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# Quantitative Methods of Stock Selection in the Construction and Testing of *Shari'a*-Compliant Strategies

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**ABSTRACT**

The use of quantitative methods of stock selection has many advantages in the construction and testing of *shari'a*-compliant portfolios. Quantitative methods permit the objective exclusion of stocks that do not meet *shari'a* guidelines, allowing an easier communication between the *shari'a* board and the portfolio manager. Additionally, quantitative methods allow managers to back test models over an extended period of time while complying with the constraints of *shari'a* in an objective and consistent way. In the absence of the back testing of an active strategy, the relatively short history of most *shari'a* funds limits a potential investor in his evaluation of the strategy. The effect of excluding stocks that are not permitted by *shari'a* law is evaluated in back tests for both passive and active strategies over a 15-year period. It is shown that not only does an Islamic index tend to be more volatile and more heavily weighted in technology stocks than the unconstrained universe from which it is derived, but that this overweighting in technology has also had a major impact on performance during recent years. An active strategy applied to a selection universe from which stocks not meeting *shari'a* law guidelines have been excluded is also discussed. The strategy has strongly outperformed the associated Islamic index in back tests over the past 15 years and has matched the risk-adjusted performance of the same strategy applied to the selection universe without exclusion of stocks not meeting *shari'a* guidelines. The imposition of *shari'a* constraints is likely to have less effect on the performance of an active strategy if there are limits on sector concentration and if the initial selection universe is sufficiently large to ensure that a large number of stocks will remain after the *shari'a* constraints have been applied.

## I. INTRODUCTION

The use of quantitative methods of stock selection has many advantages in the construction and testing of *shari'a*-compliant portfolios. It permits the objective exclusion of stocks that do not meet *shari'a* guidelines, thereby allowing an easier communication between the *shari'a* board and the portfolio manager. Additionally, it allows managers to back test models over an extended period of time while complying with the constraints of the *shari'a* in an objective and consistent way. In the absence of the back testing of a quantitative strategy, a potential investor is limited in his evaluation of a strategy to the relatively short history of most *shari'a* funds.

There is obvious interest in understanding how the performance of an equity strategy is likely to be influenced by the exclusion of stocks that do not meet *shari'a* guidelines. The question can be answered in two ways, which take into account whether the Islamic investor wishes to pursue a passive investment strategy or an active one. A passive investor will invest in an index or basket of stocks that are held without changing the portfolio, while an active investor will change the portfolio as he reevaluates each stock in the selection universe.

The importance of considering the effects of *shari'a* constraints over a complete market cycle in any analysis will also be shown. For example, during much of the 1990s, U.S. markets were characterized by strength in technology stocks, which tend to be *halal* investments, so that the effect of the constraints during this period was to concentrate the portfolio in better performing sectors of the market. It is not surprising therefore that Atta[i] found that the Dow Jones Islamic Market Index[ii] outperformed the Dow Jones Global Index over the period 1996-1999. The opposite effect might occur during other parts of a market cycle when technology stocks underperform the market. Unfortunately, Islamic funds have not been in existence for a sufficiently long period of time to allow this comparison to be made over a complete market cycle based on the performance of an actual Islamic fund.

This paper attempts to address these issues by using quantitative methods to replicate the performance of *shari'a*-compliant strategies over a market cycle. An Islamic index is typically constructed by excluding from a parent index stocks that do not meet *shari'a* guidelines. For example, the Dow Jones Islamic Market Index is formed from the Dow Jones Global Index. *Shari'a* constraints are first translated into quantitative screens. These screens are

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then applied to stocks that were members of the Russell 1000 Index[iii] at the beginning of each month from January 1987-December 2001, using financial information which would have been available on the screening date to calculate the screening parameters.[iv] In this way, the universe of stocks in the Russell 1000 Index which would have met *shari*$^{c}$*a* constraints over a complete market cycle can be objectively reproduced and the performance of this *shari*$^{c}$*a*-compliant universe can be compared with the performance of the Russell 1000 Index. This comparison shows the effect of the *shari*$^{c}$*a* constraints on the performance of a passive index-type strategy. The performance of a *shari*$^{c}$*a*-compliant universe formed from the Russell 2000 Index can be similarly compared with the performance of the Russell 2000 Index.

