Firms having larger capital budgeting expenditures use more sophisticated capital budgeting techniques.
- (iii) Firms that are using more sophisticated capital budgeting techniques are growing faster.
- (iv) Firms that are using more sophisticated capital budgeting techniques are more profitable.

Conclusion

Response bias is obviously possible in a survey of this nature but was found not to be a major factor in previous capital budgeting surveys in America. For example, Schall et al¹⁵ comment in their paper – "A questionnaire

follow-up to 16 randomly selected non-respondents was carried out, and answers to the questionnaire obtained from 15 of them. The results of this follow-up analysis indicate there is little response bias; the follow-up firms were slightly (not statistically significant) more sophisticated in methods used for capital budgeting and slightly less sophisticated in risk assessment methods. Thus, response bias does not appear to be a major factor . . ." Allowing for this, a definite trend to more sophisticated techniques is noted in the large South African firms from the early seventies to the present.

The survey indicates that time-weighted techniques are becoming more widely used at the expense of non-time-weighted techniques such as the accounting rate of return. This is especially prevalent with regard to a prime evaluation standard. Also noted is the use of multiple methods by most firms. As an overall evaluation, the present use of capital budgeting techniques by South African firms appears, in sophistication, to be equivalent to that found in American firms in the period 1975 to 1978.

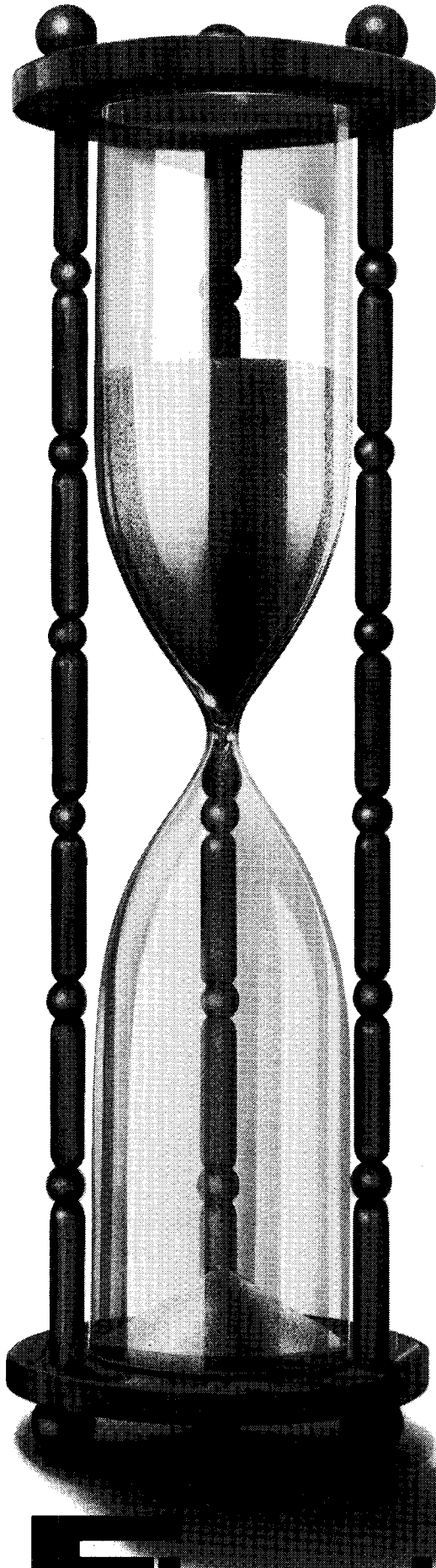
However, of particular concern is the fact that a wide gap between theory and practice still exists with nearly a quarter of the sample stating that they make no allowance for risk and uncertainty and a further quarter are using only subjective judgement to cater for risk. Inflation is completely ignored by over 40% of the respondents. Additionally, over half do not use theoretically correct methods for assessing mutually exclusive alternatives and less than 20% make explicit assumptions regarding reinvestment rates of cash flows generated.

When firms are compared using the Sophistication Index it can be inferred that those firms not adopting a sophisticated approach to capital budgeting are forfeiting both profitability and growth. The implications are clear. South Africa has limited resources and these must be allocated to those projects which will maximise shareholder wealth. These research findings, based on a survey of leading South African firms, suggest that the objective of optimal resource allocation is far from being attained. The research suggests that increased sophistication in capital budgeting is correlated with performance. This is not unexpected. What is surprising is the poor conceptual understanding of what are, after all, fairly simple techniques and the failure to adjust for or take account of such initial issues as inflation. The fact that the respondents were the chief financial officials of leading South African firms gives cause for concern regarding the training that these executives have received. The tendency in South Africa has been for executives with an accounting background to be appointed to financial positions and few would argue with the proposition that accounting and finance, although related, are different.

Finance is a top management function. As such it is concerned more with the long-term strategic issues of the firm. The lack of sophistication suggested by these research findings, implies that strategic issues are being neglected and that resources are perhaps being misallocated.

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Inflation as an obstacle to job creation in South Africa

Abstract

The trade-off between unemployment and inflation, suggested by empirical evidence both overseas and also in South Africa, has important implications for economic policy. If it can be relied upon, it suggests that it is within the power of governments to determine what the consequences of specified policy initiatives will be for either variable, given the direct effect of policy on the other. In recent years, however, the trade-off appears to have undergone a subtle change. While it continues to be evident in the short run, its dependability in the long run has become more suspect. Indeed, in the more industrialised countries, the evidence suggests that it breaks down altogether, indicating an absence of long-run money illusion. An interesting revelation of research in South Africa is that this breakdown has begun to manifest itself here too, so that the advantages of Keynesian-type reflationary policies may be shorter-lived and less than might have been the case in earlier years. The problem of the rise in unemployment in South Africa is particularly serious because of the connection in this country between unemployment and social and political instability. The problem, however, is more than just a cyclical one. In the long run, only growth in the real economy greater than the growth of population will prevent unemployment from becoming overwhelming, and this gives growth a higher ranking in the determination of policy priorities. The article draws attention to the negative correlation that has emerged between growth in production volume and inflation in South Africa and argues that a reduction in inflation here may have become a precondition for improved real economic performance and, hence, job creation itself in the long run. This is a contradiction of a conventional wisdom upon which the formulation of economic policy continues very largely to rest.

