The Investment Analysts Journal

Number 32 – Summer 1989/90

Die Beleggings-ontleders Tydskrif

Nommer 32 – Somer 1989/90

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Inhoud

This issue in brief

The use of ex post inter-country correlation coefficients to predict gains from international portfolio diversification from the standpoint of a South African investor

In the past, South African investors would have benefited from including foreign securities in their investment portfolios. Such diversification requires the investor to predict future patterns of price movements on stock exchanges in different countries. The author investigates the stability of the relationships between national stock exchanges over the period 1969-83, by means of inter-country correlation coefficients. His analysis suggests that, with regard to the countries included in the analysis and the period of time involved, for South African investors the conditions required for successful international portfolio diversification are satisfied.

The welfare effects of a boycott on investment in South African secureties

This paper by Professor R A Brealey and E C Kaplanis, both of the London Business School, deals with how an investment boycott reduces the degree of portfolio diversification as well as forcing a cut in share price in order to keep shares sufficiently attractive. The combination of these two effects on the welfare of the boycotters and the boycotted are assessed. Their findings will be of general interest to all our readers.

Should MBA students study the Theory of Finance?

Any practising manager who is sceptical about the usefulness of managerial theory would no doubt find it difficult to reconcile this view with the high value he very probably attaches to the academic qualification MBA. The focus of Professor Firer's paper is on the theory of financial management, and why it should be taught to MBA students. The abstraction inherent in financial theoretical models creates a gap between the business school and the real business environment, but this is a gap which can be bridged. Theory and practice can suggest different solutions to the same financial problem, and it is one of the tasks of the MBA programme to clarify the ways in which theory and practice relate to one another.

The determination of the price of South African stock index futures contracts

This discussion draws from a broad framework and looks at the expected price of the deliverable instrument by using a relatively simple arbitrage relationship to set limits on the price of the futures instrument. The discussion progresses from a relatively simple case where no dividends and a zero tax rate are assumed, to a case where dividends and taxes are included in the model.

Investment basics XXIII – Technical analysis

In this introductory article, the authors distinguish between "fundamental analysis," which entails a detailed estimate of companies' financial prospects, and "technical analysis," which makes use of historical data (share prices etc.) to predict future short term movements. Can technical analysis be relied upon to indicate the direction of investment taken by those in possession of private information and who are consequently in a position to make more informed decisions? This is a question the article attempts to answer. Subsequent articles will review some of the tools employed in technical analysis.

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

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

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The Investment Analysts Journal

Thirty-second issue – Summer 1989/90

Die Beleggings-ontleders Tydskrif

Twee-en-dertigste uitgawe – Somer 1989/90

The Investment Analysts Journal has received the following poem from a contributor. He is not a member of the analytical profession; nor is he from the white business establishment. Yet his message has a simple power and is one all those of the financial community would do well to heed as South Africa moves towards a new and challenging future. The gap that separates the poet and the people on whose behalf he speaks, and the privileged members of our vigourous, self-confident, industrial society, is a gap that must be narrowed if we are all to realise the future that we want for ourselves and our children.

The Editor

Die Beleggingsontleders Tydskrif het die volgende gedig van 'n bydraer ontvang. Hy is nie lid van die ontleedkundige professie nie; nóg kom hy uit die blanke besigheidsestablishment. Tog het sy boodskap 'n eenvoudige innerlike krag en die finansiële gemeenskap kan met vrug ag daarop slaan in die huidige klimaat waarin Suid-Afrika sterk beweeg in die rigting van 'n nuwe toekoms vol uitdagings. Die gaping wat daar is tussen die digter en die mense namens wie hy praat aan die een kant, en die bevoorregte lede van ons lewenskragtige en selfversekerde nywerheidsgemeenskap aan die ander kant, is 'n gaping wat vernou moet word indien ons almal daadwerklik 'n mooi toekoms vir onsself en ons kinders wil skep.

Die Redakteur

I CAN'T UNDERSTAND

The function of the economist
Who pulls wool over eyes
Shielded by catchy words
Of inflation, depression and recession,
I can't understand.

As long as I've got some money
Buy some food, wear some clothes
Untie the noose around my neck
Business must wait with their financial reports
For I can't understand.

Import and export, what is that?
When the country is crying for food
Wailing for a better education
To make me understand what I can't understand.

Gold and platinum are holding their own
Against the world's currencies
In the corridors of the earth's stock exchanges
Where dollar dominates and is stronger than metal
The yen, franc, sterling, Deutschmark and oil are secondary
That's what I can't understand.

Universities are there
Next to poverty here
Begging for more knowledge
Yet I can't understand.

There's talk of soaring budget deficits
Accepting debits and credits
And an allegiance to the shareholder
Safeguards of profits through loans
But that leaves me unclear
For I can't understand.

Foreign exchange rates
Coupled with capital yields
Do not control price indices
Rural folks are hungry
Child mortality rate is high
So I can't understand.

The politician doesn't want to marry business
There's love lost between the two
They are both rich
Looking out for losses in their interests
I really can't understand.

Operation Hunger, World Vision,
Those are charities that benefit
From the tall towers of business
But at the end of the day
After dividends, they still manage more profits
So I can't understand.

Black workers are ever striking
For a better living wage
Thinking of the company's constitutional protective page
Yet they get fired.
Factor capital yield is beyond imagination
That is a business I can't understand.

Directors lauded world over
Belong to exclusive clubs
Lavishing one another with praise
Forgetting about those who maintain
Their businesses with loyalty
I really can't understand.

Moving around in expensive cars,
In the lap of undreamt luxury
Swilling beers and vintage wines
Flying anywhere in the world like birds
I really can't understand.

Profits sponsor sports and sportsmen
Who've never set foot in this factory
But are the reapers from our sweat
Robbing us of an increment
After twelve months of exploitation
Man!! I want an answer for I can't understand.

Tayfield Nzo

The future may not be ours to see, but it is ours to build.

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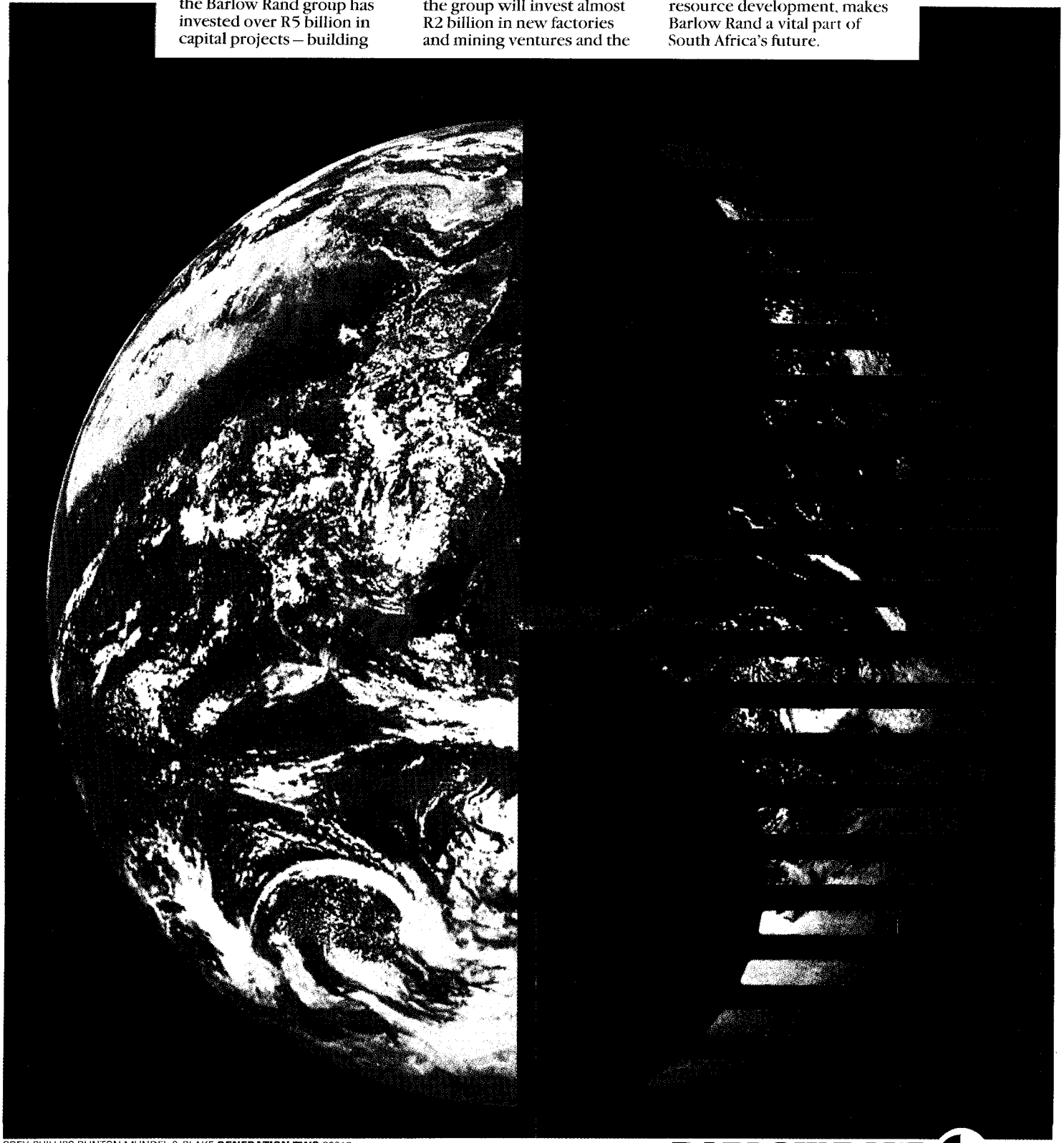

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The use of ex post inter-country correlation coefficients to predict gains from international portfolio diversification from the standpoint of a South African investor†

Introduction

In recent years several investigators such as Bhana (2), Barr (1) and Van den Honert (11) have demonstrated that South African investors would have derived substantial benefits by including foreign securities into their portfolios. If the past results are considered to be indicative of future developments, then these results suggest that future international diversification of portfolios is likely to be profitable and South African investors should take advantage of the benefits it offers.

However, the composition of optimal international portfolios is based on ex post data. This approach allocates investment funds after reviewing the results of a period that has already passed. Makridakis and Wheelwright (7) have demonstrated that in order to realise the potential gains from portfolio diversification, the investor must be able to predict future relationships among the price movements of two or more different national stock exchanges. This condition must be satisfied before the ex post benefits of international diversification can be realised on an ex ante basis. Watson (12) has shown that the above condition would be fulfilled if the relationship between the national stock exchanges were stable over time.

The stationarity of inter-country correlations during the 1969-83 period

The purpose of this investigation is to examine the stationarity of the correlation coefficients of the annual returns of the share market indices of the countries represented in optimal international portfolios during the 1969-83 period. This investigation extends an earlier study by Bhana (2), and as the methodology for the calculation of annual returns of the various countries' market indices remains unchanged, it will not be reproduced here. However, to facilitate an understanding of the analysis the inter-country correlations and annual returns are presented in Table 1.

Table 1: Rates of return, standard deviations, and coefficient of correlations of equity investments for 18 selected countries during 1969-83

Country	Compound annual return (percentage) (1)	Standard deviation (percentage) (2)	Correlation (r) with South Africa	
			Industrial shares (3)	Gold mining shares (4)
Australia	10,84	20,06	0,7055	0,0795
Austria	9,19	14,63	0,0346	0,1471
Canada	14,07	18,48	0,6718	0,1589
Denmark	20,80	29,15	0,1445	-0,3204
France	7,24	21,24	0,3904	0,0021
Finland	20,54	20,45	0,1609	0,1304
Germany	15,14	17,07	0,0882	-0,5326
Italy	0,06	16,35	0,5606	0,2970
Japan	25,60	21,99	0,1432	-0,3562
Netherlands	11,97	14,91	0,1441	-0,4383
New Zealand	12,11	15,61	0,4385	-0,1048
Norway	12,77	24,25	0,3742	0,2774
South Africa (Industrial shares)	11,77	21,43	1,0000	0,4800
South Africa (Gold mining shares)	22,45	50,17	0,4800	1,0000
Spain	1,97	21,48	-0,1117	0,0773
Sweden	18,08	20,52	0,1534	0,0125
Switzerland	16,10	18,32	0,2698	-0,4242
United Kingdom	13,11	22,35	0,2127	-0,4548
U.S. of America	12,18	18,76	0,2195	-0,3329
Average	13,44	19,74	0,3200	-0,0200

To test for stationarity, the inter-country correlation coefficients were calculated for different sub-periods of the study period. Three tests of stationarity were performed: First, the inter-country correlation coefficients were tested to determine whether they changed significantly, either from one three-year period to the next, or between the three five-year sub-periods. Secondly, the annual inter-country correlation coefficients were regressed over the fifteen-year period of study to determine whether they varied significantly over the 1969-83 study period. The third test of stationarity will determine if the correlation coefficients for the different holding periods are equal.

