

Four Dimensions

An Adaptive Multifactor Approach to Scoring Stocks

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Abstract

This white paper describes the process FusionIQ developed for scoring US equities in a four dimensional framework. The FusionIQ model is grounded in the belief that simpler is better, but more relevant information is preferred to less. The value-add of the model comes from the stability it presents using quality, time-tested factors which, in aggregate, provide a balanced picture of a company's financial situation combined with technical indicators that assess a stock's likely next move.

FusionIQ's unique security scoring methodology is unemotional, automated, and repeatable. The model utilizes a multifactor structure that has the capability to dynamically and systematically adjust factor weights based on market conditions and other proprietary factors.

The four dimensions that make up the model include Technical, Fundamental, Momentum and Sentiment. These four investment dimensions are combined into one comprehensive Master Score on a daily basis, available before the market opens.

The FusionIQ model combines both technical aspects of markets with fundamental analysis of companies. Combining factors like these, which are negatively correlated, will often result in an overall score that will exhibit a higher level of effectiveness with lower volatility.

We include technical because the laws of supply and demand hold in all markets, but especially in the stock market. When a stock is rising, there are more interested buyers than sellers. When a stock is falling, the sellers are leading the buyers. While this can be a short term phenomenon, it has been shown that price trends can also persist for some time.

We include fundamental factors because, at the end of the day, a company is only worth the present value of the future cash flows it can generate. The devil is in the details to determine the amount and timing of those cash flows for a company. Consistent with our philosophy that more is better, FusionIQ utilizes as much pertinent information from a company's financial statement as possible to derive that information. The fundamental components include only those factors that make sense from the rigorous perspective of an investment analyst. We do not include any factors that an analyst would not consider relevant.

The current version of FusionIQ was implemented in January, 2015, using a combination of FusionIQ's technical model, in existence since 2008, combined with fundamental, momentum and sentiment models in existence since 2004.

Our goal is to provide value-added and reliable scores for the equities we cover. We seek to have the future returns of the highest Master Scores outperform the future returns of the lowest Master Scores with high frequency.

Please see important disclosures on last page.

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Process

In this section, we describe the mechanical process that we employ to score stocks. The rest of this paper describes more specific elements of the dimensions as well as charts and graphs of the results.

Data

We receive comprehensive data on a daily basis from multiple sources, with our primary data from Morningstar and Zacks Investment Research. The data contains financial disclosures (balance sheet, income statement and cash flow) as well as consensus earnings information, price, volume, dividends, price trends, money flows plus many other fields. We perform a verification process on the data searching for misstated data items, and track identifier changes. We incorporate additional data into the process, including VIX data from the CBOE and interest rates from Federal Reserve online.

Dimensions

There are four dimensions – Technical, Fundamental, Momentum, and Sentiment. We believe these four dimensions represent a comprehensive group of investment behaviors that help determine future returns.

We calculate the factor scores using the daily data described above, as well as some weekly and monthly data. We do not include just one particular style of factor. Rather, we believe that many categories of factors may drive stock returns.

We include measures of cheapness or fair value by comparing intrinsic values with stock price. The momentum factors use price and volume to assess price trends, as well as price reversals. Our other categories include balance sheet strength, market sentiment and changes in a company's financials, which compares the current value of a factor with a historical trended value.

Model weights

FusionIQ incorporates a static as well as a dynamic component to weights. For the macro static weights, we utilize historical averages, including effectiveness, volatility and correlation matrix to achieve our stated goal of a balanced view of securities.

For the dynamic weighting, the fundamental score is created based on a pair-wise methodology to determine optimal weights. The methodology compares, in isolation, each pair of factors across a set of forecasted inputs that measure skill and consistency. The end result is a weighting scheme that includes only that factors forecasted to outperform over the next period, and determines the weights that are forecasted to result in the highest returns, with the least amount of risk.

FusionIQ Scores – The FusionIQ Master Score is calculated as a linear combination of the four dimension scores, Technical, Fundamental, Momentum and Sentiment on a 1 to 100 basis.

Dimensions

The FusionIQ model is comprised of four Dimensions.

Below is a description of each dimension:

Technical Dimension:

This category provides a thorough evaluation of price trends, from short term to long term, to assess most likely next directional moves. These factors are combined with non-price related inputs such as money flow and institutional ownership to create a complete technical evaluative score.

Fundamental Dimension:

There are several areas we measure under this dimension. It incorporates earnings, debt and equity levels, stock prices and cash flow measures, as well as many other metrics. We evaluate the intrinsic and relative value of a stocks' price, determine the growth opportunities, and assess the stability and quality of the company's financials. This category evaluates a stocks' financials on both a time series and a cross-sectional basis.

Momentum Dimension:

Momentum is an indicator that has worked well in the past and continues to add value. It may not be based upon financial or earnings values explicitly, but it is grounded in behavioral theory in finance. This category uses both shorter and longer term periods, and incorporates price reversals as well, knowing that all of these may add value. In addition to price momentum, volume is also included in some calculations.