Introduction

It was Keynes who provided in his *General Theory of Employment Interest and Money* (1936) the first theoretical justification for deficit financing, and this was given added rigour by Hansen and Hicks in the formulation of the famous IS-LM model. What the model demonstrated were the circumstances in which the effectiveness of monetary policy might be reduced as an instrument of macro-economic stabilisation, making fiscal policy the prime means for a policy to counteract aggravated recession. Briefly, the Keynesian argument was concerned with circumstances in which a collapse of confidence in the private sector, amongst consumers but more especially amongst corporate investors, necessitated a spending initiative by the government sector in order to check a general decline in the level of economic activity. Where entrepreneurial confidence has collapsed, even extremely low interest rates might not provide a sufficient inducement to invest, and it is changes in investment expenditure which are critical in determining changes in aggregate demand and, hence, in determining the direction of the business cycle. Empirical research has demonstrated the relative stability of

consumer spending. What gives investment spending its greater volatility is its dependence on business expectations and these are extremely dependent on delicate psychological factors. In the face of negative expectations about the possibilities of future profits, even negative real interest rates might not be enough to persuade the corporate sector to add to its productive capacity, especially in circumstances where a large proportion of existing capacity is not being utilised. This is the essence of what has come to be known as the liquidity trap.

In the immediate post-war period, Keynesian policies were applied with good effect to ensure that there was no relapse into the problems of chronic unemployment that had characterised the depression and immediate post-depression years. However, success in keeping unemployment low, involved, as time passed, renewed difficulty with inflation. Monetarists had always argued that in circumstances of full employment, this would be the consequence of excessive money creation. After 1945, deficit financing, particularly in the US, but in other major Western industrialised countries also, led to an unprecedented global monetary expansion and this was a major factor explaining a world-wide exponential increase in consumer and producer prices.

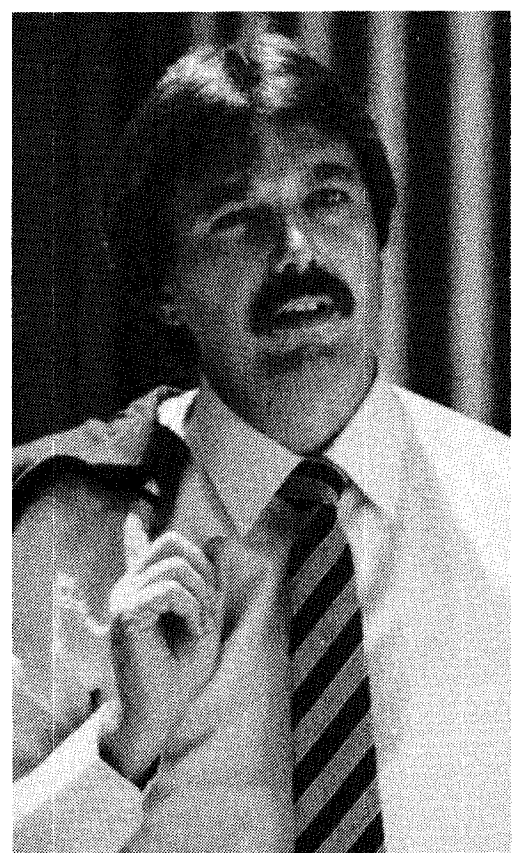
Space does not permit here a full explanation of the process that led to the stagflation of the 1970s. Suffice it to observe that it had to do with two factors in the main, namely, the breakdown in the effectiveness of what came to be known as the stop-go policies which had characterised attempts at macro-economic stabilisation in the 1950s and 1960s, and the changes which occurred in the relative fluctuation of unemployment and inflation, both set as they were in a secular upward trend. In the post-war hey-day of Keynesian influence, governments evidenced an unprecedented self-confidence in economic management as the image of the modern industrial state as an all-powerful entity, able to achieve, in economic terms, anything it set itself to achieving, gained credence. It was this view that was shattered by these developments.

Nothing sums up the change in circumstances more poignantly than the following words of former British prime minister, James Callaghan, to the Labour Party conference of September 1976:

"We used to think that you could just spend your way out of a recession, and increase employment, by cutting taxes and boosting government spending. I tell you in all candour that that option no longer exists, and that in so far as it ever did exist, it worked by injecting inflation into the economy. And each time that happened, the average level of unemployment has risen. Higher inflation, followed by higher unemployment. That is the history of the last 20 years."

This is a significant confession from a socialist leader and it is one South African policy makers would do well to heed when considering, in these grave times, what should be done about unemployment here.

*Thanks are due to Drs P D F Strydom and D W Goedhuys for their comments and suggestions regarding the revision of the original draft of this paper.



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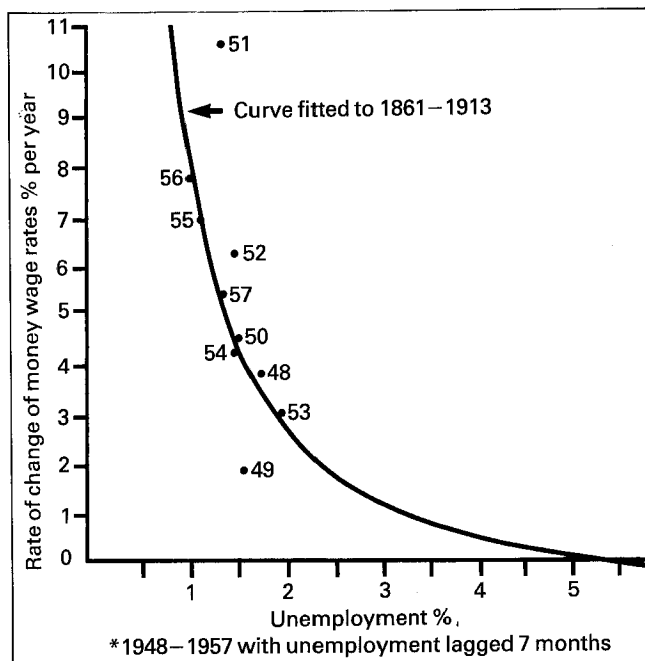
The statistical relationship between unemployment and inflation has been well explored in the more advanced industrial countries and while their circumstances are somewhat different from those of South Africa, the studies have provided guidelines for an understanding of the relationship here as well. It needs to be said, however, that there is a difference between statistical correlation and causality, and in the final reckoning, it is causality which is the interest of economic analysis and policy.

The most celebrated of the studies concerned with the statistical and causal links between unemployment and inflation was that conducted by Prof A W Phillips in the United Kingdom covering the period 1861 to 1957. Two of the graphs published in the Phillips paper are included here as *Exhibits I and II*. These reveal a definite trade-off between the two variables. The statistical correlation between high rates of inflation and low unemployment, and between low rates of inflation and high unemployment, was given causal explanation in terms of classical demand-supply analysis. Thus, in circumstances in which the demand for labour was high relative to the supply of labour, ie when unemployment was low, it was seen to be reasonable to expect employers to bid money wages up rapidly, each firm in an industry being prepared to offer a little more above prevailing wage rates to attract more labour to itself. However, in converse circumstances, when the demand for labour was low relative to its supply and unemployment was high, it was considered understandable that workers would be reluctant to offer their services at less than prevailing wage rates. This would have explained also the highly non-linear relationship between the rate of change in nominal wage rates and unemployment. It was a simple extension of the argument to compare rates of change in consumer prices and the rate of unemployment, and not unexpectedly the empirical evidence was found to confirm the trade-off.