The results of the first test of stationarity of the inter-country correlation coefficients (South African gold mining shares and other countries included in the optimal portfolios) are presented in Table 2. It has been shown by Bhana (2) that South African industrial shares and certain overseas countries do not form part of efficient portfolios available to local investors and this group was excluded from the analysis. As can be seen from Table 2, only the correlation coefficients between the South African gold mining shares and Denmark (1972-74 sub-period), Germany (1972-74 sub-period), New Zealand (1978-80 sub-period), Norway (1972-74 sub-period), and Switzerland (1978-80 sub-period), were significantly different at the five per cent level. The conclusion from this test is that inter-country correlation coefficients, in general, did not change significantly from one sub-period to the next over the fifteen-year period of this study. However, a more detailed analysis is necessary to determine to what extent the correlation coefficients for the different holding periods are equal and to determine if they varied significantly over the entire 1969-83 period.

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†Financial assistance rendered by the Human Sciences Research Council towards the cost of this research is hereby acknowledged. Opinions expressed or conclusions arrived at are those of the author and are not to be regarded as those of the Human Sciences Research Council.

Table 2: Inter-country correlation coefficients for three-year and five-year sub-periods from 1969-83

Countries	three-year sub-periods					five-year sub-periods		
	1969-71	1972-74	1975-77	1978-80	1981-83	1969-73	1974-78	1979-83
RSA gold mining shares – Australia	0,095	0,140	0,132	0,114	0,046	0,085	0,126	0,052
– Austria	0,235	0,198	0,228	0,316	0,133	0,117	0,243	0,178
– Denmark	–0,145	0,218[a]	–0,172	–0,382	–0,415	–0,128	–0,285	–0,451
– Finland	0,025	0,036	0,132	0,009	0,183	0,018	0,241	0,176
– Germany	0,016	–0,215[a]	–0,317	–0,562	–0,515	–0,327	–0,417	–0,475
– Japan	–0,282	–0,350	–0,422	–0,317	–0,214	–0,369	–0,386	–0,276
– New Zealand	0,120	–0,128	–0,264	–0,312[a]	–0,252	0,016	–0,217	–0,142
– Norway	0,317	0,217[a]	0,351	0,291	0,194	0,212	0,421	0,363
– Sweden	0,152	0,102	0,045	0,120	0,009	0,120	0,037	0,048
– Switzerland	–0,317	–0,421	–0,317	–0,103[a]	–0,488	0,334[b]	–0,364	–0,529
– United Kingdom	0,221	–0,217[b]	0,167	–0,417	–0,386	–0,385	–0,431	–0,521

[a] Sample inter-country correlation coefficient differs from previous sub-period at five per cent level
[b] Sample inter-country correlation coefficient differs from previous sub-period at ten per cent level

Note: The tests of significance used were reported by Chou (3) for the difference between two sample correlation coefficients.

The results of the second test of stationarity are presented in Table 3. It can be seen that with the exception of the correlations between Austria and Finland, Germany and Finland, Japan and Norway, Australia and the United Kingdom, and Austria and the United Kingdom, none of the other inter-country correlation coefficients changed significantly over the entire 1969-83 study period (at a five per cent level of significance). The results of the two tests of stationarity show that the correlation coefficients, in general, have been fairly stable for the period covered by this study. In addition, it can be seen from Table 1 that the inter-country correlation coefficients were substantially less than plus one, and therefore, two important conditions for the successful implementation of international diversification appear to be satisfied. According to Yallup (13), stable and low correlations between returns is a sufficient but not a necessary condition for gains to be derived from international portfolio diversification.

Table 3: Beta coefficients from regression analysis of annual inter-country correlation coefficients over the period 1969-83

Country	Australia	Austria	Denmark	Finland	Germany	Japan	New Zealand	Norway	Sweden	Switzer-land	United Kingdom
1. South African gold mining shares	0,023	0,035	–0,021	0,051	0,071[a]	0,005	–0,008	–0,002	0,013	–0,062[b]	–0,023
2. Australia		0,013	–0,034	0,032	0,001	0,026	0,035	0,012	0,002	0,007	–0,075[a]
3. Austria			0,005	–0,151[a]	–0,012	0,052	0,057	0,022	–0,052	–0,071[b]	–0,082[a]
4. Denmark				0,042	–0,022	0,008	0,022	0,005	0,142[b]	0,021	0,012
5. Finland					0,090[a]	–0,075	–0,053	–0,042	0,014	0,029	0,003
6. Germany						0,035	0,007	–0,006	–0,022	0,006	0,022
7. Japan							0,075	0,097[a]	0,012	–0,013	0,002
8. New Zealand								0,042	0,062	0,004	–0,013
9. Norway									–0,007	0,057	–0,002
10. Sweden										0,031	0,022
11. Switzerland											0,046

[a] Regression coefficient (Beta) significant at five per cent.
[b] Regression coefficient (Beta) significant at ten per cent.

The stability of inter-country correlation coefficients using chi-square test

The correlation coefficient is a measure of the closeness of relationships between measured values of two variables. The population correlation coefficient (ρ) and its sample estimate (r) are interrelated and conform to a bivariate normal distribution. An important property of this distribution is that for a specific value of one variable, the corresponding value of the other variable will follow a normal distribution. Therefore, a statistical technique known as Students t-distribution can be used for testing the null hypothesis that the population correlation coefficient is equal to zero. However, the t-statistic is unsuitable for testing null hypotheses when the population correlation coefficient is different from zero. The objective of testing the stability of corrrelation coefficients is that several sample estimates (r's) are estimates of the same population corrrelation coefficient, which does not necessarily equal zero. Therefore, the correlation coefficients can be transformed so that statistical tables can be used. The chi-square technique can be used to transform the sample estimate correlation coefficient (r) to a quantity (z) which is distributed approximately normally.

Using the chi-square statistic we test the hypothesis that the correlation coefficients for the different holding periods (1, 2, 5, 10 and 15 years) are equal. This is in essence a test of the stability of correlation coefficients over time. The 1969-83 study period was divided into 15 sub-periods (k = 15) of one-year holding period. The chi-square statistics were derived for each of the 171 possible pairs of observations for the 18 countries (industrial shares and gold mining shares counted separately for South Africa). An acceptance was recorded for any x^2 with values lower than the critical value of x^2 (28,87) at the five per cent level. The summarized chi-square results are shown in Table 4.

Table 4: Tests of the stability of correlation coefficients[a] during 1969-83 (stable pairwise correlations in which the 18 countries are included[b])

Country	Length of sub-periods			
	2 years	5 years	10 years	15 years
Australia	1	11	14	16
Austria	1	9	10	15
Canada	1	13	15	16
Denmark	2	11	13	15
France	0	8	9	13
Finland	3	12	14	15
Germany	0	8	11	13
Italy	2	13	16	17
Japan	1	10	13	15
Netherlands	1	9	10	14
New Zealand	0	7	10	13
Norway	0	7	12	16
South Africa (industrial shares)	1	6	9	12
South Africa (gold mining shares)	0	5	7	11
Spain	2	12	14	16
Sweden	3	11	13	15
Switzerland	1	7	11	13
United Kingdom	3	15	16	17
U.S. of America	3	14	15	16
Total number of stable pairs (out of 171)[c]	13	94	116	139
stable pairs (percentage)	7,60	54,97	67,84	81,29

[a] At five per cent level of significance
[b] Maximum possible per country is 18 (two entries for South Africa)
[c] Total = Sum of column/2

The hypothesis that all correlation coefficients are estimates of the same ρ was rejected for all 171 pairs of countries for a one-year holding period. From Table 4 it can be seen that in the case of a two-year investment horizon, the null hypothesis was rejected in 158 pairs of countries and accepted in only 13 pairs. On the other hand, the results obtained by assuming investment horizons of five years, ten years, and 15 years reveal a substantially increased degree of stability of the sample correlations. Table 4 shows that the null hypothesis is rejected for all 171 pairs of countries when the assumed investment horizon is one year. However, the acceptance rate increases with each increase in the assumed investment horizon. For a two-year horizon the acceptance rate of the null hypothesis is only 7,6 per cent (13 pairs out of a possible 171). For the fifteen-year horizon, the null hypothesis is accepted for 139 pairs of countries out of 171 cases (81,29 per cent acceptance rate).

The extent to which portfolio managers can implement risk reduction through international diversification depends largely on the inter-period stability of expected returns, variances, and the correlation matrix. Lessard (6) suggested that international factors would produce a high degree of stability in the correlation structure between different countries' stock markets over time. However, Maldonado and Saunders (8) have provided evidence that rejects this point of view. They have shown that for time horizons longer than two quarters, the sample inter-country correlations are unstable. Maldonado and Saunders (8) have argued that the ex ante planning of optimal international portfolios is very hazardous and the investor would have great difficulty in forecasting the outcome of a portfolio investment decision accurately when inter-period correlations are unstable.

Shaked (10) has identified several deficiences in the methodology relating to the empirical evidence presented by Maldonado and Saunders (8), and made three significant modifications to the methodology used by the latter. The three important modifications were: instead of results based on capital gains only, both capital gains and dividend yields were used for calculating returns; correlation coefficients for all countries investigated were constructed; and real rates of returns rather than nominal returns were used for measuring performance. Shaked (10) investigated the inter-period correlation coefficients for 16 stock markets covering the period 1960-79. Shaked (10) observed that a higher degree of stability is obtained over longer periods than shorter periods i.e. the observed degree of stability of the correlation coefficients increases as the assumed investment horizon increases. The findings of the Shaked investigation are in agreement with the results of the present study which are presented in Table 4.

This investigation examines the possible benefits for international portfolio diversification from the standpoint of a South African investor. The results imply that an optimal portfolio representing 18 different countries is unstable for relatively short investment horizons. The results suggest that the efficient frontier (ex post optimal portfolio) is continuously changing, and therefore, the selection of an ex ante optimal investment strategy would be very difficult to identify for short-term durations. The results also indicate that the degree of stability in the international correlation structure increases rapidly and consistently as the investment horizon is lengthened.

The results of this investigation justify the practical use of the mean variance model by portfolio managers to allocate funds for international portfolios based on ex post data. The use of the mean variance model is especially justified for investors seeking international portfolios with medium-term and long-term investment horizons. The high degree of stability observed for longer investment periods suggests the existence of some "noise distortions" that impede the flow of

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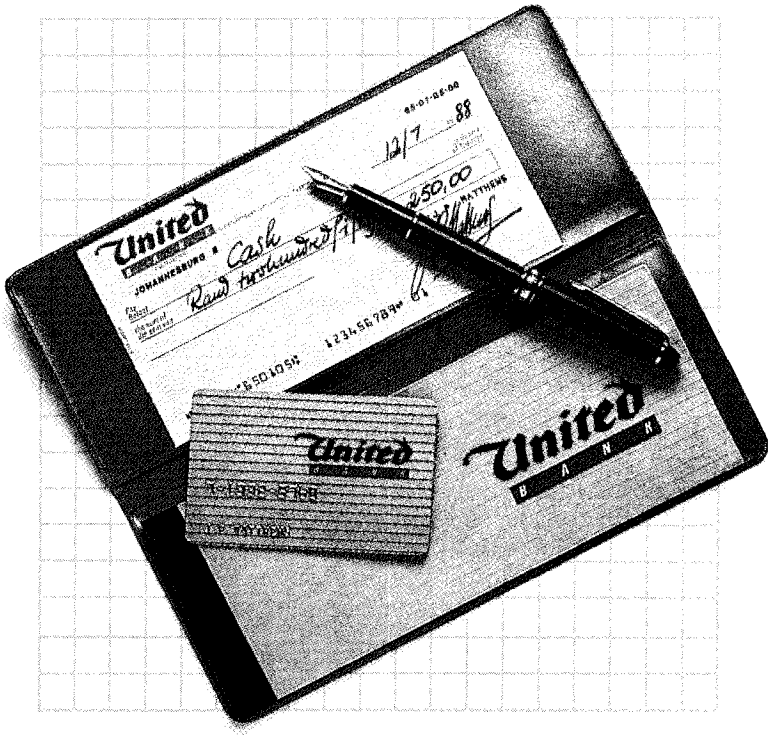

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certain international factors that would produce a degree of stability in the correlation structure between different countries over time. These results are exploratory and present a fertile area for further investigation.