Sentiment Dimension:

This dimension combines both changes in earnings and expectations to assess changing financial health. Measures such as earnings trends, changes in consensus and surprises are included.

Summary

Using mathematical and financial principles as our primary tools, we built a robust stock scoring system. Our model combines four dimensions, which when taken separately have shown skill in scoring stocks. When the four dimensions are aggregated to form a comprehensive Master Score, the model exhibits excellent tail properties, while preserving the effectiveness of the overall scores. This occurs because of the low-correlated and negative-correlated dimensions. Most investors utilize only one or two dimensions of FusionIQ to evaluate stocks, missing out on the power of combining uncorrelated information.

With simple markets, less information is preferred. With complicated markets, more information is required to accurately assess each stock. Styles periodically go in and out of favor. Without a comprehensive investment system, it is difficult to maintain returns in all market environments. FusionIQ evaluates up to 100 different investment, market and environmental factors to determine the best model at any time.

FusionIQ's unique security scoring methodology is unemotional, automated, and repeatable. The model utilizes a multifactor scheme that has the capability to dynamically and systematically adjust factor weights based on market conditions and other proprietary factors.

The value-add of the model comes from the stability it presents using quality, time-tested factors which, in aggregate, provide a balanced picture of a company's financial situation combined with technical indicators that assess a stock's likely next move.

The four dimensions that make up the model include Technical, Fundamental, Momentum and Sentiment. These four investment dimensions are combined into one comprehensive Master Score on a daily basis, available before the market opens.

The FusionIQ algorithm can be applied to stocks, mutual funds, ETFs, industries, groups and sectors.

Results

What we strived for when we built our process was a very high quality model with consistent results. The process should work both long and short, across many groups of stocks and in as many market environments as possible. We believe all of these aspects are necessary to produce the best model for all investors. Below is a summary of the highlights of the results, shown across capitalization and style, and in different market environments:

Explanation of the charts below:

Analysis

- Average IC (Information Coefficient) is the average one-month information coefficient from 2013 – 2015 for all Master Scores. Information Coefficient is the rank correlation between scores and subsequent one-month returns, and gives a measure of linearity between best and worst scores as a predictor for returns. See Exhibit B for a more detailed explanation of Information Coefficient.

- **When Top55+ and Bottom55- are shown:**
 - Top55+ is the return to an equal weighted portfolio holding the scores 55 and above long, rebalanced monthly.
 - Bottom55- is the return to an equal weighted portfolio holding the scores below 55, rebalanced monthly.

- **When Top70+, Middle and Bottom45- are shown:**
 - Top70+ is the return to an equal weighted portfolio holding the scores 70 and above long, rebalanced monthly.
 - Middle is the return to an equal weighted portfolio holding the scores between 45 and 70, rebalanced monthly.
 - Bottom45- is the return to an equal weighted portfolio holding the scores below 45, rebalanced monthly.