Exhibit I
Phillips data (UK) 1861–1913



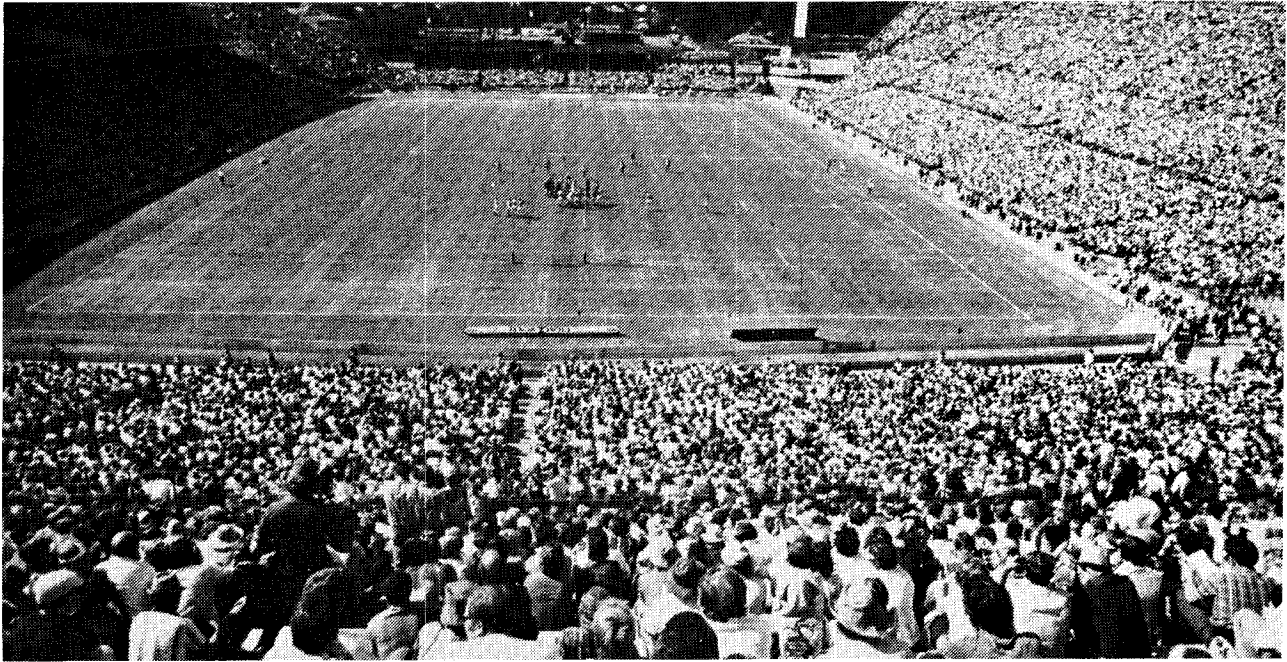
Exhibit II
Phillips data (UK) 1949–1957*



The significance of the trade-off from a macro-economic stabilisation point of view had to do with what it implied for economic policy. Briefly, if the relationship remained consistently true, it meant that the policy, concerned with reducing inflation, could be made effective by measures that would have the result of increasing unemployment. On the other hand, if the goal of policy was to reduce unemployment, measures that involved an increase of inflation could be considered. It remained, merely, for governments to decide what balance between unemployment and inflation best suited them given the prevailing circumstances of the time and their broader political objectives.

It is a matter of history that very soon after Phillips published his paper, the relationship it revealed between unemployment and inflation, not only in Britain but in the US and elsewhere, began to change. Stop-go economic policies worked while the Phillips curve was intact, but their effectiveness began to decline once the factors which had worked to maintain the trade-off in the unemployment-inflation relationship began to break down. With the breakdown in the Phillips curve in Britain and the US, the attack on the theoretical validity of the trade-off began to be mounted. It was led by no less a personality than Prof Milton Friedman.

Friedman's theoretical criticism of Phillips concerned, basically, the static view of the unemployment-inflation relationship and the confusion between real and nominal wages that it implied. If the comparison is made between inflation and real wages, and it is these Friedman argued which really matter, the relationship no longer exhibits an obvious trade-off. This focuses attention on the matter of expectations for what is "real" in the inflation-adjusted sense of the word, depends on what wage earners as well as employers, expect future inflation to be.



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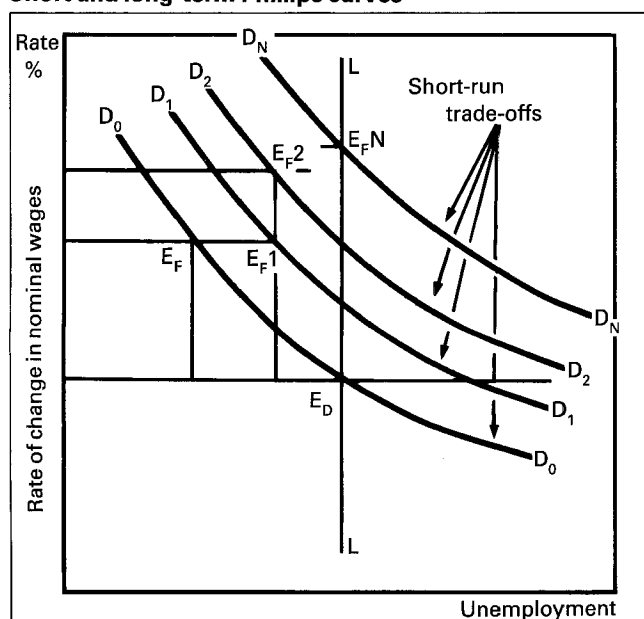
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In the General Theory, Keynes had argued that while workers will usually resist a formal reduction in money wages, it is not their practice to withdraw their labour whenever there is a rise in consumer prices that causes their real wages to decline.¹ This had provided the rationale for the Phillips argument but it did not take into account, according to Friedman, the important distinction between *anticipated* nominal and real wages, and *actual* nominal and real wages. Problems arise for employment, and indeed, for everything else in the economic adjustment process, when events or prices, turn out to be different from what was expected. Friedman, therefore, could accept the existence of a short-term trade-off, but the evidence he argued, still pointed to there being no trade-off in the long run.

