The Investment Analysts Journal

Number 44 – Summer 1997

Die Beleggings-ontleders Tydskrif

Nommer 44 – Somer 1997

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Inhoud

This issue in brief

The influence of political news events on share market activity in South Africa
The aim of this paper is to investigate the relationship between domestic political news events and share market activity on the Johannesburg Stock Exchange as measured by volume traded and the price volatility of a number of share indices. From the popular press it appears as though business analysts, editors and reporters believe that political events exert an influence on financial markets. This is especially true in South Africa, where political reporting has reigned supreme for a number of years. The country has gone through a period of transition, which started with the release of Nelson Mandela in 1990 and climaxed with the first fully democratic election in 1994. This transition period was characterised by political uncertainties, violence on the one extreme and bouts of optimism on the other extreme. The influence of these political events on the Johannesburg Stock Exchange (JSE) were often highlighted in articles like the following, which have appeared in the local press during 1994.

Assessing portfolio performance: The case of South African Unit Trusts
The standard approach used to assess the performance of unit trust managers is based on the premise that the investment strategy is basically stationary. Active management is viewed as being confined to timing – occasional switching between risky and riskless securities – and selectivity – switching between securities of essentially the same systematic risk to exploit temporary mispricing. This research utilises a traditional measure of portfolio performance and a relatively straightforward methodology that attempts to identify the timing and selection skills of a sample of South African unit trust managers.

The effect of industrial strikes on the value of shares listed on the Johannesburg Stock Exchange
The objective of this study is to determine the effect of strikes on the share values of a sample of companies listed on the Johannesburg Stock Exchange during the period 1984-1993. The results indicate that strikes do have a negative effect on share prices. The costs of a strike do not appear to be transitory since the losses incurred during the strike period are not counterbalanced by positive excess returns after its conclusion. The findings tend to support the notion that capital markets are usually able to anticipate whether an impending contract deadline will result in a strike or settlement. In the prestrike period, however, the stock market consistently underestimates the cost of a strike to shareholders, as demonstrated by the fact that nearly 70% of the total decline of returns (3,64%) occurs after the strike is announced.

Futures-Trading Activity and Share Price Volatility in South Africa
The study examines the relationship between futures-trading activity and equity volatility on the JSE for the three main indices. Contrary to findings in other markets, it is shown that positive correlation exists between equity volatility and expected and unexpected trading volumes in both the spot and futures markets. These conclusions seem robust to alternative specifications and indices used. Given an assumption of causality which runs from futures trading volumes to spot market volatility, the results are consistent with the idea that increasing trade in the futures market lead to greater volatility and price destabilisation in the share market.

The Determinants of the Risk Perceptions of Investors
The ultimate test of theory is whether it explains real world behaviour. In recent years, serious doubts have arisen as to the ability of the Capital Asset Pricing Model (CAPM) to explain investor behaviour. It has been argued that a study of investor risk perceptions will provide a different perspective on the investment and valuation process. The objective of this study was to explore investor risk perceptions and to indentify how investors treat risk in practice. The CAPM presumes that rational investors strive to maximise wealth, and it seeks to explain the relationship between risk and return, as well as to provide a mechanism for evaluating required rates of return on investments in risky assets. The CAPM is based on the premise that investors are principally concerned with those risks they cannot eliminate through diversification. This non-diversifiable risk is also termed market risk or systematic risk and stems from the 'market' factor, that is the influence of the general economic environment on investments. The CAPM provides an explicit measure of systematic risk, namely beta. Numerous authors have questioned the assumptions regarding the decision making behaviour of investors on which this theory is based, and estimation problems have been identified with beta. Thus there has been an erosion of confidence in the model, and this has led researchers to conclude that, despite efforts to improve the measurement of beta, "its usefulness to investment professionals has reached a plateau and that investors are looking elsewhere for measures, or additional measures, of risk" (Mear and Firth, 1988, p335). Partly in response to the criticisms of the CAPM, researchers have sought alternative approaches to the valuation process and to measuring risk. Two major alternatives have emerged, namely microeconomic modelling and the use of a behavioural science approach.

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

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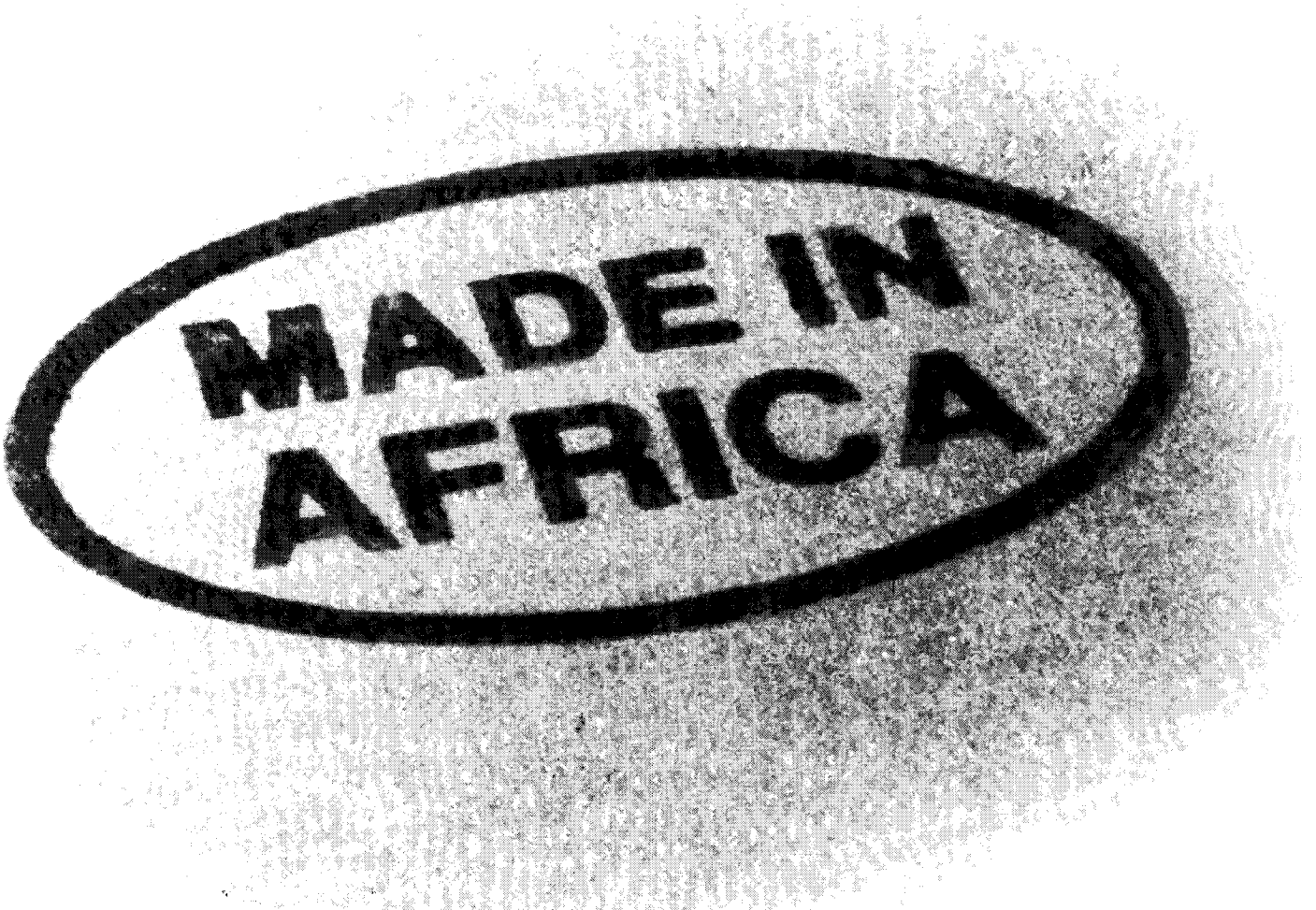

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The Investment Analysts Journal

Forty-fourth issue – Summer 1996/7

Die Beleggings-ontleders Tydskrif

Vier-en-veertigste uitgawe – Somer 1996/7

The performance of share prices on the Johannesburg Stock Exchange in 1996 has been bewildering in a number of respects. In the first place, Wall Street has risen impressively and this is something that in the past has strongly influenced Diagonal Street. Secondly, the rand has been devalued by almost twenty-five per cent against the dollar. Historically, when that has happened, there has usually been a strong rise in both mining and industrial share prices. Thirdly, economic growth in the US has been good encouraging the prospect of a wider recovery in the economies of South Africa's leading trading partners. The business cycle in this country generally lags the overseas business cycle by between six and eighteen months so the prospects seems reasonable that growth by the end of 1997, or in the first half of 1998 at the latest, will be in an upswing again. In the meantime, real GDP here is still projected to increase by at least 2,5 per cent. Stock market prices are supposed to be leading indicators, not lagging ones. Fourthly, the government has presented a sensible macroeconomic strategy to both domestic and foreign investors and this has even been given a nod of approval by the IMF. Why then all the pessimism?

Of course when share prices are down there are always explanations and these are not difficult to find in present circumstances. For example, noises coming from the political arena have been worrying. Just when everybody had adjusted to the prospect of Thabo Mbeki succeeding Mr Mandela when the latter steps down in 1999, the President drops a bombshell to the effect that he has not selected Mr Mbeki as his heir. This, if it was not calculated to do so, has certainly raised concerns of a political power struggle in the ANC as 1999 approaches. Right now South Africa needs an ANC power struggle at national level as much as the Free State needed such a struggle at provincial level. Not only did the latter struggle damage the party's credibility and reputation as a professional and disciplined organisation, it also affected the process of government in the province adversely. An ANC power struggle at national would justifiably invite the gravest of concerns in the minds of investors everywhere. Africa's record of such struggles is not the best and the concerns of investors would range all the way to the possibility of a resurgence of political violence such as that which only recently dominated the situation in Natal. We do not need to go further north in Africa for horrific examples in this regard.

Another troubling factor has been the dissension within the ANC-COSATU-SACP alliance over the government's new macroeconomic strategy. COSATU's criticisms of the strategy, and its rejection of its central objective regarding the reduction of the deficit before borrowing in particular, have been a concern. With debt servicing costs now the second largest item on the government's expenditure budget, and rapidly approaching the education budget in size, one is forced to wonder as to what kind of logic drives its macroeconomic thinking. Of course, reducing the deficit involves problems, and downsizing in the public sector is one of them. But is COSATU seriously arguing that jobs can be saved in the long run by casting fiscal

Die vertoning van aandelepryse op die Johannesburgse Aandelebeurs in 1996 het in verskeie opsigte verras. In die eerste plek het die pryse op Wall Street indrukwekkend gestyg – iets wat in die verlede altyd 'n sterk invloed op Diagonaalstraat gehad het. In die tweede plek het die rand met byna vyf en twintig persent teenoor die dollar gedevalueer. Wanneer so iets in die verlede gebeur het, het sowel die myn- as nywerheidsaandele gewoonlik sterk geklim. In die derde plek het die goeie ekonomiese groei in die VSA die moontlikheid vergroot dat die ekonomieë van Suid-Afrika se belangrikste handelsvennote aan 'n breër front sou herstel. Omdat die sakesiklus in hierdie land gewoonlik tussen ses en agtien maande agter die oorsese sakesiklus is, is die vooruitsig redelik goed dat daar teen die einde van 1997 of op die laatste in die eerste helfte van 1998 weer 'n opswaai in die groei sal wees. Intussen word steeds 'n toename van 2,5 persent in die BBP hier geprojekteer. Pryse op die aandelebeurse is veronderstel om leidende aanwysers te wees wat nie sloer nie. In die vierde plek het die regering 'n heel verstandige makro-ekonomiese strategie aan sowel die binnelandse as buidelandse beleggers voorgehou wat selfs deur die IMF goedgekeur is. Maar waarom is almal dan so pessimisties?

Vir dalende aandelepryse is daar altyd verklarings, wat in die huidige omstandighede nie moeilik is om te vind nie. Uit byvoorbeeld die politieke arena klink daar sekere geluide op wat allermins gerusstellend is. Net toe almal gewoond begin raak aan die gedagte dat adj. pres. Thabo Mbeki mnr. Nelson Mandela sal opvolg wanneer laasgenoemde in 1999 uittree, krap die President sake lelik deurmekaar deur te kenne te gee dat hy mnr. Mbeki nog nie as sy opvolger "gesalf" het nie. Hoewel dit miskien nie so bedoel was nie, het dit vrese laat ontstaan oor 'n politieke magstryd in die ANC rondom 1999. Op die oomblik kan Suid-Afrika net so min 'n ANC magstryd op nasionale vlak bekostig as wat die Vrystaat dit op provinsiale vlak nodig het. Die stryd in die Vrystaat plaas nie net 'n vraagteken oor die party se geloofwaardigheid en goeie naam as 'n professionele en gedissiplineerde organisasie nie, maar dit ry ook die regeringsproses in die provinsie in die wiele. 'n ANC magstryd op nasionale vlak sal tereg tot ernstige kommer lei onder alle beleggers. Afrika se rekord in hierdie verband lyk nie alte goed nie en besorgde beleggers kan selfs begin dink aan die moontlike opvlamming van die politieke geweld wat nog onlangs die toneel in KwaZulu-Natal oorheers het. Ons hoef ook nie baie verder noord in Afrika te soek na afskuwelike voorbeelde hiervan nie.

Nog 'n onrusbarende faktor is die tweespalt in die ANC-COSATU-SAKP alliansie oor die regering se nuwe makro-ekonomiese strategie. COSATU se kritiek op die strategie en in die besonder sy verwerping van die allerbelangrike doelwit om die tekort voor verdere lenings te verminder, is 'n bron van kommer. Dat die skulddelgingskoste nou die naasgrootste item op die regering se uitgawebegroting is en in omvang vinnig die onderwysbegroting inhaal, laat 'n mens wonder oor die logika agter sy makro-ekonomiese denke. Om die tekort te verminder gaan vanselfsprekend

caution to the winds? Or is it only interested in the short run, and the jobs of its members as apposed to the well-being of the wider population? In this regard, the matter of inflation deserves special mention. Has COSATU one might ask, ever stopped to think of the damage this does to the masses of ordinary people, most of them black and poor, who save their hard earned money in fixed income repositories and then, when their savings are not sufficient to meet their old age requirements, are thrown onto the assistance of the State. The very State whose burgeoning deficit is generating the inflation in the first place? Jobs created or jobs saved through the printing of money cannot be sustained in the long or even medium run. There is no other answer but to get the dissaving of the public sector down, deliberately and surely, even if that means tempering ones action to take account of destabilising political effects. The dogmatic rejection of any possibility of a further raising of VAT, indeed the threat of general strike at the very suggestion of the matter, when such a move actually makes a great deal of fiscal sense, is hardly calculated to inspire confidence in the government's ability to follow through with its macroeconomic proposals.

Finally, there is the matter of the rand exchange rate and the role the Reserve Bank has been playing to halt its decline. If speculators are right in seeing the Bank as a net buyer of rand at any particular time, they must also be right in concluding that the rand would be lower than it is were the Bank not in the market to support it. And this would be true even were the rand actually to be oversold on any consideration of economic fundamentals. Keynes made the point a long time ago but it deserves repeating regarding the behaviour of speculative markets generally. 'It happens,' said Keynes, 'that the energies and skill of the professional investor and speculator are ... largely concerned, not with making superior long-term forecasts of the probable yield of an investment over its whole life, but with foreseeing changes in the conventional basis of valuation a short time ahead of the general public. They are concerned, not with what on investment is really worth to a man who buys it "for keeps", but with what the market will value it at, under the influence of mass psychology, three months or a year hence. Moreover, this behaviour is not the outcome of a wrongheaded propensity. It is the inevitable result of an investment market organised along the lines described. For it is not sensible to pay 25 for an investment of which you believe the prospective yield to justify a value of 30, if you also believe that the market will value it at 20 three months hence.' If confidence in the rand is to be restored, two things are essential. First, the adverse inflation differential between South Africa and its leading trading partners must be eliminated. Second, the rand must be allowed to find its own level in exchange markets. Moreover, these two requirements are interlinked. When the adverse differential has been eliminated, the rand's own level will not be a cause of fear to the South African monetary authorities. And when it is at its own level, concerns of prospective investors that it might be forced lower by negative speculation will logically be less, encouraging their long-term direct commitments.

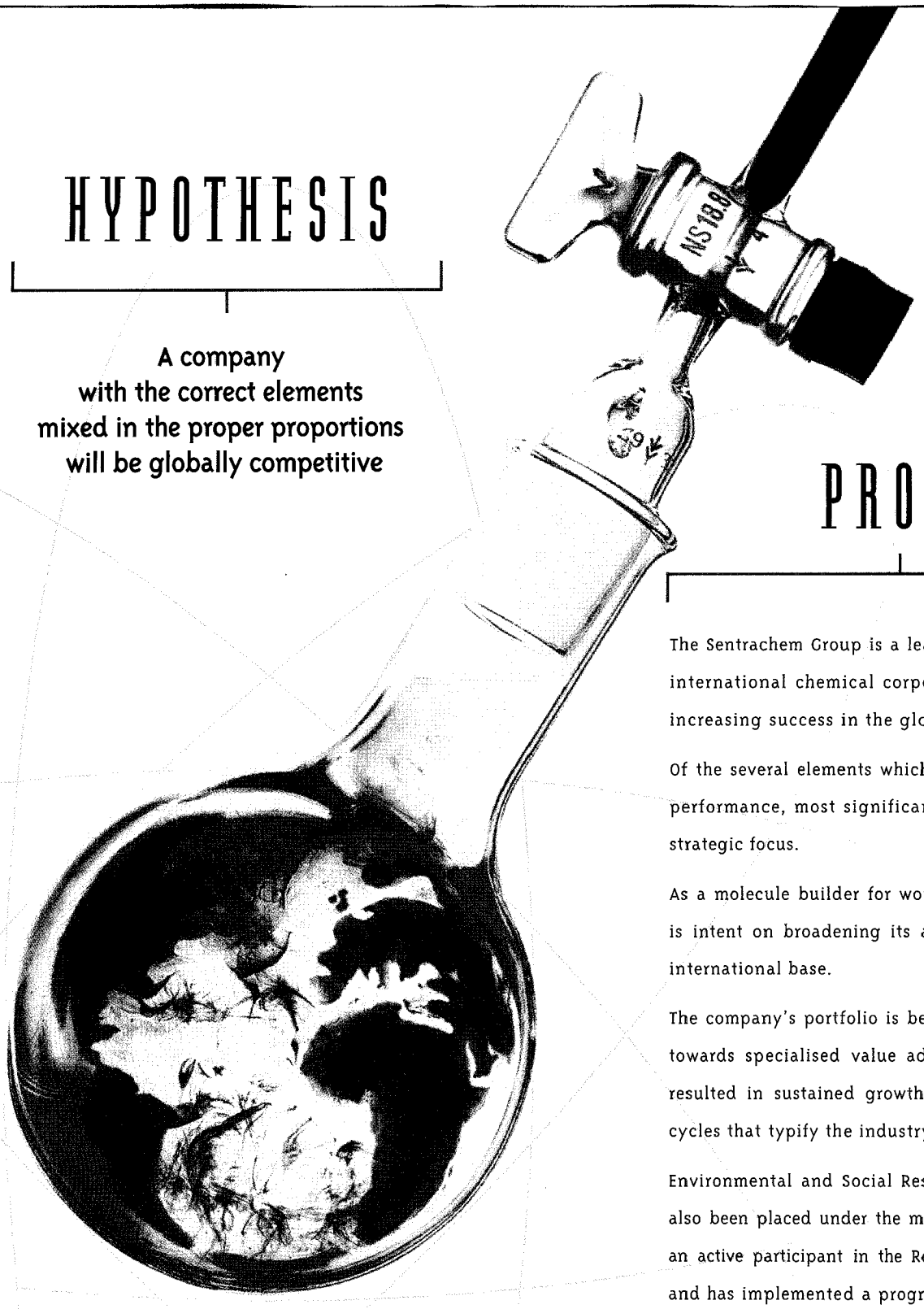
A matter of some interest to an assessment of current stock market performance is the failure of both the mining and industrial sectors to respond to the decline that has occurred in the rand exchange rate since February. When the financial rand was in existence, a fall of 25 per cent in the exchange rate was usually accompanied by a firming of share prices. That has not happened on this occasion and the question is 'Why?' A number of possible answers

met sekere probleme gepaard, waarvan die afskaling van die openbare sektor een is. Maar dink COSATU eerlikwaar dat die diensstaat op langtermyn verklein kan word deur fiskale dissipline oorboord te gooi? Of stel hy slegs in die korttermyn belang, en in werkgeleenthede vir sy eie lede in plaas van vir die breë bevolking? In hierdie verband verdien die kwessie van inflasie spesiale aandag. 'n Mens kan jou afvra of COSATU al ooit gedink het aan die implikasies hiervan vir die menigte gewone mense, van wie die meeste swart en minder bevoorreg is, wat hul swaarverdiende geld in vaste deposito's belê het en wat, indien hul spaargeld dan ontoereikend vir hul behoeftes blyk te wees, op hul oudag op hulp van die staat aangewese sal wees. Dit is die einste staat wie se groter wordende tekort in eerste instansie vir inflasie verantwoordelik was. Daar kan nie op langtermyn of selfs op mediumtermyn voortgegaan word met die skepping van werkgeleenthede of die besnoeiing van poste deur bloot geldnote te laat druk nie. Die enigste oplossing is om die ontsparing van die openbare sektor doelbewus en doelgerig te verlaag, selfs al moet 'n mens die maatreëls verwater om met destabiliserende politieke gevolge rekening te hou. 'n Kategoriese afwysing van enige moontlikheid om die BTW-koers verder te verhoog – die blote gedagte daaraan sal begroet word met 'n dreigement van 'n algehele staking, hoewel so 'n stap fiskaal sinvol sal wees – is hoegenaamd nie bedoel om vertroue te kweek in die regering se vermoë om met sy makroekonomiese voorstelle deur te druk nie.

In laaste instansie is daar die kwessie van die randwisselkoers en die rol wat die Reserwebank speel om hierdie daling te stuit. Indien spekulante korrek is in hul siening van die Bank as 'n netto koper van rand op enige spesifieke tydstip, kom hulle seker ook tot die logiese gevolgtrekking dat die rand nog swakker sou gewees het as die Bank dit nie in die mark gedra het nie. Dit sou moontlik kon wees selfs indien te veel rand inderdaad bloot op grond van ekonomiese beginsels verkoop is. 'n Stelling wat Keynes lank gelede gemaak het, kan ook hier op die gedrag van spekulatiewe marke oor die algemeen van toepassing gemaak word: "It happens," said Keynes, "that the energies and skill of the professional investor and speculator are ... largely concerned, not with making superior long-term forecasts of the probable yield of an investment over its whole life, but with foreseeing changes in the conventional basis of valuation a short time ahead of the general public. They are concerned, not with what an investment is really worth to a man who buys it 'for keeps', but with what the market will value it at, under the influence of mass psychology, three months or a year hence. Moreover, this behaviour is not the outcome of a wrongheaded propensity. It is the inevitable result of an investment market organised along the lines described. For it is not sensible to pay 25 for an investment of which you believe the prospective yield to justify a value of 30, if you also believe that the market will value it at 20 three months hence." Twee dinge is nodig om vertroue in die rand te herstel. Ten eerste moet die nadelige inflasiedifferensiaal tussen Suid-Afrika en sy vernaamste handelsvennote uit die weg geruim word. Ten tweede moet die rand toegelaat word om sy eie vlak in die valutamarkte te vind. Hierdie twee vereistes is ook onderling verbind. Wanneer die nadelige verskil uit die weg geruim is, sal die rand se eie vlak nie 'n bron van kommer vir die Suid-Afrikaanse monetêre owerheid wees nie. En wanneer dit op sy eie vlak is, sal dit vanselfsprekend in 'n mate die vrese besweer van voornemende beleggers dat dit deur negatiewe spekulasie nóg laer gedwing sal word en hulle dan tot direkte langtermynverbintenisse oorhaal.

HYPOTHESIS

A company with the correct elements mixed in the proper proportions will be globally competitive



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suggest themselves. One is that an upward correction in share prices has been delayed. Another is that a new situation has come into effect in which classical adjustment responses no longer apply and that the market is now set upon uncharted waters. Given the major political changes that have taken place in South Africa since 1994, and most particularly the opening of the South African economy to the world economy that has occurred in terms of ANC economic policy (the removal of exchange control with respect to non-residents, the lowering of tariff barriers in terms of GATT, deregulation of financial markets and prospective privatisation), the possibility is real that a completely new investment situation is in the process of coming into place. If this is the case, competition in the equity market can be expected to increase making portfolio management different and more challenging from anything that has been experienced in the days of the hothouse economy of yesteryear. It is a challenge investment analysts will need to take seriously if they are personally to survive in career terms and if their profession is to play its proper part in helping the country to realise its true and undoubted potential.

THE EDITOR

Wat interessant in die beoordeling van die aandelebeurs se huidige vertoning is, is dat die myn- en nywerheidsektor nie reageer op die daling wat sedert Februarie in die randwisselkoers plaasvind nie. In die tyd van die finansiële rand het 'n daling van 25 persent in die wisselkoers gewoonlik gepaardgegaan met 'n verstewiging van die aandelepryse. Dit was nie hierdie keer die geval nie. Waarom nie? 'n Mens kan aan 'n paar moontlike redes dink, onder meer dat 'n opwaartse regstelling in aandelepryse vertraag is en dat 'n nuwe situasie hom voordoen waarin klassieke aanpassings nie langer geld nie en die mark hom nou op 'n onbevare see bevind. Teen die agtergrond van die ingrypende politieke veranderings sedert 1994 in Suid-Afrika en in die besonder die oopstelling van die Suid-Afrikaanse ekonomie aan die wêreldekonomie ingevolge die ANC se ekonomiese beleid (die opheffing van valutabeheer ten opsigte van nie-Suid-Afrikaanse burgers, die verlaging van tariefmure volgens die AOTH, die deregulering van die geldmarkte en die voorgenome privatisering), is dit 'n wesenlike moontlikheid dat 'n geheel en al nuwe beleggingsituasie aan't ontstaan is. In so 'n geval kan toenemende mededinging op die aandelemark verwag word, wat portefeuljebestuur nie net sal verander nie, maar ook 'n groter uitdaging sal maak as tydens die kweekhuis-ekonomie van vroeër. Dit is 'n uitdaging wat beleggingsontleders ernstig sal moet opneem as hulle persoonlik in hul loopbaan wil oorleef en ook as hul professie 'n wesenlike rol wil speel om die land te help om sy ware en onbetwyfelbare potensiaal te ontsluit.

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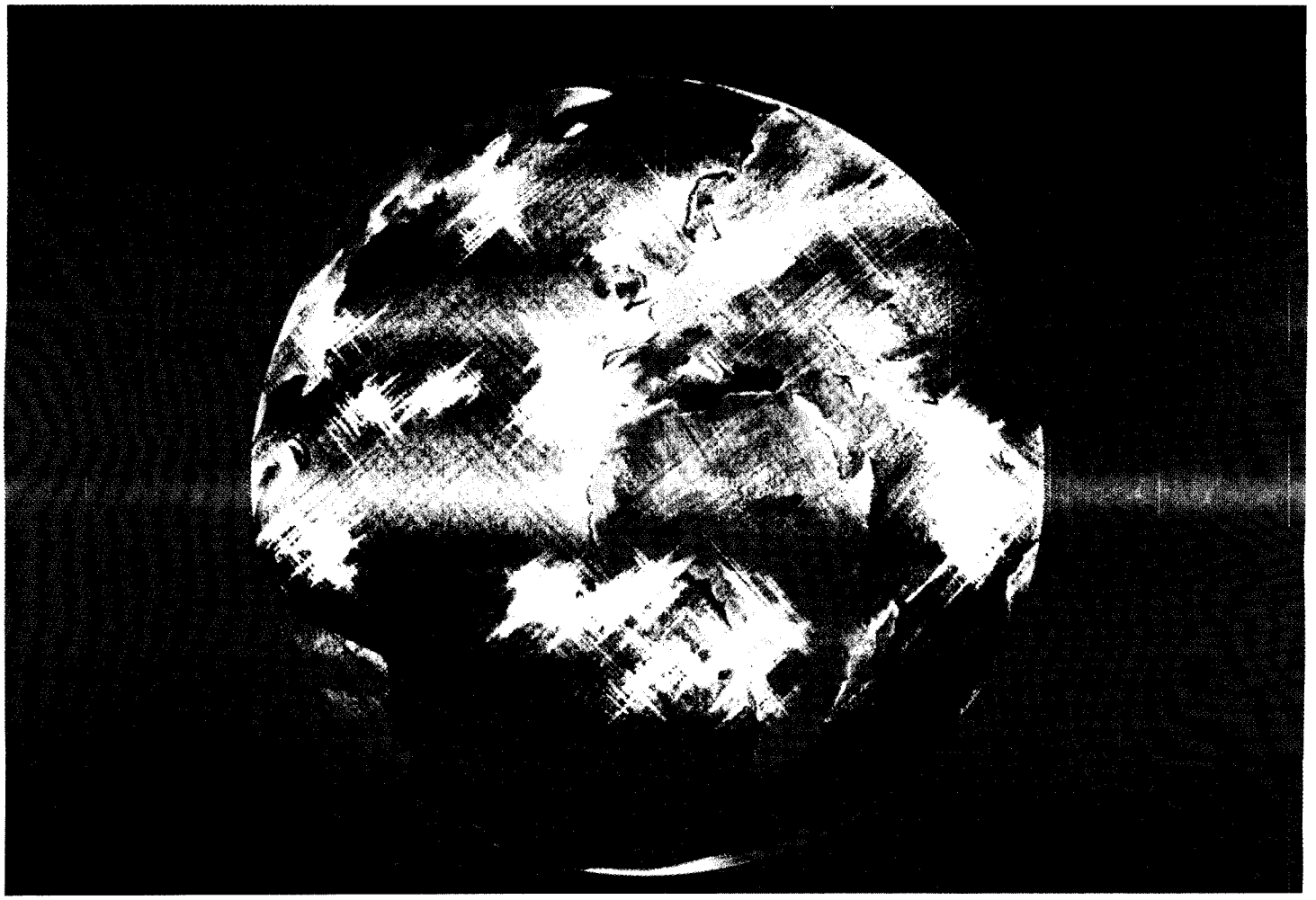

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The influence of political news events on share market activity in South Africa

1. INTRODUCTION

The aim of this paper is to investigate the relationship between domestic political news events and share market activity on the Johannesburg Stock Exchange as measured by volume traded and the price volatility of a number of share indices. From the popular press it appears as though business analysts, editors and reporters believe that political events exert an influence on financial markets. This is especially true in South Africa, where political reporting has reigned supreme for a number of years. The country has gone through a period of transition, which started with the release of Nelson Mandela in 1990 and climaxed with the first fully democratic election in 1994. This transition period was characterised by political uncertainties, violence on the one extreme and bouts of optimism on the other extreme. The influence of these political events on the Johannesburg Stock Exchange (JSE) were often highlighted in articles like the following, which have appeared in the local press during 1994:

- "Domestic politics and international economics have conspired to produce a remarkable convergence of forces driving the Johannesburg Stock Exchange to dizzy heights" (Van Staden and Stewart, 1994:3).
- "ANC politics hits JSE share prices" (The Citizen, 1994:23).
- "Business, investors and financial houses are in for a roller-coaster ride from now until after the April elections as consumers and markets overact in the prevailing good news/bad news syndrome" (Cameron, 1994a:1).
- "Whoever said a transition to full democracy would be difficult, must have been talking of the JSE" (Magliolo, 1994:20).
- "Shifting political sentiment hits JSE" (Harris and Galli, 1994:1).
- "Business paralysed, markets nervous as homeland revolts" (Ryan, 1994:1).
- "Within hours of announcement of the political agreement yesterday the financial markets were buzzing" (Cameron, 1994b:1).