An evaluation of the stationarity of correlation coefficients

Roll (9) has shown that a necessary and sufficient condition for gains to be derived from portfolio diversification is that the sample minimum variance portfolio contains at least two non-zero investment proportions. Simply studying the sample minimum variance portfolio has the advantage that investment proportions of this portfolio are independent of expected returns and depend only on the sample covariance matrix. This relaxes the difficulty of assuming unrealistic (negative) expected returns. Therefore, a study of the minimum variance portfolio is a method of indirectly examining the stability of the correlation structure as well as showing directly if there are benefits from international diversification. This study has made use of the minimum variance portfolio as well as tests of stationarity to determine potential benefits (ex post) from international diversification. It is therefore submitted that sufficient evidence has been provided to demonstrate that international diversification is beneficial to South African investors.

As argued above, the stability of correlation coefficients is only a sufficient and not a necessary condition for correlation structure stability. Accordingly, tests of stationarity do not imply that one can estimate ex ante returns from portfolio diversification. The ideal situation would be to identify the stochastic process underlying ex post returns. It is submitted that tests of stationarity suggest that ex post inter-country correlations can be used to achieve gains from international diversification beyond those available to the investor who pursues a naive strategy. However, if return-generating data could be provided by another (stochastic) process, even better predictions on portfolio performance could be obtained than those provided by ex post data.

Elton and Gruber (4) have shown that for domestic portfolio construction there is great difficulty with respect to compiling an accurate matrix of correlation coefficients. The reason for this is that the organizational structure within which security analysis is typically performed does not lend itself to extensive inter-company analysis. Moreover, at the international level, in addition to the usual difficulties of performing domestic security analysis, the analysis of foreign securities is likely to be beset by such difficulties as fluctuating exchange rates, government interference in the capital and foreign exchange markets, varying accounting standards and disclosure requirements across countries, and language barriers. Hence, it is unlikely that security analysts will generate accurate estimates of future correlation coefficients between all pairs of domestic and foreign securities. Consequently, some type of forecasting model is desirable for obtaining accurate estimates of the future correlation structure of international share prices.

Eun and Besnick (5) have evaluated 12 alternative forecasting models that can be used to estimate the correlation structure of international share prices. The National Mean Model dominates all other models in terms of forecasting accuracy. This result confirms earlier findings that there is a strong country factor influencing the return-generating process. This study also observed that the Full Historical Model performed well in spite of the random noise contained in the historical data. This result probably reflects the model's ability to capture the influence of the country factor. This finding could help other researchers in developing algorithms that can be used to determine optimal international portfolios. To date no accurate forecasting model has been developed to provide accurate estimates of future correlations relating to international share prices. Therefore, the challenge to future researchers lies in developing models which might provide higher correlations between the forecast and actual correlations.

The lack of forecasting methods to predict future correlations among foreign equity investments does not preclude investment managers from using ex post data for constructing portfolios. The results of the stability of correlation coefficients suggest that the probability of success in international diversification is highly correlated with the length of the investment horizon. Therefore, the recommended investment strategy will depend on the duration of the investment horizon. For short-term investment horizons (correlation coefficients are relatively unstable), a passive strategy is preferred to an active strategy. On the other hand, for long-term investment horizons (correlation coefficients are more stable), an active strategy can be expected to outperform a passive investment strategy. The rationale for these strategies is based on the finding of increased potential utilization of ex post data for longer investment horizons.

Conclusion

This study has shown that inter-country correlations, in general, did not vary significantly with time during the period covered by this study. Furthermore, the inter-country correlation coefficients were found to be substantially less than plus one. Therefore, from the standpoint of a South African investor, the two necessary conditions for successful international portfolio diversification appear to be satisfied so far as the 18 countries in this study are concerned over the 1969-83 period. A major limitation of this study is that the empirical evidence is based on ex post data which may not be a good proxy for expected future returns. Therefore, in order to demonstrate the likely level of benefits available from international diversification, it is considered necessary for future studies to construct internationally diversified portfolios on an ex ante basis and to compare the results of such portfolios with the results of domestically diversified portfolios. Nevertheless, the results of this study suggest that ex post inter-country correlation coefficients can be used to achieve gains from international portfolio diversification beyond those available to an investor who pursues a naive investment strategy.

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R A Brealey and E C Kaplanis*

The welfare effects of a boycott on investment in South African securities

Introduction

In response to the demand for economic sanctions against South Africa, a number of investment institutions have divested from the stocks of firms doing business in South Africa.

The term 'doing business' is subject to varying interpretations. At its narrowest, divestment may be limited to the stocks of South African firms. However, a manager who decides to exclude *any* firms investing in South Africa would significantly reduce the universe of eligible stocks. For example, two years ago 40 per cent of the market capitalisation of the Standard and Poor's stocks was composed of companies that had part of their assets invested in South Africa. Furthermore, 1068 multinational companies were estimated to have invested more than ten per cent of their capital in South Africa. While subsequent divestments may have reduced the involvement in South Africa of large U.S. firms, it is clear that even a partial boycott of offending firms could have a relatively large effect on investment portfolios and stock prices.[1]

The effect of a boycott of a particular set of shares by one group of investors is twofold. First, it reduces the degree of portfolio diversification both for this investor group and for the other investors who take on larger holdings in the boycotted securities. Second, all shares must be held by somebody. So, if some investors in South African shares decide to hold them no longer, then they need to find other investors who are prepared to buy them. These other investors cannot be forced to buy and they will only be prepared to increase their weighting in South African shares if the price is sufficiently attractive. The combination of these two effects on the welfare of the boycotters and the boycotted is relatively complicated.

Although there have been a number of general discussions of the loss of diversification and some attempt to measure this loss empirically,[2] there has been little serious attempt to model the effect on welfare and to our knowledge no study has incorporated the change in equilibrium prices.

Our focus in this paper is on the effect of boycotting investment in South African securities. But our comments could apply equally well to the effects of 'ethical investment policies' which exclude investment in arms manufacturers, casinos, polluters and so on. Also, in many countries, investors are prohibited from investing overseas by exchange controls or similar government barriers. You can think of investment sanctions as being rather like self-imposed exchange controls and as having similar consequences. We have analyzed the welfare effect of exchange controls on portfolio investment in another more technical paper.[3] Our discussion in this paper both omits the algebra and represents a particular application of that work.

The issue of South African sanctions arouses understandably strong emotions. This paper neither advocates investment sanctions nor does it do the reverse. Its sole and limited purpose is to analyse the economic consequences of such sanctions.

The Motives for Boycott

There are at least two possible motives for boycotting the securities of a country of whose policies one disapproves. The most obvious purpose would be to influence the country's actions by causing hardship to its citizens and supporters. In this case an efficient boycott would presumably be one that imposes the maximum welfare loss on the boycotted at a minimum cost to the boycotter.

Notice that a boycott segregates investors into two camps. Those who don't support a boycott of firms doing business in South Africa are economically in the same position as South African citizens.[4] In effect those who are not *for* the boycott are *against* it. Yet the boycotter may not be indifferent between imposing losses on South African citizens or those of his fellow countrymen that do not participate in the boycott.

If only a single individual boycotts South African securities, he may suffer a significant loss of diversification but his action will have little effect on others. If the welfare loss for the boycotted is less than it is for the boycotter, there will be a difficulty in ensuring that the boycott is widely applied, for there will be an incentive for others to free-ride and let others carry the burden of the boycott.

A second possible motive for boycotting investment in South African securities is to serve as a gesture or a signal of the boycotter's opposition to the South African government's policies. Since words are cheap, an individual's opposition to a country's policy is more credible if accompanied by a tangible and costly expression of his views. For example, an individual who goes on hunger strike for a particular cause is much more likely to convince others of his sincerity. Investment boycotts may not be in the same league as hunger strikes but nevertheless may serve as a credible signal.

The Effect of an Investment Boycott on Diversification

We noted above that most writers on the subject of boycotts have focused on the effect on diversification. Suppose we start with a world in which there are no boycotts or other frictions. All investors in such a world would hold a well diversified international portfolio and the expected return on each security would depend on its beta relative to the world market portfolio.

Now suppose that the non-South African investor decides to boycott South African stocks. The non-South African will now have a *smaller* investment in these stocks and the South African will have a *larger* investment than he would like. Both suffer from a reduction in diversification. For each investor the loss in welfare depends on both how much his risk is increased and how seriously he regards this increase. The effect on risk depends in turn on two considerations. First, for each investor the effect is most marked when the benefits to international diversification are large – that is, when the national markets are individually risky but there is little correlation between them. Second, the effect on the risk of the non-South African's portfolio will depend on the market capitalisation of the boycotted stocks. If these stocks constitute only a small proportion of the world market, divestment will have relatively little effect on his portfolio risk.

*London Business School November 1989

[1] For ease of exposition we will consider the term 'South African securities' as embracing all boycotted stocks.

[2] See, for example, Rudd, A, (1979). Divestment of South African Securities: How Risky? *The Journal of Portfolio Management*, (Spring) 5-10, and Wagner, W, Einkin, A and Dixon, R, (1984) South African Divestment: The Investment Issues. *Financial Analysts Journal*, (Nov-Dec), pp14-22.

[3] See Brealey, R A and Kaplanis, E C (1988). The Welfare Effect of Exchange Controls on International Portfolio Investment. *London Business School.*

[4] However, for brevity we will use the terms 'boycotted' and 'South African' as synonomous.

The South African investor's position is only slightly different. He must absorb all the boycotted stocks that the non-South African sells. If South Africans are sufficiently rich they can do this and continue to hold non-boycotted stocks. If they are *not* rich, they will find that they have no funds left to hold non-boycotted stocks, so that their portfolios are made up entirely of boycotted stocks. Indeed, it is possible that they may even have to borrow to take on these stocks. Thus, for the South African, the increase in portfolio risk will be relatively small if the boycotted stocks account for only a small proportion of the world market portfolio or if he is very wealthy.

It is difficult to judge how important these diversification effects are in practice. Since the South African economy is relatively isolated and since it has a large mining component, the South African stock market largely marches to its own drum. On the other hand, South African stocks account for such a small proportion of the world market portfolio that a boycott that was restricted to South African stocks would be unlikely to affect greatly the risk of either the boycotters or the boycotted. Where the effects clearly can be important is if the boycott embraces the wider population of firms doing business with South Africa.

The Welfare Effect of Price Changes

The loss of diversification is only part of the story. The South African investor must absorb all the boycotted stocks and he will only be prepared to do so if prices change. It is possible that these portfolio shifts are sufficiently important to cause changes in the overall value of the world market portfolio, but it seems likely that by far the most important effect is on relative prices. Therefore, in our analysis, we assume that the risk-adjusted expected returns on the world market portfolio are unaffected by the boycott and we focus only on the effect on relative prices.

The crucial point about this problem is that after the boycott, individual South African investors remain free to hold the world market portfolio. Therefore, they will only take on larger holdings in boycotted stocks if tempted to do so by a price cut. That causes a further welfare loss to the non-South African, who loses both by switching to a less diversified portfolio and by selling his stock at fire-sale prices.

How far prices must fall to tempt the South African investor depends on the shape of his demand curve for the boycotted stocks. Not surprisingly, this depends on the cost to him of being less well diversified. At one extreme, if there was no increase in risk or the South African did not care about risk, his demand for the boycotted stocks would be perfectly elastic. There would be no diversification loss to the South African and he would need only a negligible price fall to induce him to take on the extra stock. However, if there is a cost to being less well diversified, the South African's demand function will be less than perfectly elastic and a significant reduction in prices will be needed.

Suppose the non-South African was not obliged to sell all his holding of the boycotted stocks at the same price. The first dollar of sales would add only slightly to the risk of South African investors and only a small price cut would be needed to offload the stock. The next dollar of sales would add still more to the risk of the South African investor and would therefore require a rather larger cut in price, and so on. The total price reduction would be exactly sufficient to compensate the South African investor for his loss of diversification and therefore his welfare would be unaffected by the boycott.

In practice such price discrimination is impossible.[5] Non-South African investors would find that they were obliged to unload all their stock at a single price. Since this price must be sufficiently low to compensate South African investors for the extra risk from taking on the last dollar of boycotted stock, it will more than compensate them for the loss of diversification. In short, the South African investor will earn a consumer surplus. The larger the diversification loss, the steeper is the South African investor's demand curve for the boycotted stock and therefore the larger the consumer surplus.

Summary and Conclusion

We have argued above that the *boycotter* will always lose from the boycott both because his portfolio is less diversified than formerly and because he is obliged to take a relative price cut on the shares that he sells. The *boycotted* will also lose as a result of the reduced diversification but this loss will always be outweighed by the fact that he can only be induced to take on the boycotted stock by a relative price cut.[6]

We assumed earlier that both groups of investor started by holding the market portfolio. If there are other costs to overseas investment which cause investors to specialise in their domestic securities, there will still be a welfare loss to the non-South African investor and a gain to the South African.[7]

We should stress the limited nature of these conclusions. Our concern has solely been with a boycott of the securities of South African firms or firms doing business with South Africa. They have no implications for sanctions on direct investment or on trade.

