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Market timing under different market conditions

1. INTRODUCTION

The asset allocation decision has a profound affect on a portfolio's performance as well as on its risk characteristics. In an actively managed portfolio the proportions invested in each asset class may be changed regularly depending on the investors' perception of the equity market's future performance relative to that of other assets. The short term switching between these asset classes is often referred to as tactical asset allocation or market timing. Pure market timing involves a complete switch from one asset class to another depending on the investors' forecast of the future.

Pure market timing, an active investment strategy, often has the objective of outperforming a passive benchmark. The benchmark most often used is returns from a passive buy-and-hold the market strategy.

The success of a market timing strategy is dependent on how accurately investors can predict the future returns of the asset classes. Clearly if every market swing could be predicted then returns well in excess of the buy-and-hold return will be achieved. However, this clairvoyant-like forecasting ability is obviously beyond the capability of investors. So the question remains, how good does one have to be at predicting market movements in order to outperform the buy-and-hold benchmark? In this study the required timing abilities of investors in bull and bear phases of the equity market is investigated

2. LITERATURE REVIEW

Sharpe (1975) investigated the possible gains as well as the required predictive accuracy needed for investors to achieve a return above that of a buy-and-hold strategy. Using the Standard and Poor's Composite Index as a proxy for the market (risky asset) and U.S. Treasury bills as the debt instrument (riskless asset) for the period 1929 to 1972, Sharpe (1975) calculated that a return of 14,0% would have been obtained if perfect timing was achieved. This is in contrast to a return of 8,5% if the index was held for the same time period and 2,4% for the Treasury bills. The 14,0% return was generated by assuming that investors were able to predict perfectly which asset class, index or Treasury bills, would achieve the highest return for the following year. For each switch performed a 2% transaction charge was accounted for.

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Sharpe (1975) also observed that the standard deviation of the returns generated by the timed portfolio was 6,5% *lower* than its passive counterpart (14,6% verses 21,1%). This is an obvious result since perfect timing has the effect of reducing the downward variability of the index returns thus reducing the overall variance. In order to investigate this further, Sharpe (1975) constructed a passive portfolio of stocks and bonds that resulted in a variance equal to the timed portfolio. This new portfolio only achieved a return of 7,2% thus giving the timed portfolio a return advantage of 6,8% for the same level of variability. Therefore one can conclude that perfect timing has the effect of increasing returns as well as reducing volatility.

However it is clear that no investor is capable of timing the market perfectly. This led Sharpe (1975) to assess the gains from less than perfect timing. He used a simple tree model, similar to a binomial tree, to estimate the expected return of timers assuming that they do not predict market swings perfectly. By calculating the probability of a bullish or bearish year as well as the returns generated by each asset in each phase Sharpe (1975) could substitute different levels of predictive ability into his model to give an expected return for a given timing ability.

For a random guess an expected return of 5,7% was calculated with a standard deviation of 13,9%. This is 5,7% below the buy-and-hold return and 3,8% below a risk adjusted return. Clearly a random guess is sub optimal even when risk is taken into account. The returns on the timed portfolio only surpass the returns on the risk adjusted portfolio when the predictive ability climbs above 73%. That is to say that investors must be correct more than 73% of the time when forecasting market movements in order to beat a risk adjusted passive portfolio. Only when the predictive ability is greater than 82% does the timed portfolio achieve superior returns compared to the passive portfolio unadjusted for risk. Therefore if investors cannot predict market swings accurately more than 82% of the time then they would be better off investing passively in the index. However, as discussed previously, perfect predictability produces substantial gains at lower risk. These exceptional returns may entice investors to attempt market timing despite the downside risk.

Chua, Woodward and To (1987) investigated the potential gains from stock market timing in Canada. The methodology employed was similar to that of Sharpe's (1975) except that Chua et al. (1987) separated the investors' ability to predict bull versus bear markets. They argued that investors may have different abilities of predicting bull markets compared to bear markets and speculated that being able to

predict one market direction may have more of a influence on returns than being able to predict the other. Thus they investigated the potential returns obtainable for varying combinations of bull and bear market predictive accuracy.

Their strategy involved switching between common stock and Treasury bills, with annual review periods on the Canadian stock market from 1950 to 1983. Perfect market timing, using a 1% transactions cost whenever stocks were purchased, resulted in a return of 17,2% which was a 4,6% advantage over the buy-and-hold return. Again the timed portfolio had a lower standard deviation compared to its passive counterpart.

By using the adjusted Sharpe (1975) model, Chua et al. (1987) demonstrated that being able to predict bull markets is far more important than being able to predict bear markets. They illustrated that even if investors were able to predict bear markets perfectly but had no ability to predict bull markets (random guess) then these investors' returns are likely to be inferior to that of a passive strategy. If investors were able to predict bear markets perfectly then they would need to be able predict at least 70% of the bull markets in order to have a better than average chance of outperforming a passive strategy.

However, if investors were able to predict 90% of the bull periods then even a random guess for bear markets would have given such investors a better than average chance of out performing a buy-and-hold strategy. If investors could predict 80% of the bull periods accurately then they only require a 60% forecasting accuracy for bear markets in order to have an above average chance of beating the market.

The objective of this study is to investigate the relative required predictive abilities that investors require on the Johannesburg Stock Exchange (JSE) in order to beat the market. This study will be split between bull and bear phases of the market with Chua et al.'s (1987) methodology being applied. The publication recently (Firer and McLeod, 1999) of a 76 year historical time series, affords the opportunity to do the analysis over an extended time horizon.

3. METHODOLOGY

In order to investigate what effect the market condition will have on a timing strategy the following data and methodology will be employed.

4. DATA

The data is derived from the Firer and McLeod (1999) study on the historical performance of equities, bonds and cash in South Africa. It consists of 76 years of annual returns on these assets. The equity portfolio was designed to indicate the returns an equity investor holding a large diversified portfolio of the available shares on the market could have achieved. From 1978 the index consisted of the JSE Actuaries All-Share Index. Prior to that the RDM 100, and data from the Bureau for Economic Research at Stellenbosch University was used. The equity returns include a dividend yield.