The paper examines the empirical support for these qualitative judgements. In the next section a brief literature survey is conducted, followed by a section describing the data used and method employed. This is followed by a discussion of the empirical results and a conclusion.

2. LITERATURE SURVEY

A number of studies have investigated different aspects pertaining to the relationships between public information and the behaviour of financial markets.

Most studies are concerned with the content of news events or their timing or both. Regarding the content of news events, Schwert (1981) investigated the reaction of the New York Stock Exchange daily returns to the announcement of the inflation rate. The study indicated that the share market does not react strongly to unexpected inflation announcements. Patell and Wolfson (1982) studied the effects of earnings and dividend announcements on intraday share price behaviour. Their results indicated that dividend announcements induce much less activity than earnings announcements, although the response to dividend changes is comparable to earnings announcements. The response of market participants to announcements about the money supply, inflation, industrial production and the unemployment rate was examined by Jain (1988) who concluded that the effect of new information on share prices is reflected in a relative short period of about one hour. Cutler, Poterba and Summers (1989) studied the proportion of variation in aggregate share returns that can be attributed to various news items and the possibility that share markets move in response to non-economic, qualitative news. Their results hinted at the difficulty of explaining changes in aggregate share prices on the basis of publicly available information. Mitchell and Mulherin (1994) addressed the question of whether the amount of information that is publicly reported affects trading activity and price movements in security markets. They found a direct, albeit weak, relationship between Dow Jones news stories and share market activity, thus confirming prior results pointing at the difficulty of linking volume and volatility to observed measures of information. Similar conclusions were arrived at by Berry and Howe (1994) who studied the arrival and impact of public information on financial markets. They concluded that information arrival was non-constant displaying seasonality and interday patterns; that a positive, moderate relationship exists between public information and trading volume; and that the relationship between public information and price volatility is insignificant.

As far as the timing relationships are concerned, Patell and Wolfson (1982) examined the realtime process by which corporate information about earnings and dividends are released, distinguishing between good news and bad news and in an often quoted study French and Roll (1986) concluded that the difference in volatility between trading and non-trading days is to some extent caused by differences in information flows during trading and non-trading hours. Thompson, Olsen and Dietrich (1987) studied types of firm-specific news reported in the Wall Street Journal Index, their contents and timing and the institutional arrangements for their publication. They concluded that the financial community receives news from a variety of sources and noted further substantial variation in the number of firm-specific news items when decomposed by day-of-week, month-of-year, firm size and industry groupings. The intraday market response to announcements of new equity issues was examined by Barclay and Litzenberger (1988) who found an abnormally high volume traded and small negative average returns for the fifteen minutes following the announcements. They

found no evidence of significant abnormal trading activity or abnormal variance of returns during any other interval on the announcement day. Harvey and Huang (1991) studied the volatility implications of around-the-clock foreign exchange trading and found higher exchange-rate and cross-rate volatilities during trading hours. They concluded that this phenomena was attributable to macro-economic news announcements. Harris and Ravir (1993) developed a model of trading in speculative markets based on announcements of public information from which it could be deduced that absolute price changes and volumes traded are positively correlated, consecutive price change exhibit negative serial correlation and volume traded is positively autocorrelated. In a recent study Ederington and Lee (1995) examined how prices in interest rate and foreign exchange futures markets adjust to new information contained in scheduled macro-economic news releases over the very short run. They found that prices overreact within forty minutes after the release and that volatility tends to be higher just before the news release and return to normal within the second or third minute after the news release.

The above studies focused mainly on economic, financial and firm specific (dividends and earnings announcement) information. The main themes of these studies were the relationships between market activity and the following public information phenomena: the timing of news items, their content, the difference in trading and non-trading days, interday and seasonality patterns displayed. Most of the studies found that certain interday and seasonality patterns exist and that the relationship between news items and stock market activity is weak, but that a positive moderate relationship exists between public information and volume traded.

This study examines the impact of political news events on financial markets and in specific the domestic political events in South Africa on the Johannesbug Stock Exchange. Most of the above studies are related to the timing of news announcements and the period shortly before and after the announcements. Most of these studies monitored the reaction of the markets over short time-intervals (within-day patterns). Due to the nature of political events, which do not appear at a specific predetermined time and has an extended build-up period, it is not feasible to narrow a specific political event down to an exact moment in time. Therefore, in this study, the effect of political news events were monitored using daily data intervals.

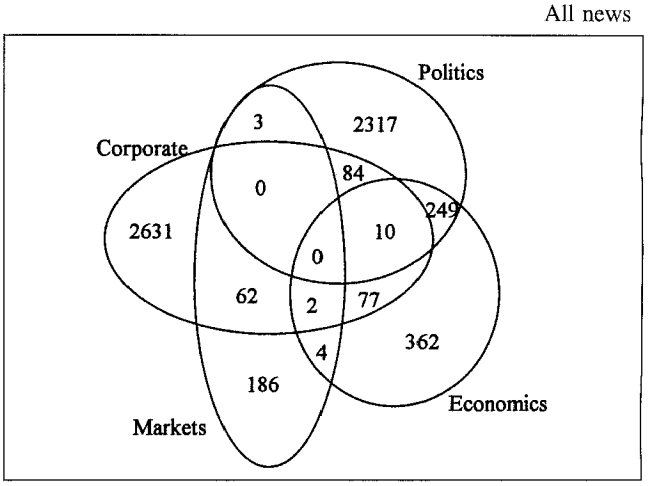
3. DATA AND METHOD

3.1 News events data

3.1.1. News source

Different definitions and classifications of political news events exist. For this study it is important that the classifications of news items are consistent and unbiased throughout the period of investigation. For this reason an external and single source of news items was used. Reuters News Services, which is readily available and widely used by participants of markets, was used as a source of news events. The archive product, Reuters Business Briefing, allows access to a database of all news items released through Reuters for a period dating back five years from the current date. The news items are grouped per country and classified by editorial staff in the following main categories: Corporate, Economics, Markets and Politics. Each main category consists of further subsets. The following are subsets of the Politics category: Defence, Domestic Politics, Education, Environment, European Union, Foreign affairs, Government List, and Health and Welfare. It is possible for a news item to be classified in more than one category and Figure 1 is a Venn diagram showing the number of news items per main category for the period June 1990 to December 1990.

Figure 1: Reuters news items per category for period June – December 1990



The subject of investigation for this study is the effect of South African domestic political news events on the Johannesburg Stock Exchange market activity. Therefore, the news items on the Reuters database pertaining to South Africa and classified as Domestic Politics (DP), subset of Politics, were extracted.

3.1.2 News events data description

The descriptive statistics of the number of daily Domestic Political news items over the period April 1990 to June 1995 are shown in Table 1 and Figure 2 shows the distribution of the number of daily Domestic Political news items.

TABLE 1
Descriptive statistics of the number of daily Domestic Political news evens.

Measure	Value
Mean	17,87
Standard Error	0,48
Median	13,00
Mode	12,00
Standard Deviation	17,45
Sample Variance	304,61
Kurtosis	20,16
Skewness	3,76
Range	175,00
Minimum	0,00
Maximum	175,00
Count	1311,00

The statistics show that on average, about 18 Domestic Political news items were reported per trading day and that the distribution of the news items was skewed to the right (positive). The increase in news activities during the election period (March 1994 to June 1994) is apparent in Figure 3, which shows the monthly total number of news items during the period of investigation for the All News, Political and Domestic Political categories of news items.

Figure 2: Histogram of the number of daily Domestic Political news events.

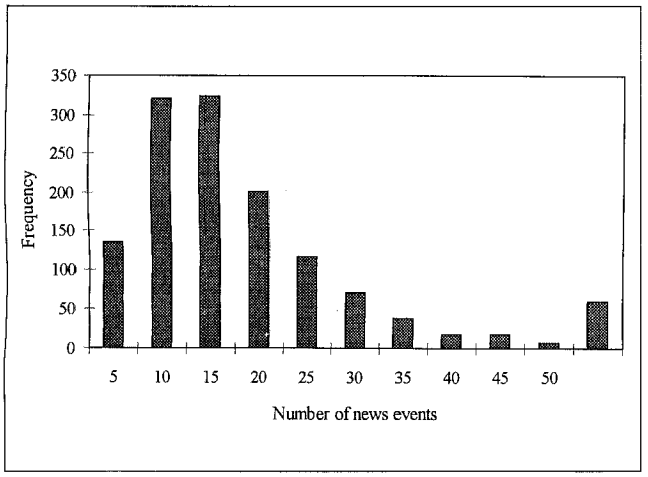


Figure 3: Total number of news events by month.

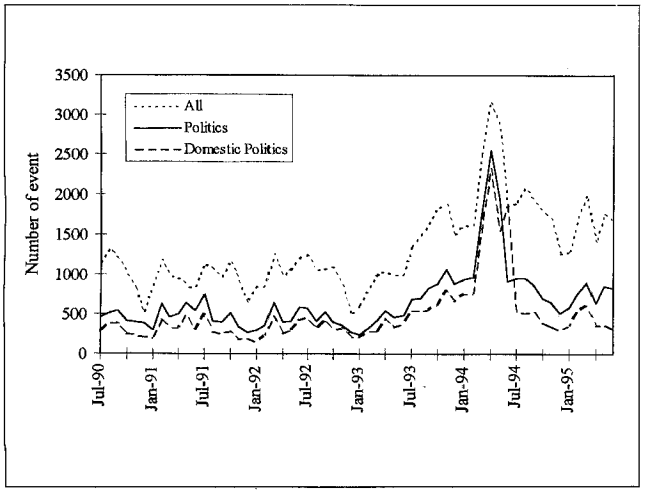
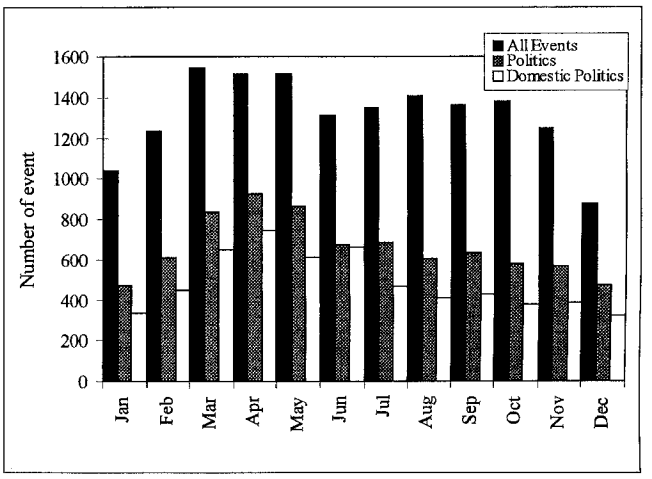


Figure 4 shows the average number of news items per month of the year. It indicates that during the months of March, April and May more news items were released than during the rest of the year. This can also be attributed to the election period in April 1994, which skewed the data. January and December tend to be the months when fewer news items are release. Mitchell and Mulherin (1994) in their investigation of Dow Jones news announcements also found that December had the least announcements and April the most announcements. The same sort of cyclical tendency was observed by Thompson *et al.* (1987) in their study of firm specific news reported on the Wall Street Journal Index. Their study indicated that December contained the fewest number of items, whilst April, July and October had the most announcements.

Figure 4: Average total number of news events by month.



From Figures 3 and 4 it is apparent that Domestic Political news items, as a subset of Political news items, follow the same trend as political news and All news items.

The null hypothesis of equal means per day in Domestic Political news items cannot be rejected at the 5% level of significance. This is contrary to the results of Berry and Howe (1994), who observed that public information arrival on the Reuters's North American Securities News Service exhibits an inverse U-shaped pattern across trading days. Mitchell and Mulherin (1994) in their study of Dow Jones announcements, rejected the null hypothesis of equality of means for all Dow Jones announcements across the days of the week at the 0,1% level of significance.

They observed that the number of announcements increased through to Thursdays and decreased on Fridays.

Through Reuters Business Brief archive news items dating back five years from the current date could be obtained. For this investigation news items for the period 1 July 1990 to 30 June 1995 for the All News category were extracted. News items for the categories Political and Domestic Politics were extracted for the period 1 April 1990 to 30 June 1995.

3.2 Johannesburg Stock Exchange data

The Johannesburg Stock Exchange (JSE) data used in this study were obtained from the Ivor Jones, Roy and Co Database through the Sanlam Investment Department. The following data sets were used:

- the daily All Share Index closing prices;
- the daily All Gold Index closing prices;
- the daily Industrial Index closing prices; and
- the daily Johannesburg Stock Exchange total volume traded.

The data for the three share indices (All Share, All Gold and Industrial) were obtained for the period April 1990 to 30 June 1995. Volume traded data was only available from 25 March 1991. The volume traded data used in this study was for the period 1 April 1991 to 30 June 1995.

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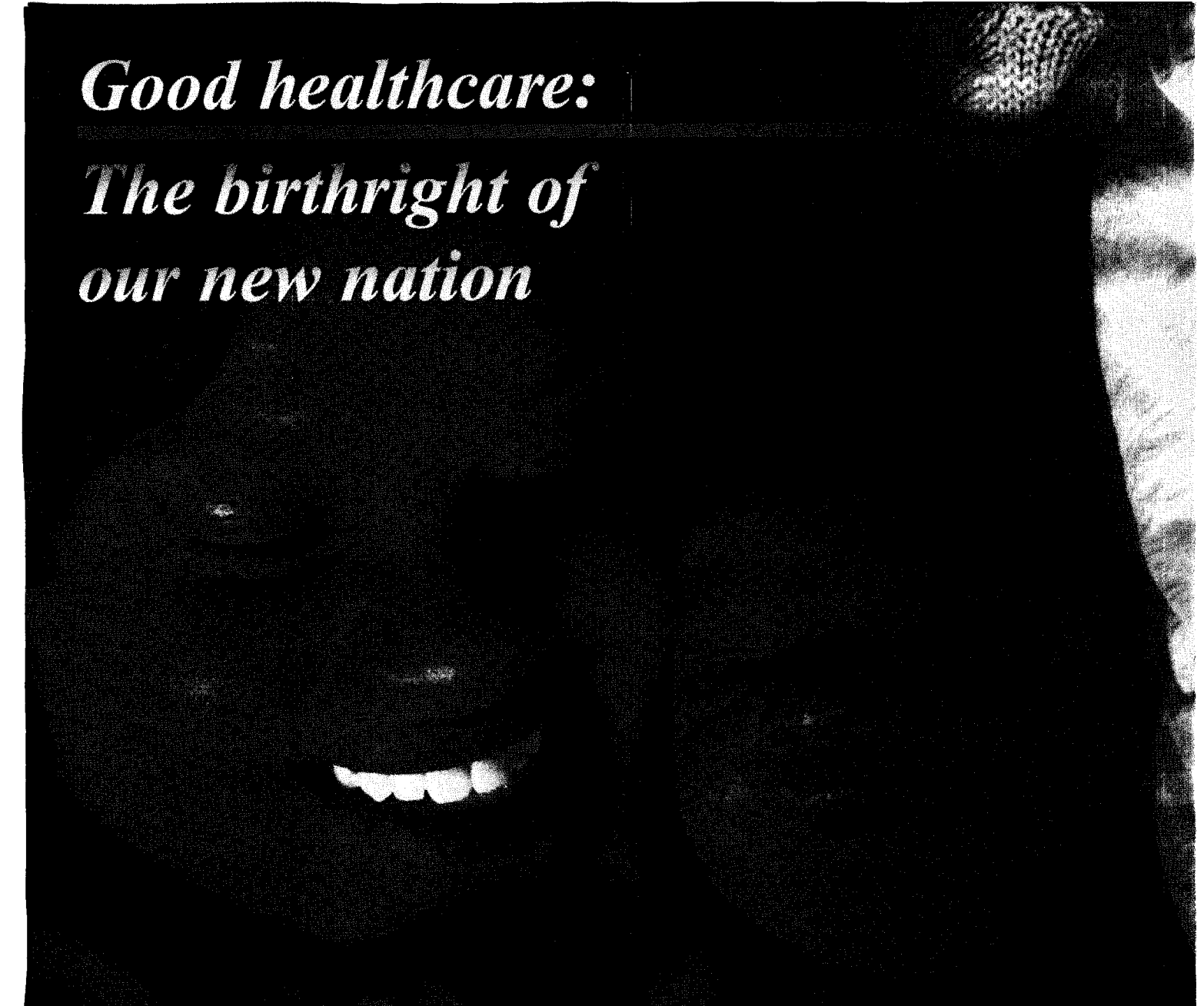

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All analyses on volume traded data were performed for the period 1 April 1991 to 30 June 1995. Monthly volatility analyses were performed for the period 1 April 1990 to 30 June 1995, and weekly volatility analyses for the period 1 April 1991 to 30 June 1995.

3.3 Measures of market activity

Share market volatility refers to the variability of share prices. The following formulae (Wiggins, 1992) were used to convert the closing prices of the three indices (All Share, All Gold, Industrial) to annualised volatilities:

$$\sigma^2 = \ln(C_t/C_{t-1})^2$$
$$\sigma_T = [(253/N)\Sigma\sigma^2]^{1/2}$$

where

σ^2 = variance estimator for date t;
C_t = closing price on date t;
C_{t-1} = closing price on date t-l;
σ_T = annualised close-to-close volatility for period T; and
N = number of trading days in period T.

Hull (1989) suggests the following formulae to estimate annualised stock price volatility:

$$s = [\{1/(n-1)\}\Sigma(u_t-\hat{u})^2]^{1/2}$$
$$s^* = s/\text{sqrt}(\tau)$$

where

s = an estimate of the standard deviation of the daily returns;
n = number of observations for period T;
u_t = daily return = ln (C_t/C_{t-1});
$\hat{u}$ = mean of daily returns for period T;
s* = estimate for annualised volatility; and
τ = 1/253 (assuming 253 trading days per annum).

As a comparison the annualised monthly volatilities of the All Share Index over the period of May 1990 to October 1990 were calculated using both estimators. The results are presented in Table 2.

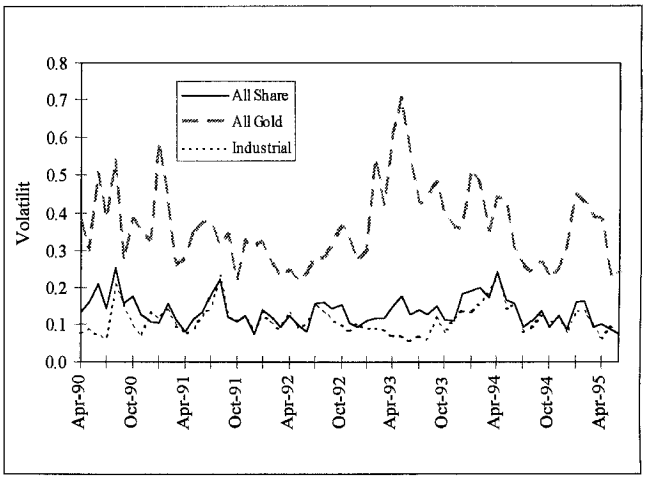
TABLE 2
Comparison of volatility estimators (All Share Index)

Month	C_T	s*
May 1990	0,159	0,158
June 1990	0,211	0,214
July 1990	0,143	0,145
August 1990	0,254	0,257
September 1990	0,156	0,144
October 1990	0,175	0,178

As shown in Table 2, the calculated values obtained using the different estimator formulae do not differ substantially. Therefore any one of the above formulae can be used as an estimator. Due to the ease of use, the volatility estimator of Wiggins (σ_T) was used.

The annualised monthly volatilities for the three indices (All Share, All Gold, Industrial) were calculated for the period, April 1990 to June 1995, and the results are shown in Figure 5:

Figure 5: Annualised monthly volatilities



The annualised weekly volatilities for the three indices (All Share, All Gold, Industrial) were also calculated but for the period, April 1991 to June 1995.

The descriptive statistics for the annualised monthly volatilities of the three indices are shown in Table 3. The average All Share Index Volatility is 13,5%, which is slightly higher than the average Industrial Index Volatility at 11,0%. The average All Gold Index Volatility at 36,1%, is substantially higher than the All Share and Industrial Index volatility averages.

TABLE 3
Descriptive statistics of annualised monthly volatilities of three shares indices

	All Share	0,135	0,005
Mean	0,125	All Gold	0,361
Standard Error	0,040		0,014
Median	0,002		0,345
Standard Deviation	0,625		0,108
Sample Variance	0,854		0,012
Kurtosis	0,180		0,678
Skewness	0,074		0,932
Range	0,254		0,490
Minimum			0,217
Maximum			0,706

As a measure of market activity the volume traded on the Johannesburg Stock Exchange for the period April 1991 to June 1995 was averaged on a monthly and weekly basis

3.4 Measures of political news

As a measure of political news the number of news events released through Reuters over a period were calculated. The underlying assumption to this measure is that a significant political event causes a larger number of reports than an average event. Therefore, more news items should be released in periods of heightened political activity. This assumption is similar to assumptions made in a study by Mitchell and Mulherin (1994) which investigated the effect of public information released by Dow Jones on trading activity and price movements in securities markets.

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As a test of the above assumption, the main news events on days with more than twice the average number of Domestic Political news items were identified. The events identified in this way include the major events of violence, unrest, and negotiations between leaders (Mandela and De Klerk) and political parties over the period of investigation. Although this identification process is by no means comprehensive, it does indicate qualitatively that there is a relationship between the number of news items reported and the importance of the events.

The monthly total number of news events released through Reuters for the period July 1990 to June 1995 were calculated. These totals were calculated for the All news, Political and Domestic Politics categories of South African news events. The daily average number of Domestic Political news items per month were calculated for the period April 1990 to June 1995. Similarly, the weekly average number of news events released on Reuters in the category South Africa Domestic Politics for the period April 1991 to June 1995 were also calculated.

4. EMPIRICAL RESULTS

4.1 Day-of-the-week effects

In the analysis of the day of the week effect for Domestic Political news items, the null hypothesis of equal means across trading days of the week could not be rejected. In the case of the day of the week effect for volume traded on the Johannesburg Stock Exchange, the null hypothesis of equal means in volume traded across trading days of the week, was rejected. The volume traded on the Johannesburg Stock Exchange increases from Monday to Friday, while the number of Domestic Political news items do not change significantly from Monday to Friday. The increased market activity towards the end of the week cannot, therefore, be attributed to an increase in political news activity.

The day-of-the-week effect of volume traded on the Johannesburg Stock Exchange differs from the results of studies on the New York Stock Exchange by Mitchell and Mulherin 1994 and Jain and Joh (1988) who found an increase in volume traded from Monday to Wednesday, with a decrease to Friday. The day-of-the-week effect of Domestic Political news events differs from results obtained from studies using firm specific or macro-economic news events (Thompson *et al.*, 1987; Patell and Wolfson, 1982; and Berry and Howe, 1994). These studies show a day-of-the-week effect, starting at a low on Mondays increasing towards the middle of the week and declining towards Fridays. The difference in day-of-the-week patterns obtained for domestic political news and firm specific news can be explained by the nature of the news events. Firm specific news events are released by firms and they can plan the timing of the release. Political news events happen at random and no prior timing of the release of these events takes place.

4.2 EFFECT OF NEWS CATEGORIES

Correlations between measures of market activity and political news events were calculated using data for the period 1 April 1991 to 30 July 1995 and the results are shown in Table 4.

Next correlations between measures of market activity and political activity were calculated using data for the period 1 April 1991 to 30 July 1995, but excluding the data of the election period, March 1994 to June 1994. The results are summarised in Table 5.

Table 4 and 5 indicate positive correlations between all three categories of news events and measures of market activity (Volume traded and Volatilities of All Share, All Gold and Industrial Indices). The only exception to this positive correlation, is that between All News items and the monthly Volatility of All Gold Index when the election period results were omitted.

TABLE 4
Correlation coefficients: Market measures and News items

	Domestic Politics (Excluding Weekends)	Domestic Politics	Politics	All news
Volume Traded	0,60	0,59	0,70	0,77
All Share Index Volatility	0,50	0,52	0,46	0,35
All Gold Index Volatility	0,16	0,18	0,14	0,05
Industrial Index Volatility	0,53	0,55	0,49	0,40

TABLE 5
Correlation coefficients: Market measures and News items (excluding 1994 election period)

	Domestic Politics (Excluding Weekends)	Domestic Politics	Politics	All news
Volume Traded	0,60	0,58	0,71	0,72
All Share Index Volatility	0,29	0,32	0,13	0,04
All Gold Index Volatility	0,26	0,28	0,06	0,05
Industrial Index Volatility	0,07	0,10	0,04	0,03

Volume traded showed the highest positive correlation with All News items, followed by Political news events and then by Domestic Political events. The volatilities of all three indices, however, showed better positive correlations with Domestic Political news events, followed by Political news and then by All News items.

The volatilities of the Industrial Index, followed by the All Share and then the All Gold Index, correlated best with the number of news events in all categories of news, when the election period (March 1994 to June 1994) data were included in the investigation. These correlations, however, weakened when the election period data were omitted from the investigation. With the election period data omitted, the news items correlated better with the volatility of the All Share Index than with the Industrial Index.

In both investigations, with and without the election period data, the correlations between the news items and the All Gold Index Volatility were weaker than the correlations between the news items and the Volatilities of the All Share and Industrial Indices. This can be attributed to the use of South African news events in this investigation. It is expected that the All Gold Index would influenced more by international events.

From the above, it seems as though volume traded is dependant on the number of news events, regardless of the classification of the information. The volatilities of the All Share and All Gold indices are sensitive to the type of information available. These two measures correlated better with Domestic Political news events than with Politics and All News events.

4.3 Effect of non-trading-day news data

According to the correlation results shown in Table 6, the number of Domestic Political news events for trading day (excluding weekend) data correlates better with volume traded than when non-trading-day (weekend) data are included. The opposite effect is shown in the correlations of non-trading-day news data and the volatility of the three indices.

TABLE 6
Correlations: Market measures and Domestic Political items (including and excluding non-trading days)

	Domestic Politics (Trading days)	Domestic Politics	Excluding Election period Domestic Politics (Trading days)	Excluding Election period Domestic Politics
Volume Traded	0,60	0,59	0,60	0,58
All Share Volatility	0,50	0,52	0,29	0,32
All Gold Volatility	0,16	0,18	0,26	0,28
Industrial Volatility	0,53	0,55	0,07	0,10

The above differences in correlation results for including and excluding non-trading-day news data are, however, small. This can be contributed to the fact that the number of news items released on non-trading days are small in comparison to the number of news items released on trading days.

4.4 Effect of election period

The first fully democratic election in South Africa was held in April 1994. During the period before and after the election (March 1994 to June 1994) the daily number of news items increased to a large extent. To measure whether the election period had an effect on this study the correlations between news items and market measures were analysed with and without the election period data and the results are shown in Table 4 and 5.

The correlation results indicate that the volume traded has a high positive correlation with the number of news items regardless whether the election period data was included or excluded. The volatilities of the three indices show better correlation results with news items when the election period data was included. The exception, however was the All Gold Index Volatility, which shows a better correlation with Domestic Political news items when the election period results were excluded. This can be explained that the All Gold Index Volatility is more dependent on international events than local South African news events.

The insensitivity of the volume traded correlations to the inclusion or exclusion of the election period data indicates once again, that volume traded is more sensitive to the volume of news items as opposed to the nature of the news items. The higher positive correlations of the volatilities of the All Share and Industrial Indices with news items including election period data, indicate the sensitivity of these volatilities to the content of local information.