We have also not been concerned with the indirect effects of a boycott, though on this issue we can make two general comments. First, such a boycott is likely to encourage firms to unbundle their South African and non-South African assets, so that the effect of the boycott is limited only to the value of their South African assets. This has of course occurred as many firms have sold off their South African subsidiaries. If the unbundling represents simply a repackaging of the claims on the firm's assets, it can do no more than reduce the effect of the boycott. However, in practice there may be important secondary effects. For example, after the spin-off, the South African entity may lose access to the parent company's research output.

The second indirect effect of a boycott is that the fall in the price of boycotted stocks increases the required return on these stocks. This affects not only the required return on existing securities but also the cost of capital for new investment. If this is a matter for concern, the government can offset the effect by direct investment incentives (if necessary, financing them by a tax on those investors who received the welfare gain).

If a boycott of South African securities increases the welfare of the South African investor, one might expect that ending the boycott would reduce it again. This is not the case. The welfare gain came solely from the fact that South African investors had to be bribed to take on more South African stocks. Removing this self-imposed constraint on the boycotter does not reverse the process. Instead, removal of the boycott would allow both the South African and non-South African investor to realise a welfare gain by moving to a more diversified portfolio.

We suggested two possible motives for a boycott. One was to encourage a change in South African policy by imposing a welfare loss on its citizens. Our analysis suggests that this is unlikely to be effective. The direct effect of the boycott is to improve the welfare of the South African investor.

The second possible role of a boycott would be to signal the investor's opposition to South African government policies. Our analysis suggests that this signal does indeed have the necessary property of being costly to the boycotter.

[5] If prices did not adjust immediately and completely, individual non-South African investors would hurry to offload all their boycotted stock and individual South African investors would hold back from buying it. The actions of both would force the price to move immediately to its new equilibrium.

[6] Notice that we assumed that the expected *risk-adjusted* return on the market was unchanged by the boycott. Since the relative prices of different securities change, the value of the market portfolio could change. It is possible to show that the change in the value of the market portfolio cannot be sufficient to outweigh the loss for the boycotter or the gain for the boycotted.

[7] This would not be true if investors were able, and wished, to sell short.

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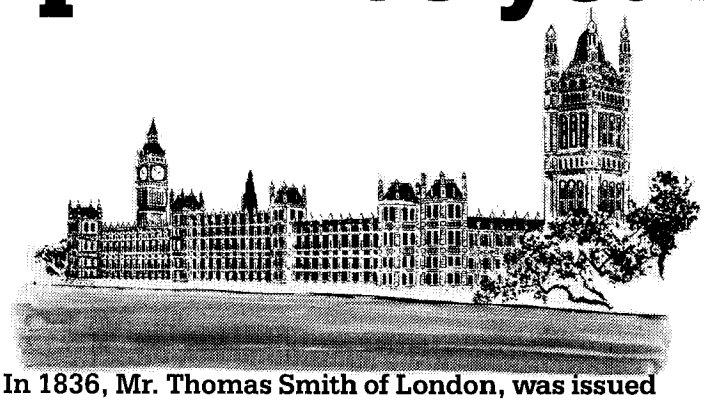

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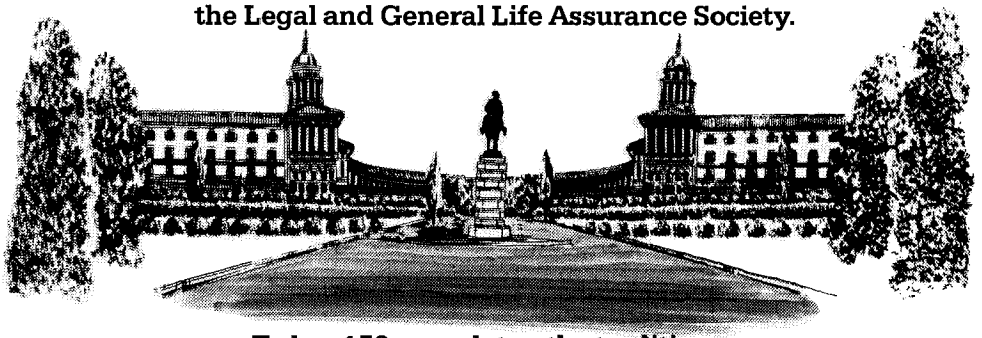

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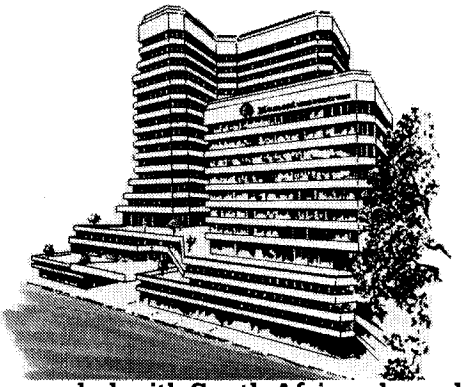

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Colin Firer*

Should MBA students study the Theory of Finance?†

Abstract

Students come to business schools to gain the skills necessary to be good general managers. This paper poses the question as to whether there is a benefit to such students to be taught theory – and in particular the theory of finance. After briefly reviewing the field of financial management, the concept of a theory is discussed. This is followed by some thoughts on why, in general, theories should be studied. The theory of risk and return is then presented as a conceptual framework for the study of finance, and it is shown how important this framework is for students of management. Some comments follow on the gap between theory and practice, and finally it is postulated that finance, when taught in a risk-return framework, may be considered to be the key subject on the MBA programme.

Introduction

Finance, like the other functional areas of business, is probably viewed by the vast majority of businessmen as an essentially pragmatic subject. After all, cash flow must be maintained by seeing that debtors pay promptly and that stocks do not rise too high, fixed assets must be acquired at the best possible price, and sources of funds must be secured to pay for these assets.

Managers who do not have the benefits of formal business school educations have, of course, been doing these things for many years.

And yet, when reviewing the academic literature in the field of financial management, one finds prestigious journals, such as the Journal of Finance, carrying very quantitative articles, which deal largely with issues relating to a subject called the "Theory of Finance". Reading such articles, let alone understanding them, is an often formidable task, quite unsuited to any but the most disciplined of scholars with a background of work at the doctoral level.

Business school students seek the knowledge and skills which will enable them to manage enterprises, and are perhaps at that stage in their careers where they are somewhat less concerned with acquiring a depth of knowledge for knowledge's sake.

Against this background, therefore, it was felt appropriate to address the question of whether, in the financial management course which all MBA students are required to take, financial theory should be presented.

The rest of the paper is arranged as follows:

The field of financial management is briefly reviewed. After discussing the concept of a theory, an overview of financial theory is presented, and some thoughts are then proffered as to why one should study theories.

The pricing of risky assets and how this provides a conceptual framework for studying finance will be addressed. Some thoughts on the debate between theorists and practitioners follows.

Finally it is postulated that finance is the keystone course in a business school curriculum.

What is Financial Management all about?

The firm is owned by its shareholders who appoint management to act as their agents in managing the enterprise. Management are thus required to operate in the best interests of the shareholders.

In finance texts, therefore, the assumption is made that the primary goal of the management of the firm is to maximise the wealth of shareholders, which translates into maximising the share price or equity value of the firm.

Whilst one may argue that it is the duty of business to commit at least a portion of its profits to social upliftment programmes, unless the fundamental objective of the firm is to maximise the returns to its shareholders, that special something which separates the profit oriented corporation from more bureaucratic operations will be lacking, and the money which could have been channelled into such socially desirable programmes will simply not be created in the first place.

Wealth creation is one thing, its distribution another! In finance the focus is on creation – and the problems of distribution, other than the question of the dividend, are left to the students of business policy.

The main functions of financial management are to plan for, acquire, and utilize funds in order to maximise the efficiency and value of the firm. Thus, there are financial implications in virtually every business decision.

The major problems facing financial managers can be enumerated as follows:

(1) What assets to acquire?
A major area of concern in finance is that of capital budgeting. How should the firm select its capital projects? Which investments will create value for the firm, and which will not? How does one select from two mutually exclusive projects? Because of the long-term nature of these decisions, they will impact the future profitability of the firm, and hence its value, for years to come.

(2) What measure of current assets is needed to support the intended level of activity of the firm? Over-investment in this area will cause severe cash flow problems; too little will impair the operating capabilities of the firm. Is there in fact an optimal level which will maximise the value of the firm?

(3) The desired level of assets then determines the level of funding which should be committed to the enterprise.

(4) What mix of capital should be used?
The financial manager can select the proportions of equity and debt funding to be used. It must then be determined how much of the equity should be raised as new capital and how much via retained earnings. Should short- or long-term debt be used? Does it make any difference to the value of the firm what proportions are chosen, and, if so, how can value be maximised using the financing decision?

(5) What dividend should be paid to the shareholders?
The question facing the financial manager is whether the proportion of profits paid out as dividend can affect the value of the firm. This decision of course links back to the mix of financing that is selected.

To summarize, a financial manager, not unlike his other functional counterparts in the firm, is primarily concerned with maximising the value of the firm. His specific problems relate to making the investment and financing decisions which will result in this goal being achieved.

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†This paper was delivered by the author at his inaugural lecture on June 1, 1988.

Financial managers must therefore have the tools to evaluate potential investment opportunities in order to be able to select those which will produce the highest return to the firm. A knowledge of the firm's operations is therefore essential.

They also require a knowledge of the workings of the capital markets so as to be able to decide where and in what quantities funds should be raised. This is tantamount to understanding how financial assets are valued.

In this brief overview of financial management some of the major issues in corporate finance have been raised. One must now turn to the theory, and where it stands in relation to these issues.

What is a Theory?

In its broadest sense, a theory is a series of interrelated constructs with rules of correspondence which relate those constructs, sometimes tenuously, to experience (Morgenau, 1966).

A theory enables one to cope with the organization of large amounts of data and to view the world in a more coherent, albeit usually somewhat simplified, way.

Theories tend to be abstract because they are not designed to solve a specific problem, but rather they attempt to explain a general class of relationships. They eliminate detail in order to promote clarity (thus avoiding the problem of not being able to see the wood for the trees).

The consequence of this is, of course, that any model deriving from the theory provides a simplified view of the world which only focuses on those variables or relationships which are thought by the theorist to be most significant.

One must not fall into the trap of dismissing a theory because its assumptions are purported to be "too far removed from reality", for that is in fact its very purpose: namely to abstract from complexity the issues deemed to be most significant in understanding the problem.

In any event, models are but stages in the process of understanding the world around us. They are always to be viewed as the foundation upon which better and more revealing models can be built.

The Theory of Finance

Finance deals with the investment decisions of individuals and firms which are linked through the supply and demand for financial securities (such as bonds, debentures, options, gilts and shares). By selling such securities, firms obtain capital for investment in real assets. The individual, in return for buying such securities, receives a claim against the firm's real assets.

Thus, the existence of financial securities presents opportunities for an inter-temporal shift in consumption through the financing of productive activities. The equating of the demand and supply of securities leads to the establishment of security prices, and financial theory seeks to analyze how the individual and firm investment decisions may be optimized.

Over the past 30 years a branch of applied micro-economics has been developed and specialized into what is known as modern financial theory. 1958/9 was an historical watershed, for it marked the publications of Markowitz (1959) and Tobin (1958), who were working on the theory of portfolio selection, and those of Modigliani and Miller (1958), whose major concerns were capital structure and the value of the firm.

Prior to 1958, finance was a largely descriptive field of endeavour. When it first appeared as a separate area of study in the early years of the present century, capital markets were very primitive, and the critical problem the firm faced was obtaining sufficient capital for expansion. Thus, finance concentrated on the legalities relating to the issuing of securities.

The unprecedented number of business failures during the depression of the thirties changed the focus of finance to corporate liquidity and bankruptcy. However the issues were still largely descriptive in nature, with emphasis on survival rather than expansion.

In the immediate post-war years, finance continued to be taught from an institutional point of view rather than from a management perspective. However, the late 1950s saw the start of a shift towards more rigorous analysis, in which the asset side of the balance sheet began to receive major emphasis. The topic of central interest at this time was capital budgeting.

In the past 30 years considerable theoretical thrusts have transformed the field into a positive science. The major aim of the predominantly academically trained finance faculty at universities today has been to develop theories to explain observed economic behaviour. Thus, researchers began asking questions of the type: "What effect will an alternative financing policy have on the value of the firm?"

Financial models can be catagorized as normative or positive. Normative models define what ought to be. Such models may pinpoint the criteria managers should use when selecting the optimal financial mix for the firm, or when deciding between mutually exclusive investment opportunities.

On the other hand, positive models attempt to describe the observed world. Such models could, for example, be used to explain differences in required rates of return for investments having differing risk characteristics.

Jensen and Smith (1984) argue that better answers to normative questions are likely to occur when the decision maker has a richer set of positive theories that provide an understanding of the consequences of his or her actions.

