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# International diversification and the South African investor

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In the event of a relaxation or scrapping of the current exchange control regulations, the South African investor could consider an investment in foreign stocks or commodities as well as local stocks. In this article two approaches to the assessment of the past performance of various local and foreign security markets are considered. Initially the past performance of 24 markets are studied individually and their returns and corresponding risks are examined, with special reference to the exchange rate factor. Secondly the statistical technique of multidimensional scaling is applied to the 24 markets. Since portfolio diversification is a fundamental aim of any rational investor, securities from markets which exhibit dissimilar price movements would be favourable for inclusion in a portfolio. The method of multidimensional scaling results in a map-like picture which gives the investor a visual display of those markets which move together (i.e. limited diversification opportunities) and those that move differently (i.e. provide good diversification opportunities).

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Indien 'n verslapping of verwydering van die huidige handelsbeheermaatreëls sou intree, mag die Suid-Afrikaanse belegger investering in plaaslike sowel as buitelandse aandele of produkte, oorweeg. In hierdie artikel word twee benaderingswyses tot die vasstelling van die prestasie van verskeie plaaslike en buitelandse sekuriteitsmarkte in die verlede bespreek. Eerstens word die historiese prestasie van 24 markte individueel bestudeer en hul opbrengs en ooreenkomstige risiko ondersoek, met spesiale verwysing na die handelskoersfaktor. Tweedens word die statistiese tegniek van multidimensionele skaling toegepas op die 24 markte. Aangesien portfolio-diversifikasie 'n fundamentele oogmerk van enige rasonale investeerder is, sal sekuriteite van markte wat verskillende prysbewegings openbaar voordelig wees vir opname in 'n portfolio. Die metode van multidimensionele skaling lewer 'n kaartuitlegprentjie wat die belegger 'n visuele uitleg bied van die markte wat saam beweeg (t.w. beperkte diversifikasiemoontlikhede) en die wat verskillend van mekaar beweeg (t.w. dié wat goeie diversifikasiemoontlikhede skep).

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## Introduction

The abolishment of the financial rand discount on 7 February 1983 has led investment managers to believe that the current exchange control regulations are to be relaxed. This relaxation is likely to proceed in steps, according to the Director-General of Finance, Dr Joop de Loor, each step being subjected to rigorous testing before the ultimate objective of a totally unrestricted flow of funds to and from the country is allowed (De Loor, 1983).

The second step in the relaxation process took place on 5 September 1983 when the gold mines gained permission to be paid for their gold in US dollars, and they were given some flexibility in their handling of these funds. It has been suggested by Dr de Loor that the next step in the relaxation process will be that the major institutions (the life insurers, pension funds and mining houses) will be granted permission to invest a portion of their assets abroad. This will allow companies to make portfolio investments out of the country. The final step will be to permit individuals to move money in and out of South Africa at will.

In view of the proposed relaxation of the exchange control regulations as they apply to the South African investor, it is worthwhile investigating the past performance of the alternatives available to him. In this article the opportunities for increased return as well as the potential risk reduction obtained through international diversification are analysed from an ex post point of view.

## Alternative investment media

In the absence of exchange control regulations the South African investor would be able to consider an investment in common stocks (both South African and foreign), metals, or soft commodities (traded on the world's commodity exchanges). It should be noted that investors would also be able to invest in corporate or government bonds, both local and foreign. However, these securities have not been considered in this study because of the desire to concentrate on the more speculative markets. In addition, there are many other forms of non-security assets, such as real estate, art, antiques, and stamps in which an investor may invest. These assets will not be considered as they are heterogeneous in nature and market values are hard to establish for each individual item. The psychological return from owning such a non-security asset is also difficult to quantify.

For the purposes of this study the stocks quoted on the Johannesburg Stock Exchange (JSE) have been divided into seven security groups according to the first level composite indices of the JSE Actuaries Index. They are, together with the

proportion each contributes to the JSE All Share Index:	
JSE All Gold Index	(32,61%)
JSE Coal Index	( 3,15%)
JSE Diamonds Index	( 7,99%)
JSE Metals and Minerals Index	( 4,65%)
JSE Mining Financials Index	(20,00%)
JSE Financial Index	( 5,06%)
JSE Industrial Index	(26,54%)

Thus the JSE is regarded as a seven 'security' market, where each security is in fact a portfolio of similar shares aggregated into a composite index.