4.5 Effect of domestic political news on market activity

4.5.1 All Share Index

The linear regression results in Table 7 indicate small differences in the slopes of the equations pertaining to Volatility of All Share index and Domestic political news events for monthly and weekly data with or without election period. The coefficients of determination (r^2) of the regressions which included the election period data are higher than those that exclude this data.

The coefficients of determination (r^2) of the monthly and weekly regressions are of the same magnitude. The relationship between the All Share Index Volatility and the average number of Domestic political news events is statistically significant at the 5% significance level for all data sets, except for the monthly data set that excludes the election period.

TABLE 7
All Share Index Volatility vs. Domestic Political news events

x	y	Linear equation (standard error)	r^2
No. of DP news events	Monthly All Share Volatility	y = 0,0010x + 0,1163 (0,0003) (0,0074)	0,1474
No. of DP news events	Monthly All Share Volatility (1994 election excluded)	y = 0,0011x + 0,1148 (0,0008) (0,0130)	0,0323
No. of DP news events	Weekly All Share Volatility	y = 0,0012x + 0,0989 (0,0002) (0,0054)	0,1373
No. of DP news events	Weekly All Share Volatility (1994 election excluded)	y = 0,0014x + 0,0955 (0,0005) (0,0085)	0,0388

4.5.2 All Gold Index

The linear regression results in Table 8 indicate small differences in the slopes of the equations pertaining to volatility of All Gold Index and Domestic Political news events for monthly and weekly data. The slopes for the regressions excluding the election period are, however, three times higher than when the election period is included. The coefficients of determination (r^2) of the regressions which included the election period data are slightly lower than those that exclude the data. The coefficients of determination (r^2) of the monthly and weekly regressions are of the same magnitude. The regression results of the All Gold Index volatility are however insignificant, thereby indicating a weak, insignificant relationship between Volatility of all Gold Index and Domestic Political news events. The relationship between the All Gold Index volatility and the average number of Domestic political news events is not statistically significant at the 5% significance level for all data sets.

TABLE 8
All Gold Index Volatility vs. Domestic Political news events

x	y	Linear equation (standard error)	r^2
No. of DP news events	Monthly All Gold Volatility	y = 0,0008x + 0,3476 (0,0009) (0,0213)	0,0114
No. of DP news events	Monthly All Gold Volatility (1994 election excluded)	y = 0,0029x + 0,3181 (0,0024) (0,0376)	0,0248
No. of DP news events	Weekly All Gold Volatility	y = 0,0009x + 0,3172 (0,0005) (0,0085)	0,0137
No. of DP news events	Weekly All Gold Volatility (1994 election excluded)	y = 0,0027x + 0,291 (0,0014) (0,0233)	0,0193

4.5.3 Industrial Index

The linear regression results in Table 9 indicate small differences in the slopes of the equations pertaining to volatility of Industrial Index and Domestic Political news events for monthly and weekly data. In contrast to the All Gold Index, the slopes are higher when the data for the election period is included than when it is excluded. The coefficients of determination (r^2) of the regressions which included the election period data are also much higher than those that exclude this data. The coefficients of determination (r^2) of the monthly regressions are higher than the weekly regressions.

The coefficients of determination (r^2) of the Industrial Index volatility are larger than those of the All Share Index when the election period data are included. Both indices show better regression results than the All Gold Index. However, if the election period results are excluded, both volatilities of the Industrial Index and All Share Index show poor regression relationships with the number of news events. The relationship between the Industrial Index Volatility and the everage number of Domestic political news events is statistically significant at the 5% significance level for the data sets that include the election period results, but not for the data sets that exclude the election period.

4.5.4 Volume traded

The linear regression equations in Table 10 indicate a substantial differences in the slopes of the equations pertaining to volume traded and Domestic Political news events for monthly and weekly data including and excluding the election period. In the case of weekly regressions, the coefficient of determination (r^2) for the analysis that includes the election period data is slightly higher than when the election period data is excluded. For the monthly regressions the coefficients of determination (r^2) are equal, regardless of whether the election period data is included or excluded. The r^2 values of the monthly regressions are higher than the weekly regressions. The All news category also has higher r^2 values than Domestic Political regressions. The relationship between volume traded and the average number of Domestic Political news events is statistically significant at the 5% significance level for all data sets.

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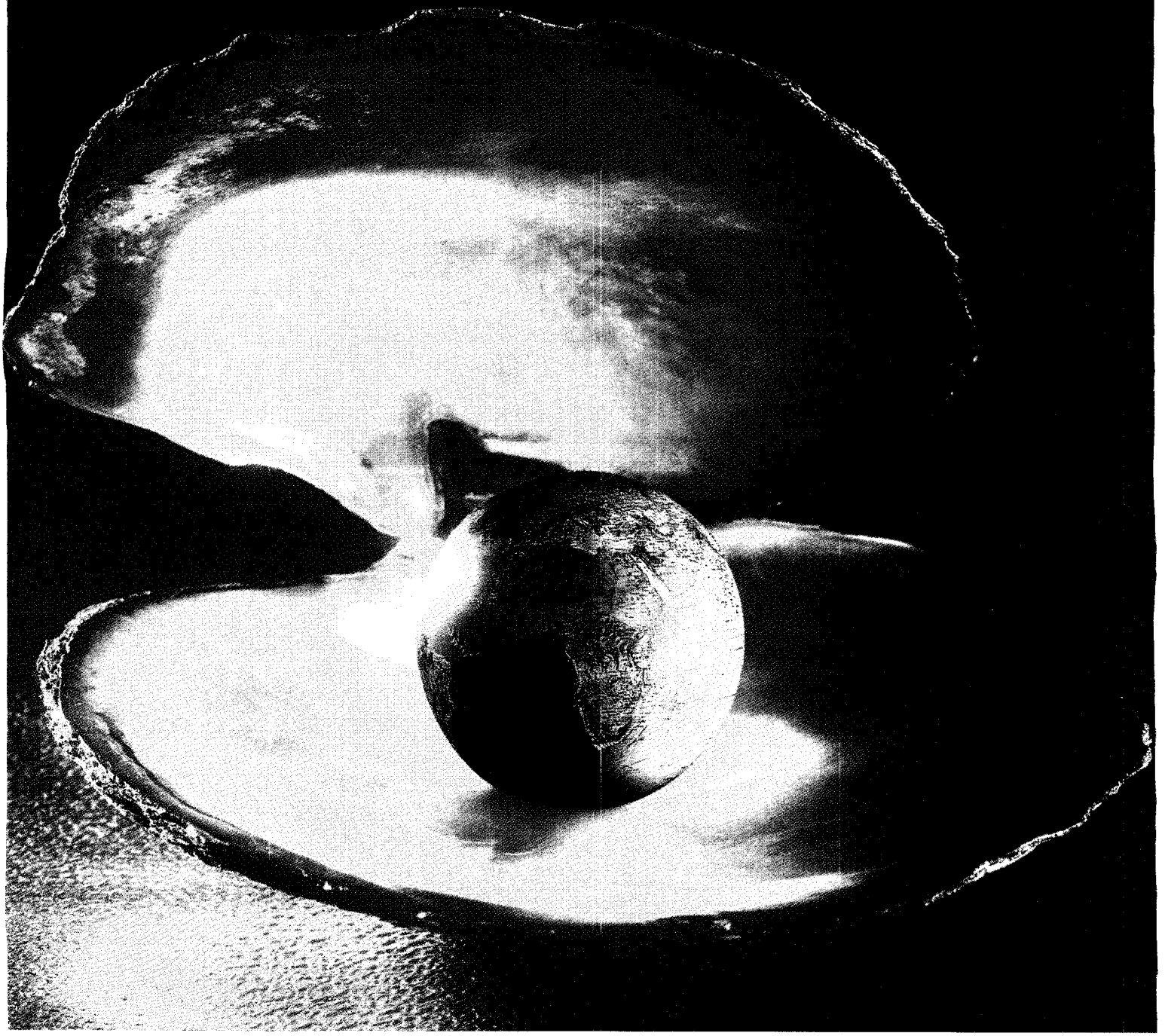

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TABLE 9
Industrial Index Volatility vs. Domestic Political news events

x	y	Linear equation (standard error)	r^2
No. of DP news events	Monthly Industrial Volatility	y = 0,0013x + 0,0873 (0,0003) (0,0069)	0,2294
No. of DP news events	Monthly Industrial Volatility (1994 election excluded)	y = 0,0006x + 0,0965 (0,0008) (0,0119)	0,0105
No. of DP news events	Weekly Industrial Volatility	y = 0,0013x + 0,074 (0,0002) (0,0055)	0,1596
No. of DP news events	Weekly Industrial Volatility (1994 election excluded)	y = 0,0005x + 0,0856 (0,0005) (0,0085)	0,0060

TABLE 10
Volume traded vs. Domestic Political news events

x	y	Linear equation (standard error)	r^2
No. of DP news events	Monthly average Volume traded	y = 0,2258x + 10,556 (0,0431) (1,0947)	0,3589
No. of DP news events	Monthly average Volume traded (1994 election excluded)	y = 0,5392x + 5,8929 (0,1075) (1,7822)	0,3586
No. of DP news events	Monthly average Volume traded	y = 0,2602x + 3,2779 (0,0308) (1,4916)	0,5933
No. of DP news events	Weekly average Volume traded	y = 0,1805x + 11,38 (0,0217) (0,5856)	0,2385
No. of DP news events	Weekly average Volume traded (1994 election excluded)	y = 0,03573x + 8,6393 (0,0514) (0,8820)	0,1924

The regression results indicate much stronger relationships between Domestic Political news events and volume traded than between Domestic Political news events and volatilities of the three indices (All Share, All Gold and Industrial). This finding is similar to the finding of Berry and Howe (1994) in their study of the relationship between public information variable, Reuters's North American Securities News, and measures of market activity, trading volume and volatility.

5. CONCLUSIONS

1. The volume traded on the Johannesburg Stock Exchange (JSE) displays a different day of the week pattern than the New York Stock Exchange (NYSE). Whereas the volume traded on the NYSE reaches a maximum in the middle of the week, the volume traded on the JSE increases from Monday through to Friday.
2. The number of South African Domestic Political news items does not display a day of the week pattern. This is contrary to the behaviour observed in studies using economic and firm specific news.
3. Of the four indicators of market activity investigated, the volume traded on the JSE displays the strongest relationship with the number of Domestic Political news events reported by Reuters.
4. The correlation of volume traded with number of news events displays little sensitivity to the category of news.
5. Volatilities of the All Share and Industrial Indices are more sensitive to the classification (content) of news items and correlate better with the sub-categories of Political and Domestic Political news events, than with the All News category.
6. Volatilities of the All Gold Index correlate poorly with South African news events, regardless of the classification. It is expected that the All Gold Index Volatility would be more sensitive to international news events.
7. Although the relationship between South African Domestic Political news and the Volatilities of the All Share and Industrial Index are better than those of the All Gold Index, these relationships are not as strong as the correlation with volume traded.

The above summary of results provide the answer to the central question investigated in this study: Depending on the price index investigated, the number of South African Domestic Political news events explain between one and 23 percent of the movement in prices (volatility) of shares traded on the Johannesburg Stock Exchange. The relationship between volume traded on the Johannesburg Stock Exchange and number of South African news events is more significant with explained variances ranging between 19 and 59 percent of the total variance.

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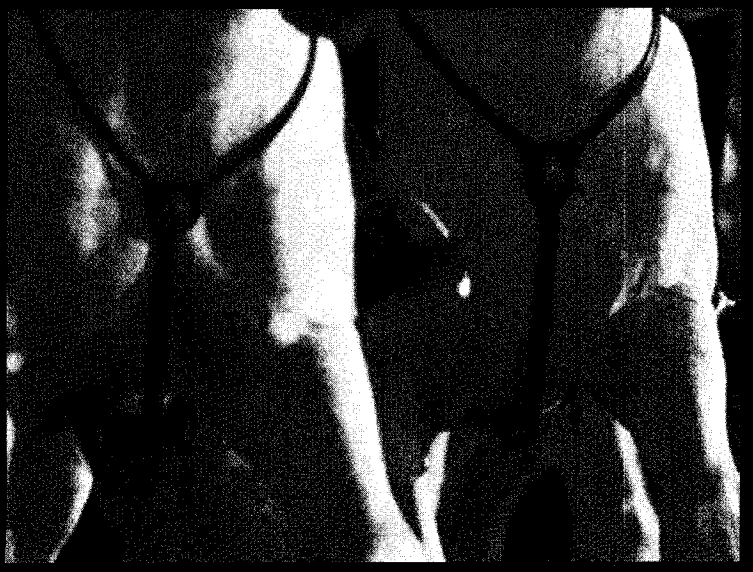

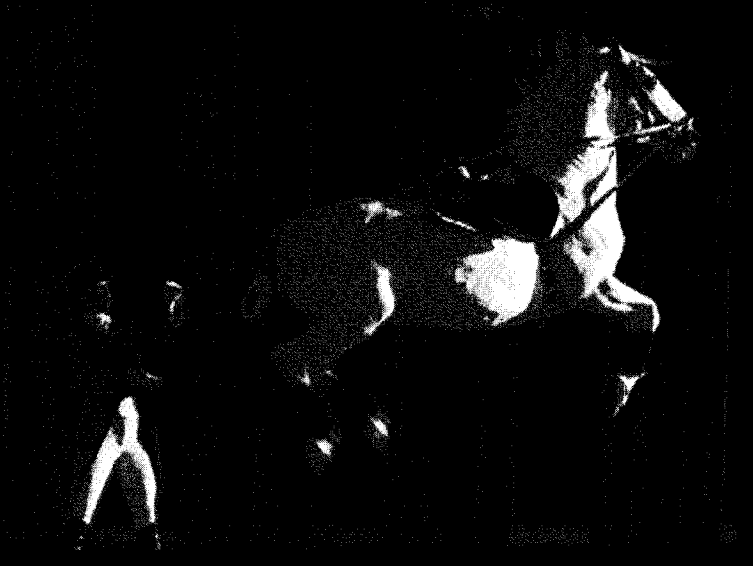

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Assessing portfolio performance: The case of South African Unit Trusts

The standard approach used to assess the performance of unit trust managers is based on the premise that the investment strategy is basically stationary. Active management is viewed as being confined to timing – occasional switching between risky and riskless securities – and selectivity – switching between securities of essentially the same systematic risk to exploit temporary mispricing. This research utilises a traditional measure of portfolio performance and a relatively straightforward methodology that attempts to identify the timing and selection skills of a sample of South African unit trust managers.

1. INTRODUCTION

In an effort to market their products and services, unit trust managers claim to be able to provide superior investment opportunities than individuals can achieve by their own efforts. This claim runs counter to the notion of efficient markets whereby it is suggested that equally diversified portfolios of equivalent risk should produce equivalent returns in the long run. The question of whether "experts" who have specialised knowledge of the market can earn superior risk adjusted returns has led to a great deal of debate in the financial literature where these claims have been tested using a variety of empirical techniques. In essence, these techniques have attempted to distinguish between the market timing skills of fund managers and their asset selection skills. Market timing refers to the fund manager's macro forecasting ability – his or her ability to forecast and exploit anticipated movements in the market as a whole. Asset selection skills refers to a manager's micro forecasting ability – his or heir ability to select specific securities that are undervalued by the market.

Current literature available on the performance of South African unit trusts provides investors with an analysis of the overall returns provided by the funds over varying investment horizons but gives no indication of whether the returns achieved are associated with each manager's ability or merely fortuitous predictions on future market conditions. An assessment of the timing and selection skills of the managers of the longer surviving unit trusts could prove to be extremely useful to investors attempting to maximise their wealth using this type of investment medium. In addition, the absence of any evidence of superior ability to time and select the market on a consistent basis could add to the evidence regarding the validity of the efficient market hypothesis.

The economic assessment of the performance of professionally managed funds is at best problematic. In the standard tests of investment performance, the rate of return to the holder of a particular fund is compared to the performance of a proper "buy and hold portfolio" that has the same priced risk characteristics as the fund under consideration. The traditional use of the Capital Asset Pricing Model (CAPM) as a means to define this benchmark portfolio implicitly assumes stationarity in the systematic risk coefficient of the managed fund[1]. Similarly, the use of the Arbitrage Pricing Theory (APT) to define the benchmark for the assessment assumes stationarity in the systematic risk factors of the managed fund[2]. These assumptions are explicitly violated by the very nature of many unit trusts. The management philosophy is to adjust the unit trust asset holdings in order to pre-empt both positive and adverse developments in the different segments of the securities market. Hence, the management philosophy is one of non-stationarity in the portfolio. For this reason the assessment of the performance of unit trusts might have to be based on another methodology.

Another weakness of the above approach in evaluating the performance of portfolio managers is that it fails to separate the aggressiveness of the manager from the quality of the information he or she possesses. It is apparent that superior performance of a unit trust can occur because of the manager's ability to time the market or because of his or her ability to forecast returns on individual risky assets. Indeed, portfolio managers often characterise themselves as market timers and/or stock pickers. Fama (1972) and Jensen (1972) first addressed this issue and suggested a finer breakdown of performance. Since these pioneering papers, many researchers have investigated the performance of unit trust and mutual fund managers and developed elaborate statistical and econometric approaches in an attempt to detect and distinguish between the timing and the selectivity performance of portfolio managers. (Henricksson and Merton, 1981; Henricksson, 1984; Admati, Bhattacharaya, Pfleiderer and Ross, 1986; Jagannathan and Korajczyk, 1986; Lee and Rahman, 1990 and 1991; Black, Fraser and Power, 1992). In most of these studies, data on mutual fund performance contained time series information on the

1. For a recent assessment of South African unit trusts using a CAPM methodology see Knight and Firer (1989).
2. See Biger and Page (1993).
3. While our method may be theoretically less robust, it has the advantage of using additional data in the form of the varying proportions of each fund invested in different markets. This benefit will become apparent below.
4. Within this context, return maximisation does not merely refer to the process of buying and holding a high beta portfolio but rather to the process of maximising return within an overall risk context.
5. For instance, if one of the classes is "government long-term bonds", the assessor can compute the holding period return on a well diversified "all government bond portfolio". Such information is exogenous to the performance of any unit trust.
6. This indexed level is constructed by compounding the sub-periodic total rates of return inclusive of all cash disbursements over several sub-periods.
7. The term "period" referred to in this context is a short period dt commencing at time t during which no trading takes place. There is no switching of securities intra each class nor across asset classes. This can be extended in a multi-period context by ensuring that the weights of the investment in the different asset classes are updated regularly by design. In constructing the macro designed, full diversification portfolio, the actual change in the proportions which emanate from changes in market prices of the asset class portfolios must be accommodated.
8. An index is not available for "other investments" and the Johannesburg Stock Exchange Overall Actuaries Index was therefore used as a surrogate. The rationale for adopting this approach is that there is little information on what unit trust managers actually do with these funds and it is therefore difficult to measure the performance of this proportion of funds. The investments should, however, earn their share of the return for the portfolio and investing "in the market" best represents the opportunity cost of these funds. The proportion invested in this category is generally small (3.1% on average for the general equity funds and 1.4% for the specialist equity funds) and we therefore do not expect the choice of this basket of assets to significatly effect the results.

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rates of return on each portfolio. The actual composition of the securities held by each fund through time was not explored. Only recently have researchers started to allude to the potential refinements to measurement and assessment of fund managers when more detailed information on the portfolio composition is at the disposal of the assessor. In two recent papers, Elton and Gruber (1991) and Biger and Page (1994) derived techniques for evaluating superior performance when access to the composition of the portfolio is provided.

The overall objective of this paper is to investigate whether South African professional fund managers are able to successfully predict future equity market performance – as reflected in their macro investment strategies – and whether they have superior asset selection ability – as reflected in their micro strategies within each broad market segment. If it can be shown that South African fund managers have superior ability in either macro or micro selection ability, then unit trusts do indeed offer attractive investment opportunities for individual investors over-and-above their ability to provide pure diversification benefits.

No published research into the performance of South African unit trusts has specifically investigated the timing and selection abilities of the unit trust managers although the increasing popularity of unit trusts as an investment medium has spawned a dramatic increase in the number of trusts available. In September 1989 there were 31 unit trusts operating with a market value of R6.08 billion. By September 1994, the number had grown to 66 and the market value had increased by 31.7% per annum to R24.38 billion.

In Section II of the paper we present an evaluation of prior international reseach into the timing and selection abilities of professional fund managers. In Section III, we discuss the methodology used and highlight the specific hypotheses to be tested. Section IV outlines the data sample used, while the empirical results are presented in Section V. Finally, we conclude with some general observations in Section VI.

II. PRIOR EMPIRICAL RESEARCH

The general development of modern portfolio theory, and the specific development of the CAPM and APT, have resulted in considerable empirical research into the performance of professionally managed portfolios. Following the ground breaking research by Jensen (1968), numerous authors have proposed alternative and enhanced statistical procedures in an effort to refine the analysis. However, most of them have concentrated on the aggregate market price of the funds as the means of measuring fund manager performance. Table 1 presents a brief synopsis of some of the more quoted historical research into the area.

TABLE 1
Prior research into the timing and selectivity ability of professional fund managers

Author	Research Method	Data analysed	Results
Jensen (1968)	Capital Asset Pricing Model	115 United States mutual funds from 1955 to 1964	no funds significantly outperformed a buy and hold strategy
McDonald (1974)	Sharpe, Treynor & Jensen measures	123 United States mutual funds from 1960 to 1969	majority of funds did not perform as well as NYSE
Kon & Jen (1979)	Varying market risk over time & CAPM	49 United States mutual funds from 1960 to 1971	results indicated a large number of funds engage in marketing timing activities due to multiple levels of beta risk
Kon (1983)	Extension of the 1979 analysis to examine selectivity & timing issues	37 United States funds from 1960 to 1976	14 funds had overall timing performance but none were statistically significant 23 had overall selectivity performance but only five were significant
Henriksson (1984)	CAPM, selectivity & timing analysis	116 United States funds from 1968 to 1980	11 significantly positive and 8 significantly negative measures of selectivity ability 3 significantly positive and 9 significantly negative measures of timing ability
Chang & Lewellen (1984)	CAPM, selectivity & timing analysis	monthly returns of 67 United States funds from 1971 to 1979	4 funds exhibited statistically significant timing skills while 5 funds exhibited statistically significant selection skills and of these 3 were negative

TABLE 1
Prior research into the timing and selectivity ability of professional fund managers (continued)

Author	Research Method	Data analysed	Results
Chen & Stockum (1986)	CAPM using generalised varying parameter regression procedure to examine selectivity, timing & beta instability	quarterly returns of 43 United States funds	approximately 30% of the funds exhibited selectivity, 19% were found to have random betas, 14% had significantly negative timing performance
Grinblatt & Titman (1989)	CAPM, selectivity & timing using a Jensen type measure	quarterly holding period returns on 274 US mutual funds using actual portfolio holdings from 1974 to 1984	evidence of superior performance expecially among the aggressive growth portfolios
Lee & Rahman (1990)	CAPM, selectivity & timing analysis	monthly returns on 93 US mutual funds from 1977 to 1984	some evidence of superior selection and timing ability
Black, Fraser & Power (1992)	CAPM, selectivity & timing analysis using random walk betas	monthly returns on 30 United Kingdom mutual funds from 1977 to 1984	majority of funds offered investors significantly higher risk adjusted returns
Grinblatt & Titman (1993)	portfolio change measure	quarterly proportional holdings of 155 US funds from 1974 to 1984	funds achieved abnormal returns on average
Biger & Page (1994)	extension of the methodology by Elton and Gruber (1991)	monthly proportional holdings of 16 Israeli unit trusts	no evidence of timing or selection ability found

As is highlighted in Table 1, there is a greater tendency for the empirical evidence to suggest that professional fund managers exhibit either positive (or negative) abilities when more "sophisticated" methodologies are employed. Approaches that have attempted to model the non-stationarity of the risk parameters generally conclude that there is some evidence of timing and selection skills. The most surprising results are those achieved by Black, Fraser and Power (1992) using random walk betas, and Grinblatt and Titman (1993) using portfolio composition measures, which established that the majority of the sample of trusts used in their analyses managed to earn positive abnormal returns.

The only empirical research undertaken using South African unit trust data has involved using standard aggregate evaluation methods such as that of Jensen. Knight and Firer (1989) evaluated the performance of 10 South African unit trusts over the period 1977 to 1986 and found only two of the funds performed better than the overall market on a risk adjusted basis.

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III. MEASURING THE PERFORMANCE OF PROFESSIONAL FUND MANAGERS

As mentioned above, the traditional Jensen (1968) methodology has, almost without exception, been unable to identify funds that significantly outperform the market on a consistent basis. Two performance measures are therefore adopted in this paper. The first of these is based on the Jensen measure and the second on a methodology initially proposed by Elton and Gruber (1991) and subsequently used by Biger and Page (1994) to assess the performance of Israeli flexible investment unit trusts. If the South African market is efficient and the local unit trust managers have no superior ability then we would not expect the two approaches to yield different conclusions. If, however, South African managers do exhibit superior ability then the lower power of the Jensen measure may result in the two approaches yielding conflicting conclusions.

III-a. The Jensen (1968) performance measure

Using the CAPM as a theoretical framework, Jensen (1968) postulated that the overall performance of a portfolio could be assessed from the following regression equation:

$$R_{i,t} - R_{f,t} = \alpha_i + (\beta_i + e_{i,t})(R_{m,t} - R_{f,t}) + u_{i,t}$$

where; $R_{i,t}$ is the continuously compounded return of the i^{th} portfolio in period t; $R_{f,t}$ is the corresponding return from a risk-free investment; α_i is the regression equation intercept for the portfolio; β_i is the targeted systematic risk of the i^{th} portfolio; $R_{m,t}$ is the continuously compounded return on the market portfolio in period t; $u_{i,t}$ is a random error term; and, $e_{i,t}$ is the measure of the change in systematic risk over time. Additionally,

$$e_{i,t} = a_i\pi_t + w_{i,t}$$

where; $w_{i,t}$ is an error term assumed to be normally distributed with a mean of zero; π_t is an unobservable "market factor" which to some extent affects the returns on all securities; and, a_i is a measure of the relationship between $e_{i,t}$ and π_t. Jensen suggests a_i will be positive if the manager has any forecasting abilities and zero if he has none.

Asset selection skills can be deduced from the sign and magnitude of the regression equation intercept. A significantly positive value suggests superior ability on the part of the manager while a significantly negative value implies inferior ability or alternatively that the manager is generating too many transaction expenses through excessive trading. A value not significantly different from zero suggests the manager is merely performing in a manner consistent with a random buy and hold strategy.

Jensen used his model to show that the 115 United States mutual funds analysed were unable to outperform a simple "buy the market and hold" strategy on average. The research resulted in considerable interest from finance academics who were quick to point out that the final measure of performance was dependent on, and sensitive to, the benchmark portfolio selected and that the choice of the "timing measure" introduced a downward bias of the estimated risk parameter $E(\beta_i)$ in the equation;

$$E(\beta_i) = \text{cov}[(R_{i,t} - R_{f,t})(R_{m,t} - R_{f,t})]/\text{var}(R_{m,t} - R_{f,t})$$
$$= \beta_i - a_iE(R_m)$$

because a manager having the ability to time the market would have an a_i greater than zero. This would downwardly bias the estimated β_i and upwardly bias the estimated performance measure α_i. This means that a manager exhibiting timing skills would have an upward bias for the estimated returns on the managed portfolio.

Further research by Grant (1977) explained how market timing skills will affect the results of empirical tests that focus only of asset selection skills and ignore market timing skills. Lee and Rahman's (1990) findings are consistent with those of Grant. They found that the estimate of selectivity is lower when timing is ignored. It is thus important to simultaneously evaluate fund managers on both their selection and timing skills.

Finally, empirical analysis of managed portfolios should take into account that the risk profile of the portfolio may change over time depending on the risk of the assets held as well as the proportion of funds invested in the different assets. The Jensen α_i assumes that fund managers aim at a target risk, and attempt to maintain this risk profile. Kon and Jen (1979), Chang and Lewellen (1984), Lee and Rahman (1990) and Black, Fraser and Power (1992) have all reported changes in the systematic risk of the funds that they examined. It is therefore difficult to meaningfully evaluate professional fund managers on the basis of this measure alone.

III-b. Measuring market timing and selectivity ability

As has been alluded to above, any superior performance by a professional fund manager can result from two aspects of investment strategy. Firstly, the manager may have superior ability in forecasting when to move in and out of a particular segment of the market. Elton and Gruber (1991) see this timing ability as being concerned with the decision to move funds between the risky portfolio and a riskless asset. This definition is consistent with securities market line (SML) analysis and the perception of a single systematic risk factor influencing risky asset returns. Secondly, the manager may have superior ability in selecting securities within a particular segment of the market. In this context we are referring to the manager's forecasting ability with respect to firm specific risk factors.

Clearly, if managers continue to altar the portfolio composition in their attempts to both time and select, the systematic risk of the portfolio is unlikely to remain constant and the construction of a stationary benchmark is inappropriate. This argument applies whether a CAPM or APT based performance benchmark is selected. In an attempt to resolve this difficulty, Black, Fraser and Power (1992) suggest the use of Kalman Filters to estimate the time-varying beta of a unit trust for bench marking purposes.

The use of a single time-varying beta still implicitly assumes a uni-dimensional security space where all securities and portfolios are affected in a systematic fashion by a single market "factor". Given the considerable research into multi-factor economic environments, and that unit trusts generally invest across a wide spectrum of securities, a multi-factor approach to performance measurement may be more appropriate. While it may still be possile to use a time-varying multi-beta econometric approach to address this issue, the methodology presented here adopts a simpler approach[3].