In the field of finance, managers in the firm are assumed to choose, from the options available to them, those opportunities which best increase shareholder wealth. One of the tasks of financial theory is to translate this rather broadly stated goal into a series of simple and easy to apply decision rules for managers.

The major building blocks of the theory, which have been formulated since 1950, are:

Efficient Market Theory – analysis of equilibrium behavior of price changes through time in speculative markets.

Portfolio Theory – analysis of optimal security selection procedures for an investor's entire portfolio of securities.

Capital Asset Pricing Theory – analysis of the determinants of asset prices under conditions of uncertainty.

Option Pricing Theory – analysis of the determinants of the prices of contingent claims such as call options.

Agency Theory – analysis of the control of incentive conflicts in contractual relations.

Thus, for example, asset pricing theory assists in formulating the capital budgeting decision, by helping to define those characteristics of a project which are important in determining its cost of capital. We can therefore approach the problem of valuing cash flows under uncertainty in a systematic way.

Many important corporate policy problems require an estimate of the value of assets which have contingent payoffs, such as call options. The equity of a firm financed in part with borrowed funds can be regarded as a contingent claim, for shareholders can be viewed as only having an option on the ownership of the firm.

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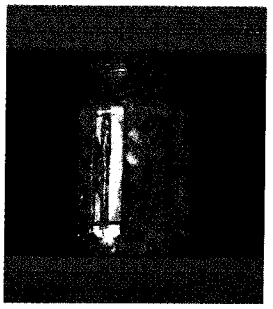

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Some Benefits of Studying Financial Theory

What benefits can be gained from studying financial theory? In order to tackle this question, one should perhaps begin by looking at the material covered in an elementary economics course. Here conceptual frameworks are developed – a good example of which is the theory of supply and demand, which enables one to estimate the probable effects of a wide variety of variables on the supply and price of goods. The theory has enabled the economist to make sense of a complex and changing world.

Thus, the possibility of direct implementation, if the manager can recognize the circumstances where a model is appropriate, is an obvious benefit deriving from the study of theory.

Against the background of a theory, it should be possible to make an evaluation of the strengths and weaknesses of a firm's existing decision-making criteria. The theory should provide the rationale for making changes.

Managers who study theory should understand the role of assumptions in the derivation of models. They would therefore have an understanding of the background to the decision rules which flow from the models, and hence should be more sensitive to the significant role of judgement when applying financial theory.

They should also become aware that not all assumptions have equal importance. Time and effort can thus be directed towards those areas which have the greatest impact on the outcome of the analysis.

A manager should become sensitive to the advantages and disadvantages of modelling, in which detail is sacrificed for clarity. Do the benefits of clarity outweigh the costs of ignoring the detail? All decisions involve simplification – the issue is, how much is appropriate?

Finally, any scientific enquiry necessarily contains the elements of:

- specification of environment to be studied, and
- the variables on which to focus.

Managers are constantly faced with an array of problems which are not well formulated or grounded in well-specified theories. Knowledge of the techniques of modelling should enable managers to increase their efficiency in formulating solutions to such problems.

The Risk-Return Model as a Conceptual Framework

One of the most important aspects of finance theory is the development of models which allow one to talk about risk in a quantifiable fashion. Perhaps a good way to indicate the importance of the theory of pricing risk to the field of financial management is to briefly review the content and structure of finance texts over the past decades.

One of the better known textbooks of the 1960s and 70s was that of Weston and Brigham (1969). In common with other texts of the time, their material tended to be organized around financial statement analysis, and the unifying, preeminent theme was the corporate balance sheet. Thus, one typically found chapters on topics such as ratio analysis, profit planning, forecasting, working capital management and the decision rules for capital budgeting.

The focus of these texts did represent an enormous step forward from the material typical of earlier decades, for it changed the emphasis from descriptive to analytical material.

O'Connor and Buesco (1980) have argued that after completing a "traditional" course as outlined in Weston and Brigham, students should be able to analyze financial statements, know when debt is an appropriate means of financing, have a view on the capital budgeting process, etc, but would probably not develop an understanding of how the various financial decisions relate one to the other.

The enormous strides made by theoretical academicians in the 60s and 70s in the area of asset pricing under conditions of uncertainty were bound to make their mark in the newer texts. Thus the text by Brigham (1985) – Financial Management: Theory and Practice – introduces the theory of risk and return early on and leaves the chapters on financial analysis and planning to the second last section of the book.

Likewise, Pringle and Harris (1984) in their basic text: Essentials of Managerial Finance, present the theoretical, conceptual material very early on. In their discussion of the organization of the text they comment as follows: "The introduction . . . deals with the scope and objectives of financial management and the environment in which financial decisions are made." They continue:

"We then go straight into time and risk on the premise that dealing with these two factors is what finance is really all about, and it is here that finance makes its distinctive contribution to the management process. (This section of the book) is more general than the rest . . . as it deals with the concepts of finance as distinct from business financial management".

Today, in virtually all modern texts, the risk- return frame of reference pervades the material presented.

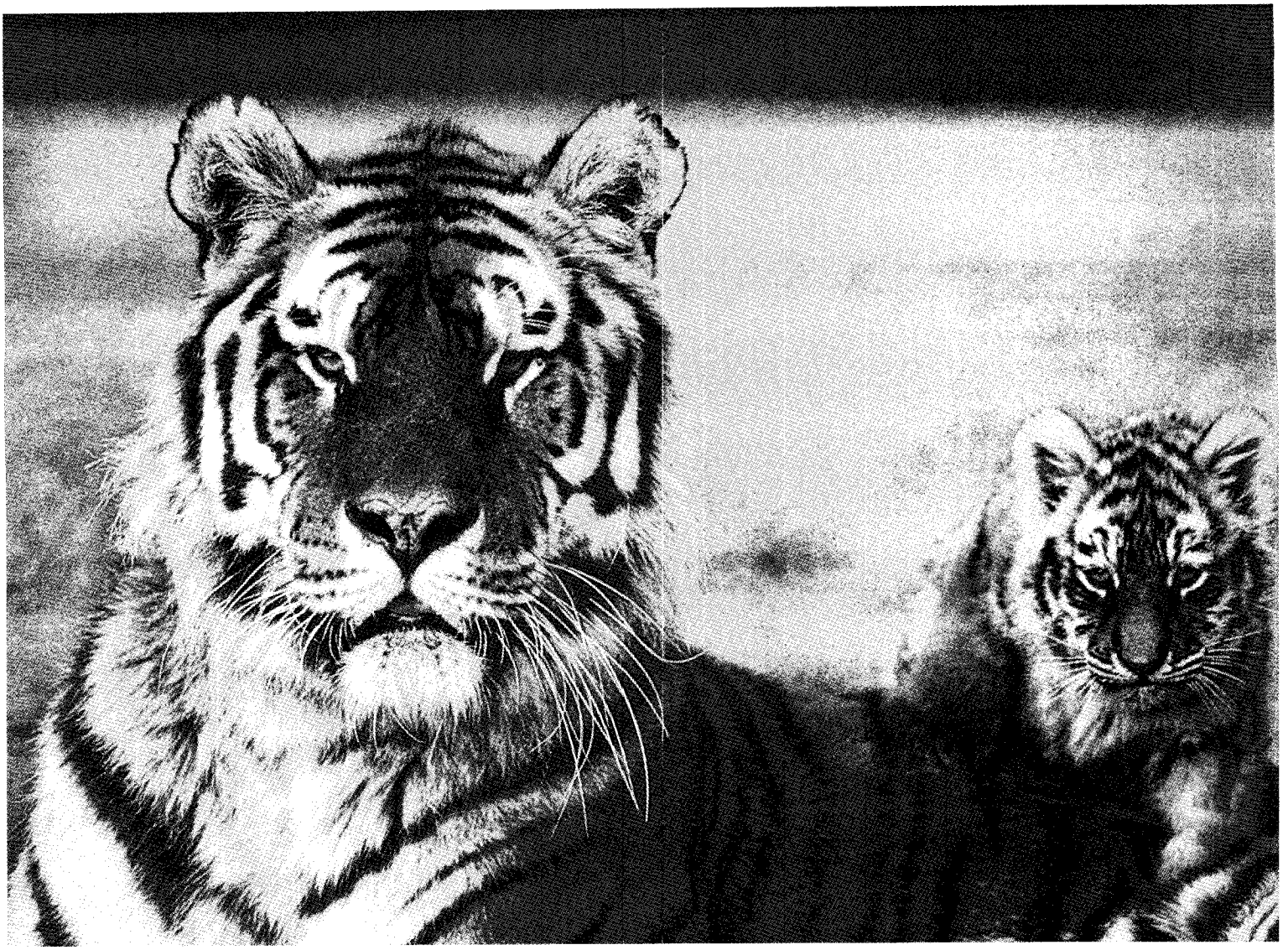
There certainly does exist some controversy surrounding the use of the Capital Asset Pricing Model. The very foundations of the theory have come under strong and sustained pressure in certain academic quarters, notably by Richard Roll, and the more general Arbitrage Pricing Model has been proposed in its stead.

However the hallmark of a good model is that, in using it, we obtain a clearer understanding of the world around us, and are in a position to make better decisions than we were previously. There is no doubt that this is the case with the CAPM.

We visualize the goal of management as being the maximization of shareholder wealth. The value of the firm, and hence its share price is affected by the size, timing *and* riskiness of its anticipated cash flows, and thus whenever management makes an important decision, its probable effect on *all* three of these variables must be considered. Risk is, therefore, an essential element of any financial decision.

Within the framework of the theory of risk and return, the cost of capital of the firm can be determined. This leads the financial manager into taking correct capital asset acquisition decisions, as well as being able to describe the issues relating to optimizing the capital structure of the firm, and to deal with the problems of valuing potential acquisitions. As these are the critical decisions which have lasting impact on the value of the firm, having a solid theoretical base upon which to take such decisions is of inestimable value to management.

It is not necessary for managers to be equipped with advanced statistical tools in order to be able to discuss and deal with risk in a meaningful way. The basic concepts of risk can be introduced in an intuitive and non-statistical way. However, there is no doubt that a good understanding of quantitative techniques enables the manager to better grasp the concepts involved.



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The model itself is extremely simple and easy to remember. The student should therefore leave the business school equipped, if with nothing else, with an overview of the most important dimension of financial decision making.

Financial Theory vs Financial Practice

How close, in fact, are financial theory and financial practice?

Hettenhouse (1981) illuminates a fundamental difference between theory and practice. Theory, he says, is "most often an attempt to generalize economic activity into equilibrium models". Practice is, however, an "attempt to identify, prolong or create conditions of disequilibrium". The question is: Can two such diverse goals have any congruence?

Certainly, just as financial theorists will puzzle over examples of disequilibrium which persist in the market place, so businessmen will regrettably observe that the competitive advantage for which they strive rarely lasts for long.

In fact, theory and practice in many ways complement one another. They draw together the short-term and the long-term perspectives and alert the players in the game to the realization that theories are but simplistic models of reality with less than perfect explanatory power, and that short-term competitive advantage in a free enterprise system is usually a diminishing asset.

On the other hand, in the world of corporate finance there are major differences in the viewpoints of "town and gown". For example:

(1) The Use of Debt in Corporate Financing:

The theory tells us that the addition of debt to the balance sheet results in increased firm value because of the fact that debt costs are tax deductible, and the tax thus saved adds to the firm's value.

Practitioners, on the other hand, believe that it is vitally important to retain financial flexibility in terms of future means of financing, thus use less debt than the theory may "prescribe", yet do not believe that firm value suffers.

(2) The Management of Market Risk:

The CAPM suggests investors are only interested in market risk, since non-market risk is diversified away.

The logical consequence of this is that managers will not be able to improve their share prices by the management of non-market risk. This runs directly counter to the notion of corporate strategy which involves matching resources and strengths with opportunities in the firm's environment. Skilful management of company-specific risk lies at the very heart of strategic management.

As an example, one of the types of company-specific risk a firm faces occurs when a competitor enters the market and begins to produce a similar product. Modern financial theory would lead one to the conclusion that this risk should not be managed (for it can be diversified by investors). However, maintaining entry barriers is a major goal in corporate strategy.

As this example demonstrates, from the viewpoint of financial strategy, managers may spend considerable effort managing non-market risk, even though financial theory suggests that equity markets will not reward such behaviour.

Thus, one can see that substantial differences exist between the perceptions of theorists and practitioners. One good reason for teaching theory to MBA students is that they are the future corporate managers. They will carry within them an overview of this division, and so should be able to recognize the benefits of marrying the two approaches. The key goal for the teacher of finance on an MBA programme is to show how the two views relate one to the other.

Although students will probably always want tools or knowledge that they can apply in the short run, broad concepts and the ability to solve financial problems should be stressed, rather than the solution to a specific problem (which many students might not face).