By far the most heavily traded of the world's exchanges are the New York Stock Exchange (NYSE) and the London Stock Exchange (LSE), and most empirical studies have been carried out on one or both of these two exchanges. The SA investor would thus be most likely to direct his attention to these markets as he is somewhat more familiar with them in comparison to other exchanges. Accordingly, these two exchanges were chosen to represent alternative stock market investments that would be available to SA investors in the event of a relaxation in foreign exchange regulations. Of course it is not intended to imply that SA investors would be limited to these two exchanges but it is probable that many of the funds invested in foreign stock exchanges would be invested in these two markets.

In investing in a foreign stock exchange local investors will have to decide between an active or passive portfolio management strategy. That is, should they actively research the company's quoted on that exchange and attempt to identify undervalued securities (i.e. an active management policy) or should they consider these markets as reasonably efficient in the sense of the efficient market hypothesis and therefore merely choose a well diversified portfolio or even an index

fund (i.e. the passive approach)? In this study we have assumed the latter. Hence a composite index from each of these two exchanges has been taken to be representative of the foreign stock exchanges. They are the Standard and Poor's '500' Index (NYSE) and the Financial Times UK Actuaries Index (LSE).

The world's commodity markets can be broadly divided into two groups — metals and soft commodities. Ten commonly quoted metals and five commonly quoted soft commodities have been chosen to represent these markets. This group is a non-exhaustive subset of all possible traded commodities. However, an examination of the past performance of these commodities will give an indication of the investment opportunities available to the SA investor in the commodities markets.

### Performance, volatility, and the currency factor

The 24 securities studied (seven South African 'securities', two foreign indices, ten metals, and five soft commodities) appear in Table 1, together with the currencies in which they are quoted. In addition, performance and risk measures calculated from month-end data for the period February 1965 – January 1980 (180 months in all) are presented. These data are all expressed in the currency of the location of the market (e.g. NYSE in dollars, LSE in pounds). It should be noted that the domestic risk is defined as the standard deviation of the annual returns over the entire 15-year period.

From the rankings of the compound annual return it will be seen that the best returns in recent years have been achieved by gold, silver, sugar, and platinum. However, these securities (as well as zinc, copper, cotton, and SA financial shares) have the largest risk, as can be seen from the rankings of the domestic risk.

**Table 1** Risks and returns (in local currencies) of 24 securities, February 1965 – January 1980

Security	Local currency	Compound		Domestic	
		return (%pa)	Ranking of return	risk (%pa)	Ranking of risk
JSE Coal	SA Rand	11,23	12	22,08	17
JSE Diamonds	SA Rand	12,44	6	31,06	12
JSE All Gold	SA Rand	11,63	9	32,48	11
JSE Met & Min	SA Rand	11,58	10	29,32	14
JSE Min Fin	SA Rand	11,86	7	20,94	20
JSE Financial	SA Rand	6,40	21	35,74	5
JSE Indust	SA Rand	5,90	23	21,50	19
Std & Poor's	US \$	1,92	24	14,85	23
UK ACT index	UK £	5,98	22	27,07	16
Lead	UK £	8,38	16	32,59	10
Tin	UK £	12,92	5	21,93	18
Zinc	UK £	8,09	17	40,70	3
Silver	UK £	19,61	2	46,66	1
Aluminium	UK £	9,74	13	13,19	24
Antimony	UK £	11,85	8	32,70	9
Copper	UK £	7,53	18	38,10	4
Nickel	UK £	11,29	11	16,34	22
Platinum	UK £	14,19	4	32,97	8
Gold	US \$	21,74	1	34,36	7
Wool	UK £	6,74	20	30,66	13
Cotton	UK £	7,15	19	34,87	6
Sugar	UK £	15,23	3	45,96	2
Wheat	UK £	8,71	15	19,91	21
Maize	UK £	8,85	14	27,67	15