Exhibit III illustrates what the long-run relationship between unemployment and inflation (measured in terms of the per annum rate of increase in nominal wages) looks like in terms of Friedman's hypothesis. The natural rate level of unemployment (ie that rate determined by structural and frictional forces, and which cannot be reduced by raising aggregate demand) is indicated by the vertical line LL and the equilibrium position in the labour market at zero inflation is indicated by E_0 . Any shifting away from this equilibrium position, say to E_{F1} where unemployment is now below the natural rate level and nominal wages are rising as a result, will cause an adjustment of expectations and a movement of the short-run curve upwards to a resting place on a short-run curve which reflects an equality between anticipated inflation and the current inflation rate, in this illustration shown by E_{F1} . However, E_{F1} still reflects disequilibrium in the labour market because at it, the unemployment rate remains below the natural rate level, and the result is that the rate of inflation would rise further causing another shift upward in the short-run trade-off. For an inflationary equilibrium to be established, the upward shift in short-run trade-offs would have to continue until the position E_{FN} was reached. This would be a confirmation of the view that in the long run no money illusion exists. The model indicates that the only way in which unemployment can be kept below its natural rate level is by an ever-accelerating inflation, which always keeps actual inflation ahead of anticipated inflation.²

Exhibit III
Short and long-term Phillips curves



At the start of the 1980s, the global prospects for inflation were threatening. Over an extended period of time, the rate of inflation in most industrialised countries had been rising and with the sharp increase in the world price of crude oil in 1979 from nearly \$15 a barrel to over \$30 a barrel, it seemed certain that inflation would continue to worsen. There was reason to fear, indeed, that if something was not done on the policy front in the US, Western Europe and Japan to check it, inflation internationally would soon reach a level beyond which a breakdown of the world currency system would occur. The fact that such fears proved groundless, at least during the first half of the present decade, is now generally acknowledged but it is still useful to examine what happened, to understand why, and to explore the lessons the experience has had for countries like South Africa.

Dispute between theoreticians continues to rage as to whether the policies adopted by the Reagan and Thatcher governments in the US and Britain, have really provided good examples of monetarism in practice. While they have tended to be viewed as monetarist by political adversaries, purists on both sides of the theoretical debate have tended to argue like Prof Milton Friedman on one side and Prof Nicholas Kaldor on the other, that they have not. Friedman has maintained that control of the money supply has not been achieved, let alone pursued, in accordance with monetarist principles. Kaldor has asserted of the Thatcher policies, that to the extent to which they have worked to reduce inflation, they have done so only through a painful Keynesian-type deflation of the economy. It is beyond the scope of this paper to deal with these conflicting claims. There is truth in each of them and the dispute will probably never really be settled. What, however, is important is that as a result of Reagan and Thatcher, no one really doubts any longer that in circumstances of relative prosperity such as the Western world currently enjoys, the problems of unemployment or of economic disequilibrium more broadly, cannot be solved simply by resorting to the printing press. It might be said that we are all monetarists now if by monetarist is meant that inflation is a monetary phenomenon and regulating the growth in the money supply is important to its control.³

Exhibit IV
US unemployment and inflation rates

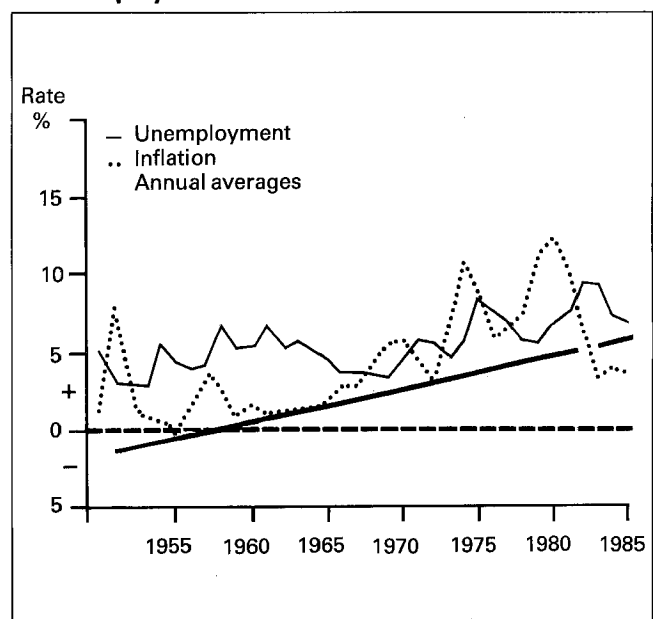


Exhibit IV shows the relationship between unemployment and inflation in chronological perspective since 1950 in the United States. Two factors deserve special attention. The first concerns the rising trend in unemployment between 1953 and 1983 which has been due mainly to the structural shift away from manufacturing production and towards the service sectors of the US economy. (This trend can also be explained in terms of the "natural rate" hypothesis already mentioned above.) The second concerns the secular rise that is likewise evident in inflation. The decline that has occurred since 1983 in both unemployment and inflation in the US, is especially important because it has not been duplicated in other leading industrial countries. However, in the case of Western European states, although unemployment has proved a more intractable problem, inflation has been reduced and real economic growth has improved. *Exhibits V* and *VI* provide, for illustrative purposes, figures for the United States and the United Kingdom only.

Exhibit V
Unemployment, inflation and real GDP growth – US

Annual averages Years	Real GDP growth % per annum	Inflation % per annum*	Unemployment rate %
1950–59	3,3	2,1	4,5
1960–69	4,0	2,8	3,8
1970–79	3,1	7,8	6,2
1980–85	2,6	5,5	8,0
1983–85	4,6	3,9	8,0†

* As measured by year-on-year changes in the CPI.
† Average for 1984 and 1985: 7,3%.

Exhibit VI
Unemployment, inflation and real GDP growth – UK

Annual averages Years	Real GDP growth % per annum	Inflation % per annum*	Unemployment rate %
1950–59	2,8	3,4	1,6
1960–69	2,8	4,0	1,9
1970–79	1,8	13,7	4,1
1980–85	1,9	7,2	11,3
1983–85	2,5	5,5	13,0

*As measured by year-on-year changes in the CPI.

The Phillips curve in South Africa

The trade-off between unemployment and inflation is an underlying assumption of much of the thinking that governs policy formulation in South Africa. It is widely accepted, for example, that effective anti-inflationary policies would cause black unemployment to rise and this is seen as being a threat to the socio-economic stability of the country. On the other hand, as now, inflationary monetary and fiscal policies are seen as having the possibility of at least some beneficial effect for employment. Although inflation is generally acknowledged as being undesirable, by both the Government and the public, it is seen as being less undesirable than unemployment for the reasons stated. It seems to have been overlooked by many that the truth of such wisdom is a truth limited essentially to the short term, and that on a longer run analysis, inflation itself could be a threat to job creation.