Business schools should be giving students concepts and an analytical framework that will improve their decision-making and serve them for many years to come.

In order to obtain the views of practising managers about the importance of understanding risk in the context of capital budgeting, Parry (1987) surveyed Southern African industrial firms in order to obtain information on the extent to which risk adjustment techniques were used in the capital budgeting process.

One third of responding firms did not use any form of quantitative method to assess risk and adjust for it. They relied, rather, on purely subjective analysis by decision makers. Of the companies that did use a quantitative technique, almost all used the most unsophisticated of the available tools.

Most respondents confirmed the hypothesis that decision-makers are not sufficiently skilled in the use of the methods of risk adjustment to fully benefit from them, but that there is a need by decision-makers for the use of these more sophisticated techniques.

One can conclude that an important part of business school education is to produce managers who are aware of, and able to use the more sophisticated techniques of risk analysis.

Finance as the Key Course in a business school Curriculum

Given that finance at a business school is taught in a risk-return framework, it can be argued that this course may well emerge as the key subject in the MBA curriculum.

In the first place, all decisions in the business environment have financial implications. Typical marketing decisions, such as changing a price or promotion strategy, affect the flow of funds in the firm. A production decision to switch to seasonal production, or to become more capital intensive, has cash flow implications. A new human resource strategy, such as to move to a system of unitary pay scales, will have a major impact on short-term budgets.

Thus, whenever management makes a decision, irrespective of the functional area of the business in which it is made, the riskiness of the cash flows emanating from the decision, in addition to their size and timing, should be estimated. This in effect 'operationalises' the notion that the probable impact on share prices, and hence shareholder wealth, should be part of every management decision.

Since many students at business schools do not go on to take finance electives at which the theory of finance can be discussed in a more detailed and rigorous way, building the introductory course around the risk-return framework not only provides them with a concept which unifies the diverse subject matter of finance, but also gives them a unique view of every business decision-making situation.

The course helps to emphasise the role played by non-financial managers in the financial process, and assists in linking together the various functional areas covered by business administration.

This integrative role, supposedly filled by the business policy course, may well, at the functional level, provide an early demonstration that management is a generalist issue, not a specialist one, and that there is a common framework within which all decisions can be analysed.

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Since this frame of reference is useful for analysing marketing, production and human resource decisions, not to mention issues which occur at the strategic level, is it too much to hope that it will not be long before this aspect of finance will be introduced into non-finance courses?

Conclusion

A serious observer of the field of finance over the past few decades will have no doubt that it has become a rich and exciting field of study.

Theory, and the vast body of accumulated evidence associated with it, have much to offer to the practising manager. Sensible analysis of many of the corporate financial problems, such as the relationship between risk and return, the valuation of contingent claims like options, and the decision to lease or to buy, is now possible.

Needless to say, many questions remain unanswered. Included amongst these are problems such as: "What is the appropriate quantity of debt and equity in the firm's capital structure?" and, "What dividend should a company pay?"

Brealey and Myers (1984) comment that our uncertainty in the capital structure issue is certainly not for want of argument on the subject – literally hundreds of learned papers have appeared in recent years. The theory is just not far enough developed to provide managers with an answer.

They also note that, whilst academics have been arguing that "dividends don't matter", and the real world has continued to pay dividends on which investors are immediately taxed, a senior vice-president of the Minnesota Light and Power Company wrote to the Wall Street Journal, obviously incensed by the yawning gap between the ivory tower and the real world:

"Dear Sirs," he wrote, ". . . while (academics are) gamboling from pinnacle to pinnacle in the upper realms of the theoretical, those of us in financial management are down below slogging through the foothills of reality!" (Wall Street Journal, August 20, 1979, p16.)

The challenge to the finance professor is to bridge the gap! There is no doubt that the manager of the future needs to understand the theoretical base upon which business is based. MBA students should unquestionably study the theory of finance.

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H A Lambrechts*

The determination of the price of South African stock index futures contracts†

1. Introduction

The price or value of a futures contract is directly related to the price of the security or commodity which is expected to be delivered against an open futures position during the delivery period. Futures prices are so influenced by the institutional characteristics of the futures market where they are traded (Kolb 1982: p101).

The general valuation principles which will be discussed in this introductory exposition are drawn mainly from the first aspect named above, ie the expected price of the deliverable instrument by using a relatively simple arbitrage relationship to set limits on the price of the futures instrument. The valuation of futures contracts by using arbitrage-enforced relationships is probably the most commonly utilized "pricing mechanism" and can be found in almost every model dealing with the pricing of futures instruments. This discussion, however, draws from the broad framework provided by three pioneering articles on the subject of the pricing of stock index futures (Cornell & French 1982, 1983) and Cornell (1984) which were published soon after trading in stock index futures had started in the US in 1982. A stock index future contract is a bilateral agreement to buy or sell a standardized quantity of a specific asset at a fixed price for a specific future settlement date on a regulated futures exchange. The valuation principles may also be applied to interest rate futures, provided that adjustments are made to reflect the characteristics of interest rate futures versus stock index futures contracts. The discussion will progress from a relatively simple case where no dividends and a zero tax rate are assumed, to a case where dividends and taxes are included in the model.

2. The pricing of stock index futures

It is assumed initially that:

- perfect capital markets exists with no transaction costs or taxes,
- short sales (ie stock is sold without actually possessing it) are not restricted in any way,
- financial assets are perfectly and costlessly divisible,
- the risk free interest rate is known to all market participants,
- the risk free interest rate will remain constant during the life of the futures transaction and is the same for borrowers and lenders,
- the futures contract is based on one underlying share which does not pay dividends.

Then it follows that the price at time t (the current time) of the futures contract to mature on time T on the above stock (denoted by FP(t,T)) would have to equal the current share price (denoted by CP(t)). It is assumed that interest is compounded annually in arrears. Therefore,

$$FP(t,T) = CP(t)(1+r)^{(T-t)} \quad \ldots (1)$$

where

FP(t,T) = the price at time t for a futures contract with maturity at time T,
CP(t) = share price at time t,
r = risk free annual effective interest rate (e.g. a Treasury bill rate) and
T – t = difference in time between t and T measured in years.

The interest rate represents the cost of carry (the differential between the cost of funds and the yield on the asset) for a share that does not pay dividends. The relationship (equation 1) between the futures price (ie the left hand side of the equation) and the maturity (deferred) value (ie the right hand side) of the current share price must hold in equilibrium. If this is not the case, traders can perform certain trades to ensure a guaranteed profit without a net investment outlay – ie a so-called riskless arbitrage portfolio can be created to achieve the required results[1].

The futures contract price is closely related to the cash price of the underlying security and therefore to supply and demand conditions affecting the cash market instrument. Arbitrage serves as the link that creates a close relationship between the futures contract price and the cash market price. It involves the simultaneous purchase of one instrument (eg the futures contract) against the sale of another (eg the cash market instrument) in an endeavour to profit from distortions between their normal price relationships. The speculator may sell the futures contract, buy the cash market instrument and hold it for delivery. This phenomenon "imposes a theoretical relationship between the cash price, the futures price and the cost of carrying the securities until the delivery date, which is found to hold quite closely in practice" (Merrick and Figlewski 1984: p11).

The introduction of dividend-paying shares into the equation reduces the intrinsic or fair value of the futures contract. The impact of dividends can be explained by using the example of two investors who make the same initial investment. One investor buys shares to the value of CP(t) at time t. It is assumed that dividends are paid annually at time $t_1 (t < t_1 < T)$ at a known constant rate of D Rand. The second investor buys Treasury bills to the value of CP(t), also at time t. He also goes long in stock index futures with maturity at time T.

If the investor who purchases shares at time t also invested all his dividends in risk free Treasury bills, the value of his portfolio (TV_1) at time T is

$$TV_1(T) = CP(T) + D(1+r)^{(T-t_1)} \quad \ldots (2)$$

The second investor can obtain the same value by adding futures contracts to his cash investment in risk free Treasury bills at time t. He would go long one futures contract at a price of FP(t,T) and simultaneously make a cash investment in short-term Treasury bills at time t worth $\{FP(t,T) + D(1+r)^{(T-t_1)}\}(1+r)^{-(T-t)}$. The value of the second investor's portfolio at time t is therefore

$$TV_2(t) = \{FP(t,T) + D(1+r)^{(T-t_1)}\}(1+r)^{-(T-t)} \quad \ldots (3)$$

*Graduate School of Management, University of Pretoria
†Paper delivered to the EBM Research Conference, 28-29 November 1988, the University of Stellenbosch.

1) The arbitrageur may initiate the following trades if the futures price is greater than the purchase price of the stock and the carrying cost until the futures contract reaches maturity, ie if $FP(t,T) > CP(t)(1+r)^{(T-t)}$
(a) Borrow CP(t) rands at an interest rate of r% p.a. and buy one share.
(b) Sell one futures contract short.

The following cash flow pattern will result at time T from the investment action taken at time t:
(i) $-CP(t)(1+r)^{(T-t)}$ . . . (repayment of debt plus interest)
(ii) CP(T) . . . (sell the share at time T), and
(iii) FP(t,T) – CP(T) . . . the difference between the price of futures contract (sold short) at maturity and the spot price of the share on the same date. The reward to the arbitrageur is $FP(t,T) - CP(t)(1+r)^{(T-t)}$, which means a riskless profit without having to make an investment from his own financial recources.

The total value of his portfolio when the futures contract matures at time T comprises the maturity value of the Treasury bills, $FP(t,T) + D(1+r)^{(T-t_i)}$, and the value (or profit) on the futures contract, $CP(T) - FP(t,T)$, or

$$TV_2(T) = CP(T) + D(1+r)^{(T-t_i)} \quad \ldots (4)$$

The end-of-period values at time T of both portfolio strategies are the same (see equations 2 and 4) and because neither strategy requires any cash payment during the intermediate period (T–t), their portfolios must have the same initial value at time t. The share price must therefore equal

$$CP(t) = \left\{FP(t,T) + D(1+r)^{(T-t_i)}\right\}(1+r)^{-(T-t)} \quad \ldots (5)$$

The futures contract price must equal

$$FP(t,T) = CP(t)(1+r)^{(T-t)} - D(1+r)^{(T-t_i)} \quad \ldots (6)$$

The price of the futures contract FP(t,T) is equal to the accumulated value (deferred value) of the current share price $CP(t)(1+r)^{(T-t)}$ less the future value of the dividends that will accrue to the shareholders. The investor who included the futures contract in his portfolio does not receive the dividends that are paid out on the underlying share. Therefore, the forward (futures) price "is reduced by the time T value of the dividends that are paid over the life of the contract" (Cornell & French 1983: p677).

The parameters that influence the futures contract price are directly observable given the assumptions underlying the perfect markets scenario. By setting the dividend yield on the share equal to the dividend received (D) per Rand invested (CP) at time t, or

$$d = D/CP(t), \quad \ldots (7)$$

Cornell and French express the forward (futures) price as a function of the share price, dividend yield, interest rate and time remaining to maturity:

$$FP(t,T) = CP(t)\left\{e^{r(T-t)}[1 - d/r] + d/r\right\} \quad \ldots (8)$$

Equation (8), using continuously payable interest rates and dividend yields, represents the same underlying principles as equation (6) but is more appropriate for the calculations that follow because of the abscence of a uniform date of payment of interest and dividends. A full theoretical derivation of equation (8) is given in Appendix 3.

In Appendix 1 theoretical futures prices implied by equation (8) are compared with quoted Rand Merchant Bank (RMB) "mid-market" futures prices on the 15th or subsequent business day of May, June, July, August and September 1988. The "mid-market" price is calculated by taking the arithmetic mean between RMB bid and offer prices. The interest rate used to calculate the theoretical prices is the interest rate on the Treasury bill that matures nearest to the maturity of the futures contract, converted to a continuously payable rate. The dividend yields based on the Johannesburg Stock Exchange (JSE) All Share Index, the All Gold Index and the Industrial Index between May and September 1988 were used to calculate the theoretical prices, also converted to continuously payable rates. The dividend yield on the All Share Index fluctuated between 4,6% – 5,3%, and 5,5%* was used in the model. The All Gold Index varied between 5,6% – 6,7% with 7% being selected for pricing purposes, while the range for the Industrial Index was 3,9% – 4,3% and 4,5% was used.*

Some of the restrictive assumptions underlying the so-called "perfect markets" pricing model in (8) are relaxed below. The assumption of a constant dividend payout pattern is relaxed to incorporate seasonal variations in the payout pattern. The model is also extended by introducing stochastic interest rates and an uniform tax rate of b% on both interest and dividends. It is assumed that these taxes are paid continuously as the interest and dividends are received. The theoretical values of the futures contract based on the extended model are then compared in Appendix 2 with quoted RMB futures prices.