**Table 2** Risks and returns (in SA rand) of 24 securities: February 1965 to January 1980

Security	Compound		Exchange gain (%)	Total risk	Ranking of total risk	Domestic risk (%)	Exchange risk (%)	Coefficient of variation
	annual return (%)	Ranking of returns (%)						
JSE Coal	11,23	11	0,00	22,08	14	22,80	0,00	1,97
JSE Diamonds	12,44	6	0,00	31,06	8	31,60	0,00	2,50
JSE All Gold	11,63	8	0,00	32,48	6	32,48	0,00	2,79
JSE Met & Min	11,58	9	0,00	29,32	10	29,32	0,00	2,53
JSE Min Fin	11,86	7	0,00	20,94	17	20,94	0,00	1,77
JSE Financial	6,40	21	0,00	35,74	3	35,74	0,00	5,58
JSE Indust.	5,90	22	0,00	21,50	16	21,50	0,00	3,64
Std & Poor's	2,84	24	-1,05	20,48	18	14,85	8,16	7,21
UK ACT index	5,44	23	0,67	31,46	7	27,07	10,05	5,78
Lead	7,82	16	0,67	25,24	12	32,59	10,95	3,23
Tin	13,34	5	0,67	18,07	21	21,93	10,95	1,35
Zinc	7,53	17	0,67	33,26	5	40,70	10,95	4,42
Silver	26,14	1	0,67	19,51	20	46,66	10,95	0,75
Aluminium	9,17	13	0,67	15,63	23	13,10	10,95	1,70
Antimony	11,27	10	0,67	37,09	2	13,19	10,95	3,29
Copper	6,98	18	0,67	30,93	9	38,10	10,95	4,43
Nickel	10,72	12	0,67	12,19	24	16,34	10,95	1,14
Platinum	13,60	4	0,67	22,06	15	32,97	10,95	1,62
Gold	22,84	2	-1,05	19,57	19	32,97	8,16	0,86
Wool	6,81	19	0,67	29,13	11	34,36	10,95	4,28
Cotton	6,60	20	0,67	33,43	4	30,66	10,95	5,04
Sugar	14,63	3	0,67	42,55	1	34,87	10,95	3,59
Wheat	8,15	15	0,67	17,07	22	54,96	10,95	2,09
Maize	8,29	14	0,67	22,90	13	27,67	10,95	2,76

This information is not of great relevance to the South African investor as all the returns and risks in Table 1 are calculated from prices expressed in local currencies. More meaningful figures for the South African investor would be those calculated when the prices are all expressed in SA rands.

Table 2 contains performance and volatility figures for all 24 securities in rand terms for the same 15-year period, namely February 1965 – January 1980. The domestic risk is defined in the same way as before. The total risk is defined as the standard deviation of the annual returns of each security (in SA rands) over the entire 15-year period, while the exchange risk is the standard deviation of the returns of the US dollar and UK pound exchange rates (expressed in per cent per annum). The exchange gain is the percentage return per annum for each of the two currencies under study (Solnik & Noetzelin, 1983). This indicates how these currencies have moved relative to the South African rand over the entire 180-month period. This is positive in the case of UK pounds-quoted securities (indicating an overall appreciation of the rand against sterling), negative in the case of US dollar-quoted securities (indicating an overall depreciation of the rand against the US dollar) and of course zero in the case of the South African securities.

Table 2 indicates that the best returns from a South African investor's point of view would have been achieved by investing in gold, silver, sugar, and platinum. Sugar, antimony, and the South African financial shares tend to be the most volatile. Of interest is that both gold and silver are only moderately risky to the South African investor. This is because the correlation between these securities and the exchange rate was large and negative, thus 'smoothing' out the price series. When the standard deviations of returns of these series are calculated they are much smaller than those of the original series. They

are thus less risky to the South African investor if held in rands rather than in dollars or pounds sterling. The South African securities appear to be less attractive to the South African investor since their rankings, according to total risk, have decreased by three or four places on average whereas their rankings according to return have hardly changed.

The coefficient of variation is a measure of the relationship between the return and the risk in SA rands. In essence, it expresses the risk per unit percent of return. Thus, if an investor values return and risk equally, the lower the value of the coefficient of variation, the more desirable is the security. It is clear from Table 2 that silver, gold, and nickel offer the best return for their risk levels. Both US shares and UK shares as well as most of the soft commodities are undesirable from this point of view.

It is clear that the exchange rate had a significant effect on the performance and risk of these securities in the 15-year period studied. It is also important to note that the securities which prove desirable to a South African investor in terms of risk and return may not be as desirable to a US investor when the base currency used is US dollars.

Furthermore the difference between volatility (risk) in SA rand and in local currencies is always smaller than the exchange risk, owing to the low and even negative correlation between security prices and exchange rate movements. This has been found to be true in general.

It can thus be seen that the variability of the exchange rate in recent years has played a major role in making certain foreign securities and commodities more or less attractive to the SA investor.

