77

The effects of selected trading strategies on the value of closed-end investment trusts — a test of the efficiency of the Johannesburg Stock Exchange

Narendra Bhana

Graduate School of Business, University of Durban-Westville, Private Bag X54001, Durban 4000, Republic of South Africa

Closed-end investment funds listed on the Johannesburg Stock Exchange invariably trade at discounts from their net asset value. The purpose of this article is to test a series of trading rules to determine whether an investor can capitalize on these discounts to earn excess returns. The buy-and-sell points strategy produced returns significantly in excess of these obtainable by holding the market portfolio or by following a buy-and-hold strategy. Using standard deviation of return as a proxy for risk, the results fail to confirm that an investor had to accept significantly more risk to earn a larger return. However, there is no assurance that the same strategies will produce excess returns in the future. The trading strategies tested over the 1979–88 period may require adjustments in today's market.

Geslote trustbeleggingsfondse wat op die Johannesburgse Effektebeurs genoteer word, verhandel gereeld benede hulle netto batewaarde. Die doel van hierdie artikel is om 'n reeks handelsreëls te toets om te bepaal of 'n belegger hierdeur addisionele voordele kan verdien. Die koop-en-verkoop-punte-strategie het winste getoon wat beduidend hoër was as dié wat verkry is deur die markportefeulje of deur 'n koop-en-nie-verkoop-strategie te volg. Deur standaardafwykings van opbrengs as 'n maatstaf vir risiko te gebruik, kon die resultate nie bewys dat 'n belegger beduidend meer risiko moet aanvaar om 'n groter wins te maak nie. Daar is egter geen versekering dat dieselfde strategieë ekstra winste in die toekoms sal oplewer nie. Die handelstrategieë wat oor die periode 1979–88 getoets is, mag wel aanpassings in die huidige mark vereis.

Introduction

Most academic research on share prices has strongly supported the view that security markets are highly efficient (Fama, 1970). According to the Efficient Market Hypothesis (EMH), share prices quickly reflect all publicly available information relevant to the companies' future prospects. Therefore, at any time, the actual share prices provide the best estimates available of the present values of the shares.

The pricing of shares of closed-end investment companies appears to provide a startling counter-example to the general rule. These companies invest in a portfolio of shares and other securities just as do open-end unit trusts (mutual funds). Unlike the unit trusts, however, closed-end companies neither issue new shares nor redeem existing shares. Investors who wish to purchase or sell closed-end shares must do so on the open market at prices reflecting not the net asset values of the companies but rather the supply and demand for the shares. Therein lies the seeming inconsistency with the EMH. The shares of closed-end investment companies usually sell at discounts, and sometimes at substantial discounts, from the actual values of the portfolios of shares they represent.

Studies by Malkiel (1975) and Litzenberger & Sosin (1978: 66) have concluded that imperfections may exist in the market for closed-end fund shares. Researchers have reached this conclusion because they have been unable to explain completely the existence and behaviour of discounts between net asset value and the market price of the shares.

If imperfections exist, investors may be able to implement trading rules that can achieve excess risk-adjusted returns. The purpose of this article is to test a series of trading rules to determine whether an investor can capitalize on the existence of these discounts to earn excess returns.

Previous studies

Various researchers have presented empirical evidence or theoretical arguments to explain the reasons for closed-end fund discounts. Brauer (1988: 126) has reviewed this literature but had difficulty in arriving at a possible explanation for the existence of discounts and premiums which is simultaneously consistent with both a competitive market for fund management talent, and a semi-strong form efficient capital market which can be described by a two-parameter capital asset pricing model. An association between discounts and performance is predicted by an explanation which argues that discounts (premiums) occur because investors perceive closed-end fund shares to have unattractive (attractive) attributes associated with their cash flows not directly related to systematic risk (Malkiel, 1977: 858). Most of the popular explanations of discounts and premiums explicitly or implicitly make this prediction.

There are essentially five classes of explanations for discounts and premiums: the effects of (1) discrepancies between the true market value of the assets and liabilities held by the fund and their quoted net asset value (i.e., accounting problems); (2) personal income taxes and accrued capital gains tax liabilities; (3) the existence of transactions costs and the demand for diversification by small investors; (4) the productivity of fund management and their ability to generate expenses; and (5) naive security market information inefficiency.