The money market instruments' performance is tracked by constructing a portfolio of three 90 day Negotiable Certificates of Deposit (NCD's) purchased in successive months. The returns therefore represent the earnings of investors who hold a portfolio of three 90 day NCD's, each with a different maturity month.

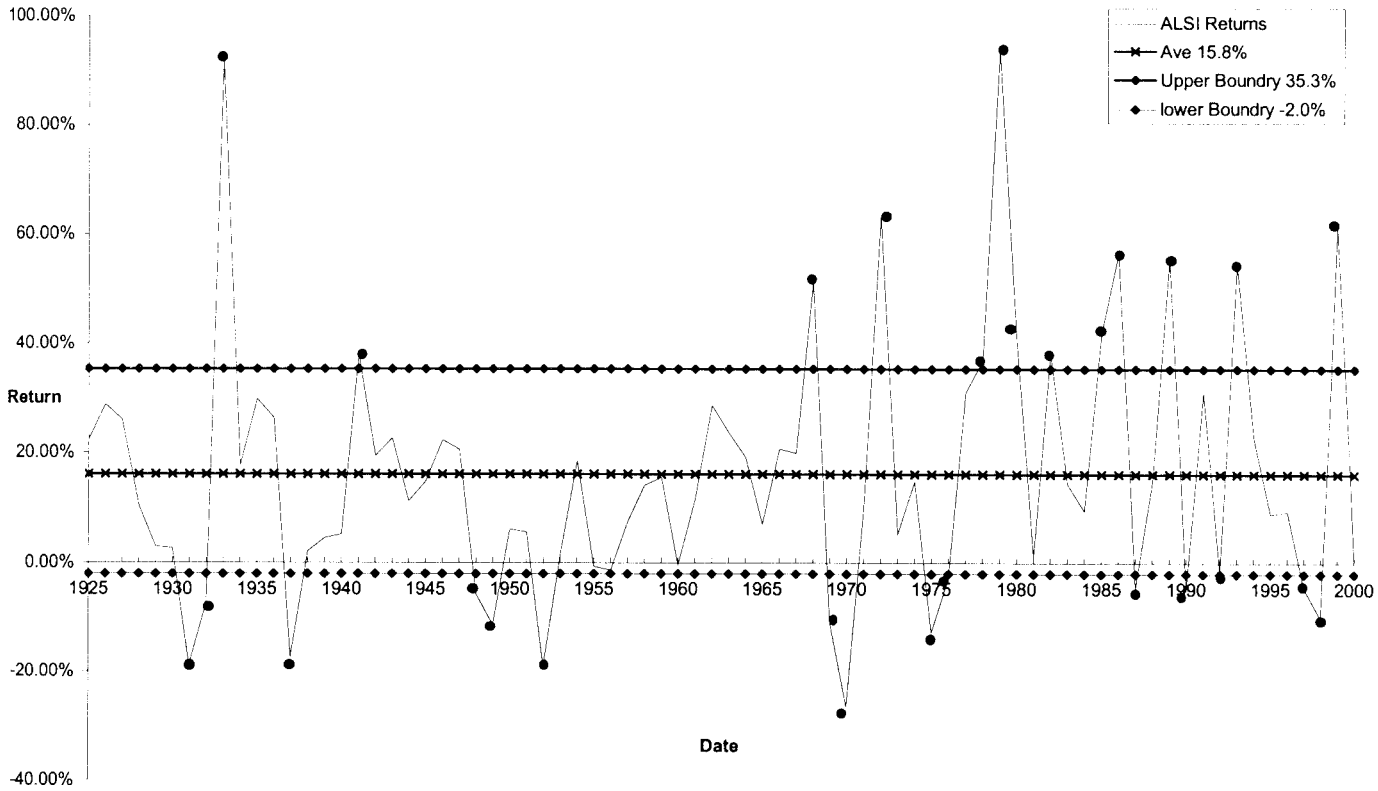
5. SEGREGATION OF THE TIME SERIES INTO BULL AND BEAR PERIODS

In order to split the market's performance over time into bull and bear trends, use is made of Polakow's (2000) study on a memory effect on the JSE. By using distributional theory he identified outliers, or extreme events and then discovered that there is a statistically significant mean reversion effect between such extreme events. That is to say that after an extreme event like a 'crash' the market return is more likely to revert back to the mean return and then continue to rise until an extreme rise occurs. This will then be followed by a fall in returns thus reverting back to the mean then continuing to fall until another 'crash' occurs. This can be seen graphically as shown by Figure 1 below.

By using the Fisher-Tippet distribution Polakow (2000) demonstrated that all annual returns greater than 35,3% or less than –2,0% can be considered to be extreme events. As the market returns mean revert between such extreme events, there exist periods where the returns are above the market's average followed by periods where the returns are below the average. Just from inspection (Figure 1) it appears that once an extreme event occurs the returns tend to mean revert and continue to the next extreme event. This is particularly prominent in the last twenty years with very few exceptions.

In order to segment the market into bull and bear periods the following process is used.

- Identify the market average (15,8%)
- Identify the extreme events as per Polakow (2000)
- Identify where the market mean reverts between two consecutive extreme events (eg 1937 and 1941)



Adapted from Polakow, "Market Crashes: Predicting Extreme Market Movements. A Memory Effect on the JSE (1925-1999)"

Figure 1: Time series of returns from 1925 to 2000. Extreme events indicated by dots

- Identify what year the return intersects the market mean between such extreme events (eg during 1941).
- Between two successive intersecting points the majority, if not all the market returns are either above or below the market average return depending on which phase the market is in.
- For the purpose of this study the time periods in which the returns are above average will be deemed to be bull periods and the time periods in which the returns are below average will be deemed to be bear periods.