#### A multidimensional scaling approach

Modern portfolio theory has shown that in assessing the value

of a particular investment it is not the total variability of the return which is of paramount importance but rather the co-variability or co-movement of the security with all other securities available to the investor (Sharpe, 1964: 425 – 442). Thus the risk measures presented in Tables 1 and 2, while of interest, may be misleading in that they indicate total risk and not systematic risk. The tables therefore give no indication as to which foreign securities would provide the best diversification opportunities for a South African investor. To measure systematic risk correctly, we would require a world-wide soft commodity, metals, and securities index. Unfortunately such an index does not exist.

However, using the statistical technique of multidimensional scaling (Kruskal, 1964a: 1 – 27 and 1964b: 115 – 129) a pictorial representation of the co-movement between a number of investment alternatives can be obtained. More formally, it can be said that the technique of multidimensional scaling can be used to display the price series of a security through time as a single point in two-dimensional space. When this is done for a number of such price series a map of the points, as well as their proximities, distances, and groupings can be obtained (Greenacre and Underhill, 1982: 183 – 268). Clearly the closer the points, the greater the degree of their co-movement and hence, the less their diversification potential when held together in a portfolio.

A scaling of the 24 securities for the entire 180-month period covered by the data is presented in Figure 1. This scaling was derived from using the correlation between the price series of each pair of securities as a measure of the similarity between the securities. As mentioned above, the closer two points in the plot, the higher their degree of co-movement. Conversely, points far apart represent good

diversification opportunities.

It will be noticed that any movement towards the right-hand side of the plot implies an increasing likeness to South African securities. In the left half of the plot lie all the metals, soft commodities, and foreign exchanges, while all the South African securities lie in the right half of the display. Exceptions are the SA gold shares and the SA coal shares. The former are probably more closely related to the price of gold and other precious metals than to other South African shares, while the latter might be reflecting a dependence on exports — that is, world-wide rather than South African influences.

There appears to be a tendency for increasing liquidity and durability of the securities in question from the top to the bottom of the display. Thus the world's stock exchanges (the most liquid of the assets under study) which are represented by indices on the NYSE, LSE, and JSE appear in the top half of the display. An exception is the SA gold shares but these are very dependent on the gold price as discussed above. The metals, which are less liquid, are all situated close to the horizontal axis of the display (with the exception of zinc). The soft commodities lie in the bottom half of the display, and these are the least liquid of all the securities considered.

A share of stock of a company is considered as a perpetuity, and will only cease to exist if the company ceases to exist. Thus shares are extremely durable investments, and are mainly in the top half of the display. On the other hand the soft commodities are of short durability, and hence are positioned in the bottom half of the display.

It will be seen that 'cluster loops' have been arbitrarily inserted to group various securities according to type (e.g. precious metals, soft commodities, etc). These loops serve to indicate that the two foreign stock exchanges considered