The statistical relationship between unemployment and inflation in South Africa since 1960, ie over a time span of twenty-five years, is illustrated by *Exhibits VII* and *VIII*. These show the relationship using both annual percentage changes in money wages in manufacturing and in the All Items Consumer Price Index in a regression analysis. Short-run trade-offs are suggested, but it is also clear that there has been an upward shift in these that is similar to such upward shifts revealed by overseas data. Nobody should be surprised by this. The upward shifting of short-run trade-offs is part of a learning process demonstrated by efficient financial and factor markets, and there is evidence that financial and factor markets in South Africa are efficient, or exhibit important characteristics of efficiency.⁴

Exhibit VII
Changes in nominal wages and unemployment in South Africa

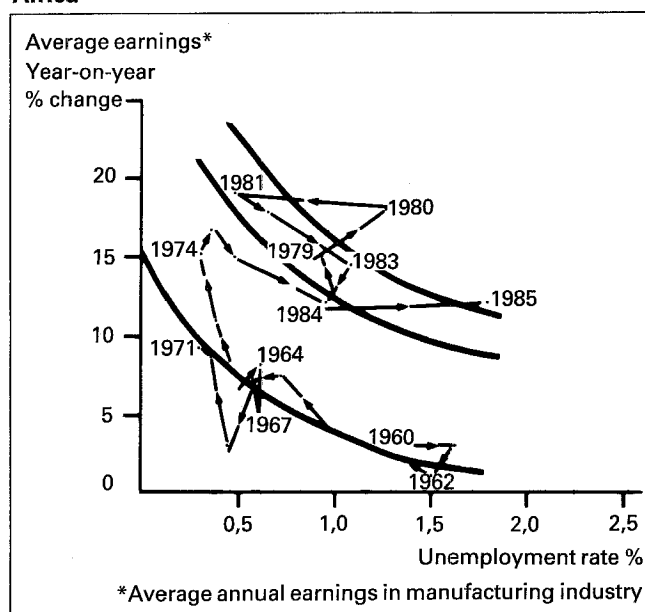
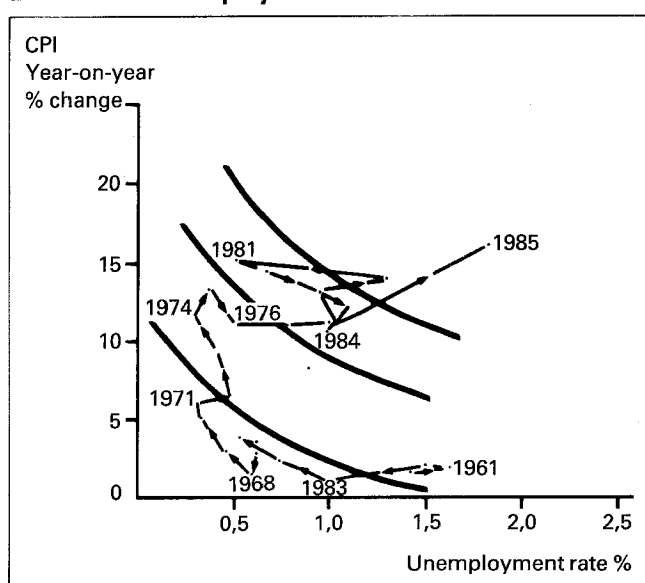


Exhibit VIII
Inflation and unemployment in South Africa



Learning works most importantly through its effect on expectations and the taking of anticipatory action. Thus, a policy change that has been tried before in similar cir-

cumstances, will invoke a different response in free markets from the response originally induced because the second time around, the response will be adjusted to account for the likely consequences of the response itself. If the period of time for a policy initiative to work its way through had previously been six months, it could be shortened to only three months or less, because of such anticipatory effects. In democratic countries, where governments depend on electoral approval, unpopular measures need to be effective quickly. If they are not, they might have to be abandoned before their beneficial consequences have had time to work themselves through and knowledge of this may have its own effect on the process of change. Prior to the Thatcher government in Britain, trades union negotiators in wage disputes had been able to rely on the election cycle to secure demands for pay increases that were in excess of productivity improvements. Mrs Thatcher's special achievement has been to break this pattern in pay settlements. Expectations and anticipation are at the heart of efficiency of the mechanism whereby policy effects are transmitted through the economic system. The more efficient the transmission mechanism, the less the cost in terms of lost employment and a wasting of resources caused by expectational or anticipatory errors.

In a more rigorous investigation of the unemployment-inflation relationship in South Africa but covering the period 1958/9 to 1974/5, ie prior to the major inflationary surge that followed the 1973/4 oil crisis and the final emergence of a floating currency system, Strydom and Steenkamp⁵ found evidence of a trade-off which did not disappear in the long run but which became steeper. External influences were found to have been important to a small open economy such as that of South Africa.

The conclusions that can be drawn from both this study, and that of Strydom and Steenkamp, is that accelerating inflation, and with it expectational factors, cause the Phillips curve in this country as elsewhere to shift so that the trade-off ceases to have dependability. In the short run, the more recent evidence shows, the trade-off is no longer identifiable in the clear way, and in the long run it deteriorates. This must render stabilisation policy based on the trade-off inefficient.

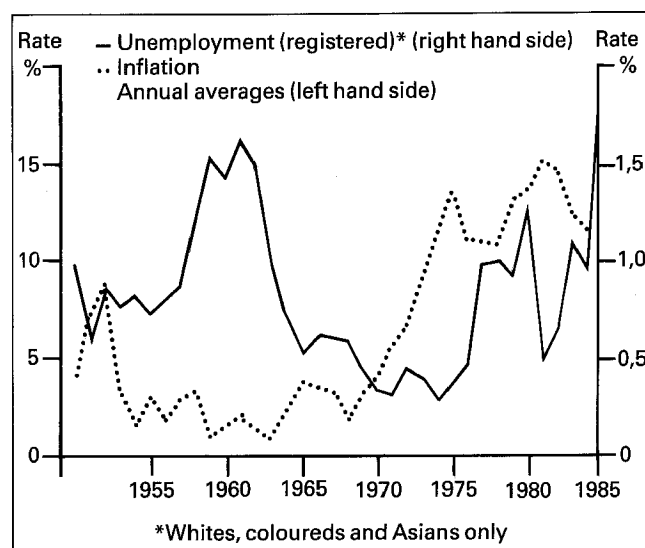
Unemployment, inflation and real GDP growth in South Africa

The causal link between real GDP growth and the growth of employment in any country is direct, but susceptible to change particularly in the face of structural adjustments in the economy. In South Africa, this has been particularly true as the manufacturing sector has increased in relative importance to the agricultural and mining sectors. In more recent years, the growth of the service sector relative to the rest of the economy has added to the tendency for the rate of growth of employment to lag behind the growth of total output. This explains the existence in South Africa also of a secular rise in unemployment although here, in contradistinction with North America and Western Europe, the rise has been given added impetus by a high rate of population increase. In *Exhibit IX*, the relationship between changes in registered unemployment and inflation between 1950 to 1985 are illustrated.

When considering the relationship between unemployment and inflation in South Africa, account has to be taken of special local factors which have a bearing on the Phillips curve trade-off. One of these is the country's high rate of population increase. Another concerns the inadequacy of the official South African unemployment data.