Consider a unit trust with the stated investment philosophy of attaining the highest possible rate of return for investors who hold the fund's units. The manager is free to invest in any of, say, three classes of risky securities as well as in a risk-free money market instrument. We further presume that the investment portfolio is still managed on the principles of proper diversification, but the fund manager is supposed to closely monitor market behaviour and pre-empt market developments by shifting from one class of securities to another and within each class in order to maximise the rate of return to the unit holders[4].

Assume that the assessor obtains information on the actual proportion of the funds of the unit trust which were allocated to each class of securities at different (consecutive) points in time, say at the start of each week or month. Further, assume that the assessor is in possession of exogenous information on the periodic (weekly, monthly) rate of return on each of the classes of securities[5].

The flexibility available to the manager suggests two areas of investment strategy for achieving high portfolio performance. Firstly, the choice of the macro composition of the portfolio from period to period must be considered – the proportion of each class of securities held in the portfolio. This choice of the investment vehicle, or the group of securities to be held, is termed "market timing". Secondly, the manager can choose to switch between securities inside each of the security classes. The ability to choose the right securities in each category, and switch between

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securities in each, is termed "selectivity". Overall success can therefore be measured relative to the actual performance of composite indices constructed to represent each of the groups of securities.

Measuring market timing ability

Consider a given holding period of, say twelve sub-periods. For this holding period, we can compute the rate of return which a given unit trust could attain if its initial allocation of funds into the four asset classes was not altered by actual trading. This is simply reflected by the weighted average of the holding period return of the four asset classes. The weights are the unit trust's start of period proportional allocation of funds into the four asset classes. The rate of return thus computed can be termed the return on a 'no-timing' buy and hold strategy. For a holding period commencing at t and ending at T, this rate of return is given as;

$$R^{(A)}_{T\text{-}t} = \sum_{i=1}^{4} w_{i,t}\, I_{i,T}/I_{i,t} - 1; \qquad (2)$$

where $w_{i,t}$ is the proportion of the fund's wealth invested in the i^{th} class of assets at time, t, and $I_{i,t}$ is the indexed level of the i^{th} asset class at time[6].

Next, we can use the actual proportion of the unit trust's allocation of funds into the four asset classes in each of the sub-periods (weeks, months) to compute the weighted average sub-periodic rate of return that the unit trust would earn if the changes from one sub-period to the next, during the entire period of twelve sub-periods, were confined to switching between investments in the four asset classes. The above can be viewed as an investment in well diversified groups of securities in each of the four classes of assets. The rate of return in each sub-period is computed by applying these weights to the exogenously given rates of return of each of the asset classes during that sub-period. The holding period rate is computed by compounding the sub-periodic rates of return. This compound rate of return reflects the timing record of the said unit trust during the holding period. It can be termed the return on a "macro traded" strategy. More formally, it is written as;

$$R^{(B)}_{T\text{-}t} = \prod_{j=1}^{T-1} \left(\sum_{i=1}^{4} w_{i,j}\, I_{i,j+1}/I_{i,j} \right) - 1. \qquad (3)$$

The market timing success of the unit trust manager in selecting and changing the marco composition of the portfolio over any particular investment horizon may be assessed by comparing the performance of the marco traded strategy against the performance of the no-timing buy and hold strategy. The use of the macro traded removes any superior selectivity ability from the performance assessment because it implicitly assumes that the manager invests in a well diversified but naive portfolio within each class of securities. The timing ability is therefore measured as $R^{(B)}_{T\text{-}t} - R^{(A)}_{T\text{-}t}$.

Measuring selectivity ability

The second component of the assessment examines the extent to which the managers of unit trusts are successful in selecting the superior performing securities within each asset class. Although unit trust managers diversify their investments, they engage in active management of their portfolios by purchasing, holding, selling, and switching securities in an effort to achieve superior performance.

Consider a unit trust manager who chose to invest proportions $w_{1,t}$, $w_{2,t}$, $w_{3,t}$, and $w_{4,t}$ in the four asset classes. If the securities actually selected were the fully diversified basket in each class, then the sub-periodic rate of return would be the weighted average of the rates of return on each asset class, the weights being the proportions chosen by the fund manager. This rate of return can be termed the rate of return on the macro designed, full diversification portfolio of the unit trust. Formally, this rate of return is;

$$r^{(C)}_{t} = \left(\sum_{i=1}^{4} w_{i,t}\, I_{i,t+1}/I_{i,t} \right) - 1. \qquad (4)$$

The actual rate of return on the unit trust reflects not only the macro design but also the performance of the securities specifically selected within each class. These specific securities were presumably chosen in order to achieve superior rates of return[7].

The investment manager can select particular securities within a segment, squeeze the returns, sell and switch to other intra-asset class securities. His or her success may be assessed by comparing the actual rate of return achieved by the unit trust against that of the macro designed, full diversification portfolio, measured as $r^{Actual}_{t} - r^{(C)}_{t}$.

III-c. Hypotheses tests

The Jensen measure

A regression of monthly excess returns on the unit trust against monthly excess returns on the Johannesburg Stock Exchange Actuaries overall index is first run for each unit trust. The specific regression equation used for each unit trust is;

$$(R_{i,t} - R_{f,t}) = \hat{\alpha}_i + \hat{\beta}_i\, (R_{m,t} - R_{f,t}) + e_{i,t} \qquad (5)$$

where $R_{i,t}$; $R_{f,t}$ and $R_{m,t}$ the monthly rates of return of the i^{th} portfolio; the risk free rate and the market portfolio for time period t respectively; and $\hat{\alpha}_i$ is the estimated Jensen intercept for the i^{th} portfolio.

As the efficient market hypothesis would imply that managers cannot consistently outperform the market, the performance hypothesis tested is;

$$H_0 : \alpha_i = 0 \text{ versus } H_a : \alpha_i > 0. \qquad (6)$$

The market timing measure

For each unit trust, and for each of a series of six overlapping two year investment horizons, we use equations (2) and (3) to compute two geometric average rates of return. The first computation gives the average rate of return that the "no timing" buy *and hold strategy* would have earned the portfolio over each period. The second computation gives the average rate of return earned by the portfolio which is managed in accordance with the "macro traded" strategy over the same period.

$$r^{(A)}_{T\text{-}t} = \sum_{i=1}^{4} w_{i,t}\, I_{i,T+1}/I_{i,t} - 1; \text{ and,} \qquad (7)$$

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$$r_{T-t}^{(B)} = {}_{T-t}\prod_{j=t}^{T}\left(\sum_{i=1}^{4} w_{i,t}\, I_{i,j+1}/I_{i,j}\right) - 1; \qquad (8)$$

where; $r_{T-t}^{(A)}$ and $r_{T-t}^{(B)}$ are the geometric average rates of return on the two respective portfolios; $w_{i,t}$ is the proportion of fund's wealth invested in the i^{th} class of assets at the beginning of period t; and $I_{i,t}$ is the indexed level of the i^{th} asset class at the beginning of period t.

As the efficient market hypothesis would imply that fund managers cannot successfully time their switching from one macro segment to another and attain superior performance, the following hypothesis can be tested for each investment horizon across the sample of unit trusts.

$$H_0 : \bar{r}_{T-t}^{(B)} - \bar{r}_{T-t}^{(A)} = 0 \text{ versus } H_a : \bar{r}_{T-t}^{(B)} - \bar{r}_{T-t}^{(A)} > 0. \qquad (9)$$

where; $\bar{r}_{T-t}^{(B)}$ and $\bar{r}_{T-t}^{(A)}$ are the average geometric average rates of return across investment horizons for the unit trusts for the two respective strategies.

The selectivity measure

The selectivity ability of the fund managers is assessed by comparing the quarterly performance of each unit trust against the performance of the synthetic macro designed, full diversification portfolio. This portfolio is defined in equation (4). As is the case for market timing, the efficient market hypothesis would imply *fund managers cannot* successfully select securities within each of the asset classes and attain superior performance.

The following hypothesis is tested for each unit trust.

$$H_0 : \bar{r}^{Actual} - \bar{r}^{(C)} = 0 \text{ versus } H_a : \bar{r}^{Actual} - \bar{r}^{(C)} > 0. \qquad (10)$$

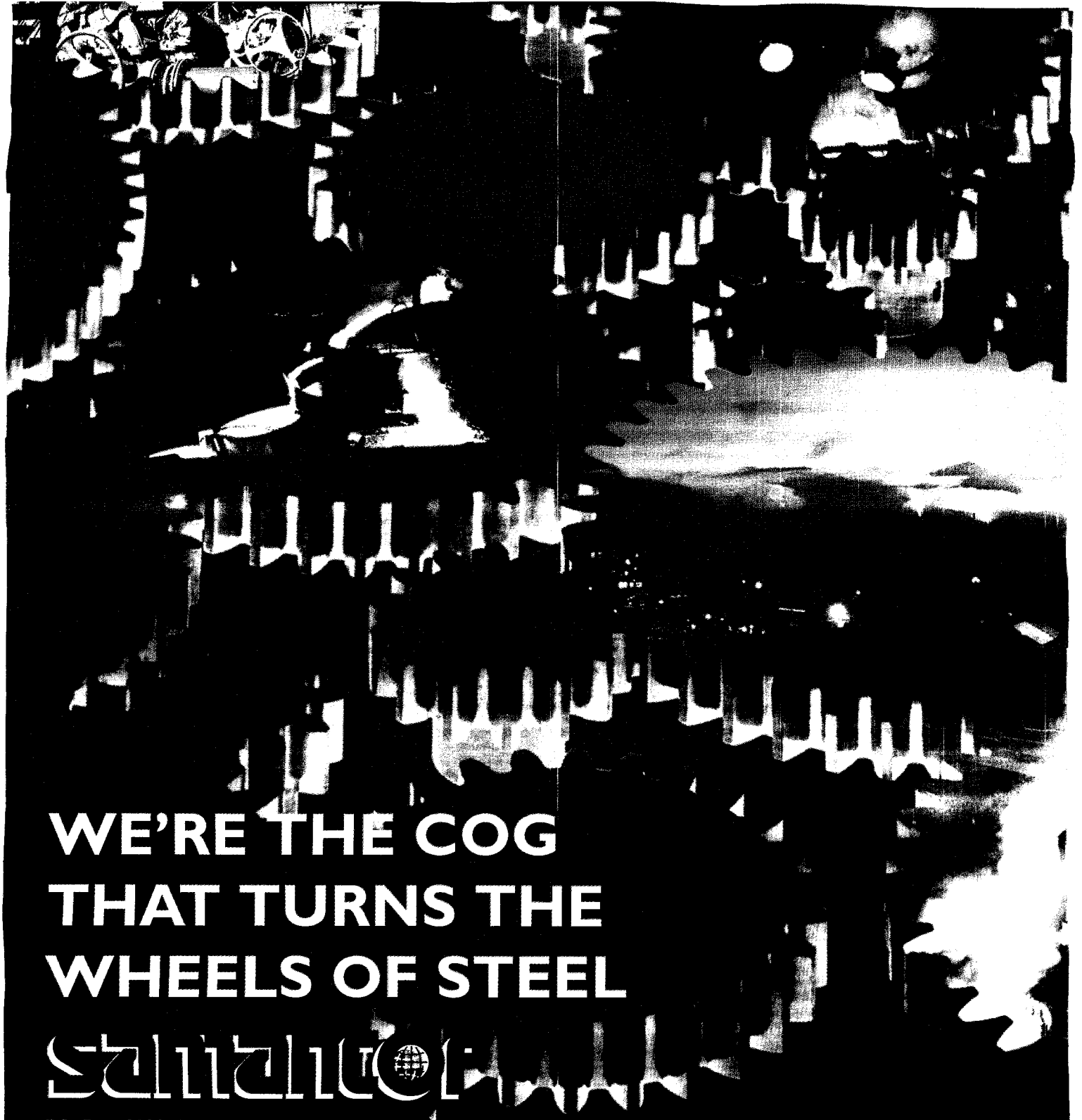
IV. THE SAMPLE

The sample of unit trusts used for the empirical analysis consists of eight general equity funds and nine specialist funds continuously available in the South African market since September 1987. All South African unit trusts that were in existence in 1987 survived the analysis period and there is consequently no survival bias in the selected sample of seventeen. One unit trust, historically called the Sanlam Dividend Fund, was originally designated a specialist equity trust and has subsequently changed its investment objective to that of a general equity trust. It is now termed the Sanlam Prime Growth Trust. No other classification changes were made and this fund has been grouped with the specialist equity unit trusts for the purpose of the analysis. The funds used in the analysis are presented in Table 2.

TABLE 2
Variation in investment proportions across asset classes September 1987 to September 1994

	Gold		Mining Financial		Other Mining		Finance & Industrial		Other Assets		Liquid Assets	
General Equity Funds												
Guardbank Growth	3.1	*8*	15.9	*15*	6.8	*5*	55.2	*12*	5.0	*13*	14.2	*17*
OM Investors	5.1	*10*	18.4	*14*	12.9	*10*	48.8	*24*	1.1	*7*	13.6	*19*
Sage	5.3	*10*	13.6	*7*	6.6	*4*	52.8	*17*	4.3	*8*	17.2	*21*
Sanlam Index	7.9	*15*	16.1	*8*	14.3	*11*	47.8	*18*	6.3	*12*	12.2	*23*
Sanlam Trust	6.6	*13*	16.0	*9*	10.4	*12*	48.4	*22*	2.0	*12*	16.7	*26*
Standard Mutual	3.4	*7*	12.2	*12*	4.3	*12*	43.2	*21*	2.4	*15*	34.4	*26*
Syfrets Growth	4.6	*16*	14.6	*23*	9.6	*13*	53.3	*39*	2.7	*16*	15.0	*31*
UAL	2.1	*11*	17.1	*18*	15.1	*21*	42.4	*11*	0.7	*9*	22.5	*29*
average	**4.8**		**15.5**		**10.0**		**49.0**		**3.1**		**18.2**	
Specialist Equity Funds												
Guardbank Resources	17.5	*16*	26.5	*16*	23.3	*23*	11.5	*12*	5.1	*18*	15.8	*23*
OM Mining	16.6	*21*	31.2	*18*	29.0	*21*	9.2	*15*	0.0	*0*	14.0	*20*
Sage Resources	18.8	*24*	25.8	*14*	18.6	*16*	17.8	*13*	0.3	*4*	18.6	*27*
Sanlam Prime	6.4	*23*	11.3	*14*	11.9	*24*	49.0	*38*	2.0	*16*	19.2	*38*
Sanlam Industrial	0,0	*0*	3.1	*5*	0.3	*4*	77.7	*23*	1.9	*11*	16.9	*20*
Sanlam Mining	18.8	*33*	28.7	*16*	27.6	*34*	6.6	*15*	1.1	*12*	17.4	*31*
Standard Gold	52.4	*42*	20.7	*19*	0.6	*2*	0.0	*0*	1.6	*10*	24.7	*44*
UAL Mining	13.7	23	34.2	*26*	30.3	*25*	4.4	*11*	0.9	*7*	16.5	*20*
UAL Selected	2.6	*11*	3.4	*11*	6.2	*14*	71.1	*18*	0.0	*0*	16.7	*22*
average	**16.3**		**20.5**		**16.4**		**27.5**		**1.4**		**17.8**	

Average quarterly holdings by asset class and range of proportional holdings (italics) for each unit trust



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For each of the seventeen unit trusts, the time series of monthly closing repurchase prices as well as the dividends paid by the fund were extracted. When computing monthly returns for each unit trust, the dividends are assumed to be re-invested at the declaration date repurchase price. The declared dividend generally consists of two portions – a dividend portion and an interest portion. The interest portion is subject to tax and should be adjusted to a value net of tax in the calculation of re-invested holding period returns. This adjustment was not made because of the differential marginal tax rates experienced by individual investors in South Africa. Any overstatement of the holding period return is estimated to be small.

As is shown in Table 2, unit trusts in South Africa invest their funds in six broad asset categories, namely; gold, mining financial, other mining, industrial and financial, other investments, and liquid assets. Legislation requires that all unit trusts publish portfolio composition statistics on a quarterly basis and these were used to determine the quarterly proportional holdings in each of the five market sectors for each of the unit trusts. The table gives the average and range of these holdings over the seven year analysis period. As can be seen, the managers of general equity unit trusts tend to concentrate their investments in the financial and industrial sectors. In contrast, the majority of the specialist unit trusts managers concentrate their investments within the mining sector. From the range of proportions, it is also apparent that the management of both types of unit trusts move a considerable percentage of their funds in and out of liquid assets, depending on their perceptions of future market conditions.

Finally, the monthly dividend adjusted index values for the five market sectors and the 90 day treasury bill rates were extracted[8]. The returns on each of the indices reflect the returns that could be achieved by investing in a well diversified basket of securities and each unit trust manager's timing and selection ability is measured against these individual asset baskets. By adopting this approach, the benchmark portfolio is made up of several distinct asset classes rather than a single "overall" market index. The proportion of each fund held in liquid assets is presumed to be invested at the risk free rate of return which is assumed to be the 90 day Bankers Acceptance rate.

The exact choice of sector indices is less critical for evaluating a manager's timing ability than it is for the evaluation of selectivity. As discussed in Section III, timing ability is evaluated by measuring what would have happened if the manager chose not to change the investment proportion of the portfolio against the returns achieved by mimicking the changes in proportional holdings. In both instances, the returns are obtained from the same underlying indices. The evaluation of managers selection ability is however extremely sensitive to the choice of indices. In this instance, the returns of the re-balanced macro portfolio are directly measured against the returns achieved by the actual unit trust. A poor choice of a particular basket of securities could have the effect of reducing the returns achieved by the "marco" portfolio and incorrectly indicate that the manager enjoyed significant selection abilities (or vice versa).

Table 3 shows the compounded annual rates of return for the indices used to establish the "macro" and "buy and hold" investment strategies. Note that these returns are inclusive of the October crash of 1987 and would look quite different if the returns were measured after this period.

TABLE 3
Overall return on the selected asset class portfolios

Asset class index	% p.a.
All gold Index	5.832
Mining Financial Index	14.757
Other Metals Index	19.049
Financial & Industrial Index	19.792
Other (JSE Actuaries Overall)	15.409
90 Day Bankers Acceptance	14.378

rate of return per annum achieved by each index over the period September 87 to September 94

V. RESULTS AND ANALYSIS

V-a. Jensen methodology

The results of the Jensen regressions are presented in Table 4. The estimated β_i's are measures of the "average" systematic risk of each unit trust while the α_i's represent the monthly return that each fund received over-and-above the market on a risk adjusted basis. As can be seen from the table, no fund managed to outperform the market at the 5% level of significance.

TABLE 4
Jensen Performance Index for the period September 1987 to September 1994

	$\hat{\beta}_i$	$\hat{\alpha}_i$ (%)	t-statistic	R^2
General Equity Funds				
Guardbank Growth	0.778	0.249	0.957	0.80
OM Investors	0.857	0.147	0.671	0.87
Sage	0.761	0.124	0.724	0.90
Sanlam Index	0.907	-0.012	-0.052	0.88
SanlamTrust	0.778	-0.129	-0.464	0.77
Standard Mutual	0.622	0.203	0.742	0.69
Syfrets Growth	0.772	0.443	1.803	0.81
UAL	0.863	0.051	0.205	0.84
average	**0.792**			**0.82**
Specialist Equity Funds				
Guardbank Resources	0.918	0.003	0.009	0.79
OM Mining	0.970	-0.160	-0.511	0.81
Sage Resources	0.999	-0.036	-0.130	0.85
Sanlam Prime	0.748	-0.047	-0.122	0.62
Sanlam Industrial	0.637	0.142	0.371	0.55
Sanlam Mining	0.877	-0.564	-1.475	0.70
Standard Gold	0.897	-0.752	-1.330	0.52
UAL Mining	1.014	-0.219	-0.841	0.87
UAL Selected	0.640	0.226	0.578	0.54
average	**0.855**			**0.69**

*: significant at the 5% level

The coefficients of determination average 0.82 for the general equity unit trusts and 0.69 for the specialist funds. Given the well diversified nature of the funds these values are not surprising. The specialist nature of the second group of unit trusts is also evident from the broader range

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of coefficients of determination as well as the lower overall average.

It is interesting to note that the general equity trusts performed better on average than the specialist equity funds. In particular, the best performer, Syfrets Growth Fund, achieved an abnormal monthly return of 0.443%. This is equivalent to an annual compounded return of 5,447% and is significant at the 7.31% level. The worst performing fund, Standard Bank Gold Fund, achieved a monthly rate of return of 0.752% below that of the market. While not significant, this is equivalent to an annual compound rate of 9.4% below the market.

The returns used in the analysis did not not incorporate the management fee charged by the funds. These can range from 0.5% to 5% of the returns achieved. Additionally, individuals attempting to maximise their wealth by switching between unit trusts would also have to pay the difference between the selling and the repurchase price which varies between 4% and 6%. Clearly, these charges are sufficient to negate the apparently superior returns achieve by the Syfrets Growth Fund. However, the inability of management to achieve abnormal risk adjusted returns relative to the JSE Actuaries overall index does not reduce the valuable diversification service that unit trusts provide investors who do not have the means to create an equivalent diversified portfolio.

V-b. Timing ability

The mean quarterly returns for the six two year investment horizons for the "buy and hold" and "macro" traded strategies are presented in Table 5 and Table 6 respectively. To illustrate the interpretation of the results, consider the returns achieved by the Guardbank Growth Fund for the second investment horizon. The buy and hold portfolio achieved an average quarterly return over the eight quarters of 4.52%, (an annual compounded return of 19.3%) whereas the average quarterly return over the equivalent investment horizon for the macro traded strategy was 4.38% (or 20.08% per annum). Management of the Guardbank Growth Fund managed to increase the returns on the fund by 0.31 per quarter directly as a result of timing of the market.

TABLE 5
Average quarterly percentage returns for the buy and hold strategy for six two year investment period starting and ending on September 30

	87-89	88-90	89-91	90-92	91-93	92-94	*Average*
General Equity Funds							
Guardbank Growth	2.50	6.68	4.52	4.48	2.53	7.73	*4.74*
OM Investors	2.47	5.99	3.94	3.72	2.66	8.72	*4.58*
Sage	2.36	6.25	4.08	4.27	2.62	7.26	*4.47*
Sanlam Index	2.53	6.56	4.30	3.51	2.70	8.40	*4.67*
SanlamTrust	2.60	5.39	4.10	3.62	2.76	8.13	*4.43*
Standard Mutual	2.51	5.73	3.54	3.35	2.25	5.96	*3.89*
Syfrets Growth	2.10	6.80	4.61	3.82	1.62	7.82	*4.46*
UAL	2.57	6.83	4.24	3.73	2.29	6.42	*4.35*
average	**2.45**	**6.28**	**4.17**	**3.81**	**2.43**	**7.55**	***4.45***
Specialist Equity Funds							
Guardbank Resources	1.42	5.85	2.25	-0.07	2.37	10.39	*3.70*
OM Mining	1.19	5.63	1.89	0.09	2.48	11.91	*3.86*
Sage Resources	1.13	6.10	2.31	0.60	2.37	11.00	*3.92*
Sanlam Prime	2.33	4.51	4.48	3.54	2.65	6.68	*4.03*
Sanlam Industrial	3.22	5.96	5.66	5.95	2.91	5.80	*4.92*
Sanlam Mining	1.98	5.04	2.27	0.02	2.39	12.10	*3.97*
Standard Gold	-1.76	4.58	-1.88	-3.17	3.83	12.71	*2.38*
UAL Mining	1.51	5.97	2.28	-0.02	1.76	10.95	*3.74*
UAL Selected	2.44	6.50	5.63	5.86	2.86	5.37	*4.94*
average	**1.50**	**5.57**	**2.76**	**1.42**	**2.62**	**9.77**	***3.94***

It is also interesting to note that the average returns across the General Equity and Specialist Equity funds for the macro traded strategies are generally higher than those achieved by the buy and hold portfolios. Overall it appears that the managers of the general equity funds achieved an average quarterly return of 5.04% across the six investment horizons by actively trading versus a 4.45% average quarterly return for the passive strategies. A similar relationship exists for the specialist equity funds. As mentioned previously, these returns are not the quarterly returns actually achieved by the funds. They only give the part of the returns achieved that can be attributed to timing ability. We now turn to evaluating whether these differences in returns are statistically significant.

The data presented above is summarised in Table 7. The overall mean returns across the six investment horizons for the buy and hold and macro strategies are presented in columns 1 and 2 respectively. Column 3 contains the F-test for the comparison of variances between the buy and hold and Macro two year investment strategies and column 4 contains the t-statistic for the comparison of mean returns. To illustrate the interpretation of these values, consider the results for the Standard Bank Mutual Fund. The average quarterly returns for the buy and hold and macro traded strategies are 3.89% and 4.9% respectively. The t-statistic for testing the significance of the null hypothesis that the average returns for the two strategies are equal is 1.067 which is not significant at the

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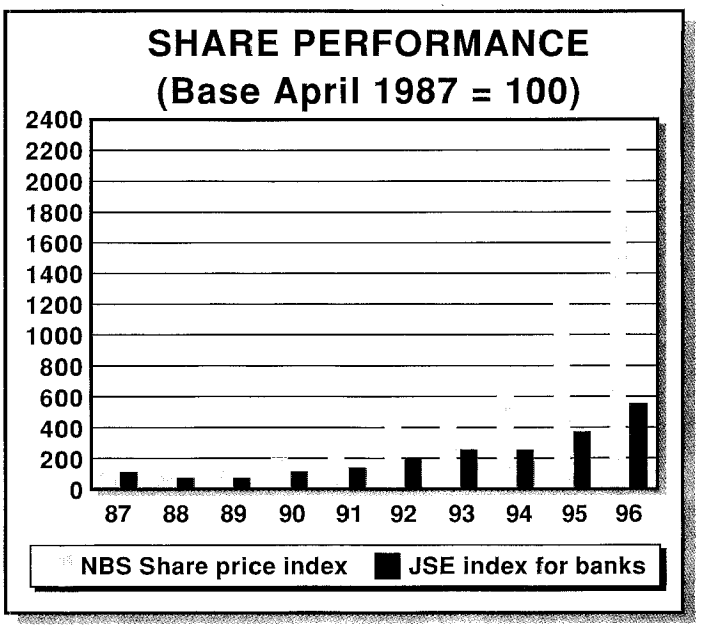

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5% level. Allowing for transaction costs would further depress the performance of the macro strategy relative to the buy and hold strategy and it therefore seems evident that the individual fund managers show little evidence of timing ability.

Turning to the question of whether the funds, on average, manage to create additional returns due to timing the market, it can be seen that the average returns for the general equity funds is 4.45% for the buy and hold strategy against 5.04% for the macro traded strategy. In testing the significance of the difference of these returns, we have used the underlying data for each individual fund rather than the mean returns shown in columns 1 and 2 of Table 7. This approach reduces the interdependency problem of the overlapping investment horizons. On average, management of the general equity funds only exhibit timing ability if one tests at the 7.0% level of significance, while there is even less evidence of such ability for the Specialist Equity Funds.

TABLE 6
Average quarterly percentage returns for the macro traded strategy for six two year investment period starting and ending on September 30

	87-89	88-90	89-91	90-92	91-93	92-94	*Average*
General Equity Funds							
Guardbank Growth	2.96	7.41	4.83	4.73	3.01	7.89	*5.14*
OM Investors	2.58	6.97	4.65	4.29	3.12	8.66	*5.05*
Sage	2.05	7.10	5.11	5.17	3.33	8.06	*5.14*
Sanlam Index	2.15	7.22	4.60	4.05	2.84	8.45	*4.89*
SanlamTrust	1.47	6.52	4.64	4.24	2.75	8.17	*4.63*
Standard Mutual	2.54	7.08	4.91	5.04	3.53	6.29	*4.90*
Syfrets Growth	2.45	7.79	5.67	5.09	3.05	7.63	*5.28*
UAL	2.90	7.65	5.30	4.93	3.45	7.72	*5.33*
average	**2.39**	**7.22**	**4.96**	**4.69**	**3.13**	**7.86**	***5.04***
Specialist Equity Funds							
Guardbank Resources	1.78	7.08	2.88	1.46	3.74	11.08	*4.67*
OM Mining	1.74	6.72	2.58	0.20	2.44	11.57	*4.21*
Sage Resources	2.37	7.07	3.03	1.57	3.14	10.91	*4.68*
Sanlam Prime	1.23	6.28	5.12	5.11	2.76	7.38	*4.65*
Sanlam Industrial	2.70	6.96	6.21	6.92	3.41	6.56	*5.46*
Sanlam Mining	0.75	6.03	2.69	0.46	1.67	10.82	*3.74*
Standard Gold	-0.23	5.69	-0.53	-2.07	5.43	11.84	*3.35*
UAL Mining	1.56	7.05	2.95	0.68	2.21	11.35	*4.30*
UAL Selected	4.93	7.21	5.88	6.58	3.33	6.71	*5.77*
average	**1.87**	**6.68**	**3.42**	**2.32**	**3.13**	**9.80**	***4.54***

TABLE 7
Comparison of the two year investment horizon mean quarterly returns for the buy and hold and macro trading strategies

	Buy & hold strategy	Macro traded strategy	variance comparison F-statistic	comparison of means t-statistic
General Equity Funds				
Guardbank Growth	4.74	5.14	0.981	0.324
OM Investors	4.58	5.05	*0.965*	0.341
Sage	4.47	5.14	0.763	0.546
Sanlam Index	4.67	4.89	0.905	0.159
SanlamTrust	4.43	4.63	0.731	0.150
Standard Mutual	3.89	4.90	0.903	1.067
Syfrets Growth	4.46	5.28	0.826	0.599
UAL	4.35	5.33	0.892	0.858
average	**4.45**	**5.04**	**0.806**	**1.44**
Specialist Equity Funds				
Guardbank Resources	3.70	4.67	0.963	0.444
OM Mining	3.86	4.21	0.938	0.139
Sage Resources	3.92	4.68	0.834	0.348
Sanlam Prime	4.03	4.65	0.446	0.543
Sanlam Industrial	4.92	5.46	0.563	0.556
Sanlam Mining	3.97	3.74	0.886	0.096
Standard Gold	2.38	3.35	0.875	0.298
UAL Mining	3.74	4.30	0.981	0,237
UAL Selected	4.94	5.77	0.619	0.879
average	**3.94**	**4.54**	**0.738**	**0.890**

*: significant at the 5% level

V-c. Selectivity ability

Table 8 summarises the results of the analysis performed to investigate whether fund managers have the ability to select undervalued securities. Columns 1 and 2 show the average quarterly returns for the macro and actual portfolios respectively over the entire analysis period. Column 3 contains the F-test for the comparison of variances between the macro quarterly returns and the actual investment returns and column 4 contains the t-statistic for the comparison of mean returns.