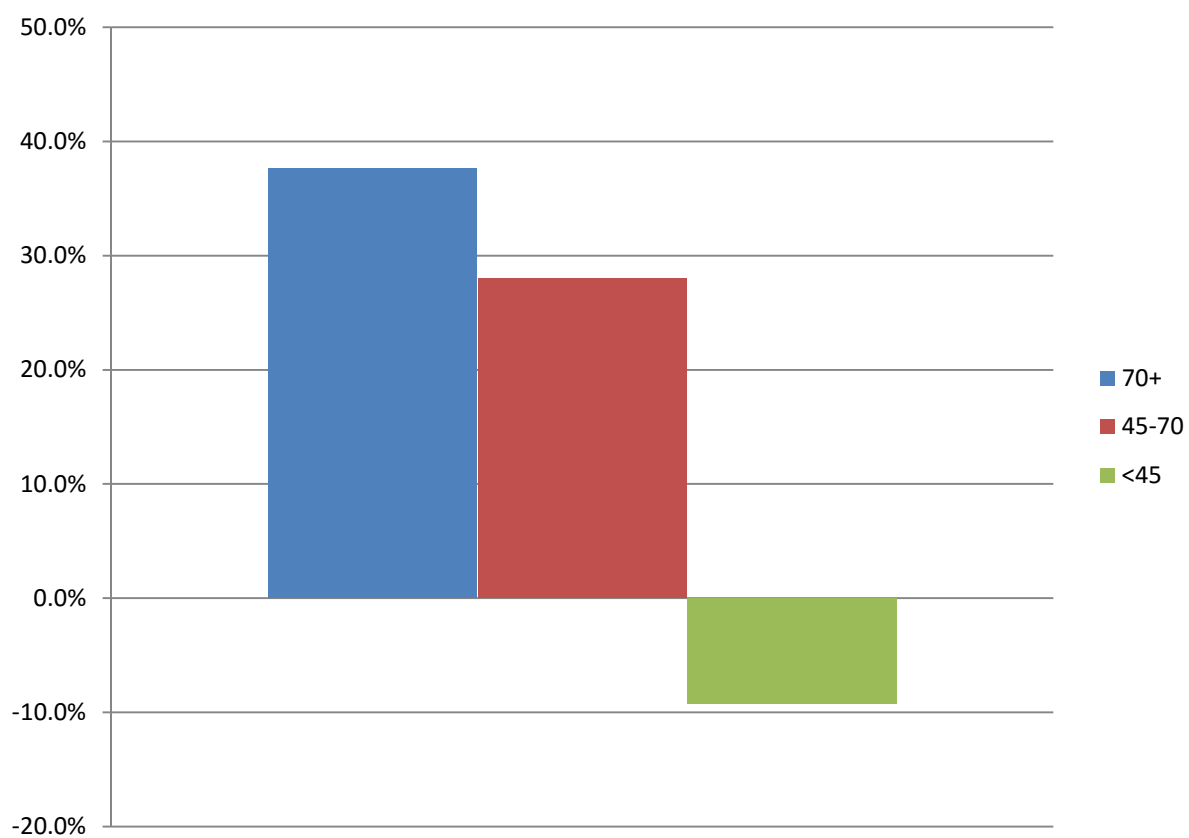
Liquid, 3 Groups

Return to Master Score Across 3 Groups

Scores <45, 45-70, 70+

Liquid Universe

Monthly Rebalance 2013-2015



Average Monthly Information Coefficient

Group	Average IC	Latest Counts
Capitalization		
Liquid	.048	2518
Large	.065	1065
Small	.037	1453
Mega	.048	65
Style		
Dividends	.064	1496
No Dividends	.032	1022
Markets		
Up	.010	21*
Down	.100	15*
Sectors		
Energy	.070	225
Materials	.128	155
Industrials	.059	287
Consumer Discretionary	.020	366
Consumer Staples	.074	112
Health Care	.005	338
Financials	.049	525
Technology	.010	383
Telecommunication	.005	52
Utilities	.081	80

Cumulative Returns for Top, Middle and Bottom Groups

Group	Top70+	Middle	Bottom45-
Capitalization			
Liquid	37.7%	28.0%	-9.3%
Dimension			
Technical	47.8%	34.6%	4.8%
Fundamental	37.1%	34.2%	30.6%
Momentum	38.5%	45.2%	18.2%
Sentiment	44.3%	31.7%	22.3%

Cumulative Return for Top and Bottom Groups

Group	Top55+	Bottom55-
Capitalization		
Liquid	35.2%	1.0%
Large	48.9%	9.2%
Small	45.1%	13.5%
Mega	37.1%	1.9%
Style		
Dividends	46.9%	1.4%
No Dividends	46.6%	21.5%
Markets		
Up	96.6%	96.1%
Down	-31.2%	-48.5%
Sectors		
Energy	8.2%	-48.1%
Materials	17.7%	-48.4%
Industrials	42.8%	10.4%
Consumer Discretionary	46.8%	27.2%
Consumer Staples	66.3%	17.4%
Health Care	81.8%	72.%
Financials	47.0%	24.8%
Technology	53.3%	54.3%
Telecommunication	6.6%	15.1%
Utilities	42.1%	1.7%

Notes

- All results are based on one process, using both historical and in-sample data from 2013 through 2015.
- The results shown above are arithmetic average values for IC and cumulative geometric values for all returns shown, unless otherwise stated.
- Determination of up and down markets is using equal-weighted return for liquid universe. Counts in up and down represent number of months of up markets vs down markets.
- Determination of dividend and non-dividend universes is using liquid universe.
- Results are shown for illustrative purpose only, and not intended as a guarantee, or indication of future results.
- We believe in our process, but do not project that future results will be the same, better or worse than the past. The analysis was performed on one specific time period of 2013 through 2015, with our best efforts to ensure the data was correct and accurate. The model may perform differently in any other time period in the past or future.

Appendix

Appendix A – Process Integrity

The FusionIQ current model has been “live” since 2015. However, the components of the model have been running since 2004 for the fundamental, momentum and sentiment dimensions, and 2008 for the technical dimension. We have a strict policy on how new ideas get included in the process – deliberately and intelligently. All of our historical and in-sample results were all calculated under one process, with every attempt to remove biases. Of course, we cannot ensure every historical bias has been negated.

The following graphs and charts are provided for informational purposes only, noting that there is no track record or guarantee that the data is correct, or that future results will look similar to past results.

Appendix B – Definitions

Information Coefficient

Information Coefficient or IC is an accepted measure of skill for scored stocks. IC is calculated as follows:

1. Rank the stocks from best long ideas (forecasted highest return) to best short ideas (forecasted lowest return). The Master Score is an example of a forecasted return.
2. Rank the subsequent period actual returns, e.g. one month or 6 month, from highest return to lowest return.
3. Calculate the correlation between those 2 series of numbers.