Theories based on the existence of personal income taxes suggest that discounts are the result of price adjustments required to compensate investors, through a higher expected before tax return, for incurring a potentially higher capital gains tax liability than would be incurred were investors simply to purchase the fund's net assets. The higher potential tax liability exists in funds with large unrealized gains in their portfolio which when realized, must be distributed to shareholders (and therefore taxed at the personal income level). Any capital loss on the shares, as the result of the distribution, cannot be realized by shareholders until the

shares are sold. Theories based on a demand for diversification by small investors imply that poorly diversified funds will sell at discounts to compensate (via higher returns) for excess residual variance and well diversified funds, perhaps at premiums. Theories based on either the importance of personal income taxes or residual variance of return are clearly inconsistent with two-parameter asset pricing (Roendfelt & Tuttle, 1973).

In addition, both Pratt (1966: 80) and Brickley & Schallheim (1985: 117) suggest that the higher (lower) required rate of return implicit in closed-end fund discounts (premiums) is not based on real effects but rather is simply the result of straightforward capital market information inefficiency. The inefficiency results from price adjustments reflecting capricious investor expectations of the productivity of management (net of expenses). In other words, closed-end fund share prices do not reflect unbiased expectations of their earning power. It is important to note that this explanation has a prediction in common with the taxes and demand for diversification explanations: discounted fund shares should yield positive risk-adjusted abnormal performance, gross of personal income taxes. Therefore, closed-end fund shares which are selling at significant discounts can be successfully used in profitable trading rules by large, tax exempt investors (Herzfeld, 1980: 82).

In contrast, both the accounting explanations and the hypothesis that discounts reflect unbiased expectations of management productivity imply that closed-end fund shares are priced to yield normal returns, but net asset value has been inaccurately represented. Net asset value is incorrect either because of the difficulties involved in accounting for such things as contingent liabilities and infrequently traded shares, or because management, as a productive (or unproductive) asset, has not been capitalized and included in reported net asset value. These explanations imply that discounts and premiums provide no information which can be profitably used in trading rules involving the purchase or sale of closed-end fund shares. Discount and premiums are simply an artifact of a complicated and perhaps unsolvable accounting problem, with investors determining market value on the basis of unbiased expectations and accountants estimating net asset value using accepted accounting principles.

There are two additional explanations for discounts associated with closed-end funds listed on the JSE. First, closed-end funds must be purchased through accredited stockbrokers, and these stockbrokers do not like to sell them. The brokerage fee of about 1.5% for closed-end funds is much lower than the commission earned for acting as agents for unit trusts (3%). And since investors are unlikely to trade from one closed-end fund to another as they might with ordinary shares, the stockbrokers realize that their brokerage commission is likely to be a 'one-shot affair'. And stockbrokers sell those types of securities that earn them the largest amount of commission. It is clear why stockbrokers are unlikely to be enthusiastic advocates for the shares of closed-end funds. Second, unlike unit trusts, closed-end funds cannot advertise their shares through investment media and newspaper advertisements. The restrictions on marketing their securities is due to their 'product' being shares. Therefore, they have great difficulty in publicising

themselves to small investors who are their major clients. Nor are they able to undertake product advertising which 'The Association of Unit Trusts' does on behalf of its members.

Thompson (1978) investigated the extent to which closed-end funds' share price discounts and premiums relative to net asset-value convey usable information about future rates of return on the funds' shares. He found that an *ad hoc* strategy of investing in portfolios of shares selling at discounts significantly outperformed the returns predicted by the Black (1972) two-factor asset pricing model. In other words, closed-end fund discounts and premiums do contain information about future returns in addition to that captured by the benchmark model. However, the precise nature of information contained in the discounts and premiums is a mystery.

Richards, Fraser & Groth (1980: 52–54) employed the buy-and-sell points strategy, as well as traditional filter trading rules, to determine what effect different trading strategies have on the value of an investment portfolio comprising of closed-end fund shares. It was shown that these trading strategies would have enabled an investor to generate larger trading profits than would have a naive buy-and-hold strategy of the funds or of the overall market. However, they conclude that 'we have no assurance that the same trading strategies will produce excess returns in the future'. Anderson (1986) replicated the Richards, Fraser & Groth study involving three different time periods and a different sample of funds. It was employing the buy-and-sell points strategy suggested by Richards, Fraser & Groth.