In this study, use has been made of registered unemployment figures which concern only the unemployment of whites, coloureds and Asians. Reliable figures for black unemployment are not available and those published tend to vary according to the definition used and the political bias of the researching agency. The official level of black unemployment, determined on the basis of periodic survey, is in the region of 8½%, but unofficial estimates put the figure much higher at between 15% and 25%. Even amongst whites, coloureds and Asians, the official unemployment figures understate the true position because not all unemployed formally register with State labour exchanges. Survey-based estimates of coloured and Asian unemployment suggest that this, currently, is in excess of 5%.

Exhibit IX
SA unemployment and inflation rates



Another reason why the unemployment rate figures may be misleading, concerns the availability of data relating to economically active persons. Because figures concerning the TBVC countries have been excluded from those pertaining to the RSA as these countries have emerged to nominal independence, one is forced to rely entirely on estimates of the numbers of such persons.

However, despite their shortcomings, the registered unemployment data provide an extremely good indicator of changes in the business cycle because they accurately reflect variations in the unemployment of mainly skilled workers. The data, therefore, can be helpful in an analysis such as this for what they show is a marked increase in unemployment over the past six years compared to the equally marked rise in inflation and a decline in growth. This is a classical illustration of the symptoms of stagflation.

The negative correlation between real GDP growth in South Africa and inflation, is illustrated clearly in *Exhibit X*. While this provides no conclusive demonstration of causality, it does draw attention to a fact which deserves very thorough consideration by policy makers. Why, it must be asked, has such a negative correlation existed? What are the factors of a structural nature which have combined here to produce such a discouraging result? Is there, perhaps, a causal connection between the two variables that justifies the assertion made in the title of this paper that inflation itself needs to be viewed as a possible obstacle to job creation? Clearly, job creation is important and not just in terms of the im-



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mediate recession. It is important also because in the longer term South Africa confronts a demographic transformation that will end in disaster if growth does not match the increase of population and if, more specifically, it does not provide jobs for the exponential rise in the numbers of people, especially black people, entering the labour market.

Exhibit X
Unemployment, inflation and real GDP growth – SA

Annual averages Years	Real GDP growth % per annum	Inflation % per annum*	Unemployment rate % [†]
1950–59	4,4	3,5	0,92
1960–69	5,7	2,5	0,91
1970–79	3,4	10,3	0,57
1980–85	1,1	14,8	1,06
1983–85	2,0 [‡]	13,9 [§]	1,29

* As measured by year-on-year changes in CPI.

[†] The registered unemployment of whites, coloureds and Asians only expressed as a percentage of the estimated economically active populations of such groups.

[‡] 1984: 5,0% (reflecting “mini-boom” effects); 1985: –1,0%.

[§] 1984: 11,7%; 1985: 16,2%; 1986 (April): 18,6%.

There are a number of factors in South Africa’s case which have combined to make inflation here more difficult to control than inflation in the industrialised countries. South Africa’s large dependence on gold sales and the heightened volatility of the gold price since the early 1970s have been the most important of these, but attention also needs to be focused on the special and powerful political pressures that exist here for a redistribution of income and wealth across racial lines. Also, the smallness of the economy and its oligopolistic structure have worked to weaken competition as a means of inflation control. A unique feature has been the country’s internal political conflict and its effect on the capital account of the balance of payments. Capital flight, particularly since mid-1985, has been an important factor in the collapse of the rand and this has fed back in a perverse way to counterbalance the effect of anti-inflationary policies.

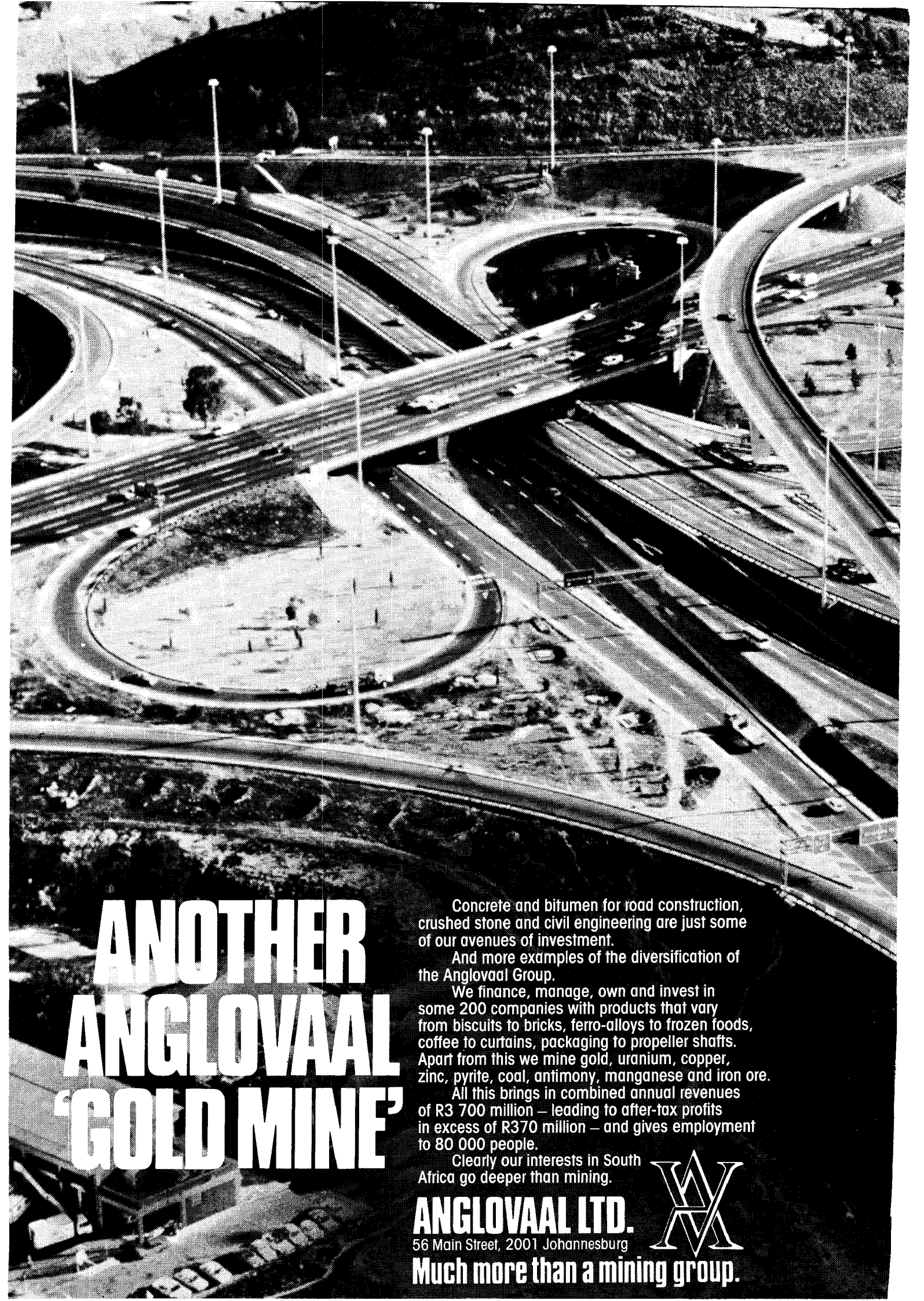
In South Africa, inflation has worked both directly and indirectly to affect unemployment negatively. Its direct impact has been mainly through the encouragement it has given to the introduction of labour-saving methods of production as a means to limiting the major element of cost in manufacturing, and through the mal-investment and wasting of resources that it has also caused. Its indirect effect has been mainly via the balance of payments and the constraint that that has imposed on economic growth generally. Inflationary disequilibrium at any given exchange rate, has contributed to balance of payments disequilibrium through a reduction of the competitiveness and/or profitability of exports, and through the encouragement it has given to imports which exchange rate depreciation has served to counteract.