The higher the IC, the better is the skill. A positive IC means there is correlation, or skill, between scores (predicted returns) and actual returns. Negative or zero correlation is not investable. IC is a measure of the slope of the graph of forecasted returns compared with actual returns. The weakness of IC is that it's a limited calculation – measures only the degree of linearity. For instance, you could have a high IC, but lower accuracy on the tails of the distribution – best long and short recommendations – or have a low IC, yet with excellent forecast ability on the tails.

Universe

Liquid – Determined based on average dollar-volume traded over a 20 day period, assuming AUM of \$125 million and a position size of 3%.
Contains approximately 2500 stocks at the end of 2015.

Large – Requires liquid universe and a minimum market capitalization of \$4 Billion.
Contains approximately 1000 stocks at the end of 2015.

Small – Requires liquid universe and a maximum market capitalization of \$4 Billion.
Contains approximately 1500 stocks at the end of 2015.

Mega – Requires liquid universe and a minimum market capitalization of \$100 Billion.
Contains approximately 65 stocks at the end of 2015.

Dividends – Requires liquid universe and that a dividend is indicated at beginning of year.
Contains approximately 1500 stocks at the end of 2015.

No Dividends – Requires liquid universe and that no dividend payment is indicated at beginning of year. Contains approximately 1000 stocks at the end of 2015.

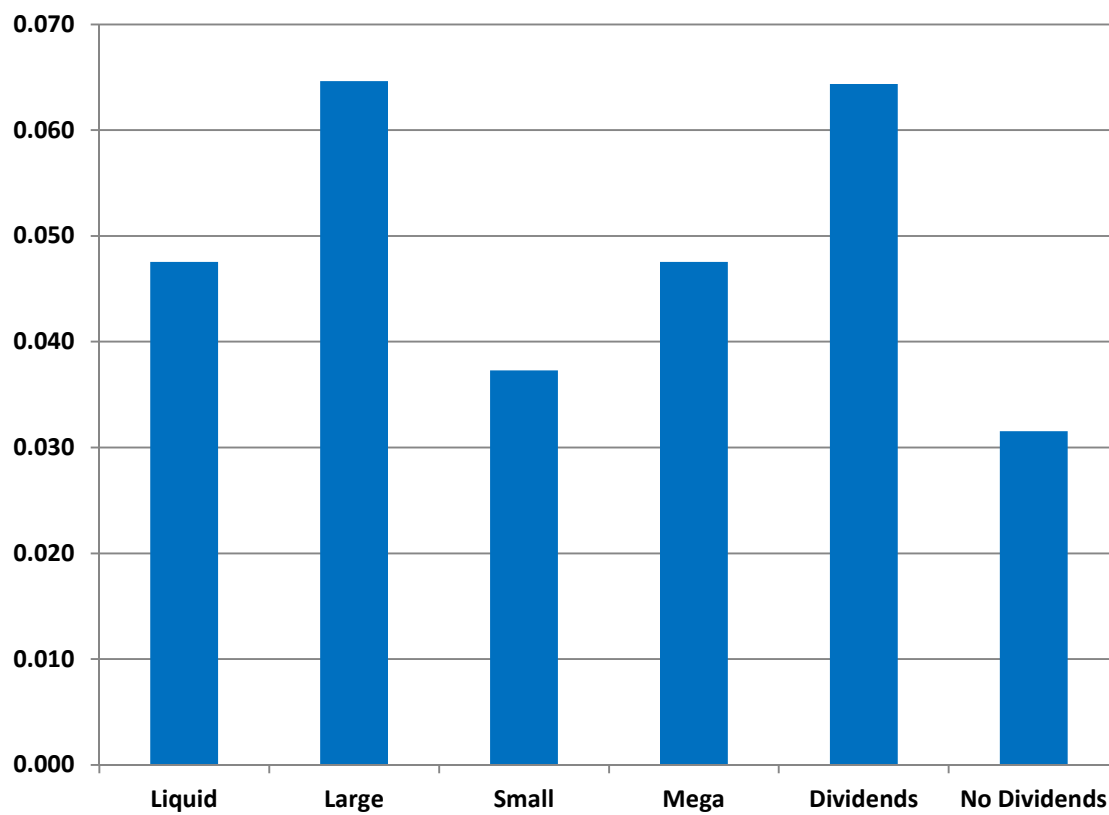
Sectors – Based on the Global Industry Classification Standard (GICS).