As can be seen, no individual funds shows any significant selection ability. Furthermore, we cannot make any inferences regarding the average selection ability of managers across the funds. The F-statistics indicate that the adjusted t-statistic for unequal variances is more appropriate for the comparison and this approach has been adopted. It is interesting to note that the performance of the General Equity Funds is again superior to that of the Specialist Equity Funds over the analysis period.

VI. CONCLUDING COMMENTS

The debate as to the appropriate method of examining the performance of unit trusts continues. For each method which is based on a theoretical model of security prices and returns there are researchers and practitioners who argue that the theoretical framework is deficient and hence the results of the tests are inconclusive. In the present paper we employed both the Jensen performance measure and an alternative method of examining the performance of unit trusts which exhibit a portfolio philosophy of investment flexibility. Investment flexibility implies that the distribution of returns on the portfolio need not be stationary by design and renders the Jensen (1968) approach to examining the risk adjusted performance of unit trusts inappropriate. The alternative technique used in this paper accounts for the stated trading objectives of professional fund managers and allows one to test whether such managers exhibit superior timing and selectivity skills. Interestingly, the two approaches yielded identical conclusions for the sample of South African unit trust managers. Neither method found evidence of superior ability over the period analysed.

The results can hardly be considered surprising. With respect to timing, an examination of a sample of seventeen South African unit trusts over a period of seven years has shown that the managers did not manage to adjust the composition of the portfolios and switch between the different asset classes in a way that could yield higher returns for their investors. The skill of the managers in selecting and switching securities within each asset class was also examined by comparing the actual performance of the unit trusts against the performance of seventeen synthetic macro designed, full diversification portfolios. Little evidence of superior selectivity was detected.

The alternative methodology described, and applied, in the above analysis enables assessors to establish whether professional fund managers actually exhibit superior performance in selecting securities. It also enables the assessor to distinguish between the macro and micro skills of these managers. The macro skills refer to the choice of asset classes while the micro skills refer to selection of specific securities.

TABLE 8
Comparison of the quarterly returns for the macro trading and actual investment strategies

	Macro traded strategy	Actual strategy	variance comparison F-statistic	comparison of means t-statistic
General Equity Funds				
Guardbank Growth	4.60	4.85	0.665	0.094
OM Investors	4.59	4.75	0.945	0.056
Sage	4.53	4.52	0.687	0.001
Sanlam Index	4.43	4.23	0.921	0.068
SanlamTrust	4.19	3.75	0.908	0.165
Standard Mutual	4.12	4.61	0.886	0.224
Syfrets Growth	4.60	5.70	0.972	0.419
UAL	4.68	4.57	0.821	0.041
average	**4.47**	**4.62**	**0.020**	**0.729**
Specialist Equity Funds				
Guardbank Resources	4.53	4.78	0.890	0.074
OM Mining	4.26	4.03	0.737	0.068
Sage Resources	4.53	4.49	0.361	0.010
Sanlam Prime	4.13	4.15	0.584	0.009
Sanlam Industrial	4.72	4.46	0.749	0.099
Sanlam Mining	3.87	2.93	0.601	0.263
Standard Gold	3.35	2.35	0.534	0.242
UAL Mining	4.38	3.80	0.716	0.171
UAL Selected	5.07	4.79	0.496	0.118
average	**4.32**	**4.00**	**0.164**	**1.039**

*: significant at the 5% level

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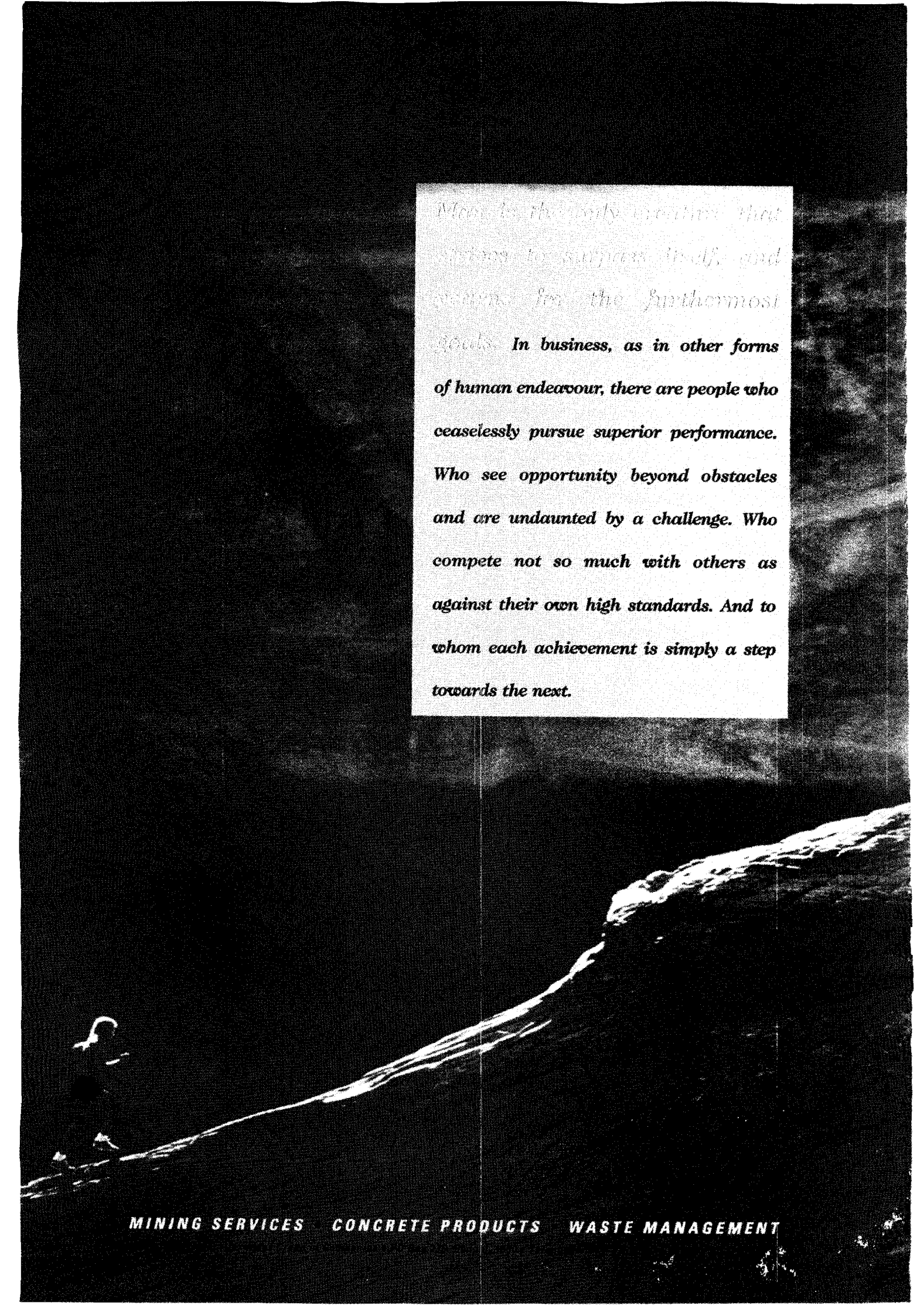

In business, as in other forms of human endeavour, there are people who ceaselessly pursue superior performance. Who see opportunity beyond obstacles and are undaunted by a challenge. Who compete not so much with others as against their own high standards. And to whom each achievement is simply a step towards the next.

MINING SERVICES · CONCRETE PRODUCTS · WASTE MANAGEMENT

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The effect of industrial strikes on the value of shares listed on the Johannesburg Stock Exchange

ABSTRACT

The objective of this study is to determine the effect of strikes on the share values of a sample of companies listed on the Johannesburg Stock Exchange during the period 1984-1993. The results indicate that strikes do have a negative effect on share prices. The costs of a strike do not appear to be transitory since the losses incurred during the strike period are not counterbalanced by positive excess returns after its conclusion. The findings tend to support the notion that capital markets are usually able to anticipate whether an impending contract deadline will result in a strike or settlement. In the prestrike period, however, the stock market consistently underestimates the cost of a strike to shareholders, as demonstrated by the fact that nearly 70% of the total decline of returns (3,64%) occurs after the strike is announced.

INTRODUCTION

Industrial relations practitioners and economists have long focussed attention on strikes as classic examples of a breakdown in collective bargaining. A strike can be viewed as an investment – a giving up of current resources in the hope of gaining larger returns in the future. Eaton (1972) showed that strikes tend to be good investments for unions and poor investment for corporations. If strikes are understood as negative corporate investments, a reduction in firm value should be reflected in negative share returns during the period of a strike. Managers have a fiduciary responsibility to maximize shareholders wealth, so the effect of strikes on wealth has important implications for managers during periods of labour negotiations.

In line with trends in many developing countries, South Africa has in recent years witnessed a sharp rise in industrial strikes. Work stoppages raise very important public policy issues and both trade unions and employer organisations advance emotional arguments in support of their respective positions. There has been a substantial growth in the strike literature motivated by the public and private costs associated with work stoppages. However, little attention has been given to an assessment of the magnitude of these costs. To date, there have been no local studies in the context of the stock market behaviour of "struck" firms' security prices. The purpose of this paper is to address this gap in the literature by examining the economic costs to companies listed on the Johannesburg Stock Exchange (JSE) which are involved in work stoppages.

PREVIOUS RESEARCH

Analytical studies of strike behaviour usually conclude that strikes are not rational and that their occurrence must be attributed to mistakes and faulty negotiations (Kaufman, 1982). Other research has focused on the results of strikes from an economy-wide point of view. Neumann and Reder (1984) investigated the relationship between strike activity and output in manufacturing industries. A major finding is that in many manufacturing industries, strikes have no discernible effect on industry output. Even when strikes are found to have a statistically significant effect on output, the net loss of output appears to be small. Overall, the evidence suggests that the ability of nonstruck firms to increase their output, and struck firms to draw on inventories, makes it highly unlikely that strikes in manufacturing companies will cause a national emergency.

Still other studies have focussed on the costs of strikes at the micro or firm level. Imberman (1979) divided strike costs into three categories. First are prestrike costs, including productivity lost because employees are disgrunted and revenues lost because customers who are faced with the likelihood of a strike diversify their suppliers. Second are strike costs that include profits lost because of a decline in revenue and executive time lost when executives attempt to operate the firm themselves. Third are long-term costs, which include lost employees, poststrike overtime, and potential permanent loss of customers. Gandz, DuMont, and Lord (1980) pointed out additional costs, including the costs of prestrike inventory build-ups, shutdown and start-ups, sabotage, negotiating, and training strike breakers. Not all of those costs can be measured, so the exact cost of any particular strike, or of strikes in general, cannot be precisely determined.

Eaton (1972) found that for employees, the value of the benefits lost during strikes was less than the present value of higher poststrike wages. When these lost benefits are combined with the costs described by Imberman (1979) and Gandz et al. (1980), it appears likely that strikes in general are quite costly to firms. Chermesh (1982) found that the costs of a strike appear to increase with the length of the strike, except possibly for very long strikes where investiment motives – such as eliminating the bargaining relationship – may predominate. The evidence seems to indicate that firms "win" more long strikes than unions.

Miller and Modigliani (1961) asserted that, in order for a firm's value to grow, it must have positive investment strategies, and that firm value depends on the expected future earnings stream of the firm. If strikes reduce a firm's expected future cash flows, its value should decline around the period of strike activity. The implication for management is that, in some instances forcing a union into a strike may not be an optimal decision. To maximize shareholder wealth at any point during the strike, the decision to continue the strike should be based on an assessment of how the future profitability of the firm is affected by either continuing the strike or making the concessions necessary to settle the strike. Bazerman, Giuliano, and Appelman (1984) have provided considerable experimental evidence showing a positive relationship between the additional resources *subjects are* willing to commit to a project and the resources already committed. If these experimental results generalize to negotiations during a strike, then managers will frequently allow strikes to continue beyond the point of greatest benefit to shareholders.

The first study to examine the effect of strikes on the value of firm as measured by the stock market was conducted

by Neumann (1980). The results indicated that strikes do have a negative effect on the value of the firm, although not a very large one, and that the stock market predicts the occurrence of strikes efficiently. Neumann found that strike starts were associated with negative returns and strike conclusions were associated with positive returns. However, none of the trading strategies analyzed produced positive excess returns when allowance is made for trading costs.

Becker and Olson (1986) using data for the 1962-82 period found that strikes do represent substantial economic costs for a firm. This study also found that capital markets are usually able to anticipate whether an impending contract deadline will result in a strike or settlement. It was found that before the strike deadline, investment returns declined substantially in the strike sample but did not change significantly in the sample that settled without a strike. Although the market did anticipate some of the costs associated with a strike, surprisingly it significantly underpredicted the costs of a strike during most of the 20-year period.

COLLECTIVE BARGAINING AND STRIKE ACTIVITY IN SOUTH AFRICA

Collective bargaining can be effective only if there is some sanction attached to such bargaining. Both parties thus have some economic sanction available: in the case of workers this is usually a strike, and in the case of the employer a lock-out. In many cases the employer also makes use of temporary labour to replace striking workers. In both cases union members suffer as a result of not receiving wages, and employers suffer because of a loss of production and revenue. This sanction of collective bargaining more often than not remains an implicit threat which encourages both parties to find a compromise solution.

Strike activity in South Africa has increased considerably since the 1980s and has been given additional impetus as a result of the new political dispensation emerging in the 1990s. The World Bank reports that South Africa's burgeoning black labour movement was at the vanguard of the struggle against apartheid and was mainly responsible for the number of man-days lost to strikes rising form 277 000 in 1981 to 3,9 million in 1994 (Financial Mail, 1995, p. 28). The political transformation and the economic empowerment of the black labour force is likely to intensify the employer-employee conflict in the workplace.

The loss of man-days through strike activity is usually regarded in a very negative light by the average man in the street, and is seen as a severe cost to the South African economy (Fabricius, 1994). Judging from recent press coverage, much of the news media believes that South African workers are underworked and overpaid. Many employer groups argue that South Africa is paying workers more than it can afford. For example, Boyd (1994, p. 24) argues that "South Africans do need to realise just how uncompetitive our wage rates are in international terms. For instance, they are on average, five times higher than those paid to factory workers for equivalent jobs in Indonesia".

The subject of wage levels is a very emotive one and has elicited contrary arguments. Trade unionist Ebrahim Patel (1993, p. 9) rejects the notion that low wages and wages that increase at a slower rate than productivity increases are necessary to support growth and employment. He has argued that massive wage increases in the manufacturing sector are necessary to encourage employers to move into higher productivity areas. He also argues that low wages are responsible for the low productivity in South Africa.

In general, the trade union movement asserts that employers in their efforts to decrease wages will not lower unit labour costs, because such policy encourages industrial conflict with consequent major economic costs, and it removes the incentive on local manufacturers to innovate, to become competitive, to restructure for capturing new markets of the world.

It is often said in the media that the cost of a strike to strikers (through loss of earnings) is much greater than the benefits they might gain (the benefits in terms of the final settlement, or even if their demands were met). This, is however, a myopic way of looking at collective bargaining. Strike activity is an integral part of collective bargaining and the benefit of collective bargaining in general is that it helps to democratize the work place. Collective bargaining in other words, gives employees more influence on their working conditions and conditions of employment. It also helps to avoid exploitative actions by the employer. The system of collective bargaining, which includes strike activity, should also be seen as a process of relationship-building with the employer (Marshall, King, and Biggs, 1980).

Strikes are a healthy sign of a free economy i.e., of a market orientated economy. To severely limit the right to strike would also mean introducing other restrictions to protect workers, which means more central control of the economy. In general, the efficient operation of the economy would thus be negatively affected.

The psychological effects of a strike should also not be ignored. It is often a way in which workers get rid of resentment built up over a period. It helps to build working relationships and to achieve more realism and moderation in both demand and supply of labour.

Higher wage rates as a result of collective bargaining and strike activity could also lead to higher productivity (McConnell and Brue, 1989). This could happen as the higher wages enable (or force) the employer to employ better quality workers, the employer is more prone to invest more in his workers (for example through training), the workers often have a better morale, and there is lower absenteeism. Higher wage costs might, however, also be passed on to the consumer, and the extent to which this happens depends in part on the monopolistic power of the employer.

During the initial stages of union development fewer of these intrinsic benefits are evident, as a certain level of union maturity is required for effective collective bargaining. Such maturity cannot be achieved except by going through the process of union development, i.e., a period of union immaturity. There are several signs in South Africa of newly developed unions gradually becoming more mature. Effective and realistic collective bargaining can also not be expected in period of political upheaval and polarization. This is especially so when the same lines of political polarization are found in the work place, i.e., with management usually being white and market orientated, and the workers usually black and socialist orientated.

RESEARCH METHODOLOGY

The *Business Day* was monitored for the 10-year period 1984-93 to find announcements of strikes involving companies listed on the JSE. For a strike to be included in the study population, the affected company's shares had to have been listed continuously on the JSE during the event period. This restriction ensured that a share is traded frequently enough to obtain reliable estimates for the market model parameters and permit the use of the JSE share price tapes. A random sample of 50 JSE listed companies involved in strikes during the 1984-93 period were chosen for this investigation.

The sample chosen for this investigation is not likely to be representative of all firms that engaged in collective bargaining for several reasons. First, the sample was obtained from *Business Day*. In order to be included in the news coverage, a company had to be large enough to be "noticed" by *Business Day*. Since strikes are ultimately related to security prices, and a company has to be fairly large to be listed on the JSE, this sample is not likely to yield biased evidence on the effect of strikes on security prices; but the implications for the research findings should be understood to refer only to large companies.

For each reference to a strike found in the *Business Day*, the cited articles were checked for information on the starting and the ending dates of the strike. The companies involved in the strike were approached to obtain details of the relevant work stoppage. In addition, various industrial relations consultants, such as the Labour Research Service, were contacted to obtain verification of the starting and ending dates of the strikes included in the sample.

The *Business Day* was also monitored for the 1984-93 period to compile a list of companies that settled their labour disputes before they occurred (strikes averted sample). As in the case of companies involved in strikes, various industrial relations consultants were contacted to obtain verification of companies that averted strikes. This procedure is especially necessary because data on strikes averted are not very accessible. While strikes make front-page news, peaceful settlements are less frequently covered in the media.

The standard methodology related to event studies was used to determine the stock markets' reaction to strike-related activity. It is necessary to compute the abnormal returns associated with each reported strike. The measurement of abnormal returns implies that a model can be specified that generates normal returns. The following model developed by Bowman (1983) was used:

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it} \quad (1)$$

Where:

R_{it} = the return for company i at time t,

α_i = the regression intercept,

β_i = the beta coefficient of the regression,

R_{mt} = the return on the market portfolio represented by the JSE Overall Index at time t;

e_{it} = the disturbance term.

One of the features of the JSE is that a large proportion of securities are thinly traded. The price quoted for a share is based on the price at the last transaction. Consequently shares which are traded infrequently will be positively autocorrelated and the estimated beta value will be underestimated (Stoll and Whaley, 1983).

Two methods were used to calculate the beta values for companies identified as events. The first method was the standard ordinary least squares (OLS) method that is normally used to derive values of beta. The second method employed the technique developed by Dimson (1979) and refined by Cohen, Hawawini, Maier, Schwartz and Whitcomb (1983) to overcome the problems of beta underestimation caused by serial correlation. Bradfield and Barr (1980) conducted a sensitivity study on the JSE and they showed that there is a statistical significance for two lagged terms, the contemporaneous term and one leading term. The Bradfield and Barr procedure was therefore used to calculate beta values.

Day O is defined as the day that news of a strike appeared in *Business Day*. The market model parameters for each of the i company's shares are applied to the actual market returns for days -30 to +30, which provide the predicted return for company i. These predicted returns are compared to the actual returns for each of the i companies from days -30 to +30. The difference between the actual returns and the predicted returns for security i at time t is called the abnormal return, AR_{it} :

$$AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt}) \quad (2)$$

where R_{it} represents the actual return on security i at time t, and the term in parentheses is the normal return. The other variables are as previously defined.
The average abnormal return is computed by summing the abnormal returns across all N companies for each relative event time t, as follows:

$$AR_t = \sum_{i=1}^{N} \frac{AR_{it}}{N} \quad (3)$$

The cumulative abnormal return (CAR) is also computed over various intervals, T_1 to T_2:

$$CAR_{T_1, T_2} = \sum_{t=T1}^{T2} AR_t \quad (4)$$

To determine if the CARs are significantly different from O, t-tests were conducted on them over those intervals.

In an efficient market, the returns on a security will react immediately to an event that affects its intrinsic value. Under these conditions, the AR_t and CAR will be random except upon receipt of the news of an event (the announcement of a strike). When information relating to the strike reaches the market for each company at the same time relative to day 0, then AR_t should not be 0. If the market accurately predicts strikes, then the difference between actual and predicted returns, should have a mean value of zero. If there is a systematic inability to predict strikes, then, assuming that strikes are costly, this should result in the average deviation of the actual and predicted returns being negative.

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The hypotheses tested in this study can be stated as:

H_1 = The stock market will review the announcement of an industrial strike as a negative event. The start of a strike is a signal to the stock market that future earnings may be impaired, and this signal may be associated with negative share returns.

H_2 = An announcement that an industrial strike has been settled may signal to the stock market that a period of strike-induced reduction of earnings is over, so that positive share returns be associated with the settlement of a strike.

H_3 = Lengthy strikes can be expected to have a greater effect on the company's future earnings than shorter strikes. Therefore, the total negative effects of strikes on share prices should be larger when strikes are lengthy.

RESULTS

The CAR_s over the interval from 30 days before the strike through 30 days after the strike (event period) is used as a measure of the total cost to shareholders of a strike. Table 1 summarizes the results of the investigation. The CAR_s for the starts of the strikes appear in the first set of columns. Over the 30 trading days immediately preceding the strike there was a negative CAR, but it was statistically insignificant. However, the CAR_s over the intervals -10 to -1 and -5 to -1 were negative and significant at the 0,05 and 0,01 levels respectively. A large portion of the negative drift over these intervals occurred on day -1, but there did appear to be a prestrike negative drift in the return series over the 5 to 10 days before the strikes.

TABLE 1
Cumulative abnormal returns surrounding strike announcements for a sample of companies listed on the JSE during 1984-93.

Intervals	Strike Starts		Strike Settlements		Strike Averted	
in Days	CAR (%)	t-Test	CAR (%)	t-Test	CAR (%)	t-Test
-30 to -1	-1,57	-1,54	-0,57	-0,49	1,64	1,60
-10 to -1	-1,38	-2,10*	-0,22	-0,37	0,53	0,98
-5 to -1	-1,31	-2,96**	0,34	0,54	0,45	1,17
-3	-0,08	0,48	0,06	0,41	0,36	1,30
-2	-0,16	-0,76	-0,10	-0,53	-0,03	-0,24
-1	-0,82	-4,21***	0,34	1,39	0,27	0,95
0	-0,48	-3,26**	0,41	2,89**	0,34	1,41
1	-0,19	-0,82	-0,17	-0,76	0,43	2,96*
2	0,23	0,91	-0,24	-0,92	0,13	0,55
3	-0,17	-0,76	0,12	0,41	-0,05	-0,23
1 to 5	-0,52	-1,26	-0,28	-0,53	0,64	1,46
1 to 10	-1,75	-2,30*	-1,07	-1,37	1,09	1,39
1 to 30	-3,64	-3,97**	-0,96	-0,85	1,47	1,22

* significant at the 0,05 level
** significant at the 0,01 level
*** significant at the 0,001 level

The CAR on day -1, the day before the strikes started, was -0,82% and was statistically significant at the 0,001 level. Whereas the strike announcements in the *Business Day* occurred on day 0, news stories that were in this publication appeared over the news wire (Reuters) on the preceding day. Thus, sophisticated investors who had access to news wire stories would have had the information on day -1. The significant reaction on day -1 was therefore not unexpected. There is also the possibility of leakage of insider information related to company strikes. These findings confirm the findings by Bhana (1985 p. 207) that leakage of insider information on the JSE occurs at a significant level in the 15 trading days preceding the public announcement of proposed take-overs and other company-specific news information. The reaction to the strike announcement was negative, and the negative return is consistent with the hypothesis that strikes are negatively valued investments representing reduction in a firm's expected cash flows.

If capital markets are efficient, investors should consistently anticipate the costs of a strike. Thus, although the market may underpredict costs in some strikes and overpredict costs in other strikes, on average, these expectations should sum to zero. Surprisingly, however, the results do not appear to be consistent with the efficient market hypothesis. From the first day of the strike to 30 days after the strike, share prices fell by an average of -3,64%, a decline that was significantly different from zero at the 0,01 level. Furthermore, the absolute value of this decline was significantly greater than brokerage and other trading costs. These results suggest that the investors could have made above-normal returns during this period by taking a short trading position on the first day of the strike.

A further aspect of the collective bargaining process is the possibility of incongruence of management decisions and shareholder interests. Strikes serve as a learning mechanism for trade unions by reducing uncertainty about the economic position of the company (Tracy, 1984). As the trade union approaches the strike deadline, it conditions its last offer on, among other things, its estimate of the future profitability of the company. If the offer is rejected and a strike occurs, the union knows the expected future profitability of the company is less than the union's prestrike expectations. Therefore, at least part of the shareholder losses associated with strikes may simply represent the "new information" about the company's economic position that is communicated by the strike to investors as well as workers. Share prices may fall in part, that is, not because of strike costs but because investors have learned that the company's future profitability is not as great as they have assumed.

If the market cannot perfectly anticipate a strike settlement, positive returns will be observed on the first day when a settlement is announced. The CAR_s for the strike settlement and test statistics appear in the second set of columns of Table 1. Prior to the end of a strike the daily returns are mainly negative, but only decline by -0,57% in the 30-day period prior to settlement. On the day that a settlement of the dispute is announced excess returns to struck firms are significantly greater than zero, consistent again with the hypothesis that strikes are costly. The returns on the days following settlement were negative and statistically insignificant. There were both positive and negative returns around strike settlements, but these reactions were not statistically different from 0. The costs of a strike do not appear to be transitory since the losses incurred during the strike are not counterbalanced by positive excess returns after its conclusion.

A better test of the market's ability to anticipate a strike requires a comparison between the strike sample and a sample of peaceful settlements (strike averted). Such a comparison ensures that any observed decline in the strike sample is due to the market's ability to predict a strike and not simply to the threat of a strike, which also exists in a sample of negotiations that eventually reach a peaceful settlement.

In the third set of columns for Table 1 are the results for the group of companies that settled with their unions and averted strikes. If the market could predict strikes with perfect accuracy, there would be no difference between the market's reaction on the first day of the strike and its reaction on the day of the peaceful settlements. We find, however, that the day after the contract expired returns rose significantly in the strike averted sample (0,43%) and declined in the strike sample. Although the declines in the strike sample were not significantly different from zero, the increase in returns in the strike averted sample are statistically significant. Thus, the market's reaction to a strike and to a settlement before a strike were clearly different.

The CAR_s for various subintervals computed for strikes of different lenghts and computed relative to both the beginnings and the ends of the strikes appear in Table 2. The CAR over the period -2 to 1 was more negative for long strikes than for short strikes. The data are consistent with the hypothesis that the market participants anticipated longer and potentially more costly strikes.

TABLE 2
Cumulative abnormal returns computed around strike dates for a sample of companies listed on the JSE during 1984-93.

Strike	Intervals			
Length	-30 tot -2	-2 to 1	0 to 1	-1' to 0'
20 days or less	-6,34%	-0,24%	1,43%	0,53%
	(-2,73*)	(-0,42)	(3,34***)	(1,31)
21 to 38 days	4,96%	-0,73%	-0,24	0,76%
	(1,95)	(-1,15)	(-0,51)	(2,15*)
39 days and more	0,97%	-1,57%	-1,12	1,34%
	(0,54)	(-2,27**)	(-1,95)	(3,39***)

[a]An interval date signified by a digit is time relative to the start of a strike. An interval date signified by a digit with a prime sign is time relative to the conclusion of the strike. The number in parentheses is the t-statistic on the CAR.
* significant at the 0,05 level
** significant at the 0,01 level
*** significant at the 0,001 level

Over the interval -1' to 0' (the prime sign signifies time relative to strike settlement) the data suggest that the market reacted more positively to the settlements of long strikes than to those of short strikes. The CAR for strikes lasting 20 or fewer trading days was 0,53%, a statistically insignificant value. If strikes lasted between 21 and 38 days, or 39 or more days, the values for CAR were 0,76% and 1,34%, respectively, and these were significantly positive.