Research data

End of the week share price, net asset value, and distribution data were collected for 13 closed-end investment funds for the period 1979–88. The 13 funds included in this article are all listed on the JSE. Information related to the net asset value was obtained from the published financial statements and also from the database of McGregor's Online Information. The daily share prices for the closed-end funds were obtained from the JSE databank and were consolidated on a weekly basis. The funds differ in size, investment objectives, and the length of time included in the sample. Seven of the 13 funds are characterized by diversified portfolios, and six are specialized funds (see Appendix A). The weekly price data for the JSE Overall Index serve as a proxy for the behaviour of the market over the period studied.

Research methodology

Buy-and-sell points

The use of trading rules constitutes only one of the several methods of testing market efficiency. If these rules produce excess returns, given the performance of the market and the risk level, those excess returns contradict the weak form of the efficient market hypothesis as it pertains to closed-end investment funds. The first test replicates the test performed by Richards, Fraser & Groth (1980). The sample of 13 closed-end investment trusts listed on the JSE during the period 1979–88 is used to examine the returns generated by each of the eight buy-and-sell rules. Under each strategy, it is assumed that shares are purchased when the discount

reaches a predetermined level and sold when the discount narrows by a given amount. The different strategies are listed in Table 1. The discount is computed as:

Discount = (NAV - Price)/Price

Where:
NAV = net asset value per share
Price = price per share

The annual average compound rate of return (geometric mean) is the most reliable measure of long-term investment performance. The purpose of the buy-and-sell-point strategies is not to measure the average return but to measure performance over the entire period of the investigation. Therefore, the single period return for 1979–88 is used to measure the relative performance of the different buy-and-sell-point strategies. This approach is consistent with the methodology used by Anderson (1986: 64) to study the performance of closed-end funds listed on the New York Stock Exchange. Therefore, the results of this South African study can be compared with the corresponding investigation in the United States (see Table 1).

Initially each portfolio is worth R100 000, and this amount is distributed equally among the funds' shares meeting the criteria for inclusion in the portfolio. For instance, if three funds under strategy 3 are selling at discounts greater

Table 1 Different trading strategies used for closed-end investment trusts listed on the JSE during 1979–88

Buy-and-sell points		
Discount from net asset value		
Strategy	Purchase	Sale
1	0.05	0.00
2	0.10	0.05
3	0.15	0.10
4	0.20	0.10
5	0.20	0.15
6	0.25	0.10
7	0.25	0.15
8	0.30	0.15

Filter rule strategies	
Strategy	Filter (%)
1	3.0
2	5.0
3	7.5
4	10.0
5	12.5
6	15.0
7	17.5
8	20.0

than 15% when the period begins, the R100 000 is invested equally in those three funds (R33 333 in each). Once included in the portfolio, a fund's shares are held until the discount drops to 10% (again under strategy 3). Then the portfolio is adjusted to assure equal rand investments in each remaining fund. This strategy is costly to administer because of adjusting the number of shares for each fund in the portfolio whenever a buy or sell signal occurs. The frequency of trades is a function of: (1) the level of the discount required for a purchase decision to be made; and (2) the difference between the purchase discount and the sale discount. Any dividends paid are reinvested in the paying company's shares. Dividends paid by the JSE Overall Index are reinvested in shares of that index. Each time a buy or sell is effected, a 2% commission is charged on the amount of the transaction.

Miller (1977) suggested that specialized funds might perform differently than do diversified funds. Therefore, the buy-and-sell point strategies are examined separately with the diversified funds and the specialized funds included in the sample. Also, four buy-and-hold strategies are utilized for the period covering the investigation. Under the first strategy, the investor is assumed to purchase equal rand amounts of each fund at the beginning of the period and to hold this portfolio throughout the period of the study. With the second strategy, diversified fund shares are held; with the third, specialized fund shares are held. The final buy-and-hold strategy presumes the investor to buy the market (proxied by the JSE Overall Index) at the beginning of the period and to hold it throughout.

Filter rules

A filter technique is a mechanical rule which attempts to apply sophisticated criteria to identify movements in share prices. According to Fama & Blume (1966), the system is based on the notion that if a security's price has been moving up (down) it will continue moving up (down). The system involves following a list of securities, buying those that are moving up and selling those that are moving down. If there are genuine trends in the price movements, the filter analysis will show returns on average greater than a policy of simply buying and holding. If trends do not exist, returns on average should be more favourable for the buy-and-hold strategy. In an efficient capital market, the use of filter rules should not enable an investor to earn excess returns.