GICS Code	Sector
10	Energy
15	Materials
20	Industrials
25	Consumer Discretionary
30	Consumer Staples
35	Health Care
40	Financials
45	Information Technology
50	Telecommunication Services
55	Utilities

Appendix C – IC by Universe

Average Monthly IC by Universe

Monthly Rebalance 2013-2015

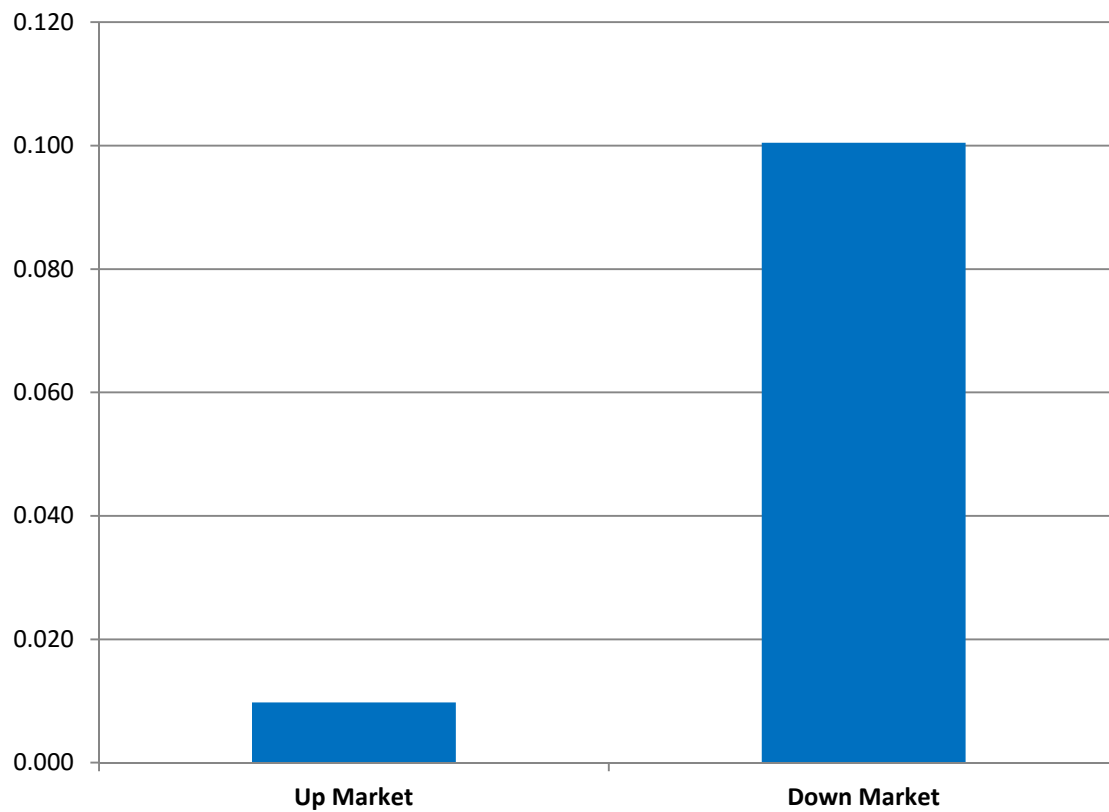