SUMMARY AND CONCLUSIONS

This study found that the beginning of a strike is associated with statistically significant, negative abnormal returns. In fact, the abnormal returns occured on the days before the *Business Bay* announcement. The market's quick reaction to the news of a strike has important implications for market efficiency. The market reacts when the information becomes public to sophisticated investors who regularly monitor the news wire services. Share transactions undertaken by company insiders may also be contributing to the negative market reaction preceding company strikes.

The market reacted very slightly over the period immediately before the strike's onset. Thus, there is some evidence that market participants are able to predict strikes. That likelihood is consistent with the findings of Becker and Olson (198[illegible]). However, the strong negative reaction on day -1 shows that strikes are not completely predictable. If strikes were predictable, the market would react before the onset of a strike, before day -1. The results also indicate that the market reacts more severely to strikes that subsequently turn out to be long. If we assume that long strikes are more costly, the results imply that market participants are able to forsee a strike's duration and react accordingly. When strikes were averted, the market exhibited random movement, except for the significantly positive return on the day after the labour contract expires.

The market did anticipate some of the costs associated with a strike. However, the stock market consistently underestimates the cost of a strike to shareholders, as evidenced by the fact that nearly 70% of the total decline in returns (3,64%) occurs after the strike is announced. The evidence that market participants are able to predict strikes has major implications for the efficiency of the JSE. The negative share market reaction in the period preceding the strike continues in the 30-day trading period immediately following the strike announcement. These results are inconsistent with the efficient market hypothesis. Investors on the JSE could have earned above-average returns by adopting a trading strategy of immediately selling short the shares of those companies whose strikes are announced. Gandz et al. (1980) and Imberman (1979) have described many costs associated with strikes. The current findings suggest that the market reacts negatively and statistically significantly, to a strike's onset; positively and significantly, to the announcement of a strike's conclusion; and positively on the first day after it becomes known that a strike has been averted. Since the positive reaction to the announcement of a strike's end is not as large as the initial negative reaction, there appears to be a permanent loss to shareholders of companies that experience strikes. The loss to shareholders is not made up during the strike nor at the conclusion of a strike. Since the cost of settlement may not be completely known at the time the strike is settled, the negative nature of the market's reaction may be short-term. Whether strikes are a negative investment in the long-term should be a subject for future research.

However, the short-term implications for management are clear. Strikes are costly to the shareholders of companies because share returns fall around the time of strike announcements, and managers should consider this negative reaction when conducting labour negotiations. Second, since long strikes are more costly to shareholders, managers should consider that fact during negotiations concurrent with strikes. In addition, management may be motivated to publicly understate the magnitude of potential strike costs in order to present a strong bargaining position to the trade union. By deliberately understating the strike costs, management will frequently allow strikes to continue beyond the point of greatest benefit to shareholders.

This study extends previous research because both strike length and the market's reaction during the time between strike onset and cessation were examined. Although the findings reported here may be specific to this study of a sample of JSE listed companies, they do confirm the results obtained by both Neumann (1980) and Becker and Olsen (1986). The time analyzed for the JSE sample (1984-93) is for the period following the earlier studies which covered the period 1963 to 1982 for companies listed on the NYSE. Despite this time difference, the results of the current investigation confirm that the market still reacted negatively to strike announcements.

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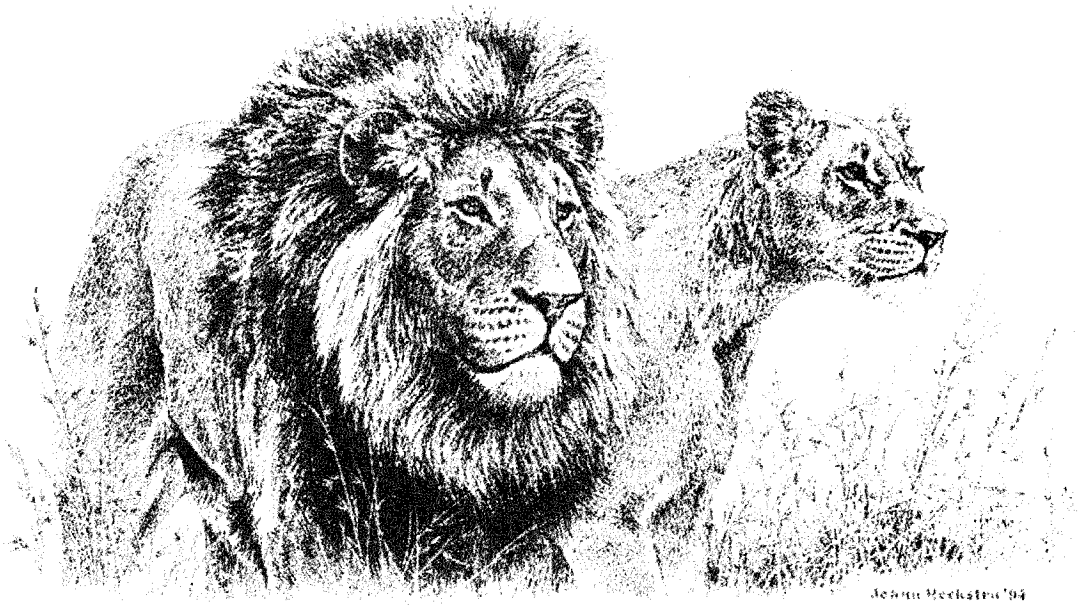

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Futures-Trading Activity and Share Price Volatility in South Africa

ABSTRACT

The study examines the relationship between futures-trading activity and equity volatility on the JSE for the three main indices. Contrary to findings in other markets, it is shown that positive correlation exists between equity volatility and expected and unexpected trading volumes in both the spot and futures markets. These conclusions seem robust to alternative specifications and indices used. Given an assumption of causality which runs from futures trading volumes to spot market volatility, the results are consistent with the idea that increasing trade in the futures market lead to greater volatility and price destabilisation in the share market.

1. INTRODUCTION

There exists a widely-held belief that trading activity in equity futures markets can lead to excess volatility in the corresponding spot equity markets. As a result, share market volatility and the role of futures trading has received considerable attention from regulators, especially in the USA. The Chicago MERC has adopted daily limits on S&P 500 contract price movements, while trading halts in both futures and spot markets have been proposed by the SEC to reduce the potential for cascade or snowballing effects. The Brady Commission has suggested the introduction of circuit-breakers and margin requirements on futures accounts have been increased (Bessembinder and Seguin, 1992).

However, theoretical analyses of whether futures trading destabilises spot markets lead to conflicting conclusions, depending on the assumptions made, making it an empirical question what impact a particular futures market will have on the associated spot market. Figlewski (1981) argues that there are several important ways in which futures trading can increase efficiency and stabilise price variations in the cash market. Firstly, futures markets provide a mechanism for those who partake in the spot market to hedge themselves against unfavourable price movements. Thus, through futures trading risk is spread across a large number of investors and transferred away from the hedgers of spot positions to professional risk-seekers. This risk transfer may substantially improve the stability of the spot market due to the reduced need to incorporate risk premia in spot market pricing. Second, the futures market may lead to increased informational efficiency in the spot market due to the fact that an informed futures market is expected to be efficient in the sense of giving best estimates of future spot values given the current information set. An informationally efficient futures market should lead to improved pricing efficiency in the spot market. Figlewski (1981) further argues that the more developed and integrated the cash market, the smaller will be the impact of futures trading. He further argues that the informational effect of futures trading will be more beneficial to the spot market if the market is made up of small dealers in geographically separated locations.

However, it is also possible that futures trading can increase spot market volatility, especially when futures prices are distorted by technical factors or manipulation. It is further possible that a futures market could induce a significant volume of hedge trading without establishing sufficient speculative activity to effect sufficient risk transfer. The hedging pressure can still spill over into the spot market where participants then end up with risk transferred through both the spot and futures markets. Thirdly, if futures traders do not have as good information as spot market participants, price volatility may increase. Even if futures prices reflect all information available to the futures market, but spot market traders are better informed, spot prices may be driven away from their best values, resulting in profit opportunities for the better informed spot market participants whose trading will stabilise futures prices, but lead to greater volatility in spot prices.

Harris (1989: 1155) summarises this dual effect of futures trading on the spot market as follows: "An increase in well informed speculative trade has two opposite effects on measured volatility. It decreases volatility due to order flow imbalances caused by uninformed traders because informed traders provide liquidity in such events, and it increases volatility due to new fundamental information since the information (which is assumed to be generated at discrete time intervals) is impounded into prices more quickly."

The empirical evidence of the effects of futures-trading on spot volatility in the USA is inconclusive and sometimes even contradictory.

Figlewski (1981) put forward evidence to show that price volatility in the Government National Mortage Association (GNMA) cash market could be related to several factors. Factors that tended to stabilise the market were increased liquidity, proxies for the volume of cash market activity and lower average prices, while futures market activity increased the volatility of prices. His findings are supported by Harris (1989) who found that no significant observable changes occurred in volatility between 1975 and 1983 – before the inception of index futures and index options. Since then, volatility in the S&P 500 shares has increased notably. He concludes that although these differences are economically small, equities are statistically more volatile subsequent to the introduction of futures trading. Grossman (1988) argued that the use of portfolio insurance strategies by institutional fund managers contributed towards raising share price volatility, irrespective of the existence of futures markets.

In contrast Edwards (1988) came to the conclusion that the introduction of financial futures-trading did not lead to the destabilisation of cash markets. Neither had volatility increased because of futures trading. In a study of the day-to-day and intra-day price volatility of the share market and of short term debt instruments over the period 1973 to 1987 it was concluded that price volatility did not increase due to the introduction of futures on these assets.

Bessembinder and Seguin (1992) contributed to this debate by showing that equity volatility declines with

predictable futures-trading activity. They go a step further than previous studies by implying that futures-trading activity actually leads to greater stability in the spot markets. Their findings are consistent with theories predicting that active futures markets enhance the liquidity and depth of the equity markets.

Some empirical studies therefore have pointed towards positive relationships between futures trading and spot market volatility, while other studies have found evidence to the contrary. The current study examines the relationship between futures-trading activity and equity volatility on the Johannesburg Stock Exchange for the All Share Index, the Gold Index and the Industrial Index and the corresponding near futures contracts using the method of Bessembinder and Seguin (1992). The paper is organised as follows: The second section deals with the data and the research method, while the results are presented and summarised in the third section, followed by a conclusion.

2. THE MODEL

Data used in this study pertain to daily trade volumes and closing prices of the three major JSE indices namely, the All Share Index, the Gold Index and the Industrial Index as well as daily trade volumes and open interest of the three corresponding near futures contracts over the period 6 June 1991 to 3 May 1994. The daily volumes of the three share indices were downloaded from the JSE onto the databases of the Graduate School of Business, while the rest of the data were extracted from I-NET.

Daily returns for the three indices (All Share, Gold, Industrial) were calculated using the formula:

$$R_{i,t} = \ln (P_{i,t} / P_{i,t-1}) \quad (1)$$

where: $R_{i,t}$ = the return of index i on day t;
$P_{i,t}$ = the closing price of index i on day t; and
$P_{i,t-1}$ = the closing price of index i on day t-1.

The empirical analysis is based on the method of Bessembinder and Seguin (1992). They used a method introduced by Schwert (1990) to determine unbiased estimates of daily standard deviations conditional on observable variables. The method involves iterating between a pair of equations of the form:

$$R_t = \delta + \sum_{j=1}^{n} \gamma_j R_{t-j} + \sum_{j=1}^{4} \rho_i d_i + \sum_{j=1}^{n} \pi_j \hat{\sigma}_{t-j} + \nu U_t \quad (2)$$

$$\hat{\sigma}_t = \alpha + \sum_{j=1}^{4} \eta_i d_i + \sum_{j=1}^{n} \beta_j \hat{\sigma}_{t-j} + \sum_{j=1}^{n} \omega_j U_{t-j} + \varepsilon_t \quad (3)$$

where R = the return on day t;
U_t = the residual from Equation (2);
$\hat{\sigma}_t \equiv |U_t| \sqrt{\pi/2}$ is the estimated conditional return standard deviation on day t; and
d_i = a dummy variable representing days of the week

Bessembinder and Seguin (1993: 23) state that if $x \sim N(0, \sigma^2)$ *then* $E(|x|) = \sqrt{(2/\pi)}\sigma$. Since x in this case is a vector of OLS residuals, the assumption that the mean of the distribution is zero is not a problem. However, the distributional assumption of conditional normality must be maintained. The presence of skewness or kurtosis could impart a bias in mean absolute deviation-based estimates of volatility. They further state that the effects of changes in higher moments on inferences made using this class of volatility estimate are negligible for equity returns.

In the conventional regression analysis the following assumptions regarding residuals are usually included:

- residuals are identically distributed; and
- residuals are independently distributed.

Financial models do not always satisfy these assumptions and information contained in residuals is lost. The model utilises the information contained in the residuals by following an iterative procedure in which residuals from a first equation are fed into a second equation.

Fitted values from Equation (2) estimate conditional expected returns, while $\hat{\sigma}_t$ is, assuming conditional normality, an unbiased estimate of the daily return standard deviation. Daily dummies are needed to capture differing mean daily returns, while lagged returns allow for short-term shifts in expected returns. Following Bessembinder and Seguin (1992) 10 lags are used in the analysis. In Equation (3) conditional standard deviations are estimated by regressing those standard deviation estimates on daily dummies, lagged standard deviation estimates and lagged raw residuals obtained from Equation (2). Lagged standard deviation estimates are included to allow for the persistence of volatility shocks. Lagged residuals from Equation (2) are included to accommodate possible effects of recent realised returns on volatility. Daily dummies make provision for day-of-the week differences in mean volatilities. All regression analysis is done in TSP using the least squares (LS) method.

An iterative procedure is used to estimate Equations (2) and (3), with lagged volatilities being left out of Equation (2) in the initial estimate. Thereafter lagged standard deviations are included as regressors in Equation (2) to allow for possible shifts in expected returns as a function of return volatility (Bessembinder and Seguin, 1992: 2019).

As the main focus on the analysis is on the relationship between trading activity and share price volatility, activity variables are introduced into the analysis. For this purpose an adjusted Equation (4) is defined and the process described above is repeated with the equation:

$$\hat{\sigma}_t = \alpha + \sum_{j=1}^{4} \eta_i d_i + \sum_{j=1}^{n} \beta_j \hat{\sigma}_{t-j} + \sum_{j=1}^{n} \omega_j U_{t-j} + \sum_{k=1}^{m} \mu_k A_k + \varepsilon_t \quad (4)$$

where A_k are m trading activity variables.

The trading activity variables that will be used in this analysis are:

- spot-trading volumes for the three main indices (All Share, Gold, Industrial);
- futures-trading volumes for the corresponding near futures contracts; and
- open interest associated with the near futures contracts.

The activity series are detrended to mitigate the effects of secular volume growth. For this purpose the Box-Jenkins ARIMA model is used to ensure that trading activity series (spot volume, futures volume and open interest) are stationary. Due to public holidays, the data does not follow

an exact five day seasonal pattern and it is therefore not possible to obtain perfectly stationary series. Given this limitation, the model generates the best stationary series possible. The ARIMA approach is then used to estimate expected volumes. The unexpected component is the difference between the observed and estimated (expected) volumes or open interest. The expected and unexpected volumes and open interest are then included as activity variables in Equation (4). The ARIMA specifications for the various expectational series are given in Table 1.

The method described in the previous paragraph differs from the method used by Bessembinder and Seguin (1992). They detrend the volume series by deducting the 100-day moving average from the original series and then use ARIMA specifications to partition the detrended series into expected and unexpected components. Their method of forecasting, however, gives rise to high correlations between the respective moving averages (95% between spot volume and open interest (Bessembinder and Seguin, 1992: 2022)). This is because their approach generates a linear forecast series based on starting values ignoring new information as it becomes available. All available information is therefore not utilised. In the present analysis ex post one period ahead forecasting, using the latest available data point, is applied. By using this method all available information is fully utilised and the forecasting process mimics real life expectation formation to a greater extent.

TABLE 1
Arima specifications for the various volume series

VOLUME SERIES	ARIMA SPECIFICATIONS
ALL SHARE INDEX	(1,0,0) x (1,1,0)
ALL SHARE INDEX NEAR FUTURES	(4,1,0) X (2,0,0)
ALL SHARE INDEX OPEN INTEREST	(1,1,0) X (0,0,0)
GOLD INDEX	(1,1,0) X (0,0,0)
GOLD INDEX NEAR FUTURES	(1,1,0) X (0,0,0)
GOLD INDEX OPEN INTEREST	(1,1,0) X (0,0,0)
INDUSTRIAL INDEX	(1,1,0) X (0,0,0)
INDUSTRIAL INDEX NEAR FUTURES	(1,1,0) X (0,0,0)
INDUSTRIAL INDEX OPEN INTEREST	(1,1,0) X (0,0,0)

The iterative procedure described above is first carried out with expected and unexpected spot volume as activity variables in Equation (4). The procedure is applied to the volumes of the three indices (All Share, Gold, Industrial). The analysis is repeated using the natural logarithm of spot-trading volume. The log volume series is detrended using the ARIMA model with the same specifications as for the spot volume series. The detrended series is then decomposed into expected and unexpected components in the same manner as the original detrended spot volume series. According to Bessembinder and Seguin (1992: 2026) the use of log volumes changes the interpretation of activity shocks. The shock in the log series roughly equals the percentage deviation of volume from its expectation, rather than representing a shock in the number of shares traded. Trend growth in volume does therefore not affect the unexpected log volume series. This specification also spreads the variance of log volatility shocks more uniformly over the sample period than the variance of share volume shocks.

The analysis is then repeated with the expected and unexpected components of spot volumes, futures volume and open interest as activity variables in Equation (4). As before, the analysis is done for the three main indices and the corresponding futures contracts and open interest. As a sensitivity check, Equation (4) is also estimated using the natural logarithms of the three activity series. The series are detrended and decomposed into expected and unexpected components in the same manner as described above.

3. RESULTS

3.1. Equity volatility and spot-trading volume

Equation (4) is estimated with expected- and unexpected volumes of the All Share Index as the only activity variables. Table 2 contains a summary of the most important results (lagged residuals and volatilities are not reported to conserve space. Full documentation is available in Nienaber (1994)).

TABLE 2
Regression of daily return standard deviation estimates on All Share Index trading volumes

VARIABLE	COEFFICIENT	t-STATISTIC	P-VALUE
INTERCEPT	0,0052144	5,1373513	**0,0000**
DAILY DUMMIES:			
TUESDAY	-0,0011184	-1,2931750	0,1964
WEDNESDAY	-0,0001206	-0,1354979	0,8923
THURSDAY	-0,00006976	-0,0796062	0,9366
FRIDAY	-0,0013135	-1,4868618	0,1375
TRADING VOLUMES:			
EXPECTED	1,975E-8	4,7718616	**0,0000**
UNEXPECTED	1,343E-8	4,1133187	**0,0000**
R-SQUARED	0,079248		
DURBIN-WATSON	2,014243		
F-STATISTIC	2,267578		
PROB(F-STATISTIC)	**0,000356**		

Estimated coefficients on both expected and unexpected volumes are positive, indicating that higher volatility is associated with larger trading volumes, with both coefficients being significant at the 5% level. The estimated coefficient on expected trading volume is greater than that of the unexpected trading volume, implying that a unit increase in expected trading volume will have a greater effect on volatility than a unit increase in unexpected trading volume. The r-squared value of 0,0792 implies that a mere 7,92% of the variation in return standard deviation estimates is explained by the independent variables.

Equation (4) is estimated with expected- and unexpected volumes of the Gold Index as the only activity variables. The results are summarised in Table 3.

As before, estimated coefficients on both expected and unexpected volumes are positive, indicating that higher volatility is associated with large trading volumes, with both being significant at the 5% level. The estimated coefficient on unexpected trading volume is greater than that of the expected trading volume, implying that a unit

increase in unexpected trading volume will have a greater effect on volatility than a unit increase in expected trading volume. The r-squared value of 0,1664 implies that only 16,64% of the variation in return standard deviation estimates is explained by the independent variables.

TABLE 3
Regression of daily return standard deviation estimates on Gold Index trading volumes

VARIABLE	COEFFICIENT	t-STATISTIC	P-VALUE
INTERCEPT	0,0162368	6,3045312	**0,0000**
DAILY DUMMIES:			
TUESDAY	-0,0020826	-0,9419391	0,3466
WEDNESDAY	-0,0021484	-0,9482070	0,3434
THURSDAY	-0,0013077	0,5837268	0,5596
FRIDAY	-0,0014272	0,6343786	0,5260
TRADING VOLUMES:			
EXPECTED	2,892E-7	6,2607185	**0,0000**
UNEXPECTED	3,710E-7	8,6793325	**0,0000**
R-SQUARED	0,166391		
DURBIN-WATSON	1,996248		
F-STATISTIC	5,258762		
PROB(F-STATISTIC)	**0,000000**		

As above Equation (4) is estimated with expected- and unexpected volumes of the Industrial Index as the only activity variables and the results summarised in Table 4.

Estimated coefficients on both expected and unexpected volumes are positive, indicating that higher volatility is associated with large trading volumes, with both being significant at the 5% level. The estimated coefficient on expected trading volume is substantially higher than that of the unexpected trading volume, implying that a unit increase in expected trading volume will have a greater effect on volatility than a unit increase in unexpected trading volume. Only 11,59% of the variation in return standard deviation estimates is explained by the independent variables.

TABLE 4
Regression of daily return standard deviation estimates on Industrial Index trading volumes

VARIABLE	COEFFICIENT	t-STATISTIC	P-VALUE
INTERCEPT	0,0043280	5,6168893	**0,0000**
DAILY DUMMIES:			
TUESDAY	-0,0009115	-1,2162044	0,2243
WEDNESDAY	-0,0006943	-0,9192383	0,3583
THURSDAY	-0,0010431	-1,3893334	0,1652
FRIDAY	-0,0020863	-2,7518085	**0,0061**
TRADING VOLUMES:			
EXPECTED	1,064E-8	2,3971794	**0,0168**
UNEXPECTED	9,172E-9	2,9800705	**0,0030**
R-SQUARED	0,0115948		
DURBIN-WATSON	2,000257		
F-STATISTIC	3,455449		
PROB(F-STATISTIC)	**0,000000**		

3.2 Equity volatility and log spot-trading activities

The analyses are repeated using the natural logarithm of volumes of the three indices. The expected and unexpected volumes of these series are used as the activity variables in Equation (4). To save space, the estimated results are not given, but these mimic the results obtained in the previous section. Full documentation is available in Nienaber (1994).

For the All Share Index estimated coefficients on both expected and unexpected volumes remain positive and significant. The magnitudes of the coefficients are closer than with spot volumes, implying that both have similar effects on volatility.

For the Gold Index estimated coefficients on both expected and unexpected volumes remain positive and significant. The magnitudes of the coefficients are greater, but remain in the same relation as for the raw volumes, with the estimated coefficient for unexpected log volume greater than that of the expected log volume.

As far as the Industrial Index is concerned, estimated coefficients on both expected and unexpected volumes remain positive and significant. However, the estimated coefficient for the unexpected log volume is now greater than that of the expected log volume.

3.3 Futures-trading activity and equity volatility

Equation (4) is estimated with expected- and unexpected volumes of the All Share Index, the All Share Index Future and the related open interest as the activity variables. Tables 5-7 contain a summary of the most important results.

For the All Share Index the inclusion of futures-trading variable does not alter the sign of the coefficient estimates on spot-trading variables and the magnitudes differ only slightly. The coefficient estimates for both spot- and futures volume (expected and unexpected) are significant and positive, with the coefficient for spot volume (expected and unexpected) smaller in magnitude than futures-trading volume (expected and unexpected). The positive coefficient estimate for unexpected volume is due to information shocks which move prices and generate trading in both markets. Coefficient estimates on expected and unexpected open interest are negative and positive, respectively, but neither are significant at the 5% level.

As regards the Gold Index, the inclusion of futures-trading variables does not alter the sign of the coefficient estimates on spot trading variables but decreases the magnitude. The coefficient estimates for both spot- and futures volume (expected and unexpected) are significant and positive, with the coefficient for spot volume (expected and unexpected) smaller in magnitude than futures-trading volume (expected and unexpected). Coefficient estimates on expected and unexpected open interest are negative and neither are significant at the 5% level.

As far as the Industrial Index is concerned, the inclusion of futures-trading variable does not alter the sign of the coefficient estimates on spot trading variables and the magnitudes differ only slightly. The coefficient estimates for unexpected spot volume and for futures volume (expected and unexpected) are significant and positive, with the unexpected spot volume smaller in magnitude than futures-trading volume (expected and unexpected).

TABLE 5
Regression of daily return standard deviation estimates on All Share Index spot and futures-trading volumes

VARIABLE	COEFFICIENT	t-STATISTIC	P-VALUE
INTERCEPT	0,0052600	5,1731671	**0,0000**
DAILY DUMMIES:			
TUESDAY	-0,0011481	-1,3478473	0,1782
WEDNESDAY	-0,0001572	-0,1792866	0,8578
THURSDAY	-0,0001061	-0,1228010	0,9023
FRIDAY	-0,0013140	-1,5062212	0,1325
TRADING ACTIVITIES:			
SPOT VOLUMES:			
EXPECTED	1,773E-8	4,0222891	**0,0001**
UNEXPECTED	1,258E-8	3,8472030	**0,0001**
FUTURES VOLUMES:			
EXPECTED	3,400E-7	2,0404789	**0,0417**
UNEXPECTED	5,929E-7	4,9593242	**0,0000**
OPEN INTEREST:			
EXPECTED	-3,126E-8	-1,3851940	0,1664
UNEXPECTED	8,007E-9	0,1234314	0,9018
R-SQUARED	0,112577		
DURBIN-WATSON	1,990868		
F-STATISTIC	2,879679		
PROB(F-STATISTIC)	**0,000001**		

TABLE 6
Regression of daily return standard deviation estimates of Gold Index spot and futures-trading volumes

VARIABLE	COEFFICIENT	t-STATISTIC	P-VALUE
INTERCEPT	0,0183449	7,1043484	**0,0000**
DAILY DUMMIES:			
TUESDAY	-0,0029378	-1,4328404	0,1524
WEDNESDAY	-0,0035350	-1,6788389	0,0936
THURSDAY	-0,0002587	-0,1240930	0,9013
FRIDAY	-0,0022107	-1,0603542	0,2894
TRADING ACTIVITIES:			
SPOT VOLUMES:			
EXPECTED	1,599E-7	2,6671560	**0,0078**
UNEXPECTED	1,769E-7	3,9417892	**0,0001**
FUTURES VOLUMES:			
EXPECTED	2,254E-6	3,4315907	**0,0006**
UNEXPECTED	7,390E-6	10,900948	**0,0000**
OPEN INTEREST:			
EXPECTED	-2,882E-7	-0,7800027	0,4357
UNEXPECTED	-8,610E-7	-0,8995838	0,3687
R-SQUARED	0,290458		
DURBIN-WATSON	2,013305		
F-STATISTIC	9,292476		
PROB(F-STATISTIC)	**0,000000**		

TABLE 7
Regression of daily return standard deviation estimates on Industrial Index spot and futures-trading volumes

VARIABLE	COEFFICIENT	t-STATISTIC	P-VALUE
INTERCEPT	0,0046808	6,0395121	**0,0000**
DAILY DUMMIES:			
TUESDAY	-0,0012821	-1,7535721	0,0800
WEDNESDAY	-0,0009852	-1,3387810	0,1811
THURSDAY	-0,0011789	-1,6109936	0,1076
FRIDAY	-0,0019195	-2,5970655	**0,0096**
TRADING ACTIVITIES:			
SPOT VOLUMES:			
EXPECTED	7,792E-9	1,5905992	**0,1122**
UNEXPECTED	6,504E-9	2,0972882	**0,0363**
FUTURES VOLUMES:			
EXPECTED	1,083E-6	3,6674276	**0,0003**
UNEXPECTED	1,580E-6	6,4968444	**0,0000**
OPEN INTEREST:			
EXPECTED	-1,643E-7	-1,5248916	0,1278
UNEXPECTED	-4,615E-7	-1,4809436	0,1391
R-SQUARED	0,169491		
DURBIN-WATSON	1,999361		
F-STATISTIC	4,632621		
PROB(F-STATISTIC)	**0,000000**		

3.4 Futures-trading activity and equity volatility using log volume series

The analysis is repeated using the natural logarithm of volumes of the different indices and the expected and unexpected volumes of these series are used as the activity variables in Equation (4). Once more, without repeating all tables, the results echo those of the previous analyses.

For the All Share Index, the inclusion of futures-trading variable does not alter the sign of the coefficient estimates on spot trading variables and the magnitude differs only slightly. The coefficient estimates for both spot- and futures volume (expected and unexpected) are positive, but with both components of the spot volume and the unexpected component of the futures-trading volume being significant. The coefficient for spot volume (expected and unexpected) is greater in magnitude than futures-trading volume (expected and unexpected). Coefficient estimates on expected and unexpected open interest are negative and positive respectively, but neither are significant at the 5% level.

Regarding the Gold Index, the inclusion of the futures-trading variable does not change the sign of the coefficient estimates on spot trading variables, but the magnitude of the coefficient estimate of the expected component decreases relative to that of the unexpected component. The coefficient estimates for spot-, futures and open interest are all positive, but only the coefficient estimate for the unexpected spot volume and those of the futures volumes (expected and unexpected) are significant. The coefficient estimates for unexpected spot- and futures volume are greater in magnitude than those for the corresponding expected components.

The inclusion of futures-trading variable does not alter the sign of the coefficient estimates on spot trading variables but the magnitude of the coefficient estimate of the expected component decreases relative to that of the unexpected component for the Industrial Index. The coefficient estimates for spot-, futures- and open interest volumes are all positive, but only the coefficient estimates for the unexpected spot volume and futures volumes (expected and unexpected) are significant. The coefficient estimates for unexpected spot- and futures volume are also greater in magnitude than those for the corresponding expected components. Coefficient estimates on expected and unexpected open interest are negative and positive respectively, but neither are significant at the 5% level.