Monthly intervals are used for timing decisions. It is therefore necessary to identify the month in which the market switches from one condition to the other. This obviously happens during the years in which the return intersects the market's mean as identified above. Since the market is mean reverting, the index is either peaking or troughing during these years. The month in which the market switches from one condition to another is deemed to occur when the index is at its maximum value for peaks or at its minimum value for troughs.

Using this methodology the time series divides as shown in Table 1. It is clear from the table that the market is well segmented into bull and bear trends. What will be noticed is the omission of certain time periods. The first two periods be omitted are 1/25 to 4/28 and 8/00 to 12/00 because these are at the ends of the time series and there is no complete cycle to comply with the above methodology.

The period 2/62 to 1/65 has been omitted because the market mean reverted but then tended to hover around the market average thus not exhibiting any bull or bear nature therefore not falling into the two specified market conditions. Lastly 2/90 to 1/93 is a very volatile period with the market oscillating around the mean but not breaching any of the extreme event criteria. Again the returns in this period did not show typical bull or bear tendencies but rather the market average. The effect of these periods will be captured when the analysis is applied to the whole time period under investigation.

Table 1: Identified bull and bear periods

Bull Period	Months	Annual return	Bear period	Months	Annual return
1/33 to 1/37	49	37,8%	5/28 to 1/33	57	0,3%
2/41 to 1/48	84	24,0%	1/37 to 2/41	50	-1,6%
1/66 to 4/69	40	39,1%	1/48 to 1/62	169	2,5%
1/72 to 6/73	18	56,5%	4/69 to 1/72	34	-15,5%
6/77 to 9/81	52	46,2%	6/73 to 6/77	49	-2,0%
6/82 to 8/87	63	45,8%	9/81 to 6/82	10	-35,7%
1/89 to 1/90	13	60,9%	8/87 to 1/89	18	-8,3%
2/93 to 12/95	35	25,8%	12/95 to 1/99	38	1,6%
1/99 to 8/00	20	34,1%			

For each market trend the returns of each sub period will be chained together to form a continuous series of returns, one representing the bull trend and one the bear trend. Chua et al.'s (1987) model will be applied to each series in order to investigate the effect of the market condition on a market timing strategy. The model will also be applied to the whole time period for comparison purposes. Table 2 illustrates how the market is segmented.

Table 2. Returns for each market trend

Market Trend	Number of Years	Return on Index p.a.	Return on BA/ NCD p.a.
Total	76,0	15,8%	6,4%
Bull	31,2	39,3%	7,3%
Bear	35,4	-0,3%	5,4%

6. THE THREE MARKET TIMING STRATEGIES

Three timing strategies are investigated: traditional timing, bull timing and bear timing. Traditional timing involves investing the whole portfolio in shares so that the portfolio will have the same exposure as the index when a market rise is predicted. When a fall in the market is expected the portfolio is liquidated and invested in short-term money market instruments.

Bull timing involves holding money market instruments continuously and liquidating a small portion of the portfolio to purchase call options on the index when a market rise is expected. The volume of call options purchased is such that an exposure equal to as if the whole portfolio was liquidated and invested in the market is created.

Bear timing involves holding the index continuously and purchasing put options on the index when a market fall is expected. Again the quantity of options purchased will create an exposure equivalent to liquidating the portfolio and investing the proceeds in money market instruments. This is commonly known as a protective put strategy.

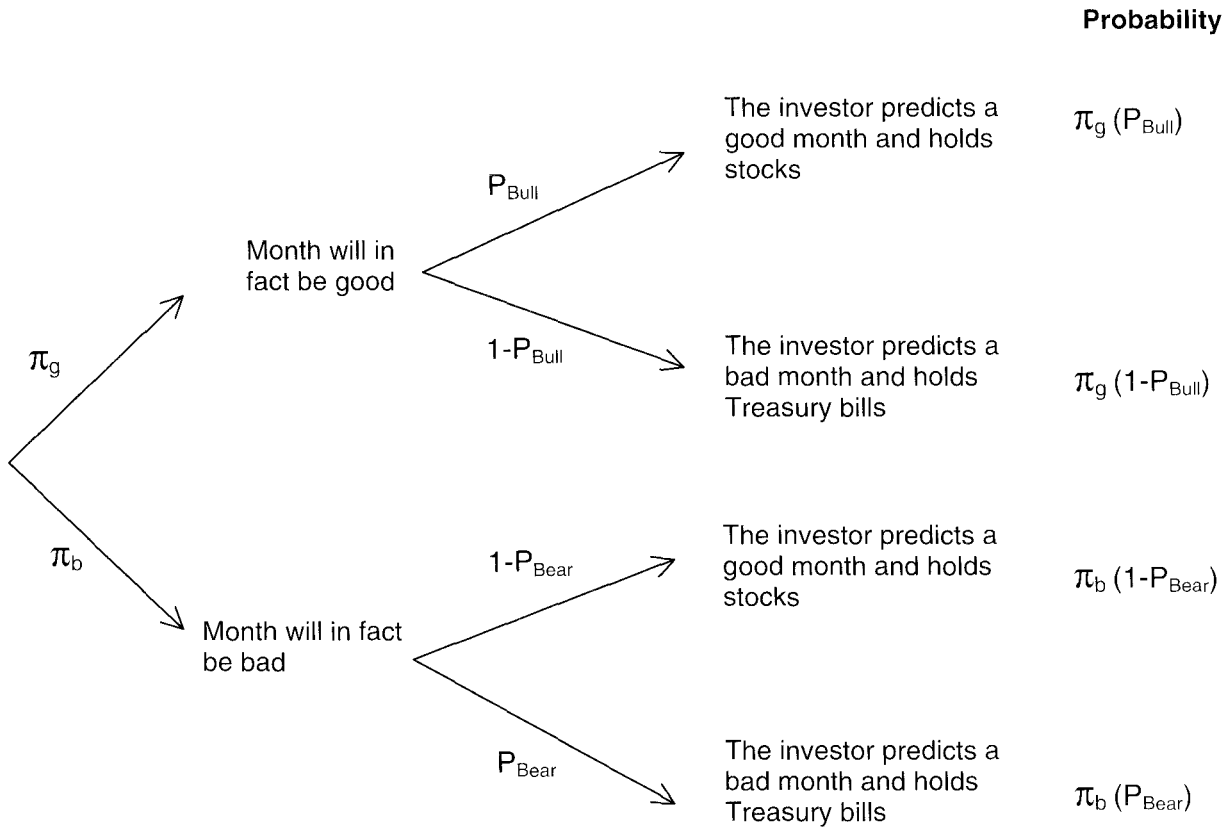
To evaluate the performance of the bull and bear timing strategies at-the-money option prices are required. Since these options did not exist for most of the time period under investigation these premiums had to be estimated. The Black-Scholes option pricing model adjusted for dividends using the Merton adjustment was used.