Appendix D – IC by Market Direction

Average Monthly IC by Market Direction

Liquid Universe

Monthly Rebalance 2013-2015

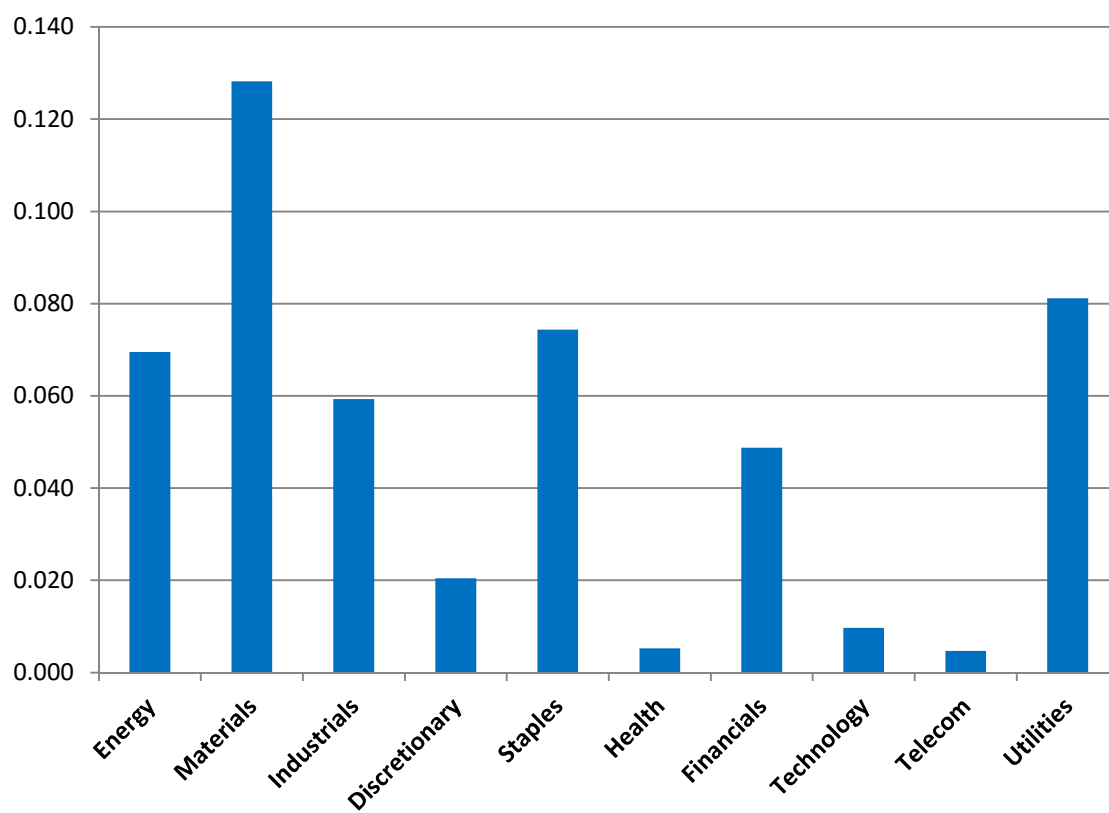


Appendix E – IC by Sector

Average Monthly IC by Sector

Liquid Universe

Monthly Rebalance 2013-2015

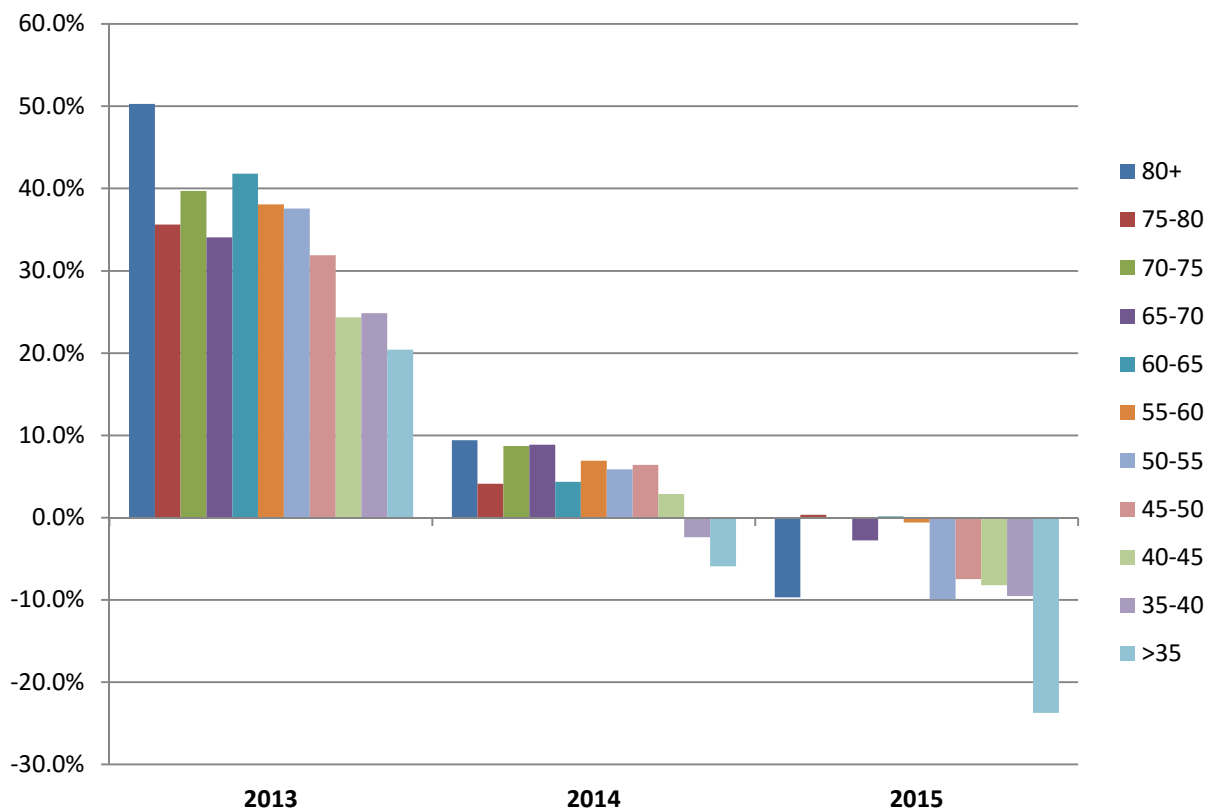


Appendix F – Liquid, Multiple Groups