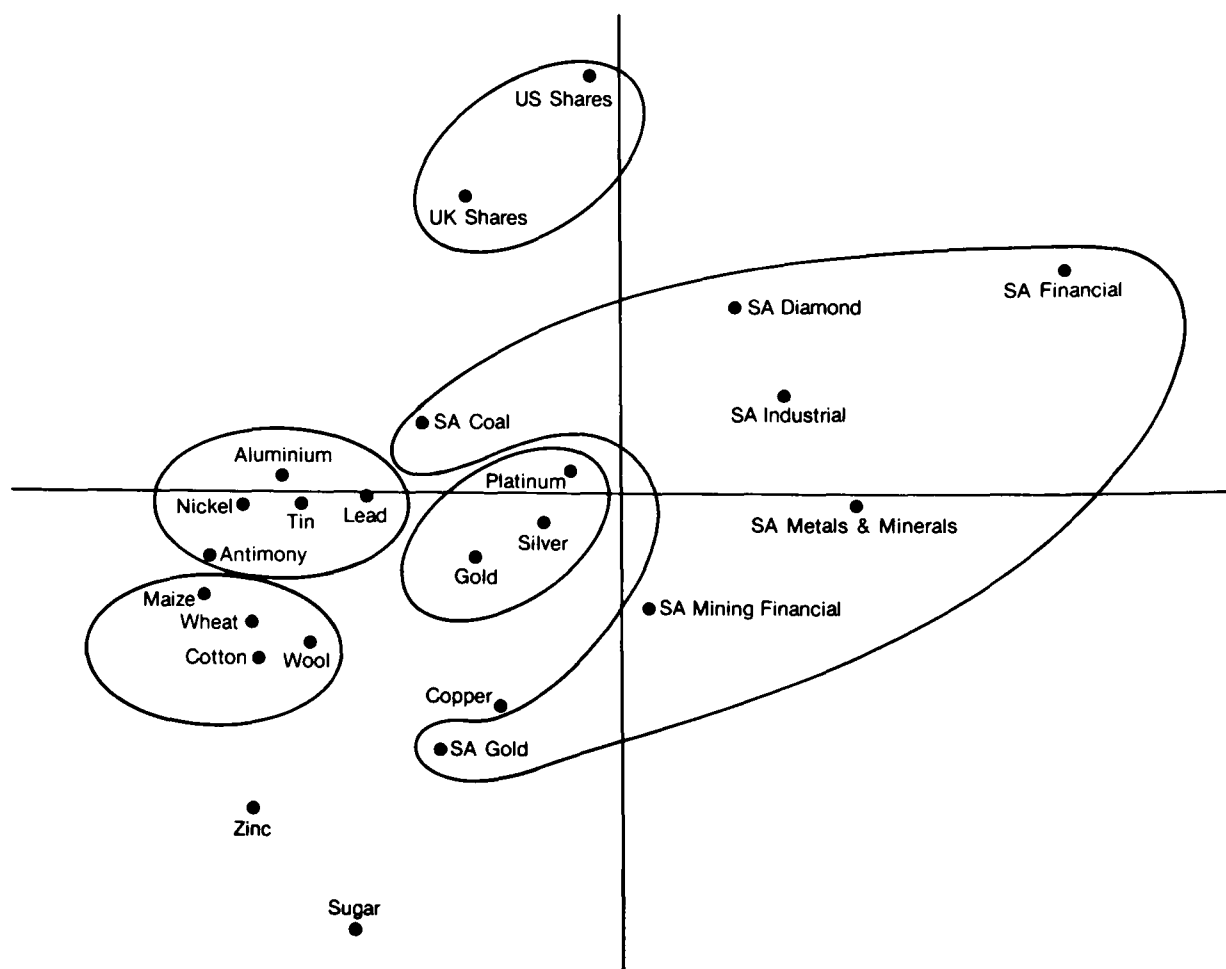


Figure 1 A multidimensional scaling of 24 securities and commodities

(NYSE and LSE) tended to show similar price movements to one another, but these movements were not highly correlated with the other securities considered. Likewise the soft commodities (with the exception of sugar) are very tightly grouped, indicating similarity within the group. These securities are positioned far away from all South African securities, indicating low or even negative correlation with these securities. The same applies to the group of industrial metals consisting of nickel, antimony, tin and aluminium, although in this case the South African investor could have got close to this market by investing in the coal sector of the JSE.

It is well-known that the risk of a portfolio can be reduced by investing in securities which have low or negative correlation with one another. From the above it becomes clear that the addition of soft commodities or industrial metals to a South African investor's portfolio will serve to reduce the risk within the portfolio. The two foreign stock exchanges were shown to have produced small annual returns relative to the other securities considered (Table 2) with relatively high risks, but from Figure 1 it is clear that their price movements did not behave like any of the other securities considered and hence they would provide risk reduction opportunities for the South African investor.

### Conclusion

The results presented in this article indicate some of the risk and the return benefits which would have been possible for South African investors over the period 1965–1980 had exchange control restrictions not been in operation. In particular three important conclusions emerge.

Firstly, in terms of return only, the South African investor has been well served by the JSE with only silver, gold, sugar, and platinum providing clearly superior returns over the 15-year period.

Secondly, because the exchange rate fluctuations of the rand to the dollar and the pound tend to be counter to major movements in the commodity markets, it would appear that South African investors have less total risk when holding these commodities in comparison with investors holding the commodity in the countries in which the markets are actually situated. Thus, for example, the South African investor has less total risk when investing in silver on the London Metal Exchange than does a UK investor.

Finally, in terms of diversifiable opportunities, the South African investor would be best served by looking to foreign stock exchanges and the soft commodities markets. While the metal exchanges do offer high return, much of this movement can be mirrored by South African investors through the Metals and Minerals Sector of the JSE. They therefore offer limited diversification opportunities.

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