All three timing strategies are applied to the three returns series'. Each strategy uses a monthly review period, that is to say that investors attempt to predict how the market will perform one month ahead and thus review the portfolio at the beginning of each month to make the necessary adjustments.

7. THE MODEL

The Chua et al. (1987) model is an extension of Sharpe's (1975) model to capture the effect bull and bear predictive accuracy (Figure 2).

π_g is the probability that the next month's index return will be greater than that of the money market instruments and π_b being the probability that next month's money market instruments will outperform the index. P_{Bull} is the probability that investors correctly forecast a bull month and thus hold the index. $1\text{-}P_{Bull}$ is the probability that investors incorrectly forecast a bull month thus invest in money market instruments. P_{Bear} is the probability that investors correctly forecast a bear month and thus hold money market instruments. $1\text{-}P_{Bear}$ is the probability that investors incorrectly forecast a bear month thus invest in the index.



Adapted from W.F. Sharpe, "Likely Gains from Market Timing," *Financial Analysts Journal*, 1975

Figure 2: The Chua Woodward to model

For each returns series the value of π_g is obtained by calculating the proportion of months in which the index outperformed the money market instruments, and vice versa for the π_b value. Different combinations of P_{Bull} and P_{Bear} ranging from 0,0 to 1,0 are substituted into the model to produce the four probabilities as indicated on the right hand side of the diagram. Each probability is then multiplied by their respective expected return i.e. π_g (P_{Bull}) is multiplied by the expected return on the index during a bull month, π_g ($1-P_{Bull}$) is multiplied by the expected return on money market instruments during a bull month, π_g (P_{Bear}) is multiplied by the expected return on money market instruments during a bear month and finally π_g ($1-P_{Bear}$) is multiplied by the expected return on the index during a bear month. The four products are then summed to give an expected return for the combination of P_{Bull} and P_{Bear} tested. This process is repeated for all possible combinations of P_{Bull} and P_{Bear} to produce a matrix of returns showing the possible returns for the various combinations of bull and bear predictive accuracy.

8. TRADITIONAL TIMING RESULTS

In Table 3 the results of traditional timing on the whole time period under investigation are presented. The results displayed are the annualised returns *less* the buy-and-hold return of the index for each combination of bull and bear predictive accuracy. Thus the returns shown are the excess returns over the passive strategy.

No transactions charges have been included in these calculations. Obviously including transactions costs will marginally reduce the returns. Droms (1989), who conducted a similar analysis, commented "on average transactions costs would reduce the theoretical annual returns to timing by about 0,5% to 2,5% per year, depending on the frequency of timing. The corresponding levels of predictive accuracy required to match a buy-and-hold policy would increase by 3% to 7%." This statement is based on a transaction charge of 1% per switch which may be considered a realistic charge for trading conditions today. However institutional investors may be able to transact at a lower rate.

Table 3: Predictive accuracy matrix for traditional timing (total time period)
Returns annualised less buy and hold return

		Bull predictive accuracy										
		0,0	**0,1**	**0,2**	**0,3**	**0,4**	**0,5**	**0,6**	**0,7**	**0,8**	**0,9**	**1,0**
Bear Predictive Accuracy	**0,0**	-26,3	-24,0	-21,6	-19,1	-16,5	-13,9	-11,3	-8,6	-5,8	-2,9	0,0
	0,1	-24,8	-22,4	-19,9	-17,4	-14,8	-12,2	-9,5	-6,7	-3,9	-1,0	2,0
	0,2	-23,2	-20,7	-18,2	-15,7	-13,0	-10,4	-7,6	-4,8	-1,9	1,0	4,0
	0,3	-21,5	-19,0	-16,5	-13,9	-11,2	-8,5	-5,7	-2,9	0,0	3,0	6,1
	0,4	-19,9	-17,3	-14,8	-12,1	-9,4	-6,7	-3,8	-0,9	2,0	5,1	8,2
	0,5	-18,2	-15,6	-13,0	-10,3	-7,6	-4,8	-1,9	1,1	4,1	7,2	10,3
	0,6	-16,5	-13,9	-11,2	-8,5	-5,7	-2,8	0,1	3,1	6,1	9,3	12,5
	0,7	-14,7	-12,1	-9,4	-6,6	-3,8	-0,9	2,1	5,1	8,2	11,4	14,7
	0,8	-13,0	-10,3	-7,5	-4,7	-1,8	1,1	4,1	7,2	10,4	13,6	16,9
	0,9	-11,2	-8,4	-5,7	-2,8	0,1	3,1	6,2	9,3	12,5	15,8	19,2
	1,0	-9,4	-6,6	-3,7	-0,8	2,1	5,2	8,3	11,5	14,7	18,1	21,5

The first impression of the results indicate that there is a significant possibility of under performing the market unless investors possess some degree of predictive ability above that of a random guess. It could argued that only the only quadrant of significance is the lower right quadrant because every other result could be improved by merely a random guess substituted for either the bull or bear predictive accuracy.