Conclusion

Between the problems of unemployment and those of the balance of payments, the problems of inflation remain the neglected issue of policy in South Africa. Not in its words but in its actions, the Government has demonstrated that it believes that these types of difficulty can be dealt with separately. This is a fundamental mistake. There will be no permanent solution to the problems of the balance of payments, or the problems of unemployment, if similar urgent attention is not given to reducing the rate of inflation. Indeed, if experience overseas is any guide, it could well be that a reduction of inflation in South Africa is a prerequisite for any satisfactory solution to the problems both of the balance of payments and of unemployment. Capital is fleeing the country not merely because of internal social turbulence. It is fleeing also because fears are compounding that the rand exchange rate is on a precipitous downward slope and can only go lower; and without capital, a required order of growth will not be possible. The historical challenge now facing policy makers is that they recognise this and that they recognise also that the battle against inflation, the underlying reason for the rand’s weakness, cannot be quickly won. In South Africa, there are inherent factors which complicate the problem (the volatility of the gold price is one, the pressure for a massive redistribution of income and wealth is another), but ways have to be found to deal with these if the battle against inflation, and hence against rising unemployment also, is not to be lost.

Footnotes and references

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Investment basics XVIII

Risk and return – part I

Introduction

The primary concerns of the investment manager are the valuation of individual securities and the combination of individual securities into well-balanced portfolios. All securities offer a return, and the returns from most are subject to uncertainty or risk. Hence, the investment manager is concerned with constructing portfolios that are efficient in the sense that they maximise returns for a specified level of risk or minimise risk for a specified level of returns.

Modern finance theory has a great deal to say about the calculus of risk and return that is of specific, quantitative assistance to the investment manager in translating the abovementioned objectives into precise operational terms. The purpose of this article is to present a brief, informal account of those aspects of modern finance theory that bear most directly on these issues – namely portfolio and capital market theory. We shall address the following questions:

- How are the returns from individual securities and portfolios measured?
- How are the risks of holding individual securities and portfolios quantified?
- How does a portfolio – ie a diversified holding of securities – reduce risk?
- How does one construct efficient portfolios that optimise return with respect to risk?
- How, in efficient capital markets, are securities priced or valued?

The measurement of historical returns

The return on an investor's portfolio for any given period of time may be expressed as follows:

$$R_p = (V_1 - V_0 + D_1) / V_0 \quad (1)$$

where:

R_p = return on portfolio

V_1 = the portfolio market value at the end of the period

V_0 = the portfolio market value at the beginning of the period

D_1 = cash distribution to the investor during the period.

The calculation assumes that any interest or dividend income received on the portfolio and not distributed to the investor is reinvested in the portfolio and thus reflected in V_1 . Furthermore, the calculation assumes that any distribution occurs at the end of the period. It also assumes that there are no capital inflows or outflows during the period, otherwise the calculation would have to be modified to reflect the changed asset base.

Now let us consider the returns to a portfolio over a number of such periods. There are three possible measures for multi-period returns, namely:

- the arithmetic average;
- the time-weighted or geometric average; and
- the money-weighted average.

Given the following consecutive monthly returns on a portfolio, as measured by equation (1), -10%, 20% and 5%, the arithmetic average return would be 5%, as shown below:

Period	Return
1	-10%
2	+20%
3	+ 5%
Total return	15%
Average return per period	5% = 15%/3

The general formula is:

$$R_a = (R_{p1} + R_{p2} + \dots + R_{pn}) / n \quad (2)$$

where:

R_a = the arithmetic average return

R_{pk} = the portfolio return in period k, where k ranges from 1 to n

n = the number of periods for which returns are measured.

On the basis of the same data, however, the time-weighted or geometric return would be 4.3%.

Period	Return
1	(1-10/100)
2	× (1+20/100)
3	× (1+ 5/100)
Total return	1+13.4/100
Time-weighted return per period	(1+13.4/100) ^{1/3} - 1 = 4.3%

The general formula for the time-weighted return per period is:

$$R_t = [(1+R_{p1})(1+R_{p2}) \dots (1+R_{pn})]^{1/n} - 1 \quad (3)$$

where:

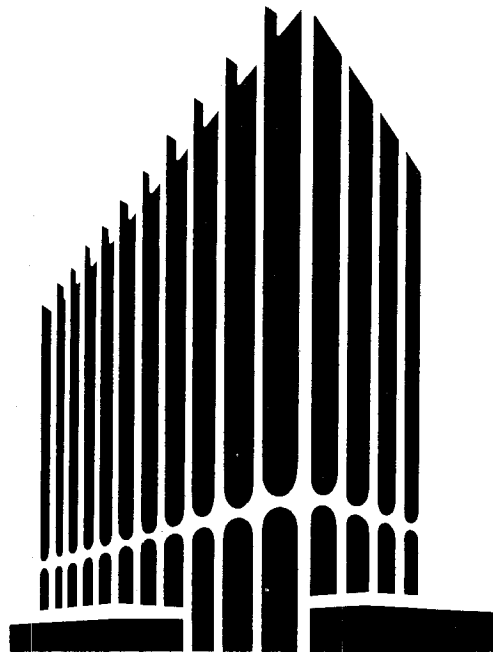
R_t = the time-weighted rate of return per period

R_{pk} = the portfolio return for period k, where k ranges from 1 to n

n = the number of periods for which returns are measured.

The average and time-weighted rates of return are in general unequal. In the case of the former, the amount invested is assumed to be maintained, through additions or withdrawals, at its initial value. The latter, however, is the return on a portfolio that varies in size because it is assumed that all proceeds are reinvested. In fact, the average return will always exceed the time-weighted return unless the returns in each period are identical, in which case the two measures of return will be equal. As shown in a previous article in this series, the time-weighted or geometric average is usually the more representative measure of the returns from an investment because it more accurately reflects the consequences of the buy-and-hold policies often followed by investors¹.