The second test replicates the eight filter rules performed by Richards, Fraser & Groth (1980), to determine if filters may have produced excess returns for closed-end funds listed on the JSE during 1979–88. The eight filters are listed in Table 1. The conventional filter rules are applied as follows: each fund is monitored for a price rise or fall by X% or more (X being the amount of the filter). When a fund's price increases by X% in a particular week, R1000 is invested in that fund's shares. Alternatively, if the fund's price declines by X%, R1000 worth of shares is sold short. The shares are held long (short) until the market price falls (rises) X% in a particular week. Once that occurs, the portfolio reverses the position. The initial R1000 for each fund is monitored separately and is adjusted over the period for dividends as well as profits and losses from trading. The

Table 2 Performance measures for trading strategies (buy-and-sell points) for closed-end investment funds listed on the JSE during 1979–88

Discounts from NAV for			All funds		Diversified funds		Specialized funds	
Strategy	Purchase	Sale	Return*	Std. dev.	Return	Std. dev.	Return	Std. dev.
1	5	0	280.3	19.8	250.2	19.2	320.4	21.2
2	10	5	276.1	20.4	241.5	19.7	315.7	21.7
3	15	10	300.2	21.3	270.3	24.1	364.4	23.5
4	20	10	325.4	21.7	262.7	25.4	391.2	23.8
5	25	10	441.5	23.1	330.1	22.5	504.6	24.6
6	20	15	480.7	26.0	395.6	25.2	648.1	28.2
7	25	15	450.9	29.1	300.4	30.1	469.3	31.3
8	30	15	391.6	29.6	281.0	33.6	480.5	32.5
Buy-and-hold			289.4	18.5	260.1	16.3	312.7	19.6

JSE Overall Index:

Return 234.9

Std. deviation 28.3

*Calculated as follows: (Ending value-beginning value) x 100/beginning value

The return is a measure of performance over the single period 1979–88.

In a few cases the funds were delisted and the amount held in these securities at that time was assumed to be constant until the end of the investigation.

specialized and diversified groups of funds are also viewed separately for the period of the study. The terminal results represent the simple mean of the funds that were traded because of a price change of X%.

Empirical results

The total returns for the single period 1979–88 and the standard deviations of weekly rates of return for the series of buy-and-sell point tests are summarized in Table 2. The most successful investment strategy using all funds over the study period called for shares to be purchased when the discount exceeded 20% and sold when the discount dropped to 15%. Each of the buy-and-sell point strategies for all funds provided higher returns than an investor would have received from investing in the market (JSE Overall Index) during 1979-88. This was also the result when diversified funds and specialized funds are viewed separately. Each of the different buy-and-sell point strategies outperformed the market. The buy-and-sell point strategies including all funds provide higher returns than would have been received from a buy-and-hold strategy for all funds. This again holds in most instances when diversified and specialized funds are viewed separately.

The weekly returns associated with the buy-and-sell point strategies were in most cases less variable than the returns from investing in the JSE Overall Index. Thus, if standard deviation of return is a proxy for risk, the results fail to confirm that an investor had to accept significantly more risk for a larger return. The excess returns pertaining to investment in closed-end funds contradicts the weak form of the Efficient Market Hypothesis.

The results in Table 2 clearly demonstrates the superiority of specialized funds as compared to diversified funds. The

return on the specialized funds was higher with each buy-and-sell point strategy, while the standard deviations were not in all cases larger. An investor who followed the most successful strategy (strategy 6) would have experienced a 648.1% gain on the specialized portfolio compared to a gain of 395.6% on the diversified portfolio. In addition, the return from the specialized fund investment was usually substantially higher than the market average as measured by the JSE-Overall Index.

The filters and the associated returns using all funds, diversified funds, and specialized funds are shown in Table 3. Suprisingly, the larger filters produced the best returns. The general consensus of earlier research involving filter rules has been that small filters generate large profits before commissions, but the excess profits are wiped out by commissions (Rogalski, 1977). The larger filters reduce transaction costs and generated higher returns. The results shown in Table 3 seem to indicate that the success of the filter trading strategy may not be related to the day-to-day fluctuations in security prices as much as it is to particular closed-end investment funds coming into favour or falling from favour. In other words, the superior performance with large filters may not have been caused by fluctuations in the market as a whole. The superior returns generated with larger filters could be ascribed to 'non-homogeneous' valuations among investors (Miller, 1977) (see Table 3).