What is also noticeable are the possible gains from successful market timing. Perfect timing results in a return of 21,5% above that of the passive strategy which translates into a total return of 37,2%. However on the downside the maximum possible loss is 26,3% below the buy-and-hold return or an annual return of –10,6% indicating that even though there are possible high returns from market timing there is also the risk of substantial underperformance.

The results also indicate that a random guess for both bull and bear periods produces a return below that of the passive benchmark indicating that some level of skill is required to be successful at market timing. Furthermore the results suggest that it is more important to predict bull periods than bear periods, a conclusion similar to that drawn by Chua et al. (1987).

There are two cells in the table worth noting namely 100 % bull and 0% bear predictive accuracy and 0% bull and 100% bear predictive accuracy. The first represents the case where by whenever there is a bull period the market is held (100% bull predictive accuracy) and when there is a bear period the market is held again (0% bear predictive accuracy) hence the market is held regardless of the market condition. This results in the achievement of the buy-and-hold passive return and the table reflects an excess return above the passive benchmark of 0%. By using the same logic the other point (0% bull and 100% bear) results in the money market instruments being held regardless of the market's performance. Here the return obtained is the buy-and-hold return of the money market instruments. This results in the return displayed in Table 3 (P_{Bull} =0,0; P_{Bear} =1,0) being the difference between the market and the money market instruments.

It is clear that markets go through phases of bullish and bearish trends and it would be reasonable to assume that these periods will have an affect on a market timing strategy. In Table 4 the results of traditional timing applied only to the bullish trends are shown.

The results indicate how difficult it appears to be to outperform the market under bullish conditions. Firstly to have a chance of beating the benchmark investors need to predict at least 80% of all bull periods. This in itself would be a formidable challenge and on top of this investors would also need to predict at least 80% of the bear periods to obtain a return greater than the buy-and-hold return. Only a 90% bull predictive accuracy allows investors to have a random guess for bear periods and still obtain a superior return.

It is clear from these results that when the market is in a bullish rally it is not worth attempting to time the market. The index should be held and the wave ridden. Trying to pick the odd downturn during these market conditions to try and protect returns is probably not worth the effort and if the prediction is incorrect then it could have a sizeable effect on the portfolio's performance. It is important to remember that the market provided an average return of 39,3% under these conditions, which in itself is quite a formidable return.

Table 4: Predictive accuracy matrix for traditional time (bull periods)
Returns (annualised) less buy and hold return

		Bull predictive accuracy										
		0,0	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1,0
Bear Predictive Accuracy	0,0	-42,8	-39,2	-35,4	-31,5	-27,4	-23,2	-18,9	-14,4	-9,7	-5,0	0,0
	0,1	-41,8	-38,1	-34,3	-30,3	-26,2	-22,0	-17,6	-13,1	-8,4	-3,6	1,4
	0,2	-40,7	-37,0	-33,1	-29,2	-25,0	-20,7	-16,3	-11,8	-7,0	-2,1	2,9
	0,3	-39,7	-35,9	-32,0	-28,0	-23,8	-19,5	-15,0	-10,4	-5,7	-0,7	4,4
	0,4	-38,6	-34,8	-30,9	-26,8	-22,6	-18,2	-13,7	-9,1	-4,3	0,7	5,9
	0,5	-37,6	-33,7	-29,7	-25,6	-21,4	-17,0	-12,4	-7,7	-2,9	2,2	7,4
	0,6	-36,5	-32,6	-28,6	-24,4	-20,1	-15,7	-11,1	-6,3	-1,4	3,6	8,9
	0,7	-35,4	-31,5	-27,4	-23,2	-18,9	-14,4	-9,8	-5,0	-0,0	5,1	10,4
	0,8	-34,3	-30,3	-26,2	-22,0	-17,6	-13,1	-8,4	-3,6	1,4	6,6	12,0
	0,9	-33,1	-29,2	-25,0	-20,7	-16,3	-11,8	-7,0	-2,1	2,9	8,1	13,5
	1,0	-32,0	-28,0	-23,8	-19,5	-15,0	-10,4	-5,7	-0,7	4,4	9,6	15,1

However, when the market is in a bearish phase these high returns will not be prominent but more likely to be poor and thus detracting from the portfolio performance. The effect of this market condition on a traditional timing strategy is shown in Table 5.

It appears from the table that under these market conditions a timing strategy could be successful at reasonable levels of predictive accuracy and contrary to the previous results the upside potential is greater than the downside. Furthermore all the returns from the bottom right quadrant are all positive indicating that any skill in predictive ability above that of a random guess will result out performance of the benchmark.

The most noteworthy observation from this table is that a random guess on whether the market will rise or fall over the next month is expected to give a return greater than the buy-and-hold benchmark. This stems from two facts, firstly the return on the market is very poor under these market conditions (-0,3%) resulting in a low benchmark, and secondly this benchmark return is appreciably below that of the money market instruments (5,4%).

Having the money market instruments outperforming the market causes 0% bull and 100% bear predictive accuracy achieving a return greater than the passive strategy. This also allows less than perfect bear predictive accuracy with 0% bull predictive accuracy achieve a return greater than the passive strategy which is contrary to Chua et al.'s (1987) results.

9. BULL TIMING RESULTS

Bull timing is one of the two timing strategies which uses options to achieve the desired exposures to the asset classes. It involves holding money market instruments and purchasing call options whenever a market rise is predicted. The results of this strategy when applied to the whole time period under investigation are presented in Table 6.

A comparison of Tables 4 and 6 suggests that it is more difficult to be successful using a bull timing strategy than a traditional strategy. Firstly and most obviously the bull timer requires a higher forecasting ability for both for bull and bear markets in order to out perform a buy-and-hold the market strategy and secondly the maximum possible gain was 13,75% less than that achieved by the traditional timer. However it must be noted that the traditional timing results do not include transactions costs whereas the bull timing results include the cost of the options purchased.