Return to Master Score Across Multiple Groups

Liquid Universe

Monthly Rebalance 2013-2015



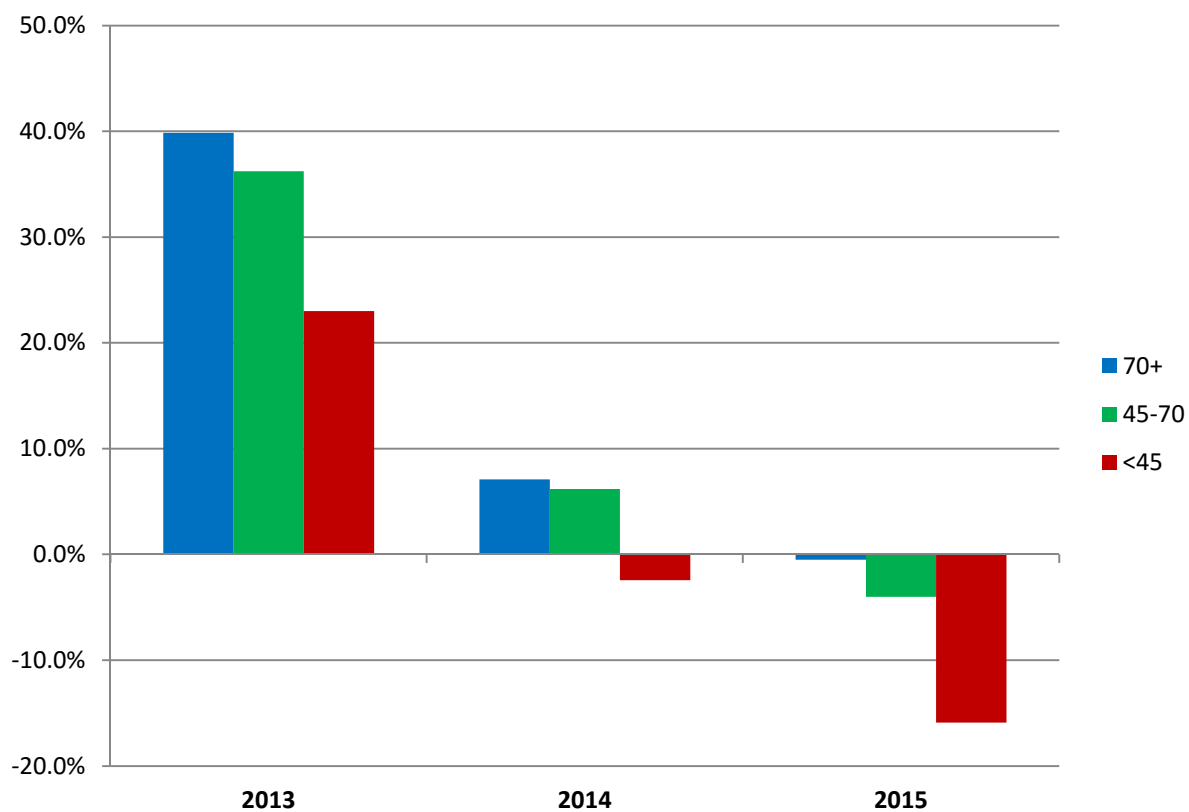
Appendix G – Liquid, 3 Groups

Return to Master Score Across 3 Groups

Scores <45, 45-70, 70+

Liquid Universe

Monthly Rebalance 2013-2015



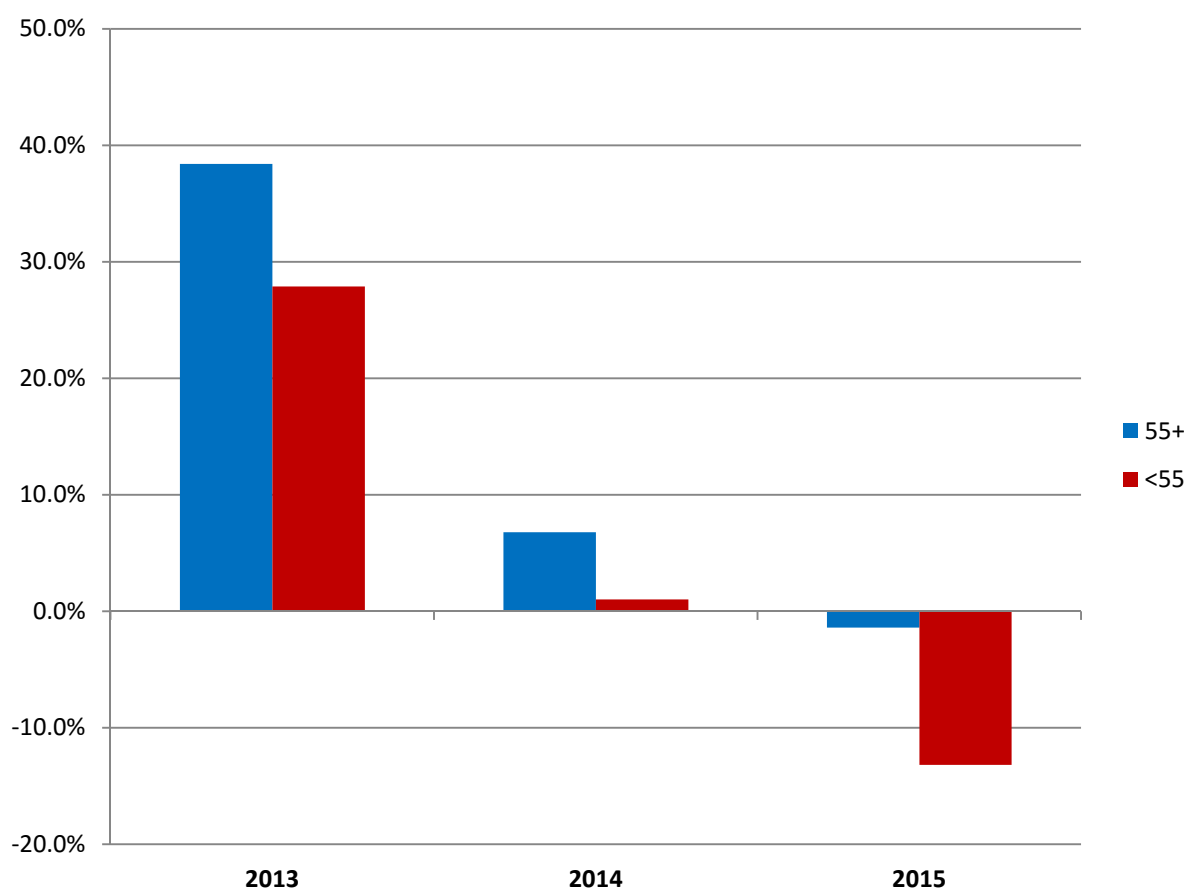