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The third measure – namely, the money-weighted rate of return – defines the average rate of growth of all funds invested in a portfolio during the relevant time span, ie the initial value plus any inflows less any outflows, and is therefore influenced by the timing and magnitude of inflows and outflows. It is equivalent to the well-known internal rate of return and is computed in exactly the same way as is the yield to maturity on a bond. The general formula is:

$$V_o = \frac{F_1}{(1+R_m)} + \frac{F_2}{(1+R_m)^2} + \dots + \frac{F_n}{(1+R_m)^n} + \frac{V_n}{(1+R_m)^n} \quad (4)$$

where:

- V_o = the initial value of the portfolio
- F_k = inflows (positive or negative) in period k, for k ranging from 1 to n
- V_n = the terminal value of the portfolio at the end of n periods
- n = the number of periods for which returns are measured
- R_m = the money-weighted rate of return per period such that the sum of all terms on the right hand side of equation 4 equals the value of the initial portfolio, V_o .

The money-weighted return represents the internal rate of return on the portfolio for the given time span. Because, however, it is affected by inflows and outflows which are typically beyond the investment manager's control, it is not as satisfactory a measure of managerial performance as is the time-weighted or geometric rate of return.

Expected returns and risk

The historical return from holding a share or portfolio is a simple matter of fact. The future return from a share or portfolio, however, is conjectural as it depends on a variety of factors that cannot be forecast with certainty. Some of these factors are specific to the company, such as the efficiency of its management or plant. Others pertain to the industry in which the company operates. Other and still more general factors relate to the state of the domestic and international economies and the socio-political climate. How, against this uncertain background, is one to measure the expected return and risk associated with a security or portfolio?

Assume, for the moment, that we have the information set out in columns 1 to 3 of Table 1. By way of paraphrasing this information, we may say the share is expected to achieve a return of –10% if environmental state "a" occurs, which state has a probability of occurrence of 0,20; 5% if state "b" occurs, its probability being 0,35; and 15% if state "c" occurs, its probability being 0,45. Then the expected return on this share, $E(R)$, is, as shown in column 4, simply the sum of the products of each possible return and the probability of that return. We may express this as:

$$E(R) = \sum_{s=1}^{s=n} p_s R_s \quad (5)$$

where:

- $E(R)$ = the probability – weighted average of returns
- R_s = the return associated with state s
- p_s = the probability of state s.

Table 1: Risk and return for a single security

(1) State	(2) Probability	(3) Return	(4) Probability × return	(5) Deviation from average return	(6) Deviation squared	(7) Probability × deviation squared
	p	R	pR	$R-E(R)$	$(R-E(R))^2$	$p(R-E(R))^2$
a	0,20	–10,0%	–2,00%	–16,50%	272,25% ²	54,45% ²
b	0,35	5,0%	1,75%	–1,50%	2,25%	0,79%
c	0,45	15,0%	6,75%	8,50%	72,25%	32,51%
Expected return	$E(R) =$		6,50%			
Variance					σ^2	= 87,75% ²
Standard deviation					σ	= 9,37%

In the given example, the probability-weighted or expected return is 6,5%. Now suppose that the return in state "a" is –30% and in state "c" 23,9%, everything else remaining the same. The expected return in this new set of circumstances would still be 6,5%, but one would surely consider the share to be riskier than before because the difference between the worst and best outcomes has increased from 25% to 53,9%. In other words, the adverse and favourable outcomes are more widely spread about the average or expected return than before. This suggests that we may use the degree of dispersion of outcomes about the average as a measure of risk. The most convenient measure of dispersion is the standard deviation, which is calculated in the manner shown in columns 5 to 7 of Table 1. Column 5 lists the deviation of the expected return for a given state from the overall expected return. These deviations are squared in column 6 to remove negative signs. In column

7, the squared deviations are weighted by their respective state-probabilities. The sum of the squared deviations is known as the variance. The standard deviation is found by taking the square root of the variance and gets us back to our original dimensions or units. In other words, the variance in the example is 87,75% squared but the standard deviation is 9,37%, a straightforward percentage just like the percentage returns from which it is derived. In general notation:

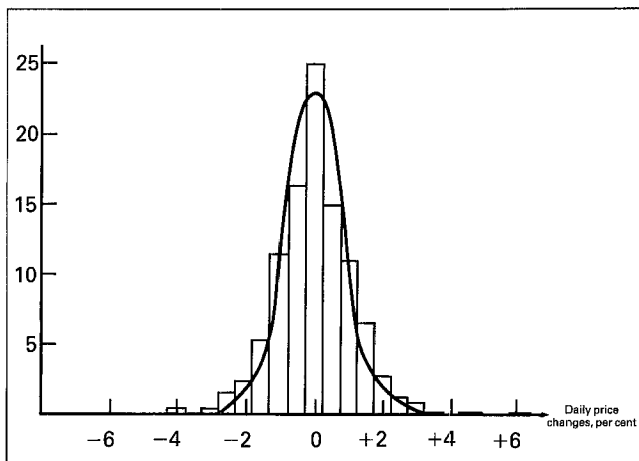
$$\sigma = \left[\sum_{s=1}^{s=n} p_s (R_s - E(R))^2 \right]^{1/2} \quad (6)$$

where:

- σ = standard deviation
- R_s = return in state "s"
- p_s = probability of state "s".

It should be remarked at this point that the standard deviation takes account of outcomes more favourable than the mean as well as those below it. In other words, it includes upside as well as downside potential. For most people, however, risk connotes downside potential only and this raises a doubt about the suitability of the standard deviation as a risk surrogate. If, however, it can be shown that rates of return are generally symmetrical about the mean, as illustrated in Figure 1 below, and that the symmetry has stability through time, the doubt would fall away. It is interesting that empirical studies of rates of return both overseas and in South Africa broadly confirm the symmetry of distribution and stability of returns, and so it does not matter that the standard deviation, which measures total variability, is twice as large as below-the-mean variability. What is important is that the standard deviation, which is a mathematically convenient concept, gives the same risk rankings for a group of portfolios as would some mathematically intractable below-the-mean measure of variability. This makes it an appropriate measure of risk.

Figure 1: Daily price changes of GM stock from 1976 to 1978 are approximately normally distributed²



In this article, we have defined the concepts of risk and return and have discovered how to measure the expected return and risk associated with a single security. Still to be covered are the following issues:

- the expected return and risk for a portfolio;
- the role of diversification in the reduction of portfolio risk;
- the meaning of efficient portfolios;
- the valuation of securities in efficient capital markets.

These will be dealt with in future articles in this series.

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I S Davies

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I S Davies

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