What is of interest and can be seen when comparing 0% bull and bear predictive accuracy between the two strategies is that the bull timing strategy out performs the traditional one. This arises because when an error is made using traditional timing the full loss of the market is incurred where as in bull timing only the cost of the call option is lost, which is often less than the fall in the market and the bull timer is still rewarded for holding the money market instruments. So the downside is somewhat protected but the upside potential is reduced due to the cost of the options.

Applying the bull timing strategy to the bullish market condition produced the returns shown in Table 7.

Under these market conditions not even perfect timing out performs the index. However it must be noted that a return of 34,0% is achieved for perfect timing which in itself is a formidable return despite it being less than the market return. This below par return is obtained because, being a bullish trend, many options will be purchased thus adding to the costs of the strategy with the average cost per monthly calls being about 1,9% of the portfolio. This sustained cost to maintain exposure to the market has the effect of reducing returns as indicated.

Table 5: Predictive accuracy matrix for traditional timing (bear periods)
Returns (annualised) less buy and hold return

		Bull predictive accuracy										
		0,0	**0,1**	**0,2**	**0,3**	**0,4**	**0,5**	**0,6**	**0,7**	**0,8**	**0,9**	**1,0**
Bear Predictive Accuracy	**0,0**	-17,1	-15,5	-13,9	-12,3	-10,6	-8,9	-7,2	-5,4	-3,7	-1,8	0,0
	0,1	-15,1	-13,4	-11,8	-10,1	-8,4	-6,7	-4,9	-3,1	-1,3	0,6	2,4
	0,2	-13,0	-11,3	-9,6	-7,9	-6,2	-4,4	-2,6	-0,8	1,1	3,0	4,9
	0,3	-10,8	-9,1	-7,4	-5,7	-3,9	-2,1	-0,2	1,7	3,6	5,5	7,5
	0,4	-8,6	-6,9	-5,1	-3,3	-1,5	0,3	2,2	4,1	6,1	8,1	10,1
	0,5	-6,4	-4,6	-2,8	-1,0	0,9	2,8	4,7	6,7	8,7	10,7	12,8
	0,6	-4,1	-2,3	-0,4	1,4	3,3	5,3	7,3	9,3	11,3	13,4	15,5
	0,7	-1,7	0,1	2,0	3,9	5,9	7,8	9,9	11,9	14,0	16,1	18,3
	0,8	0,7	2,6	4,5	6,4	8,4	10,5	12,5	14,6	16,7	18,9	21,1
	0,9	3,1	5,1	7,0	9,0	11,1	13,1	15,2	17,4	19,6	21,8	24,0
	1,0	5,6	7,6	9,6	11,7	13,7	15,9	18,0	20,2	22,4	24,7	27,0

Table 6: Predictive accuracy matrix for bull timing (total time period)
Returns (annualised) less buy and hold return

		Bull predictive accuracy										
		0,0	**0,1**	**0,2**	**0,3**	**0,4**	**0,5**	**0,6**	**0,7**	**0,8**	**0,9**	**1,0**
Bear Predictive Accuracy	**0,0**	-20,7	-19,3	-17,8	-16,3	-14,8	-13,3	-11,7	-10,1	-8,5	-6,9	-5,3
	0,1	-19,6	-18,2	-16,7	-15,2	-13,6	-12,1	-10,5	-8,9	-7,3	-5,7	-4,0
	0,2	-18,5	-17,1	-15,6	-14,0	-12,5	-10,9	-9,3	-7,7	-6,1	-4,5	-2,8
	0,3	-17,4	-15,9	-14,4	-12,9	-11,3	-9,7	-8,1	-6,5	-4,9	-3,2	-1,5
	0,4	-16,3	-14,8	-13,3	-11,7	-10,1	-8,5	-6,9	-5,3	-3,6	-1,9	-0,2
	0,5	-15,2	-13,7	-12,1	-10,5	-8,9	-7,3	-5,7	-4,0	-2,4	-0,7	1,1
	0,6	-14,0	-12,5	-10,9	-9,3	-7,7	-6,1	-4,5	-2,8	-1,1	0,6	2,4
	0,7	-12,9	-11,3	-9,7	-8,1	-6,5	-4,9	-3,2	-1,5	0,2	1,9	3,7
	0,8	-11,7	-10,1	-8,5	-6,9	-5,3	-3,6	-1,9	-0,2	1,5	3,2	5,0
	0,9	-10,5	-9,0	-7,3	-5,7	-4,0	-2,4	-0,7	1,1	2,8	4,6	6,4
	1,0	-9,4	-7,7	-6,1	-4,5	-2,8	-1,1	0,6	2,4	4,1	5,9	7,7

Table 7: Predictive accuracy matrix for bull timing (bull periods)
Returns (annualised) less buy and hold return

		Bull predictive accuracy										
		0,0	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1,0
Bear Predictive Accuracy	0,0	-40,8	-38,5	-36,2	-33,9	-31,5	-29,0	-26,5	-24,0	-21,4	-18,7	-16,0
	0,1	-39,9	-37,6	-35,3	-33,0	-30,5	-28,1	-25,6	-23,0	-20,4	-17,7	-15,0
	0,2	-39,1	-36,8	-34,4	-32,1	-29,6	-27,1	-24,6	-22,0	-19,4	-16,7	-13,9
	0,3	-38,2	-35,9	-33,5	-31,1	-28,7	-26,2	-23,6	-21,0	-18,4	-15,7	-12,9
	0,4	-37,3	-35,0	-32,6	-30,2	-27,8	-25,2	-22,7	-20,0	-17,4	-14,6	-11,8
	0,5	-36,5	-34,1	-31,7	-29,3	-26,8	-24,3	-21,7	-19,0	-16,3	-13,6	-10,8
	0,6	-35,6	-33,2	-30,8	-28,4	-25,9	-23,3	-20,7	-18,0	-15,3	-12,5	-9,7
	0,7	-34,7	-32,3	-29,9	-27,4	-24,9	-22,3	-19,7	-17,0	-14,3	-11,5	-8,6
	0,8	-33,8	-31,4	-29,0	-26,5	-23,9	-21,3	-18,7	-16,0	-13,2	-10,4	-7,5
	0,9	-32,9	-30,5	-28,0	-25,5	-23,0	-20,3	-17,7	-14,9	-12,2	-9,3	-6,4
	1,0	-32,0	-29,6	-27,1	-24,6	-22,0	-19,3	-16,6	-13,9	-11,1	-8,2	-5,3

However if the other extreme, that of a bearish trend is considered, the following returns are obtained (Table 8)

This table demonstrates that bull timing can be extremely successful during a bearish market. Most noticeable is that a random guess as to the market direction will achieve a return of 3,4% above that of the passive strategy and even if investors are only correct 40% of the time in predicting both bull and bear periods then returns above the market can be obtained.