The introduction of stochastic (variable) interest rates do not alter the basic model in (8) because "the forward price still equals the deferred value of the spot price minus the deferred value of the dividend payments, but now the interest rates used to accumulate the payments depend on when they occur" (Cornell & French 1983: p680). The deferred value of the current cash market price is calculated by using the rate of return on a Treasury bill r(t,T) that reaches maturity at approximately the same time as the futures (forward) contract. Dividend payments are accumulated at the forward interest rate that applies when dividends are paid out. The forward interest rate at time t for a loan transaction that will be entered into at time w and mature at time T may be defined as R(t,w,T) and the futures (forward) price should therefore be

$$FP(t,T) = CP(t)e^{r(t,T)(T-t)} - D\int_t^T e^{R(t,w,T)(T-w)}dw \quad \ldots (9)$$

Most South African companies pay dividends twice-yearly and have their year-end in either December, February, March, June or September†. It is therefore reasonable to expect that dividend yields during these five months would be higher than during the other seven months. A fluctuating dividend payout pattern may thus significantly impact on theoretical futures prices. Equation (9) is modified as follows to incorporate varying dividend payments.

$$FP(t,T) = CP(t)e^{r(t,T)(T-t)} - \int_t^T D(w)e^{R(t,w,T)(T-w)}dw \quad \ldots (10)$$

Where D(w) is equal to the instantaneous dividend payout at time w. The futures (forward) pricing model in equation (10) therefore reflects the accumulated value of the dividends lost if a futures contract is held (dividends lost equal the sum of the time T values of the dividends that are paid out at each instant during the life of the futures contract).

A uniform tax rate of 50 per cent on both interest and dividend income is assumed. Tax is assumed to be paid continuously as the interest and dividends are received. The extended pricing model is again derived by replicating a long position in shares with futures contracts and an investment in Treasury bills. It is assumed that shares are purchased at time t as well as a series of futures (forward) Treasury bill contracts to invest future dividends. The initial investment which is necessary at time t to create this portfolio is CP(t) because futures contracts do not require an initial cash investment.

The value of the "portfolio" at time T after taking tax into account is

$$FP(t,T) = CP(t)e^{(1-b)r(t,T)(T-t)} - \int_t^T (1-b)D(w)e^{(1-b)R(t,w,T)(T-w)}dw \quad \ldots (11)$$

The ordinary tax rate (b) reduces both dividends and interest and therefore also has an effect on the futures price. Lower (after-tax) dividends neutralize the lower (after-tax) interest to some extent, because lower (foregone) dividends increase the futures price while lower interest decreases the futures price. Appendix 2 compares the quoted RMB mid-market futures prices on the 15th or subsequent business day of May, June, July, August and September 1988 with the theoretical values predicted by equation (11).

3. Summary and conclusions

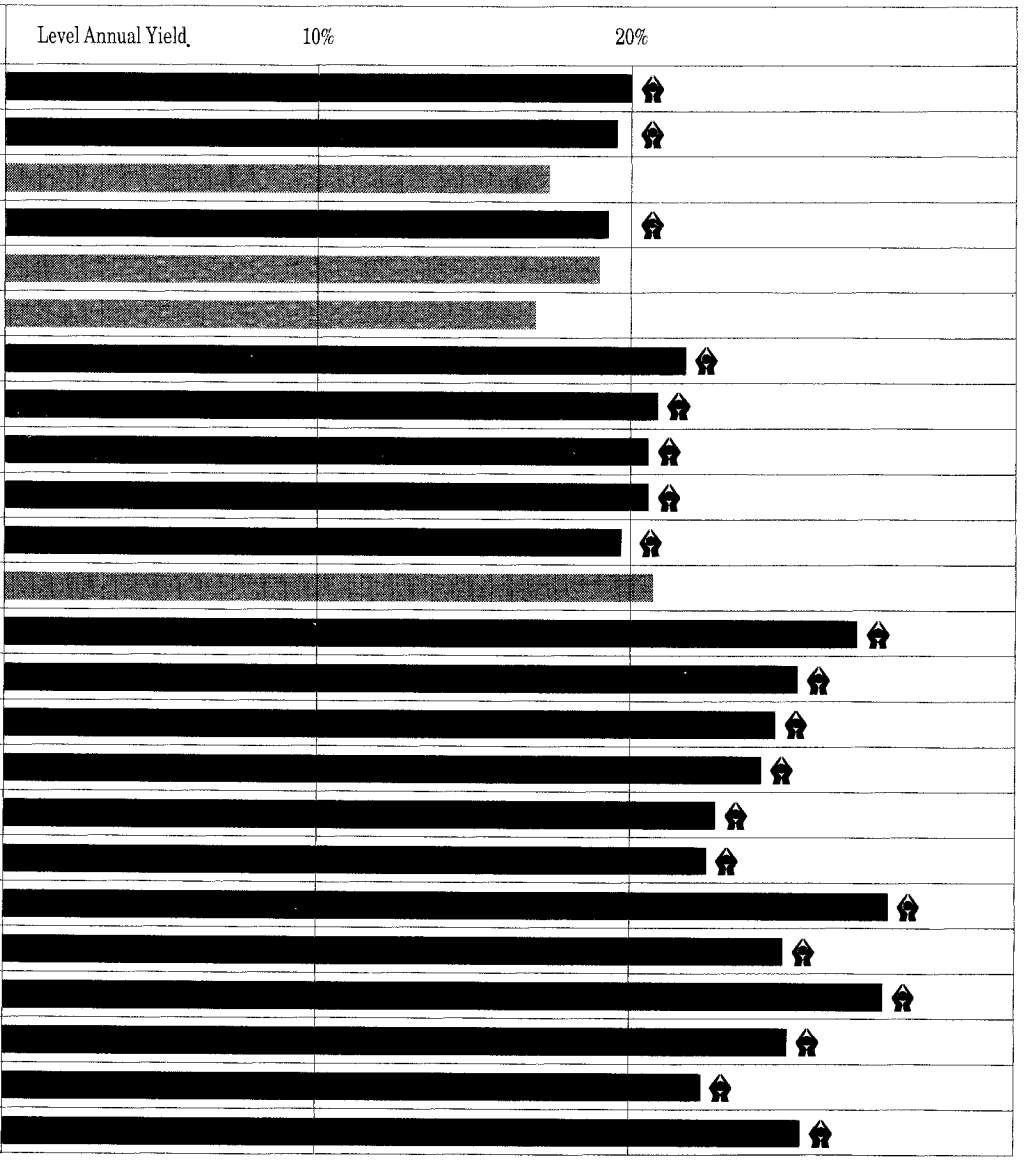
Twenty-five stock index futures prices quoted in the newspaper Business day on the All Share Index, All Gold Index and In-

* The higher dividend yields used for pricing purposes therefore caused slightly lower theoretical prices.

† According to the Bureau of Financial Analysis of the University of Pretoria 525 companies (or 95,8 per cent) out of a total of 548 quoted industrial companies have their year-end in either December, February, March, June or September.

Pictures speak louder than words.

Managed Portfolio	Premiums	Years	Tax
1	Monthly	15	Untaxed
2	Annual	15	Untaxed
3	Single	15	Untaxed
4	Monthly	15	Taxed
5	Annual	15	Taxed
6	Single	15	Taxed
7	Monthly	10	Untaxed
8	Annual	10	Untaxed
9	Single	10	Untaxed
10	Monthly	10	Taxed
11	Annual	10	Taxed
12	Single	10	Taxed
13	Monthly	5	Untaxed
14	Annual	5	Untaxed
15	Single	5	Untaxed
16	Monthly	5	Taxed
17	Annual	5	Taxed
18	Single	5	Taxed
19	Monthly	3	Untaxed
20	Annual	3	Untaxed
21	Single	3	Untaxed
22	Monthly	3	Taxed
23	Annual	3	Taxed
24	Single	3	Taxed



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dustrial Index on the 15th or subsequent business day between May and September 1988 were used in the analysis. The corresponding spot index values were also taken from the Business Day. The theoretical values of the futures contracts were calculated assuming a zero tax rate (see Appendix 1) and also assuming a 50 per cent tax rate on both interest and dividend income (see Appendix 2). These values were compared to the "mid-market" values or the arithmetic mean between the quoted daily bid and offer prices. The results from the analysis done in Appendix 2, where the maximum tax rate of 50 per cent is taken into account, will be discussed below in more detail.

The theoretical values derived in Appendix 1, by the "no-tax" model were higher than the values derived from the "richer" model in equation (11) (Appendix 2) by between 0,24 per cent for a one-month contract to 1,92 per cent for a six-month contract. The results from Appendix 1 do not detract from the general conclusions derived from Appendix 2 and are not discussed further.

In 17 cases (68 per cent of the sample) the theoretical values of the futures contracts were higher than the corresponding spot price, in one case the two prices were almost identical and in seven instances (28 per cent of the cases), the theoretical values were lower than the actual prices. The mid-market prices were lower than the spot prices in 14 instances (56 per cent of the cases) – by up to three per cent in one case. In 12 instances both the bid and offer prices were lower than the spot index. The offer prices were between 0,32 - 2,25 per cent lower than the spot index, with the bid price going down as low as 3,78 per cent below the spot value.

The results in Appendix 2 indicate that the pricing model described in equation (11) does not adequately explain the observed futures prices. The theoretical prices are higher than the actual prices in almost 70 per cent of the cases. These results point to rather obvious arbitrage opportunities "too profitable to be ignored" according to Charles Hoyt, a futures consultant from New York who spoke during a seminar on financial futures in Johannesburg. He further argued that the arbitrage possibilities or price mismatch which have occurred "to a degree rarely seen in other countries . . . existed between futures contracts on the industrial, gold and all share indices on the one hand, and the shares underlying these indices on the other" (Business Day, 7 October 1988).

APPENDIX 1

Market[1] versus theoretical values[2]

CONTRACT MONTH	DAYS TO MATURITY	MARKET PRICES	THEORETICAL VALUES
	Monday 16 May 1988		
Spot ALSI	—	1 605	—
June	30	1 585,5	1 613,17
September	122	1 611,5	1 642,69
Spot GLDI	—	1 179	—
June	30	1 189,5	1 183,54
September	122	1 204,5	1 200,64
Spot INDI	—	1 502	—
June	30	1 470	1 510,88
September	122	1 499	1 542,39
	Wednesday 15 June 1988		
Spot ALSI	—	1 721	—
September	92	1 736	1 750,56
December	183	1 737,5	1 787,15
Spot GLDI	—	1 276	—
September	92	1 324	1 293,02
Spot INDI	—	1 622	—
September	92	1 593,5	1 654,01
	Friday 15 July 1988		
Spot ALSI	—	1 881	—
September	62	1 860	1 903,28
December	153	1 860	1 944,17
Spot GLDI	—	1 399	—
September	62	1 415	1 412,01
December	153	1 400	1 436,93
Spot INDI	—	1 754	—
September	62	1 707,5	1 777,79
December	153	1 720	1 820,46
	Monday 15 August 1988		
Spot ALSI	—	1 758	—
September	31	1 770	1 768,78
December	122	1 757,5	1 805,90
Spot GLDI	—	1 272	—
September	31	1 300	1 278,17
December	122	1 313,5	1 300,13
Spot INDI	—	1 642	—
September	31	1 592,5	1 653,47
December	122	1 604	1 692,36
	Thursday 15 September 1988		
Spot ALSI	—	1 749	—
December	91	1 720	1 785,65
Spot GLDI	—	1 220	—
December	91	1 190	1 240,91
Spot INDI	—	1 672	—
December	91	1 642,5	1 711,27

Notes relating to the above tables:

1) The respective spot index values were quoted in the Business Day, while the futures contract prices are "mid-market" values, or the arithmetic mean between the bid and offer prices quoted in the Business Day.
2) The theoretical values derived by the "perfect markets model" (equation 8) are based on the assumptions that taxes are not applicable and that the risk free interest rate and the dividend yield on the respective indices remain constant until the settlement date. The respective dividend yields on the All Share Index, All Gold Index and the Industrial Index are assumed to be 5,5%, 7% and 4,5% respectively.* The range of dividend yields (%) on the respective indices between May and September 1988, were supplied by the Johannesburg Stock Exchange and are as follows:

Index	*High*	*Low*	*Dividend yield chosen**
All Shares Index (ALSI)	5,3	4,5	5,5
All Gold Index (GLDI)	6,7	5,6	7,0
Industrial Index (INDI)	4,4	3,9	4,5

The decision to use a slightly higher dividend yield for the calculation of the theoretical values of the three futures contracts causes a slight downward bias in the theoretical values. The interest rate that is used to calculate these values is the Treasury bill rate that matures closest to the maturity of the futures contract. These interest rates were supplied by Securities Discount House. The risk-free interest rate for periods between 4-6 months were estimates which had to be inferred from prime bank NCD-rates and the differences during the periods between one and three months between the Treasury bill rate and the NCD rate supplied by Securities Discount House. The theoretical values FP(t,T) are calculated from equation (8), where

$$FP(t,T) = CP(t)\{e^{r(T-t)}[1 - d/r] + d/r\}$$

APPENDIX 2

Market versus theoretical values[1]