3.5 Summary

Table 8 gives a summary of the most important results regarding the All Share Index. Values given are the estimated coefficients followed by the corresponding probability statistic in brackets. Significant values at the 5% significance level are bolded.

Results indicate that equity volatility is positively related to both expected and unexpected spot-trading activity. The relation is also positive for expected and unexpected futures-trading activity, with expected futures-trading activity not significant for log volumes. These findings imply that the futures-trading activity (expected and unexpected) increases spot equity volatility. The results also show that unexpected futures-trading has a more significant impact on volatility than expected futures-trading. These results contrast with Bessembinder and Seguin's (1992: 2030) findings that equity volatility is lower when the level of futures-trading activity is high. It is important to note that the highest r-squared value obtained is 0,1480 which implies that only 14,8% of the volatility is explained by the activity variables. The corresponding value found by Bessembinder and Seguin (1992: 2028) is 30,8%, which is much more significant in explaining the volatility. The r-squared value increases substantially with the introduction of futures volumes, underlining that futures volumes are significant in explaining volatility.

TABLE 8
Summary of results for the All Share Index

VARIABLE	RAW VOLUME	LOG VOLUME	RAW VOLUME	LOG VOLUME
SPOT:				
EXPECTED	1,975E-8(0,0000)	0,0036(0,0000)	1,773E-8(0,0001)	0,0034(0,0000)
UNEXPECTED	1,343E-8(0,0000)	0,0042(0,0000)	1,258E-8(0,0001)	0,0039(0,0000)
FUTURES:				
EXPECTED			3,400E-7(0,0417)	0,0005(0,1666)
UNEXPECTED			5,929E-7(0,0000)	0,0026(0,0000)
OPEN INTEREST:				
EXPECTED			-3,13E-8(0,1664)	-0,0002(0,4551)
UNEXPECTED			8,007E-9(0,9018)	0,0001(0,5214)
R-SQUARED	0,0792	0,1022	0,1126	0,1480
DURBIN-WATSON	2,0142	2,0140	1,9909	2,0146

Table 9 gives a summary of the most important results regarding the Gold Index. Results indicate that equity volatility is positively related to both expected and unexpected spot-trading activity, with expected spot-trading activity not significant for log volumes. The relation is also positive for expected and unexpected futures-trading activity. These findings imply that that futures-trading activity (expected and unexpected) increases spot equity volatility. The results also show that unexpected futures-trading has a more significant impact on volatility than expected futures-trading. These results again contrast with Bessembinder and Seguin's (1992: 2030) findings that equity volatility is lower when the level of futures-trading activity is high. The highest r-squared value of 29,05% compares favourably with the corresponding 39,4% found by Bessembinder and Seguin (1992: 2028). Again there is a significant increase in the r-squared value when futures-trading volumes are included in the analysis.

Table 10 provides a summary of the most important results regarding the Industrial Index. Results indicate that equity volatility is positively related to both expected and unexpected spot-trading activity, with expected spot-trading activity not significant for raw or log volumes. The relation is also positive for expected and unexpected futures-trading activity. As before these findings imply that futures-trading activity (expected and unexpected) increases spot equity volatility. Again the results show that unexpected futures-trading has a more significant impact on volatility than expected futures-trading. These results again contrast with Bessembinder and Seguin's (1992: 2030) findings that equity volatility is less when the level of futures-trading activity is high. The highest r-squared value obtained is 0,1695 which implies that only 16,95% of the volatility is declared by the activity variables, compared to the value of 39,4% found by Bessembinder and Seguin (1992: 2028). As with the other indices the r-squared value also increases significantly with the introduction of the futures volumes, enhancing the fact that futures volumes are significant in explaining volatility.

TABLE 9
Summary of results for the Gold Index

VARIABLE	RAW VOLUME	LOG VOLUME	RAW VOLUME	LOG VOLUME
SPOT:				
EXPECTED	2,892E-7(0,0000)	0,0070(0,0000)	1,599E-7(0,0078)	0,0030(0,0639)
UNEXPECTED	3,710E-7(0,0000)	0,0109(0,0000)	1,769E-7(0,0001)	0,0061(0,0000)
FUTURES:				
EXPECTED			2,254E-6(0,0006)	0,0033(0,0083)
UNEXPECTED			7,390E-6(0,0000)	0,0081(0,0000)
OPEN INTEREST:				
EXPECTED			-2,88E-7(0,4357)	0,0006(0,5193)
UNEXPECTED			-8,61E-7(0,3687)	0,0003(0,6618)
R-SQUARED	0,1664	0,1694	0,2905	0,2308
DURBIN-WATSON	1,9962	1,9942	2,0133	2,0013

TABLE 10
Summary of results for the Industrial Index

VARIABLE	RAW VOLUME	LOG VOLUME	RAW VOLUME	LOG VOLUME
SPOT:				
EXPECTED	1,064E-8(0,0168)	0,0014(0,0073)	7,792E-9(0,1122)	0,0009(0,1478)
UNEXPECTED	9,172E-9(0,0030)	0,0018(0,0003)	6,504E-9(0,0363)	0,0014(0,0056)
FUTURES:				
EXPECTED			1,083E-6(0,0003)	0,0008(0,0263)
UNEXPECTED			1,580E-6(0,0000)	0,0020(0,0000)
OPEN INTEREST:				
EXPECTED			-1,64E-7(0,1278)	-0,0004(0,2241)
UNEXPECTED			-4,62E-7(0,1391)	0,0000(0,8814)
R-SQUARED	0,1159	0,1171	0,1695	0,1562
DURBIN-WATSON	2,0003	2,0059	1,9994	2,0051

4. CONCLUSIONS

The object of this study was to determine whether greater futures-trading activity is associated with more or less equity volatility.

The important conclusions of this study are robust to alternative specifications and the indices selected. In particular a positive correlation between equity volatility and expected and unexpected trading volumes for both the spot and futures market was found. Similar results were found for all three main indices (All Share, Gold, Industrial). This differs from the findings of Bessembinder and Seguin (1992) who found a negative relationship between spot volatility and expected futures-trading volume.

For the Gold and Industrial Index it is important to note that the unexpected spot and future-trading volumes have a greater effect on volatility than does the corresponding expected trading volume.

Furthermore, in contrast to the Bessembinder and Sequin study, our results thus show that futures-trading volumes are associated with greater volatility in the SA spot markets. The results are consistent with the idea that the increasing interest in the SA futures market and the subsequent increase in trading volumes may lead to greater equity volatility and price destabilisation in the SA markets.

This conclusion must, however, be tempered by the possibility of reverse causation. The Bessembinder and Seguin model implies a line of causation which runs from trading volume to price volatility. If, however, instability in the spot market indices increased hedging in the futures market, the positive association between futures volume and share price volatility may arise from an opposite direction of causation.

Unfortunately, direction of causality is much more difficult to demonstrate statistically than mere association and as such the results must be regarded as suggestion rather than definite. The Granger and Sims approach to causality, which is best suited where the causing variable has its effect with a distributed lag, has turned out not particularly meaningful because of the contemporaneous nature of the observed correlation structures.

There is one argument which indicates that reverse causation may not hold. The futures market variables are statistically significant when introduced with other explanatory variables. Had they simply been reflecting the response of the futures market to spot market volatility generated by other factors, they should not be significant if variables measuring these factors are also included in the regression. Conclusive proof of direction of causation, however, still remains an open research issue.

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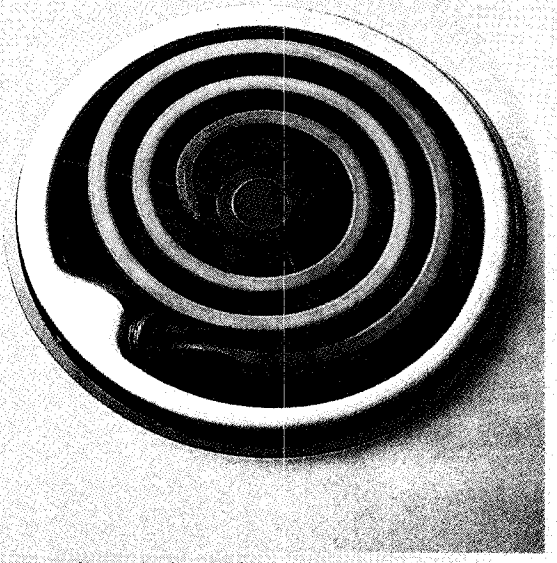
COOKING WITH FROZEN ELECTRICITY



New technology produces and transports power.

An electric generator in which nothing moves but a stream of gas. Power lines lying deep under ground, nitrogen-cooled to cryogenic temperatures. The need for cheaper, more abundant supplies of electricity is prompting scientists to investigate unconventional ways of making and transporting it. Most power generating schemes differ only slightly from the methods first used in 1881. Even in atomic power stations, heat is supplied by nuclear reaction (instead of by burning coal or gas) to rotate coils of wire through a magnet. Much greater efficiency can be achieved by blowing hot gas, called plasma, through a magnetic field. The static "plasma" electricity generator is clean, compact and easily controlled. To carry the new power generated, engineers borrowed an idea from the frozen food industry. When the temperature of power lines is reduced with liquid nitrogen, their power carrying capability is significantly increased and costs lowered. Laser beams in place of power cables, non-electric light from chemicals, electricity encased in hydrogen tubes - imaginations are now in search of a cheaper universal electric power.

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The Determinants of the Risk Perceptions of Investors

The ultimate test of theory is whether it explains real world behaviour. In recent years, serious doubts have arisen as to the ability of the Capital Asset Pricing Model (CAPM) to explain investor behaviour.

It has been argued that a study of investor risk perceptions will provide a different perspective on the investment and valuation process. The objective of this study was to explore investor risk perceptions and to indentify how investors treat risk in practice.

The CAPM presumes that rational investors strive to maximise wealth, and it seeks to explain the relationship between risk and return, as well as to provide a mechanism for evaluating required rates of return on investments in risky assets.

The CAPM is based on the premise that investors are principally concerned with those risks they cannot eliminate through diversification. This non-diversifiable risk is also termed market risk or systematic risk and stems from the 'market' factor, that is the influence of the general economic environment on investments. The CAPM provides an explicit measure of systematic risk, namely beta.

Numerous authors have questioned the assumptions regarding the decision making behaviour of investors on which this theory is based, and estimation problems have been identified with beta.

Thus there has been an erosion of confidence in the model, and this has led researchers to conclude that, despite efforts to improve the measurement of beta, "its usefulness to investment professionals has reached a plateau and that investors are looking elsewhere for measures, or additional measures, of risk" (Mear and Firth, 1988, p335).

Partly in response to the criticisms of the CAPM, researchers have sought alternative approaches to the valuation process and to measuring risk. Two major alternatives have emerged, namely microeconomic modelling and the use of a behavioural science approach.

MICROECONOMIC MODELLING

Microeconomic models use firm-specific factors such as leverage, profitability and firm size to determine the aggregate level of systematic risk embodied in the firm's equity, and are in fact an attempt to find a 'fundamental beta' as an alternative to basing risk measures solely on historical price fluctuations (Bergesen, 1994).

According to Beaver, Kettler & Scholes (1970, p660) seven accounting variables "capture most of the important relationships suggested in the literature". These variables are:

- dividend pay-out
- asset growth
- financial leverage
- liquidity (as measured by the current ratio)
- asset size
- variability of earnings (as a surrogate for business risk)
- covariability of earnings or the accounting beta.

Stewart (1991, p 452) developed a risk index based on research into 1000 public US companies, and then attempted to "identify causal, quantifiable factors that would account for differences in business risk between business peers". He found that five risk factors, namely operating risk, strategic risk, asset management, size and geographic diversification were highly significant.

In an extensive study of systematic risk in the South African market, Bergesen (1994) concluded that certain fundamental financial data was strongly correlated to market beta and market returns. His findings provided support for the work of Stewart (1991).

Based on the work of Stewart (1991), Bergesen (1994) and others, a list was complied of the most likely determinants of systematic risk based both on theory and on the earlier empirical research. These potential determinants, classified largely in the categories identified by Stewart (1991), are:

Financial risk:
- financial leverage
- liquidity
- information content of dividends

Business or operating risk:
- operating leverage
- profitability
- variability of earnings and cash flow

Asset management:
- capital intensity
- stockturn

Strategic risk:
- growth

Firm size and diversity:
- firm size
- diversification
- market structure

Other:
- availability of information.

These accounting variables are tested in the present study to determine whether the same variables explain perceived risk.

THE BEHAVIOURAL SCIENCE APPROACH

A strong argument can be made for attempting to use behavioural science techniques to add a further dimension to research in the field of finance theory (Farrelly, 1980) and, in particular, to identify how investors treat risk in practice.

Farrelly & Reichenstein (1984, p6) citing the results of studies by Crum, Laughhunn & Payne (1981), Cooley (1977) and Gooding (1975), concluded that "these studies portray risk perception as a complicated psychological process. The amount of risk perceived and the consequent nature of investment behaviour vary from individual to individual and can depend upon such conditions as how

much the particular investors feel that they control their environment, the prior existence of a specific share in the investor's portfolio at the time of purchase, and the relationship of expected return to the investor's determined target".

There is thus strong evidence that a subjective assessment of risk plays an important role in investment decisions, a factor which is not reflected in the theory or in beta as a theoretical measure of risk, and that the decision making process is more complex than the theory suggests.

Farrelly & Reichenstein (1984) found that subjective measures of risk such as the Value Line Safety measure, which adjusts price stability for subjective factors like quality of earnings, tend to outperform objective measures as an explanation for risk perceptions.

They tentatively concluded that "objective measures, based as they are entirely on past data, will be incomplete measures of risk because of their failure to consider important subjective risk considerations".

Investors' perceptions, as an *ex ante* measure of risk, in contrast to the *ex post* market beta concept, appear to have been introduced by McDonald & Stehle (1975). These authors used a questionaire to elicit a risk 'assessment' on a scale of 1 to 9 for 25 common shares from a sample of investment professionals.

They found that both historical market beta and non-market risk measured by variance of returns were significantly related to perceived risk, and together explained 83% of the variance in perceived risk.

In an extension of the work of McDonald & Stehle (1975), Farrelly & Reichenstein (1984, p8) regressed investment analysts' risk assessments of 25 shares against historical market betas, a measure of the dispersion of analysts forecasts, and against "proxies designed to be more inclusive than systematic risk" including standard deviation of share prices, and earnings predictability.

Oliver (1985) replicated the Farrelly & Reichenstein (1984) study in the South African market, and found that risk perceptions are most closely correlated with earnings variability, followed by total risk, whilst correlation with beta was quite low. The correlation between risk perceptions and beta was repeated a year later using a set of betas incorporating the additional year of data to proxy an *ex ante* risk measure, but the explanatory power of beta remained low (Firer, Oliver and Farrelly, 1986). Both Firer *et al.* (1986) and Farrelly & Reichenstein (1984) concluded that the best explanations of risk perceptions were those measures designed to be more inclusive than systematic risk measures.

In later study, Farrelly, Ferris & Reichenstein (1985) examined the relationship between perceived risk and the accounting based proxies for risk identified, *inter alia* by Beaver *et al.* (1970). They found that leverage, variability in earnings, and current ratio explained 79% of the variation in average perceived risk.

Farrelly, Levine & Reichenstein (1987) developed a model, using discriminant analysis, to identify the accounting variables which most successfully predicted risk classes as defined by investors' risk ratings. A model based on seven variables correctly classified over 80% of the shares included in the sample. These variables were the debt ratio, which displayed a positive relationship with risk ratings, profit margin, return on equity, times interest earned, book value per share and current ratio, all of which had a negative relationship to risk perceptions and debtors turnover which displayed a variable relationship depending on the level of risk class.

Mear & Firth (1988), in the context of investigating the relevance of accounting data in risk assessment, included market determined measures of risk with accounting variables in the independent set. They found that six accounting variables and two market determined measures of risk explained approximately 93% of the variation in the mean risk perceptions of financial analysts. Of the eight variables, seven were significant at the five percent level, namely net assets, proprietorship ratio, liquidity ratio, industry concentration, profitability, beta and variance of returns. The eighth variable, sales growth, was significant at the ten percent level.

Capstaff (1989) developed a regression model to explain analysts' risk perceptions, and found that the best explanation of risk perceptions was a combination of earnings variability, total risk, four year price performance and familiarity with the firm, treated as a dummy variable. This model explained 78% of the variance in risk perception ratings.

Surprisingly financial leverage was not a powerful variable in explaining risk perceptions, showing only a weak negative association. This finding was in direct contradiction with the work of Hamada (1972), who found that financial leverage explained 24% of market risk.

Capstaff (1989) noted a strong association between the measure of investors' familiarity with the shares and firm size, and postulated that this may in large part underlie the relationship observed between familiarity and risk perception i.e. the larger firms are likely to be better known. He concluded that the familiarity variable used in the study may serve as a proxy for "an extra dimension of knowledge that helps bind together the objective variables and influences the way they are perceived by analysts" (Capstaff, 1989, p10). Objective data appear to be combined with other knowledge and insights possessed by the analysts to arrive at an overall assessment of risk.

The findings of Capstaff (1989) concurred with those of Farrelly & Reichenstein (1984) and Firer *et al.* (1986) in suggesting that analysts' risk perceptions are formed with regard to the total riskiness of the share, rather than only a systematic element of risk. This reflects the adoption of a fundamentalist approach to investment assessment and specifically to risk, which has been shown by several authors to be widely used in investment analysis (Lovell-Green, Affleck-Graves & Money, 1986, and Arnold & Moizer 1984).

It appears from a review of the literature that identifiable firm-specific factors are strongly related to the risk perceptions of investors. These factors are similar to those found to explain the *ex post* measure of risk, namely beta, but appear to include a subjective element. In addition, familiarity with and knowledge about shares was found to influence risk perceptions. Futhermore, the research suggests that risk perceptions of investors are closely associated with more inclusive measures of risk than beta.

It is therefore apparent that the assessment of risk is a complex process which involves both subjective and objective inputs, and which appears to vary between markets and time periods. In addition, investors appear to view risk in a broader framework than the systematic risk suggested by financial theory, indicating that beta is not a sufficiently inclusive measurement to reflect investors' perceptions of risk.

The purpose of this study was to determine the components of perceived risk in the South African equity market, using a behavioural science methodology and to establish the degree to which investors use a range of objective measures of risk.

PROPOSITIONS

The following propositions were tested:
Proposition 1: The risk perceptions of South African investors are more closely related to the total risk of a share than to the systematic risk.
Proposition 2: The following firm-specific variables provide the best explanation of perceived risk:

- leverage
- variability in earnings
- measures of liquidity
- asset size
- profitablility
- share trading liquidity
- market: book ratio
- growth

Proposition 3: Knowledge about a company reduces the perceived risk of its shares.
Proposition 4: South African investors do not make use of objective measures of risk.

Methodology

A questionnaire was drawn up, based on the work of Farrelly *et al.* (1985) and Firer *et al.* (1985) and on the determinants of risk identified in a review of the relevant literature. A pre-test study consisting of seven exploratory interviews was used to verify the appropriateness of this questionnaire and to identify additional factors that may influence perceptions of risk. The interviewees were chosen subjectively, based on their willingness to discuss the subject of risk openly and at length with the interveiwer.

The final questionnaire was piloted, and subsequently posted to a sample of investment professionals.

It was assumed that professional portfolio managers and investment analysts, who, as a group, make significant portion of the investment decisions in South Africa, were representative of equity investors. In order to reach this group, the 1 170 locally resident members of the Investment Analysts Society as at August 1995 were included in the sample.

A four week period after posting the questionnaires was used as a cut-off date. Responses received after this date were taken to be proxies for non-respondents and the demographics of this proxy were compared with those of the timely respondents using a chi-squared goodness of fit test to check for sample bias.

The first section of the questionnaire consisted of a request for a subjective rating of firstly, the *'perceived risk of'* and secondly, the *'familiarity with'* a list of 25 shares, using a scale of one (low) to nine (high). The design of this question was based on that used by Capstaff (1989).

A definition of risk was delibetately excluded. However, the respondents were asked to estimate the risk of each share as if it were being added to a deversified portfolio.

The 25 shares for which risk ratings were sought were selected by including only those shares that were well known and widely followed. These were defined to be shares for which at least three stockbrokers' analysts' forecasts were available. Only industrial shares were included, due to the differing accounting procedures followed by mining and financial companies.

Given that institutional investors and investment analysts tend to focus on companies with larger market capitalisations, it was recognised that the need to restrict the list to the well known companies was likely to result in a bias in the sample towards larger capitalisation shares. However, within this limitation, a range of company size was sought. The beta coefficients of the resulting 25 firms ranged from 0,39 to 1,66. The 25 shares are listed in the Appendix.

The second part of the questionnaire consisted of a list of 29 variables thought to influence perceived risk. Respondents were requested to rate the importance of these potential determinants of risk on a nine point numeric scale. The list was constructed to cover the major variables which theoretical considerations and empirical research had identified as influencing risk or risk perceptions.

The responses were analysed using descriptive statistics, correlation and regression analysis, and factor analysis.

In the third section, respondents were presented with a list of alternative measures of risk and were asked to indicate, using a five point descriptive scale, the frequency with which they used each of the measures. The responses were rescaled using correspondence analysis to provide interval data (Bendixen & Sandler, 1994).

Finally biographical information relating to job description, level of experience and the extent of formal training in investment theory was requested. No further identification was required in order to preserve anonymity.

In order to identify the determinants of perceived risk, the subjective measures elicted through the questionnaire were correlated with various objective variables identified in the literature reveiw. The financial data was captured from the I-Net data base. The beta estimates were taken from the UCT Department of Statistical Sciences Financial Risk Service.

RESULTS

A total of 271 usable responses (26%) were received from respondents whose job descriptions included investment analyst, portfolio manager or private investor. Of these, 39 were received after the four week cut-off date and were used as a proxy for non respondents. The geographic distribution, qualifications and years of experience of the two groups was compared and a chi-squared goodness of fit indicated that there was no significant difference between the demographics of the sample used in the research and those of the proxy for non respondents. It was consequently assumed that no significant non-response bias existed.

77 percent of the respondents had done an investment course as part of a degree or a diploma. Only 15 percent had less than three years experience in the investment industry. 40 percent had more than eight years of experience.

Proposition 1: Correlation of risk ratings with beta and variance

The mean risk rating of the respondents was calculated for each share. These were correlated with betas estimated using both the All Share index and the Financial and Industrial index as the market proxy, and with the variance of returns. The results are summarised in Table 1.

TABLE 1
Correlation of Mean Risk Ratings with Beta and Variance

Unweighted mean risk ratings	Beta (Alsi)	Beta (Fin&Ind)	Variance
Correlation Coefficient (r)	0,167	-0,022	0,442
Probability Level	0,424	0,918	0,027

The relationship between the risk ratings and both betas was weak and not significant. There was a moderate but significant positive correlation between the risk ratings and variance. It appears therefore that investors are more concerned with total risk than with systematic risk.

In order to explore the closer correlation of perceived risk with variance than with beta, the relationship between variance and firm-specific financial variables was investigated and compared to the relationship between these variables and the risk ratings. Whilst beta displayed no significant correlations with any of the firm-specific variables, variance demonstrated a significant relationship with the volatility of return on assets.

As is reported later, the volatility of a firm's performance, its cyclicality and the stability of income, were found to be important components of perceived risk. It is therefore presumably because variance encompasses this component of risk that variance was more closely correlated with perceived risk than was beta.

The significance of the association between perceived risk and variance appears to reflect the widespread adoption of a fundamentalist approach to risk assessment, an approach that was clearly highlighted in the exploratory interviews conducted prior to the design of the questionnaire and in the research of Lovell-Green *et al.* (1986).

Proposition 1, that risk perceptions are more closely related to total risk than to systematic risk, was therefore accepted.

Proposition 2: The relationship between risk ratings and firm specific data.

To investigate the determinants of perceived risk, a number of approaches were used.

(a) Correlation Analysis Firstly the mean risk ratings for each of the 25 shares were correlated with firm-specific variables, using individual pairwise correlation. Nine variables displayed a significant correlation at the 5% probability level.

These variables (with their correlation coefficients given in brackets) were operating profit growth (0,41), operating profit to total assets (0,49), trading profit (defined as operating profit before depreciation) to total assets (0,63), variance of share price returns (0,44) and variance in five profitability measures, namely variance in operating profit to total assets (0,56), in trading profit margin (0,50), operating profit margin (0,58), trading profit to total assets (0,54), and the earnings before interest and tax margin (0,54).

(b) Regression Regression analysis was undertaken to identify the combination of determinants that best explained perceived risk. The investors' risk ratings were regressed against the financial variables highlighted by the correlation analysis as being significant at the 5% level or having a correlation coefficient of greater than 0,4. The effects of multi-collinearity were eliminated through the use of stepwise regression.

The regression analysis on the unweighted risk ratings, summarised in Table 2, resulted in a model which explained 60,4% of the variance in risk ratings (adjusted R-squared), using two variables, namely the trading profit to total assets ratio and the standard deviation of trading profit to total assets. The importance of return on assets is echoed later in the factor analysis by the strength of the asset management factor of risk.

TABLE 2
Regression of Unweighted Risk Ratings with Firm-Specific Variables

Variable	Probability	Additional R sq.
Trading profit to total assets	0,0004	0,354
Standard deviation of trading profit to total assets	0,0021	0,239
R-Squared 0,641	Adjusted R-squared 0,604	

Financial gearing was found to be negatively related to perceived risk. Although this result was not significant, it is in contrast to many multivariate studies which have found that gearing is a major determinant of beta (Beaver *et al.* 1970, Hamada 1972, Rosenberg & McKibben 1973, Belkaoui 1978, Mandelker & Rhee 1984). Gearing was ranked by respondents as the third most important determinant of risk and great emphasis was placed on its relevance in the exploratory interviews. In addition, both Bergesen (1994) and Retief, Affleck-Graves and Hamman (1986) found financial leverage to be a significant variable in explaining beta in the South African market. Farrelly *et al.* (1985 and 1987) indentified financial risk as an important variable in explaining risk perceptions.

Capstaff (1989) however found a weak negative association between risk perceptions and financial gearing. He suggested that the intuitive explanation for this negative association was that more risky firms have less inclination or ability to borrow. Stewart (1991, p391) referred to the signalling benefits of debt: "Raising debt exudes confidence. Investors take it as a sign that management is reasonably certain the interest on the new debt can be covered."

Although gearing was highlighted as an important component of risk during the exploratory interviews, the interviewees also indicated that they assessed the level of gearing of a firm within the context of industry norms, the stage in the business cycle, and the reasons for raising debt. In particular it was noted that incurring debt to fund assets on which the return on capital was expected to be high would not raise the overall risk profile of a firm.

The need to consider gearing within an industry and firm-specific context, the reasons for raising debt, the signalling effect of raising debt and a focus on the benefits of debt may explain the weak and negative relationship between risk perceptions and gearing. The high ranking of gearing as a determinant of risk may well reflect the need for management of financial risk rather than a concern with the absolute level of gearing.

Firm size was not significantly related to risk perceptions. The (weak) positive relationship observed between size and perceived risk may also have been a result of bias created by the choice of shares of a minimum size for inclusion in the questionnaire.

The appearance in the regression model of variance in return on assets, which reflects the volatility of earnings, is in line with the findings of Farrelly *et al.* (1985) and Capstaff (1989).

The importance of a measure of variance in the regression model may reflect the underlying structure of the South African economy which is highly dependent on the primary sector and on commodities whose prices are detemined on international commodity markets. The impact of cyclicality and the positive influence that product differentiation has on risk was a theme of the exploratory interviews. In addition, measures of variance in profitability and returns may also be the best financial ratio indications available to investors of the future performance of a firm. This focuses attention once again on the limitations of *ex post* historical data in explaining the *ex ante* concept of risk.

(c) Relative Rankings The ranked mean ratings of the importance respondents attached to the 29 potential determinants of the investment risk of an individual share are presented in Table 3.

TABLE 3
Ranking of Determinants of Risk

Rank	Determinant of Risk	Rating
1	Quality of management	8,24
2	Impending change in industry or market	7,63
3	Level of financial leverage or gearing	7,19
4	Cyclicality of the industry	7,15
5	Degree of earnings variability or volatility	7,13
6	Volatility of cashflows	6,88
7	Industry or market growth	6,86
8	Level of growth of cashflows	6,85
9	Forecast growth in earnings	6,71
10	Quality of assets	6,70
11	Profitability	6,69
12	Intensity of competition faced	6,64
13	Level of disclosure or amount of info available	6,62
14	Management of working capital	6,58
15	Type of products: commodities or differentiated	6,57
16	Labour relations	6,38
17	Level of growth in historical earnings	6,29
18	Tradability of ordinary shares	6,07
19	Level of liquidity	5,84
20	Percentage of market share held or market power	5,69
21	Return on assets	5,63
22	Capital intensity	5,47
23	Ratio of fixed: variable costs	5,44
24	Dependence on technology	5,38
25	Degree of diversification	5,21
26	Percentage of income earned offshore	4,94
27	Firm size	4,56
28	Market value: book value	3,93
29	Level of dividend payout or dividend yield	3,65

Quality of management topped the list as the most important aspect of risk, yet interestingly, was not a major component of any of the solutions to the factor analysis (which is discussed next). During the exploratory interviews the importance of the quality of management, and of the need for a subjective assessment of management was stressed by virtually every interviewee.