These results occur because the money market instruments out perform the market. This benefits the bull timer since the strategy requires money market instruments to be held through the period. These create a cushion in which some timing errors can be absorbed before returns fall below the benchmark.

In comparison to traditional timing the upside potential is again lower using the bull timing strategy but the downside is less risky.

10. BEAR TIMING RESULTS

Bear timing is the second of the two option timing strategies and involves holding the index and purchasing put options whenever a market downturn is expected. Applying this strategy to the whole time period under investigation produced the following results (Table 9).

Table 8 Predictive accuracy matrix for bull timing (bear periods)
Returns (annualised) less buy and hold return

		Bull predictive accuracy										
		0,0	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1,0
Bear Predictive Accuracy	0,0	-8,7	-7,7	-6,8	-5,8	-4,8	-3,9	-2,9	-1,9	-0,9	0,2	1,2
	0,1	-7,3	-6,4	-5,4	-4,4	-3,4	-2,5	-1,5	-0,4	0,6	1,6	2,7
	0,2	-6,0	-5,0	-4,0	-3,0	-2,0	-1,0	-0,0	1,0	2,1	3,1	4,2
	0,3	-4,6	-3,6	-2,6	-1,6	-0,6	0,4	1,5	2,5	3,5	4,6	5,7
	0,4	-3,2	-2,2	-1,2	-0,2	0,9	1,9	2,9	4,0	5,1	6,1	7,2
	0,5	-1,8	-0,8	0,3	1,3	2,3	3,4	4,4	5,5	6,6	7,7	8,8
	0,6	-0,3	0,7	1,7	2,8	3,8	4,9	6,0	7,0	8,1	9,2	10,4
	0,7	1,1	2,2	3,2	4,3	5,3	6,4	7,5	8,6	9,7	10,8	12,0
	0,8	2,6	3,7	4,7	5,8	6,9	8,0	9,1	10,2	11,3	12,4	13,6
	0,9	4,1	5,2	6,3	7,3	8,4	9,5	10,7	11,8	12,9	14,1	15,2
	1,0	5,6	6,7	7,8	8,9	10,0	11,1	12,3	13,4	14,6	15,7	16,9

Table 9: Predictive accuracy matrix for bear timing (total time period)
Returns (annualised) less buy and hold return

		Bull predictive accuracy										
		0,0	**0,1**	**0,2**	**0,3**	**0,4**	**0,5**	**0,6**	**0,7**	**0,8**	**0,9**	**1,0**
Bear Predictive Accuracy	**0,0**	-15,3	-13,8	-12,4	-10,9	-9,4	-7,9	-6,3	-4,8	-3,2	-1,6	0,0
	0,1	-14,2	-12,7	-11,3	-9,8	-8,3	-6,7	-5,2	-3,6	-2,0	-0,4	1,2
	0,2	-13,1	-11,6	-10,1	-8,6	-7,1	-5,6	-4,0	-2,4	-0,8	0,8	2,5
	0,3	-12,0	-10,5	-9,0	-7,5	-6,0	-4,4	-2,8	-1,2	0,4	2,0	3,7
	0,4	-10,9	-9,4	-7,9	-6,4	-4,8	-3,2	-1,6	-0,0	1,6	3,3	5,0
	0,5	-9,8	-8,3	-6,7	-5,2	-3,6	-2,0	-0,4	1,2	2,9	4,5	6,2
	0,6	-8,7	-7,1	-5,6	-4,0	-2,4	-0,8	0,8	2,4	4,1	5,8	7,5
	0,7	-7,5	-6,0	-4,4	-2,8	-1,2	0,4	2,0	3,7	5,4	7,1	8,8
	0,8	-6,4	-4,8	-3,2	-1,6	-0,0	1,6	3,3	5,0	6,7	8,4	10,1
	0,9	-5,2	-3,6	-2,0	-0,4	1,2	2,9	4,5	6,2	7,9	9,7	11,4
	1,0	-4,0	-2,4	-0,8	0,8	2,4	4,1	5,8	7,5	9,2	11,0	12,8

The predictive accuracies required to beat the market are very similar to that of traditional timing for the same data set. However the maximum possible return is again substantially lower than that of traditional timing due to the cost of the put options. Furthermore the maximum potential loss is less using the bear timing strategy because when a market rise is incorrectly predicted, the bear timing strategy still holds the market thus benefiting from the rise and only suffering the cost of the option. The traditional timer on the other hand cannot benefit in the same manner.

The ability to benefit from an incorrect bear period prediction marginally reduces the required bear predictive accuracy across the spectrum.

Always holding the index will benefit the bear timing strategy during a bull trend as the portfolio will always be exposed to the market at no additional cost unlike the bull timing strategy. The results for bear timing during a bull trend are displayed in Table 10.

Again market timing appears highly challenging under the bull trend even for the bear timer. However the bear timing strategy fairs the best when considering the required predictive accuracy needed to beat the benchmark but still remains high and probably beyond the ability of most investors. There is a reduction in the bear predictive accuracy required to out perform the market relative to a traditional timing strategy for the same reasons as stated above.