The results associated with filter rules on the specialized and diversified funds separately are presented in Table 3. As with the buy-and-sell point strategies, returns obtained from specialized funds dominated those from diversified funds. If the success associated with the larger filters was the result of particular funds coming into favour, then we can explain the differences between specialized and diversified funds by

Table 3 Nominal annual rates of return for filter trading strategies for closed-end investment funds listed on the JSE during 1979–88

		Percentage return		
Strategy	Filter (%)	All funds	Diversified funds	Specialized funds
1	3.0	−30.0	−36.3	−26.3
2	3.0	−26.5	−30.1	−21.6
3	7.5	−11.7	−16.2	−9.4
4	10.0	15.8	−4.4	17.6
5	12.5	25.2	19.9	30.4
6	15.0	31.4	28.6	40.5
7	17.5	37.3	32.5	46.1
8	20.0	41.1	39.7	54.2
Buy-and-hold		28.9	26.0	31.3

Miller's 'non-homogeneous valuations' among investors. Specialized funds will command prices that reflect expectations of investors committed to specialized areas (gold-mining shares, unlisted company shares, or industrial shares). Diversified funds will not create a similar attraction due to the nature of their portfolios — they will not be able to attract investors with optimistic expectations about all the securities in their portfolios. Small filters are unlikely to create optimistic expectations among investors and will therefore produce lower returns.

Since the methodology employed in this investigation included short selling, strong negative sentiment relating to specialized funds contributed to the smaller losses associated with small filters. Only large filters (15%, 17.5% and 20%) were able to outperform the buy-and-hold strategies associated with investing in closed-end investment funds. The results suggest that an investor should not expect consistent profits from closed-end fund shares by utilizing filter rules.

The result of this investigation have shown that investors can achieve excess returns by developing trading rules related to closed-end investment funds listed on the JSE. The following question must be asked: Why are closed-end funds unique in the sense of affording feasible trading rules based on readily available and widely known discounts from net asset value? Any explanation must be consistent with the wealth of evidence which supports the weak and semi-strong forms of the Efficient Market Hypothesis for securities other than closed-end investment funds. The superior performance documented in this investigation flies directly in the face of the hypothesis that share prices quickly reflect all publicly available information relating to the firm's assets. The evidence is clearly inconsistent with the traditional capital market efficiency in the weak and semi-strong forms. However, if the evidence is considered in the context of the theories which originally motivated the trading tests, a somewhat different picture emerges.

The prior empirical work concerned with semi-strong form trading rule performance has been concerned primarily with the speed of price adjustments to new information about the future profitability of firms. The literature dealing with the impact of public announcements perhaps epitomizes this line of research. The conclusions have generally been that investors do a good job of anticipating public announcements and, to the extent that investors are surprised, they tend to react very quickly. Price adjustments generally occur without a meaningful lag, so as to eliminate any short-run trading profits. On the basis of this prior research, it is reasonable to argue that the performance of closed-end fund shares stems from something other than the fact that discounts are not widely disseminated pieces of information. In other words, it is possible, even probable, that investors are fully aware of discounts and that the prices of closed-end fund shares reflect what information is contained in them.

Perhaps the most effective way to discriminate between the hypothesis that prior discounts are reflected in current prices (and therefore the apparent abnormal performance is a condition of equilibrium), and the hypothesis that the capital market is information inefficient, is to examine the impact of the publication of results (such as those of this investigation) on the level of discounts and the link between discounts and performance. If no change takes place in the next few years and the discount-performance relationship continues into the future, then explanations relating to information inefficiency would seem implausible. On the other hand, if the explanation lies with personal income tax effects or penalties for poor diversification, it might be asked why tax exempt institutions do not purchase closed-end funds and thereby bid up prices (reduce discounts)? For unknown reasons they have chosen not to do so.

Conclusion

The results of this article provide possible trading strategies that would enable an investor to earn excess rates of return. Consequently, these findings support the conclusion drawn by earlier researchers about possible inefficiencies of the market for closed-fund shares. The buy-and-sell points strategy produced returns substantially in excess of those obtainable either by holding the market portfolio (JSE Overall Index) or by following a buy-and-hold strategy with closed-end investment funds. Also, the returns of the various strategies did not appear to be significantly more risky than the return of the overall market. Furthermore, the returns improved when the same strategies were applied to specialized funds alone. An investor could have achieved superior performance by concentrating on specialized funds. These results generally fail to support the weak and semi-strong forms of the Efficient Market Hypothesis.

On the other hand, mechanical use of filter rules did not provide a basis of generating consistent excess profits. Smaller filters generated substantial losses in the portfolios, while large filters produced substantial profits. Therefore, it can be concluded that the day-to-day market fluctuations do not provide a basis of generating excess profits. It is suggested that success with large filters may be due to the particular funds coming into favour in the market with a corresponding price trend persisting over longer periods of time.