Additional considerations arise when the effects of the *shari*$^{c}$*a* constraints on an Islamic investor pursuing an active portfolio strategy are considered. The *shari*$^{c}$*a* constraints may eliminate the stocks that would otherwise have been selected in an active strategy. The active strategy may also offset sector shifts that otherwise would have occurred in the formation of the *halal* universe. Using quantitative rules to select stocks from the Russell indexes and then using the same rules to select stocks from the *halal* universe formed from the indexes can replicate these effects. In this way, the effects of *shari*$^{c}$*a* constraints on an active portfolio strategy can be examined.

## II. METHODOLOGY

Monthly financial data and analysts' earnings estimates were obtained from commercial database providers for stocks in the Russell 3000 Index from January 1, 1987 to December 31, 2001. By using the membership of the Russell indexes as they existed in the past, issues of survivorship bias were avoided. The Russell 3000 Index measures the performance of the three thousand largest U.S. stocks and represents approximately 98% of the investable U.S. equity market. The largest one thousand of these stocks make up the Russell 1000 Index and the remaining stocks make up the Russell 2000 Index. For purposes of this analysis, an Islamic index of large capitalization stocks (IILCS) and an Islamic Index of Small Capitalization Stocks (IISCS) were constructed on a monthly basis by excluding any stocks in the Russell 1000 and Russell 2000 Indexes that did not meet the *shari*$^{c}$*a* constraints for that month, as described in Appendix 1.[v] The broad Russell indexes were used as a starting point to ensure that a large number of stocks would remain after the application of the *shari*$^{c}$*a* constraints. Sections III and IV compare the IILCS with the Russell 1000 Index and the IISCS with the Russell 2000 Index, respectively.

An active stock selection strategy from January 1, 1987 to December 31, 2001 was also back tested on the universe of stocks in the Russell 3000 Index. The results were compared with the performance of the same strategy applied to a universe of *shari*$^{c}$*a*-compliant stocks in the Russell 3000 Index. This comparison is only strictly applicable to the specific strategy used in the analysis but the comparison is likely to capture some of the trade-offs that are introduced when *shari*$^{c}$*a* constraints are overlaid on a stock selection strategy.

## III. COMPARISON OF ISLAMIC INDEX OF LARGE CAPITALIZATION STOCKS WITH RUSSELL 1000 INDEX

From 1987-2001, the IILCS contained about 22% of the stocks in the Russell 1000 Index and there was a reduction in the median market capitalization in 14 of the 15 years when *shari*$^{c}$*a* constraints were introduced. The comparisons were made at the end of each year. Over the entire period, the IILCS outperformed the Russell 1000 Index by 3.1% per year, which seems to be consistent with Atta's findings for the period 1996-1999. The situation is in fact more complicated. What drives relative performance becomes more apparent when various parts of the market cycle are examined. The IILCS underperformed by 18.6% and 7.4% in the year 2000 and 2001, respectively. These were both years when technology stocks underperformed the market. This suggests that the recent outperformance of the IILCS is due to the fact that it has a higher weighting of technology stocks than the Russell 1000 Index. This overweighting has exaggerated the technology-related swings in the Russell 1000 Index. This effect was confirmed through direct comparison of the percentage of technology stocks in the two indexes. On December 31, 1998, technology stocks comprised 23% of the Russell 1000 Index but 55% of the IILCS, while on December 31, 1999, technology stocks comprised 34% of the Russell 1000 Index but 72% of the IILCS. On December 31, 2000, technology stocks comprised 25% of the Russell 1000 Index but 57% of the IILCS. And on December 31, 2001, technology stocks comprised 20% of the Russell 1000 Index but 50% of the IILCS. As long as technology stocks were leading the general market, the IILCS would be expected to outperform the market. More recently, as technology stocks have declined, the IILCS has declined even faster. The heavier weighting of technology stocks is consistent with a higher median trailing P/E ratio. The IILCS also has a higher standard deviation and a slightly lower Sharpe Ratio,[vi] so that the higher absolute return is achieved at the cost of increased risk.