Once more there is a reduction in the maximum possible gain but protection for the downside risk when comparing to the traditional timing results.

The bear timing strategy is far better suited for bullish trends than the bull timing strategy. This is primarily due to the bear strategy holding the index thus benefiting from the market run regardless of the prediction made. The bull timing does not share the same privileges and as a result far under performs in these market conditions.

However when the roles are reversed and the money market instruments faire better than the market, a bull timing strategy has the upper hand. Nevertheless the bear timing strategy can provide value as indicated in Table 11.

Again under these market conditions the timing strategy will provide a return above the benchmark even if random guesses are made as to the future market direction. This success comes from the fact that it is highly likely that the options will mature in-the-money thus reducing the effective cost of these options. Also having a bearish market creates an environment whereby the investor is more likely to purchase puts which are likely to end up in-the-money.

This combination of holding the index and having regular in-the-money puts easily pushes out the portfolios return above the passive benchmark. As seen previously the upside potential is greater than the downside under a bearish market.

Table 10: Predictive accuracy matrix for bear timing (bull periods)
Returns (annualised) less buy and hold return

		Bull predictive accuracy										
		0,0	**0,1**	**0,2**	**0,3**	**0,4**	**0,5**	**0,6**	**0,7**	**0,8**	**0,9**	**1,0**
Bear Predictive Accuracy	**0,0**	-21,9	-19,9	-17,8	-15,7	-13,6	-11,4	-9,2	-6,9	-4,7	-2,3	0,0
	0,1	-21,3	-19,2	-17,1	-15,0	-12,9	-10,7	-8,5	-6,2	-3,9	-1,6	0,8
	0,2	-20,6	-18,5	-16,4	-14,3	-12,2	-10,0	-7,7	-5,5	-3,2	-0,8	1,5
	0,3	-19,9	-17,9	-15,8	-13,6	-11,5	-9,2	-7,0	-4,7	-2,4	-0,1	2,3
	0,4	-19,3	-17,2	-15,1	-12,9	-10,7	-8,5	-6,3	-4,0	-1,7	0,7	3,1
	0,5	-18,6	-16,5	-14,4	-12,2	-10,0	-7,8	-5,5	-3,2	-0,9	1,5	3,9
	0,6	-17,9	-15,8	-13,7	-11,5	-9,3	-7,1	-4,8	-2,5	-0,1	2,2	4,7
	0,7	-17,3	-15,1	-13,0	-10,8	-8,6	-6,3	-4,1	-1,7	0,6	3,0	5,4
	0,8	-16,6	-14,5	-12,3	-10,1	-7,9	-5,6	-3,3	-1,0	1,4	3,8	6,2
	0,9	-15,9	-13,8	-11,6	-9,4	-7,2	-4,9	-2,6	-0,2	2,2	4,6	7,0
	1,0	-15,2	-13,1	-10,9	-8,7	-6,4	-4,1	-1,8	0,5	2,9	5,4	7,8

Table 11: Predictive accuracy matrix for bear timing (bear periods)
Returns (annualised) less buy and hold return

		Bull predictive accuracy										
		0,0	**0,1**	**0,2**	**0,3**	**0,4**	**0,5**	**0,6**	**0,7**	**0,8**	**0,9**	**1,0**
Bear Predictive Accuracy	**0,0**	-12,3	-11,1	-10,0	-8,8	-7,6	-6,3	-5,1	-3,8	-2,6	-1,3	0,0
	0,1	-10,9	-9,7	-8,5	-7,3	-6,1	-4,8	-3,6	-2,3	-1,0	0,3	1,6
	0,2	-9,4	-8,2	-7,0	-5,8	-4,5	-3,3	-2,0	-0,7	0,6	1,9	3,2
	0,3	-8,0	-6,7	-5,5	-4,3	-3,0	-1,7	-0,4	0,9	2,2	3,5	4,9
	0,4	-6,5	-5,2	-4,0	-2,7	-1,4	-0,1	1,2	2,5	3,8	5,2	6,6
	0,5	-5,0	-3,7	-2,4	-1,1	0,2	1,5	2,8	4,1	5,5	6,9	8,3
	0,6	-3,4	-2,1	-0,9	0,4	1,8	3,1	4,4	5,8	7,2	8,6	10,0
	0,7	-1,9	-0,6	0,7	2,1	3,4	4,8	6,1	7,5	8,9	10,3	11,8
	0,8	-0,3	1,0	2,4	3,7	5,1	6,4	7,8	9,2	10,6	12,1	13,5
	0,9	1,3	2,7	4,0	5,4	6,7	8,1	9,5	11,0	12,4	13,9	15,4
	1,0	3,0	4,3	5,7	7,0	8,4	9,9	11,3	12,7	14,2	15,7	17,2

11. CONCLUSIONS

It is clear that each strategy has its advantages as well as its weaknesses. However for practical purposes the traditional timing strategy is not feasible. The JSE is too illiquid and to rapidly purchase a portfolio that represents the market each time this exposure is desired makes this a cumbersome and expensive strategy.

For the whole time period the bear timing strategy out performed the bull timing strategy both from the predictive accuracy point of view as well as the possible obtainable returns. The same applies to the bullish market condition especially when considering that the bull timing strategy is sub optimal regardless of investors' predictive ability and they would be better off simply buying and holding the index.

Only when the market turns bearish does the bull timing strategy become superior both in returns and required predictive ability needed to beat the market.

However one main consideration is how do investors predict the general market trends. It is conceivable that just predicting or identifying this factor could be a formidable challenge. On top of this the investors will also need to identify when the market condition changes from one form to another thus adding to the complexity. Even with hindsight it is debatable on how to classify certain market trends let alone when they begun or ended.

This study suggests that market timing may be a viable investment strategy if the correct timing method is used during certain market conditions. However it also highlights the potential pitfalls and dangers of market

timing and any investor wishing to time the market hoping to make the impressive returns as shown in this study must also recognise that the downside risk may well outweigh the benefits.

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