Investors can improve the likelihood of trading profits by employing strategies using closed-end fund shares similar to

those tested and found successful here. However, there is no assurance that the same strategies will produce excess returns in the future. Trading rules that generated excess profits in one time period may require modification before being applied to a different period. The rules tested over the 1979–88 period may require adjustments in today's market. Furthermore, the reliability of this investigation may be questioned because of the small sample (13 closed-end investment funds). While inefficiencies may appear to exist, no universal trading rule will assure excess returns from closed-end investment funds.

There is an important additional attraction to closed-end investment funds. Armitage & Whittaker (1990) have demonstrated that fund discounts narrow when the market falls and increase when the market rises. This negative covariance of fund premiums with market movements suggests that closed-end funds should be particularly attractive investments. A closed-end fund that held the market averages would have a beta less than one owing to the covariance of the fund's discount, yet there would be no corresponding reduction in the long-run return. An application of the capital asset pricing model would therefore suggest that, assuming no unrealized capitalized appreciation, such a fund should sell at a premium rather than a discount. It would appear that the pricing of closed-end investment fund shares does provide an example of a market imperfection in the valuation of capital assets.

Acknowledgements

References

Anderson, S.C. 1986. 'Closed-end funds versus market efficiency', Journal of Portfolio Management, Vol. 13, No. 1: 63–65.

Armitage, S. & Whittaker, E. 1990. 'Investment trusts — discounting the trusts', Professional Investor, Vol. 1, No. 5: 16–18.

Black, F. 1972. 'Capital market equilibrium with restricted borrowing', Journal of Business, Vol. 43: 444–455.

Brauer, G.A. 1988. 'Closed-end fund shares' abnormal returns and information content of discounts and premiums', Journal of Finance, Vol. 43, No. 1: 113–127.

Brickley, J.A. & Schallheim, J.S. 1985. 'Lifting the lid on closed-end investment companies: A case of abnormal returns', Journal of Financial and Quantitative Analysis, Vol. 20, No. 1: 107–117.

Fama, E.F. & Blume, M.E. 1966. 'Filter rules and stock market trading', Journal of Business, Vol. 39: 226–241.

Fama, E.F. 1970. 'Efficient capital markets: A review of theory and empirical work', Journal of Finance, Vol. 23, No. 2: 383–417.

Herzfeld, J. 1980. The investor's guide to closed-end funds. New York: McGraw-Hill Book Company.

Litzenberger, R.H. & Sosin, H.B. 1978. 'The performance and potential of dual purpose funds', Journal of Portfolio Management, Spring, 56–68.

Malkiel, B.G. 1975. A random walk down Wall Street. New York: W.W. Norton and Company.

Malkiel, B.G. 1977. 'The valuation of closed-end investment company shares', Journal of Finance, Vol. 32, No. 3: 847–859.

Miller, E.M. 1977. 'Risk, uncertainty, and divergence of opinion', Journal of Finance, Vol. 32, No. 4: 1151–1160.

Pratt, E.J. 1966. 'Myths associated with closed-end investment company discounts', Financial Analysts Journal, Vol. 22: 79–82.

Richards, M.R., Fraser, D.R. & Groth, J.C. 1980. 'Winning strategies for closed-end funds', Journal of Portfolio Management, Vol. 7, No. 1: 50–55.

Roendfelt, R.D. & Tuttle, D.L. 1973. 'An examination of discounts and premiums of closed-end investment companies', Journal of Business Research, Vol. 1: 129–140.

Rogalski, R.J. 1977. 'Trading in warrants by mechanical systems', Journal of Finance, Vol. 32, No. 1: 87–101.

Thompson, R. 1978. 'The information content of discounts and premiums closed-end fund shares', Journal of Financial Economics, Vol. 6: 151–186.

Appendix A Companies included in the sample to investigate trading strategies for closed-end investment funds

Diversified funds	Specialized funds
The Common Fund Investment Society Ltd.	Oceana Development Inv. Trust Plc.
Corwil Investments Ltd.	Premier Consolidated Ltd.
First International Trust Ltd.	Tempora Investments Ltd.
Industrial Selections Ltd.	Tolux S.A. Ltd.
Issues and Investments Ltd.	Vestacor Ltd.
National Selections Ltd.	Yabeng Investments Holding Co. Ltd.
New Bemica Ltd.	