| | Return | Standard Deviation | Sharpe Ratio |
|---|---|---|---|
| Islamic index of large cap stocks | 17.8% | 26.0% | 0.47 |
| Russell 1000 Index | 14.7% | 16.2% | 0.56 |

## IV. COMPARISON OF ISLAMIC INDEX OF SMALL CAPITALIZATION STOCKS WITH RUSSELL 2000 INDEX

Similar effects are observed upon comparison of the Islamic index of small capitalization stocks (IISCS) with the Russell 2000 Index, though the overweighting of the technology sector in the IISCS is less pronounced. The IISCS outperformed the Russell 2000 Index over the 15-year period by 4.1% per year but still underperformed by 25.9% in 2000 and 4.6% in 2001, when technology shares declined. The IISCS had a higher standard deviation than the Russell 2000 Index but also a slightly higher Sharpe Ratio. On December 31, 1998, technology stocks comprised 22% of the Russell 2000 Index and 42% of the IISCS. On December 31, 1999, technology stocks comprised 33% of the Russell 2000 Index and 49% of the IISCS. On December 31, 2000, technology stocks comprised 18% of the Russell 2000 Index and 34% of the IISCS, and on December 31, 2001, technology stocks comprised 22% of the Russell 2000 Index and 42% of the IISCS. The heavier weighting of technology stocks is consistent with the higher median trailing P/E ratio for the IISCS.

| | Return | Standard Deviation | Sharpe Ratio |
|---|---|---|---|
| Islamic index of large cap stocks | 16.1% | 24.6% | 0.43 |
| Russell 2000 Index | 12.0% | 17.0% | 0.38 |

## V. EFFECTS OF *SHARI[C]A* CONSTRAINTS ON AN ACTIVE STRATEGY

It is difficult to compare the performance of an active strategy with and without *shari[c]a* constraints unless quantitative methods of stock selection are employed. An active strategy was back tested on stocks selected from the IILCS and the IISCS for the calendar years 1987-2001. The strategy enforces size and style diversification by selecting ten growth and ten value stocks from both the IILCS and the IISCS. Value stocks are selected not only based on factors such as price-to-book but the stocks are also screened for likely increases in future earnings. All stocks are equally dollar-weighted on the selection date. There is also a limit imposed on sector concentrations to offset any overweighting in technology when *shari[c]a* constraints are introduced. Portfolios are formed at the beginning of each year and held for one year without rebalancing. The same strategy was used to select ten growth and ten value stocks from both the Russell 1000 Index and the Russell 2000 Index. Average annual returns, standard deviations and Sharpe Ratios over the 15-year period are as follows:

| | Return | Standard Deviation | Sharpe Ratio |
|---|---|---|---|
| 12-month holding period strategy, with stocks selected from equal-weighted IILCS and IISCS | 21.6% | 17.8% | 0.90 |
| Equal-weighted IILCS and IISCS | 17.0% | 24.1% | 0.47 |
| 12-month holding period strategy, with stocks selected from equal-weighted Russell 1000 and Russell 2000 Indexes | 25.4% | 21.5% | 0.93 |
| Equal-weighted Russell 1000 and Russell 2000 Indexes | 13.3% | 15.4% | 0.51 |

Transaction costs are small with a one-year holding period and have not been included. In performing these back tests, errors that could arise from survivorship bias and look-ahead bias were carefully avoided. For example, a research database made up of stocks that would have been available for selection on the selection date was used. The long holding period also reduced the importance of trading issues.

The active strategy applied to stocks in the IILCS and the IISCS outperforms the passive strategy of investing in an equal-weighted portfolio of the IILCS and the IISCS on an absolute return basis and also has a lower standard deviation. It underperforms on an absolute return basis the same active strategy applied to stocks in the Russell indexes but also has a lower standard deviation. However, on a risk-adjusted return basis measured by the Sharpe Ratio, the active strategy applied to stocks in the IILCS and IISCS not only greatly outperforms the passive strategy of investing in an equal-weighted portfolio of the IILCS and the IISCS but also matches the performance of the same strategy applied to stocks in the Russell indexes.