CONTRACT MONTH	DAYS TO MATURITY	MARKET PRICES	THEORETICAL VALUES
		Monday 16 May 1988	
Spot ALSI	—	1 605	—
June	30	1 585,5	1 609,07
September	122	1 611	1 623,65
Spot GLDI	—	1 179	—
June	30	1 189,5	1 181,26
September	122	1 204,5	1 189,71
Spot INDI	—	1 502	—
June	30	1 470	1 506,43
September	122	1 499	1 521,99
		Wednesday 15 June 1988	
Spot ALSI	—	1 721	—
September	92	1 736	1 735,67
December	183	1 737,5	1 753,54
Spot GLDI	—	1 276	—
September	92	1 324	1 284,44
Spot INDI	—	1 622	—
September	92	1 593,5	1 637,88
		Friday 15 July 1988	
Spot ALSI	—	1 881	—
September	62	1 860	1 892,08
December	153	1 860	1 912,14
Spot GLDI	—	1 399	—
September	62	1 415	1 405,45
December	153	1 400	1 417,70
Spot INDI	—	1 754	—
September	62	1 707,5	1 765,83
December	153	1 720	1 786,77
		Monday 15 August 1988	
Spot ALSI	—	1 758	—
September	31	1 770	1 763,37
December	122	1 757,5	1 781,68
Spot GLDI	—	1 272	—
September	31	1 300	1 275,08
December	122	1 313,5	1 285,91
Spot INDI	—	1 642	—
September	31	1 592,5	1 647,72
December	122	1 604	1 666,89
		Thursday 15 September 1988	
Spot ALSI	—	1 749	—
December	91	1 720	1 767,16
Spot GLDI	—	1 220	—
December	91	1 190	1 230,37
Spot INDI	—	1 672	—
December	91	1 642,5	1 691,47

Note relating to the above tables:

1) The theoretical values of the futures contract prices FP(t,T) are calculated from equation (11), which can be reduced to the following:

$$FP(t,T) = CP(t)e^{(1-b)rt} - \frac{CP(t).d}{r}\left\{e^{(1-b)rt} - 1\right\} \quad \ldots (11a)$$

where d = the percentage dividend yield,
r = the respective risk-free interest rate; and
b = the tax rate (assumed to be 50 per cent).

APPENDIX 3

$$\begin{aligned} FP(t,T) &= CP(t)e^{r(T-t)} - CP(t)(d/r)\left[e^{r(T-t)} - 1\right] \\ &= CP(t)\left\{e^{r(T-t)} - (d/r)\left[e^{r(T-t)} - 1\right]\right\} \\ &= CP(t)\left\{e^{r(T-t)} - (d/r)e^{r(T-t)} + (d/r)\right\} \\ &= CP(t)\left\{e^{r(T-t)}(1-d/r) + d/r\right\} \end{aligned}$$

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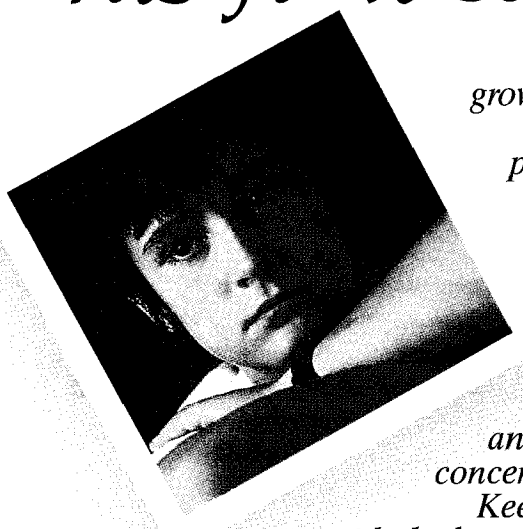

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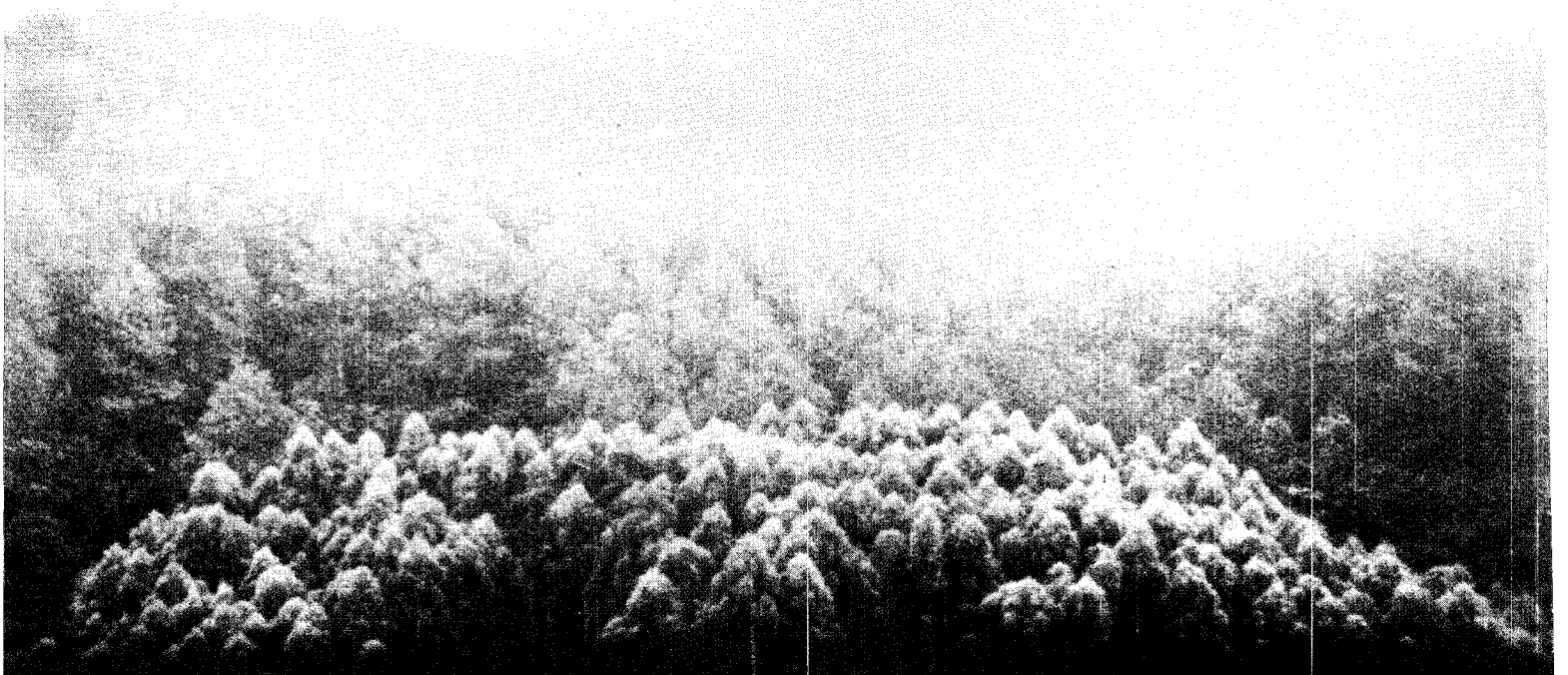

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Investment basics XXIII Technical analysis

1. Definition

The classical method for making investment decisions is the analysis of the financial prospects of all companies that are candidates for investment. A thorough analysis would require the analyst to begin with a study of trends in the economy, with special attention being given to the particular markets in which the companies operate, before proceeding to an estimate of the future financial performance of them all. Using the net present value method, for example, one can reduce the expected income from each investment to a single value that allows a comparison to be made between the alternatives.

This approach, known as fundamental analyses, requires an extensive data base on companies, their markets, and their competitors, and the economy in general. The available information needs to extend even to an evaluation of managerial ability, and prospects for new products and services.

Initially, the conclusions of all fundamental analyses will tend to be confidential, to provide those people privy to them with an advantage. However, this advantage begins to dissipate as soon as the persons concerned begin to act on the information they have. By buying shares that are priced low, or selling shares that are overpriced, they initiate actions that are reported in the daily press.

While the analyses might remain privileged, their effects have to enter the public domain.

The technical analyst believes that analysis of public information on share prices and volumes can identify shares that are in demand, or those that have lost favour, early enough to ensure a trading or investment profit.

Technical analysis can therefore be defined as the use of historical data on prices and volumes to make assumptions about the future behaviour of prices.

Traditionally, technical analysis was performed using hand-drawn charts of prices and volumes, or of various indicators that could be derived from price and volume data. The modern trend is for computers to be used to perform the analysis of complex indicators, to produce a ranking of shares to buy or sell, without the need actually to create charts for visual display.

2. Trends in technical analysis.

Murphy (1) states that technical analysis rests on three premises:

* that market prices reflect everything there is to know regarding all shares
* prices move in trends, because it takes time to achieve a correct price level
* history repeats itself.

These imply that market prices do not vary randomly, and that their behaviour is rooted in human psychology. Accordingly, it should be possible for an astute observer of the market, employing appropriate analytical tools, to anticipate what will happen next with a reasonable chance of success.

Charles H Dow laid the foundation of technical analysis during the early years of this century with what is now known as 'Dow Theory'. Observation had revealed that certain patterns occur regularly just when prices underwent significant changes in trend. Such repeating patterns can only be the result of typical changes in supply and demand when market forces move towards a major turning point.

At the time when charts were still updated manually, analysts could observe each chart as the price pattern unfolded and were therefore able to recognise selected patterns before they were complete. However, this ability was lost when advances in technology made it possible to find solutions for two factors that limited the popularity of Dow Theory, and of any other approach based on pattern recognition.

Manual charting, and the need for careful visual analysis, restrict the number of shares that can be analysed by one person. Secondly, considerable skill and experience is required to recognise the key patterns with any confidence, particularly while the patterns are incomplete.

The search continues for indicators that would be less time consuming to use, less demanding to interpret, and yet highly effective as predictors of price behaviour. Moving averages have been popular for decades, largely because they are so easy to comprehend and to interpret, while the widespread availability of personal computers has resulted in ever more complex indicators, such as the Relative Strength Index or the Stochastic Indicator.

These popular indicators share the characteristic that they produce clear and unambiguous buy and sell signals, and are therefore very simple to apply, irrespective of how complex their calculation. In most instances, signals are produced when an indicator crosses some specified threshold. The direction of the crossover is assumed to indicate a buy or a sell signal. Such a simple system of signal generation is easy to program for the automated selection of shares to buy, or sell, which then leaves the investor with little more to do than to decide between the alternatives offered by the selection process.

Many popular indicators are based only on price movements, disregarding changes in turnover. The analysis of market volumes only came into its own with the concept of On Balance Volume, developed by Joseph Granville (2). This indicator, which had been designed to reflect the relationship between demand and supply over the period under review, has been the leading method for the analysis of turnover for many years.

The lack of satisfactory results when using event driven indicators is prompting a re-evaluation of pattern based techniques. The human eye is still more effective than computers in recognising patterns. Therefore analysts are again spending a substantial amount of time looking at charts, and not at lists. The wheel has turned, and technical analysis is on the way back to where it began.

3. How effective is technical analysis?

Perhaps the question should be rephrased to ask 'How effective is technical analysis compared to fundamental analysis?' There are, after all, some significant parallels.

Both depend, at least partially, on the use of standard techniques – technical analysts mostly use the same indicators, while fundamental analysts employ standardised methods for the analysis of financial reports. The latter will all do their market forecasting using a similar kind of time series analysis, and other statistical and econometric forecasting tools.

Despite the standardised methodology, fundamental analysis requires the analysts to make assumptions about the future that are based on incomplete information. As a consequence, most people would agree that the skill of the analyst

is decisive for the success of fundamental analysis. Similarly, despite attempts to identify objective criteria for the generation of signals from technical indicators, the experience and the skill of the technical analyst remain key ingredients for success.

One advantage of technical analysis is its effectiveness over the shorter term, days or weeks. In this respect it actually complements fundamental analysis, which has a time horizon of months or years. Given the results of fundamental analysis, an investor can turn to technical analysis to improve the timing of his purchases or sales. A matter of a few weeks' change in the date of purchase or sale may exercise a marked effect on the profitability of a medium to long-term investment – well worth the expenditure of time and effort on the additional work.

In subsequent articles a few of the better known technical indicators will be reviewed. Recent developments that provide new insight into the behaviour of buyers and sellers during bull and bear cycles will be among the subjects covered. This new information will be evaluated in the light of the hypotheses of random walks and efficient markets.

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