It was however clear from the discussions that management ability was both reflected in the financial ratios, and impacted on most of the deteminants of risk discussed. In other words the 'quality of management' was an umbrella concept which would manifest itself in or be indirectly measured by the financial data. It also reflects in the firm's ability to anticipate and manage change, the ability to manage assets, to structure the financing of the firm, and to develop sound labour relations.

The lack of weighting of quality of management in any of the factors of risk could therefore be the result of the factor analysis reflecting the fragmentation of this broad concept into its component parts, whilst the less sophisticated ranking technique reflected the concept in its entirety.

(d) Factor Analysis Finally, the responses regarding the determinants of risk were subjected to factor analysis in order to identify the major constructs of perceived risk. A five factor solution, which explained 51,1% of the variance in the responses, was obtained. The rotated factor loadings for the deteminants of risk of each of the five factors are presented in the following tables. All variables with a factor loading of greater than 0,40 were included in the relevant factor.

The determinants of risk which loaded onto factor 1 related to the profitability and use of assets, both operating and fixed, and the growth generated by those assets (see Table 4). This factor was named Asset Management. It echoed the strong explanatory power of the volatility of return on assets in the regression model.

TABLE 4
Factor 1: Asset Management

Determinant of risk	Loading
Return on assets	0,760
Quality of assets	0,741
Profitability	0,735
Management of working capital	0,724
Level of growth of cashflows	0,566
Level of growth of historical earnings	0,458
Quality of management	0,415

The emphasis on the quality and profitability rather than size of assets in the Asset Management factor might explain the lack of importance attached to firm size in any of the analyses. Comments made during the exploratory interviews highlighted the view that the size of, or growth in assets was irrelevant if "poor returns were being generated by vast amounts of assets."

Factor 1 was the most heavily weighted, accounting for 25,6% of the variation in the original set of determinants. A Cronbach alpha co-efficient of 0,83 indicated a high level of internal reliability.

Factor 2 (Table 5) appeared to describe barriers to entry. These could result either from the structure of the industry or from actions taken by the firm itself in order to provide defences against competitors. Barriers of a capital nature, such as capital intensity and the use of technology, seemed to be particularly important. Such defensive barriers would logically reduce the level of risk, which would be influenced by the intensity of competition. This factor was therefore named Defensive Barriers against Competition. Cronbach's co-efficient alpha was acceptable at 0,79.

Concern was expressed during the exploratory interviews regarding the ability of South African firms to compete against international competitors. This may underlie the weighting of the Defensive Barriers factor. An implication of the grouping of the determinants of this factor was that investors appeared to view companies from a broad and strategic perspective, an observation that was highligted in the exploratory interviews.

TABLE 5
Factor 2: Defensive Barriers against Competition

Determinant of Risk	Loading
Dependence on technology	-0,702
Capital intensity	-0,602
Ratio of fixed: variable costs	-0,577
Firm size	-0,576
Percentage of market share held or market power	-0,514
Intensity of competition faced	-0,501
Type of products: commodities or differentiated	-0,490
Volatility of cashflows	-0,449
Level of liquidity	-0,435

The determinants of risk which loaded most heavily onto factor 3 related to the prospects for a firm and its market. Concern over the level of confidence in the forecast, or forecast risk, was indicated by the inclusion of impending change and the level of disclosure. This factor (Table 6) was thus labelled Forecastability. Cronbach's alpha was 0,75.

An important facet of this factor is its focus on the future. An *ex ante* orientation is integral to the assessment of risk. The *ex post* nature of historical financial data and of the beta estimation process is limiting when compared to risk perceptions that include an assessment of the impact of changing circumstances on future earnings and company valuation.

There is a similarity between the Forecastability factor and the strategic risk highlighted by Stewart (1991) which revolves around investor concern that the value of future investment opportunities may not be fully realised. The inclusion in this factor of the level of disclosure and impending change underlines investors' concerns with the risk of forecasts being inaccurate or not realised.

TABLE 6
Factor 3: Forecastability

Determinant of Risk	Loading
Industry or market growth	-0,689
Forecast growth in earnings	-0,683
Cyclicality of the industry	-0,649
Impending change in industry or market	-0,604
Level of disclosure or amount of info. available	-0,545

The fourth factor related to the ability of a firm to spread its risk outside South Africa. Its presence was assumed to indicate an overall concern by investors regarding the security of cashflow. Named Security of Cashflow, it was dominated by the percentage of income earned offshore. The currency risk attached to offshore earnings was repeatedly mentioned in the exploratory interviews, and the interviewees felt that both offshore earnings and diversification could increase or decrease risk, depending largely on the specific circumstances of the firm.

The weak loading of the level of dividend payout complicated the interpretation of this aspect of risk. Its presence may have indicated an overall concern by investors regarding the security of cashflow. It may be reflecting the "information content" of dividends, i.e. that management will only pay the level of dividend that can be sustained, thus reflecting the sustainability or security of cashflows.

TABLE 7
Factor 4: Security of Cashflow

Determinant of Risk	Loading
Percentage of income earned offshore	0,716
Level of dividend payout or dividend yield	0,517

Cronbach's alpha at 0,69 was below the accepted norm 0,70, indicating that either the statements were not capturing the spirit of the respondents' meaning, or that this was a difficult factor to describe.

Factor 5, the determinants of which are listed in Table 8, described the extent and origins of earnings volatility. Impending change, the impact of interest rate risk through the level of gearing and the impact of labour unrest were highlighted as particular sources of volatility. The ability of management to manage these factors and to anticipate and manage impending change will affect the volatility of earnings, explaining the inclusion of "quality of management" in this factor. This component of risk was labelled Earnings Stability.

Cronbach's alpha of 0,58 indicated a low level of reliability. As with the Security of Income factor, the determinants provided in the questionnaire do not appear to provide a suitable measure of this component of risk. However, the magnitude of the factor scores suggested that it was considered to be the most important risk factor.

TABLE 8
Factor 5: Earnings Stability

Determinant of Risk	Loading
Degree of earnings variability or volatility	0,717
Level of financial leverage or gearing	0,539
Quality of management	0,489
Impending change in industry or market	0,449
Labour relations	0,428

The low Cronbach's alpha for both Factors 4 and 5 pointed to a lack of reliability in these factors. The lack of internal consistency of these factors may stem from the view expressed frequently in the exploratory interviews that an assessment of the importance of any determinant of risk requires contextualisation.

The factor scores were calculated by averaging the ratings of the statements loading onto each factor. The higher the factor score, the more importance is placed on the factor by the respondents. The scores are presented in Table 9. These scores indicated that factors five, three and one were relatively more important.

TABLE 9
Factor Scores

Factor Description	Factor Score $\mu \pm \sigma$
Factor 1 Asset Management	6,73 $\pm$ 1,16
Factor 2 Barriers to Entry	5,74 $\pm$ 1,09
Factor 3 Forecastability	7,00 $\pm$ 1,21
Factor 4 Security of Income	4,29 $\pm$ 1,50
Factor 5 Stability of Earnings	7,56 $\pm$ 0,98

In summary, the major determinants of perceived risk appeared to be the returns generated on assets, and the volatility of those returns, both of which are important reflections of the quality of management. Gearing was not an important component of perceived risk. There was a strong future focus to perceived risk that highlighted the major shortfall of historical measures of risk which cannot by their ex post nature anticipate or adjust rapidly to change. The qualitative components of risk highlighted by respondents were asset management, forecastability and stability of future returns and the need for defensive barriers against competition.

Proposition 3: The impact of investor familiarity with individual shares

The relationship between knowledge about a company and perceived risk was analysed in three ways:

(a) Respondents' ratings of familiarity with each company were used as a proxy for knowledge about the company, and the mean familiarity ratings were correlated with the risk ratings, beta and variance of returns. These results are shown in Table 10.

Although the risk ratings were negatively correlated with the familiarity ratings as expected; the correlation was relatively weak and not statistically significant.

TABLE 10
Correlation of Familiarity Ratings with Perceived Risk and Market Risk

	Risk Rating	Size	Beta	Variance
Correlation Coefficient (r)	-0,300	0,666	0,059	-0,112
Probability Level	0,145	0,0003	0,779	0,593
R Squared	0,090	0,444	0,004	0,013

(b) Respondents' ratings of their familiarity with each company was included in the regression analysis, both as a dummy variable, and in the raw data format. Neither the inclusion in the regression model of the mean familiarity ratings nor a dummy variable based on the familiarity ratings improved the adjusted *R*-squared. This contrasts with the results obtained by Capstaff (1989), who found that inclusion of the familiarity data as a dummy variable improved the explanatory power of the other objective data.

(c) Finally, the correlation and regression analysis described under Proposition 2 was also performed on the risk ratings weighted by the familiarity ratings. The correlations were rerun after weighting each risk rating by the corresponding familiarity rating to provide a "weighted" risk rating.

This additional analysis was based on the premise that the more familiar investors are with a share, the more accurate their risk ratings are likely to be. The same nine variables were significantly correlated with the weighted risk ratings and very similar correlation coefficients were obtained. The adjusted R-squared of the regression analysis using the weighted data was only slightly higher than that for the unweighted data.

The mean of the investors' ratings of their level of familiarity with each share were correlated against the ojectives risk ratings: beta, variance of returns and firm size. Familiarity showed the anticipated positive and significant association with size.

The results presented here may have been biased by the inclusion of only larger capitalisation shares. These shares tend to be well researched and more information about them is generally available. In addition, the sample of 25 companies was possibly too small to test this proposition rigorously, thus rendering the results sample specific.

Proposition 3 could not be accepted as investor familiarity with shares did not appear to reduce perceived risk.

Proposition 4: Univariate statistical analysis of the measures of risk

To investigate wheter explicit measures of risk were used by the respondents, the mean response, standard deviation and total of the responses for each measure were calculated, and the measures were ranked. The results are presented in Table 11.

TABLE 11
Frequency of Use of Measures of Risk

	Rank	Mean	Std. Dev.	Total
PE Relative to Market	1	4,65	0,68	1079
PE Ratio	2	4,65	0,74	1078
Subjective Assessment	3	4,22	1,06	980
Discount Factor	4	3,32	1,36	770
Variance of Returns	5	2,85	1,32	662
Beta	6	2,34	1,22	542

The two most widely used methods of assessing risk were the Price Earnings (PE) Ratio relative to the market and the absolute PE Ratio. From the exploratory interviews conducted, it was apparent that investors impute into the PE ratio or PE relative the result of a complex risk assessment process that involves both an assessment of the measurable financial and economic variables as well as a subjective assessment of unmeasurable variables such as the quality of management. A PE ratio which is considered to reflect appropriately the perceived level of risk is then used to value the individual share, and is thus seen as embodying the level of risk attached to that share.

A purely subjective assessment of risk was ranked as the third most widely used method. The interviewees referred frequently to "gut feel" as an apparent synonym for a subjective assessment of risk, and it appeared that many investors either combine this subjective perspective with a more quantitative method such as the use of a PE ratio, variance, beta or discount rate. Most of the interviewees indicated that they adjust the PE ratio or discount rate, used in models such as the Free Cash Flow model or dividend discount model, to reflect their subjective perception of risk.

Variance and beta were ranked fourth and fifth respectively in terms of frequency of usage. Only 71 of the 233 respondents indicated that they used beta occasionally or frequently and only five indicated that they used beta "almost always". Although the mean risk ratings were significantly correlated with variance, formal use of variance as a measure of risk appears to be limited. Only 15 of the 233 respondents "almost always" use variance and a further 100 use it occasionally or often. The sum of the ratings given to variance totalled 662 against 1079 for the PE relative, and compared with a total possible sum of the ratings for each measure of 1165.

The interviewees indicated a scepticism for both beta and variance, apparently on the basis that these measures ignored many of the factors which respondents considered to be important components of risk and which they felt were often unmeasurable, with the quality of management being the most frequently cited example. Given the poor correlation between the risk ratings and both beta and variance, an apparent lack of faith in and infrequent use of these measures was not surprising.

These results indicate that proposition 4 should be accepted. They support the contention of Farrelly and Reichenstein (1984) that measures of risk such as beta and variance which are based entirely on historical data are incomplete because of their failure to encompass important subjective considerations. The relative ease with which these subjective considerations can be imputed into the PE ratio and PE relative would probably explain the popularity of these ratios in the valuation process.

Finally the respondents were categorised according to both their level of experience and their degree of formal training in investment theory. The responses regarding the usage of various risk measures were compared across these categories using a Kruskal-Wallis test.

Investors having 6-8 years experience were the most frequent employers of variance as a measure of risk, and those with little experience (0 – 2 years) using it least. Formal training in investment theory seemed to be related to the level of usage of beta and variance.

CONCLUSIONS

The primary objective of the current research was to explore the components of perceived risk in the South African equity market, using a behavioural science methodology.

The study indicated that investors are more concerned with total risk than with systematic risk.

The firm-specific variables which provided the best explanation of risk perceptions were the level and variance of return on assets.

Factor analysis highlighted asset management as a key component of perceived risk. The volatility of, and the ability to forecast investment returns, together with the existence of defensive barriers to competition were also found to be material components of risk.

The quality of management appeared to be an important "umbrella" concept which investors perceive to influence virtually all the major determinants of risk.

The volatility and level of returns generated by assets were seen as critical measures or reflections of management effectiveness. Firm size, as measured by total assets, was not significant from a risk perspective within the sample of large firms chosen.

An *ex ante* or future orientation is fundamental to risk assessment and is not adequately in the historical data, particulary in historical market betas. The assignment of a PE ratio which is believed to impute the subjective information which investors deem essential to risk assessment is likely to remain the predominant method of reflecting perceived risk.

The absolute level of gearing appeared to have little impact on risk perceptions. It is possible that investors assess gearing in the context of industry norms, the benefits of debt and the reasons for raising capital in this form.

Investor familiarity with shares did not appear to reduce perceived risk. This may have been the result of a bias in the sample towards larger capitalisation shares which tend to be well known.

Finally, objective measures of risk such as beta and variance were not widely used by the questionnaire respondents.

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APPENDIX:

List of shares used in risk perception study

Adcock
Afrox
AMIC
Anglo Alpha
AVI
Charter
Ellerines
Engen
Foodcorp
Foschini
Hiveld
Malbak
Nampak
Pick 'n Pay
Plate Glass
Remgro
Reunert
SA Breweries
Sappi
Sentrachem
Suncrush
Tiger Oats
Toyota
Trencor
Wooltru

On Foucault's pendulum, Warren Buffett, and R88 billion.

There's a discernible difference between investing, speculating, and gambling.

At Old Mutual Asset Managers, an entrepreneurial company in the Old Mutual family, we believe in investment. Specifically value investing, and the pendulum of value as advocated by one of the world's most successful investors, Warren Buffett.

As Foucault's theorem would have it, a pendulum is always attracted towards its plumb line. In the pendulum of value, we believe that an asset's worth is always attracted towards its fair value, based on an assumption of rational pricing of assets in the long term.

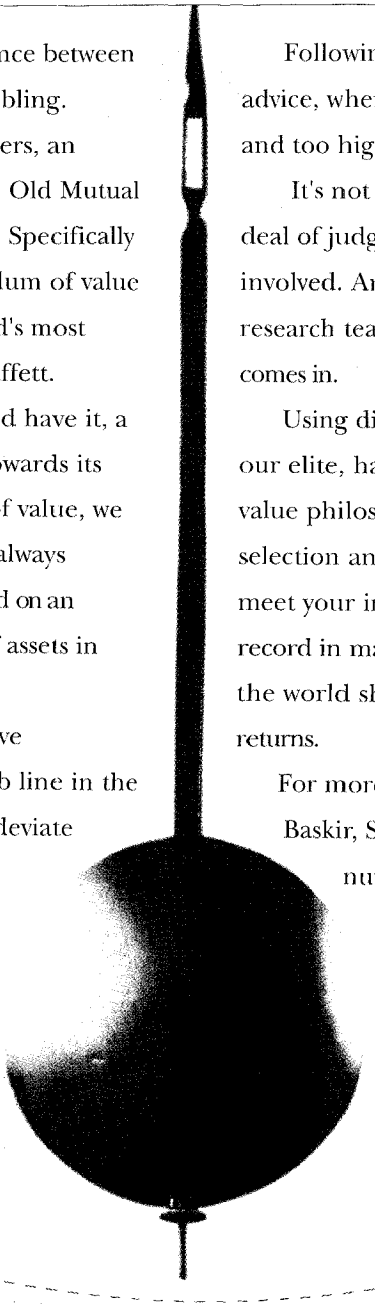
Just as a pendulum may move temporarily away from its plumb line in the short term, an asset's price may deviate from its fair value.

Following Warren Buffett's irrefutable advice, when it's priced too low, one buys, and too high, then one sells.

It's not an exact science, in fact a great deal of judgement and subjectivity is involved. And that's where our dedicated research team of 24 analysts and economists comes in.

Using disciplined investment processes, our elite, hand-picked team applies our value philosophy to the task of stock selection and portfolio construction to meet your investment mandate. Their track record in managing over R88 billion around the world shows consistently excellent returns.

For more information, please call Brian Baskir, Senior Executive, on telephone number (011) 321-4631.



UNDER VALUED
BUY

OVER VALUED
SELL

OLD MUTUAL
ASSET MANAGERS

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Investment Basics: XXXIV. The Du Pont Identity

No individual ratio provides an adequate assessment of all aspects of a firm's financial health. In this note a systematic approach to financial ratio analysis is introduced. It was first used by the Du Pont Chemical Corporation in the U.S. at the turn of the century.

The Du Pont system is a financial analysis and planning tool which uses basic accounting relationships. It is designed to provide an understanding of the factors that drive the return on equity of the firm. It may be represented by a flow chart in which return on equity is progressively decomposed until specific income statement and balance sheet items are reached.

The analysis is initiated by expanding the return on equity into the product of two ratios, the return on net assets after interest and tax (RONAT) and an equity multiplier ratio (EM):

$$ROE = \frac{NPAT}{E} = \frac{NPAT}{NA} \times \frac{NA}{E}$$

$$RONAT \quad EM$$

where NPAT = net profit after tax
E = book value of closing equity
NA = book value of closing net assets

RONAT in turn is decomposed into a profitability ratio (PM) and an asset turnover (AT) ratio. Thus:

$$ROE = \frac{NPAT}{S} \times \frac{S}{NA} \times \frac{NA}{E}$$

$$PM \times AT \times EM \qquad [1]$$

where S = sales revenue for the past year

Equation [1] is the traditional **Du Pont identity**. It shows that ROE is driven by the firm's profitability, the management of its assets and the extent to which financial leverage is used.

However, for analytical purposes, the profit margin ratio (which is in an after interest and tax form) can be split into the product of three factors, an operating profit margin, an interest factor and a tax factor. Thus

$$PM = \frac{NPAT}{S} = \frac{(PBIT - I) \times (1 - T\%)}{S}$$

where PBIT = profit before interest and tax (operating profit)
I = interest charge on income statement
T% = taxation charge on income statement/ PBIT

After a little algebraic manipulation[1]:

$$ROE = \frac{PBIT}{S} \times \frac{S}{NA} \times \frac{PBIT - I}{PBIT} \times (1 - T\%) \times \left(\frac{D}{E} + 1\right) \quad [2]$$

Operating profit margin x *Asset Turnover* x *Interest effect* x *Tax effect* x *Equity multiplier*

where D = book value of interest bearing debt

We have thus expanded the traditional Du Pont identity (equation [1]) into the product of five performance drivers, the operating profit margin (before interest and tax), the sales to net assets ratio, an interest effect ratio, the taxation effect and the equity multiplier. The expanded Du Pont analysis for the hypothetical Bushbuck Company is shown in Figure 1.

The flowchart demonstrates how the basic income statement items flow together to give PBIT and the balance sheet items give net assets. Together with sales, these form the profitability and asset turnover ratios, which when multiplied together result in RONA.

RONA is converted to the after interest and tax form (RONAT) by multiplying by the interest and tax effect factors. Finally when RONAT is combined with the equity multiplier (which is a measure of the extent to which leverage is employed) ROE is obtained.

The addition of debt to Bushbuck has resulted in the aftertax returns of the firm rising from 10,7 to 13,4 percent. Looking at equation [1] it appears the ROE could always be leveraged up by increasing the amount of debt in the firm. Adding debt does not always have this beneficial effect on a firm. If the firm's RONA before interest and tax does not exceed the interest rate paid on the debt (a before tax figure), adding debt will in fact result in a lowering of the firm's returns.

The decomposition of ROE discussed here is a convenient way of systematically approaching financial statement analysis. If ROE is unsatisfactory, management is able to trace backwards through the Du Pont flowchart in order to identify those ratios where improvement can best be achieved.

BUSHBUCK COMPANY
1995 Income Statement
(R in millions)

Sales	R2 311
Cost of goods sold	1 344
Depreciation	276
Profit before interest and taxes (PBIT)	R 691
Interest paid	131
Profit before tax (PBT)	R 560
Taxes (35% + STC)	213
Net profit after tax (NPAT)	R 347
Dividends	R134
Addition to retained profit	213

[1]Multiplying the expression for PM by PBIT/PBIT and rearranging, gives:

$$PM = \frac{PBIT}{S} \times \frac{PBIT - I}{PBIT} \times (1 - T\%)$$

Since NA= (D+E), we can rewrite EM as:

$$EM = \frac{NA}{E} = \frac{(D+E)}{E} = \frac{D}{E} + 1$$

If we now substitute for PM and EM in equation [1], we get:

$$ROE = \frac{PBIT}{S} \times \frac{PBIT - I}{PBIT} \times (1 - T\%) \times \frac{S}{NA} \times \left(\frac{D}{E} + 1\right)$$

Finally we rearrange the factors to give equation [2].

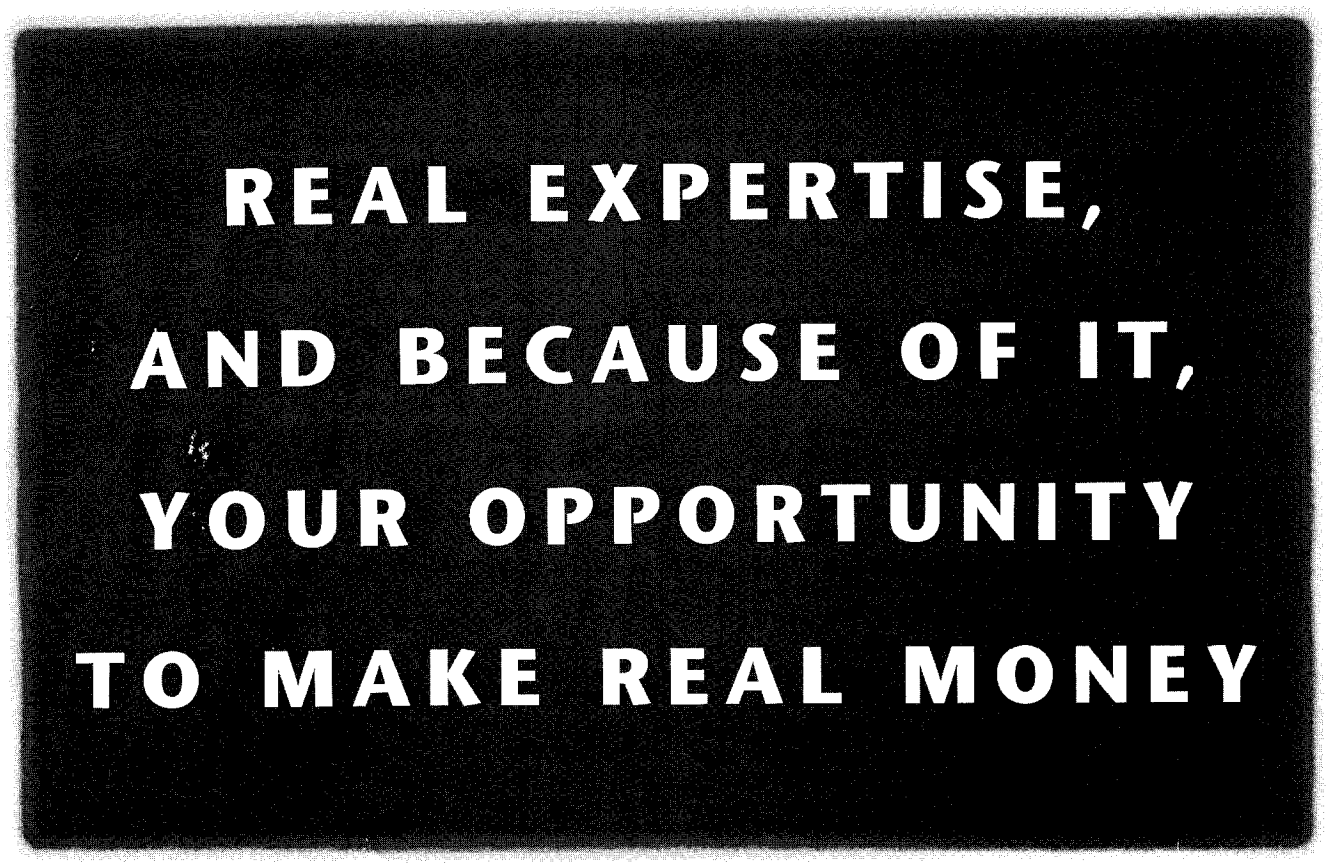

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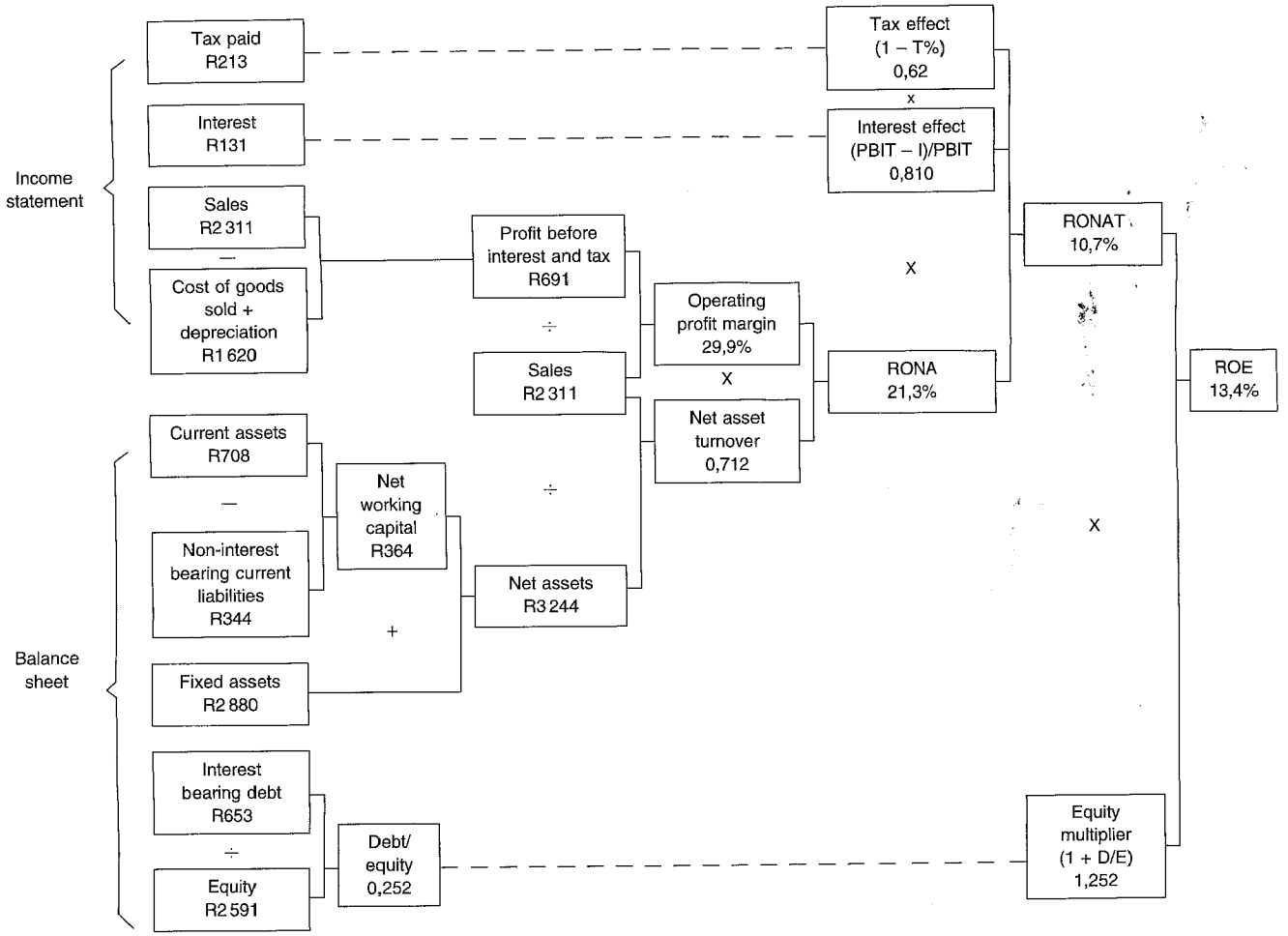
Figure 1 Du Pont analysis of Bushbuck Company



Balance Sheets as of December 31, 1994 and 1995
(R in millions)

	1994	1995
Capital Employed		
Owner's equity		
Share capital	R 490	R 550
Retained profit	1 828	2 041
	R2 318	R2 591
Interest-bearing debt		
Long-term debt	R 531	R 457
Short-term debt	231	196
	R 762	R 653
Capital	R3 080	R3 244
Employment of Capital		
Fixed assets		
Net plant & equipment	R2 750	R2 880
Current assets		
Inventory	R 393	R 422
Accounts receivable	165	188
Cash	84	98
	R 642	R 708
Less		
Non-interest bearing current liabilities		
Accounts payable	R 312	R 344
Net working capital	R 330	R 364
Net assets	R3 080	R3 244

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