## VI. CONCLUSION

There is obvious interest in understanding how the performance of an equity portfolio is likely to be influenced by the exclusion of stocks that do not meet *shari*$^{c}$*a* guidelines. Unfortunately, Islamic funds have not been in existence for a sufficiently long period of time to allow this comparison to be made over a complete market cycle based on the actual performance of an Islamic fund. This paper seeks to overcome the problem by using quantitative methods to replicate the performance of both passive and active *shari*$^{c}$*a*-compliant strategies over a market cycle. It shows that an Islamic index will tend to be more heavily weighted in technology than the parent index and this overweighting explains the outperformance of an Islamic Index noted by Atta from 1996 to 1999. Active strategies that limit sector concentrations may compensate for the sector distortions that might otherwise occur when *shari*$^{c}$*a* guidelines are applied. An active strategy applied to a selection universe from which stocks not meeting *shari*$^{c}$*a* have been excluded is discussed. The strategy has outperformed the associated Islamic index in back tests over the past 15 years and has matched the risk-adjusted performance of the same strategy applied to the universe without the application of *shari*$^{c}$*a* constraints. The imposition of *shari*$^{c}$*a* constraints is likely to have little effect on the performance of an active strategy if there are limits on sector concentration and if the initial selection universe is sufficiently large to ensure that a large number of stocks will remain after *shari*$^{c}$*a* constraints have been applied.

## APPENDIX 1: EXCLUDED STOCKS

Stocks were excluded from the Russell Indexes if they were involved in the following businesses:

- Alcoholic beverages
- Financial services
- Tobacco
- Aerospace and defense
- Movie and TV production and distribution
- Meat products
- Gambling

Also excluded were stocks with unacceptable levels of debt or interest income, defined as follows:

- Interest income greater than 15% of total revenue
- Debt greater than 30% of equity
- Accounts receivable greater than 50% of book value

## APPENDIX 2: CALENDAR 12-MONTH RETURNS

| | Russell 1000 Return (%) | IILCS Return (%) | Russell 2000 Return (%) | IISCS Return (%) |
|---|---|---|---|---|
| **1987** | 2.94 | 7.94 | -8.77 | -0.52 |
| **1988** | 17.23 | 6.26 | 24.89 | 23.55 |
| **1989** | 30.42 | 29.17 | 16.24 | 26.95 |
| **1990** | -4.16 | 2.49 | -19.51 | -9.65 |
| **1991** | 33.03 | 47.82 | 46.05 | 54.07 |
| **1992** | 9.04 | -1.00 | 18.41 | 11.82 |
| **1993** | 10.15 | 5.45 | 18.91 | 16.73 |
| **1994** | 0.38 | 6.44 | -1.82 | 3.47 |
| **1995** | 37.77 | 39.34 | 28.44 | 35.80 |
| **1996** | 22.45 | 23.91 | 16.49 | 13.64 |
| **1997** | 32.85 | 27.14 | 22.36 | 14.05 |
| **1998** | 27.02 | 54.49 | -2.55 | 12.81 |
| **1999** | 20.91 | 62.50 | 21.26 | 70.15 |
| **2000** | -7.80 | -26.77 | -3.03 | -25.41 |
| | | | | |
| **Average** | **16.59** | **20.37** | **12.67** | **17.67** |
| Sharpe Ratio | 0.74 | 0.60 | 0.41 | 0.50 |

[i] Atta, Hajara. "Ethical Rewards." M.Sc. Dissertation. University of Durham, Department of Economics and Finance. September 29, 2000.

[ii] Dow Jones Islamic Market Index and Dow Jones Global Index are trademarks of Dow Jones and Company, Inc.

[iii] Russell 1000, Russell 2000 and Russell 3000 are trademarks of Frank Russell Company.

[iv] Here and subsequently, in performing these back tests, we were careful to avoid survivorship bias and look-ahead bias.

[v] The stocks remaining after applying *shari[c]a* constraints were weighted by market capitalization to form the IILCS and the IISCS. The Russell Indexes are weighted by their available market capitalization.

[vi] The Sharpe Ratio is a measure of return adjusted for risk. It is calculated as (average return-1-year T-bill rate)/standard deviation of return.