Appendix H – Liquid, 2 Groups

Return to Master Score Across 2 Groups

Scores <55, 55+

Liquid Universe

Monthly Rebalance 2013-2015



Appendix I – Liquid, Growth of \$10,000

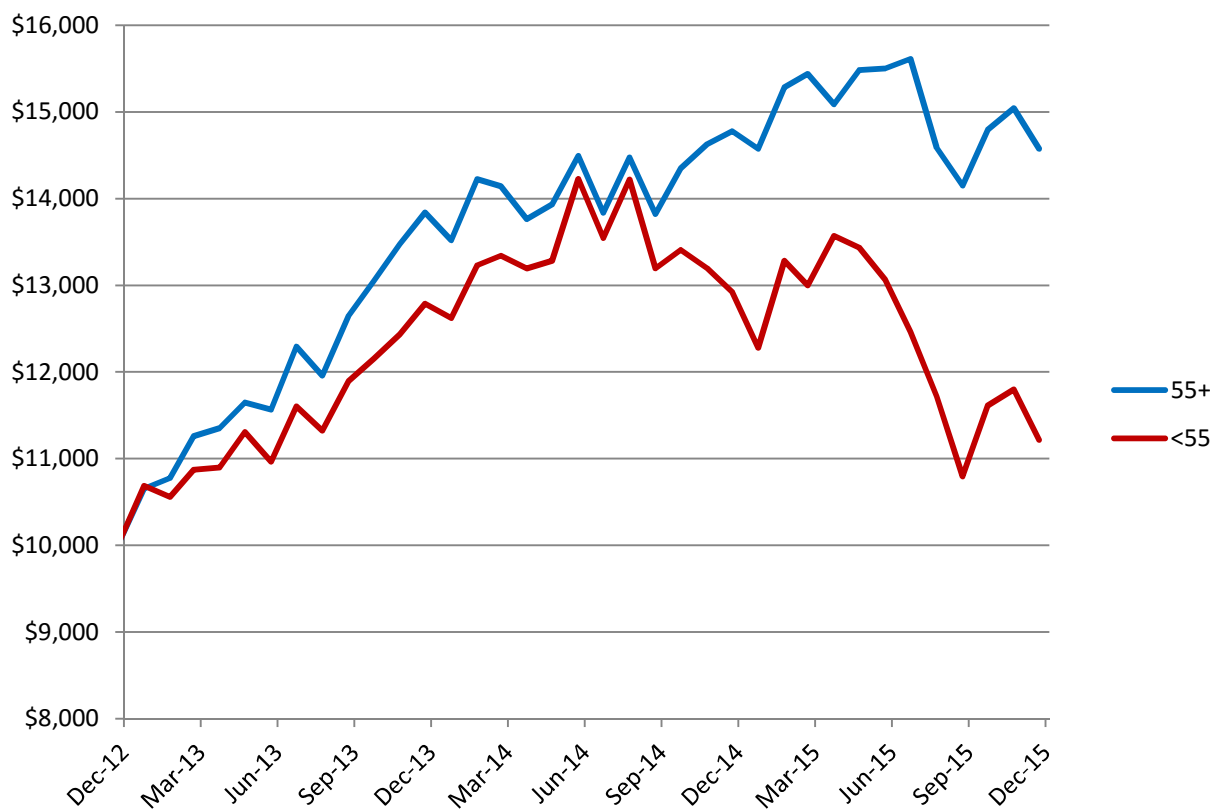
Growth of \$10,000

Return to Master Score for 2 Groups

Scores <55, 55+

Liquid Universe

Monthly Rebalance 2013-2015



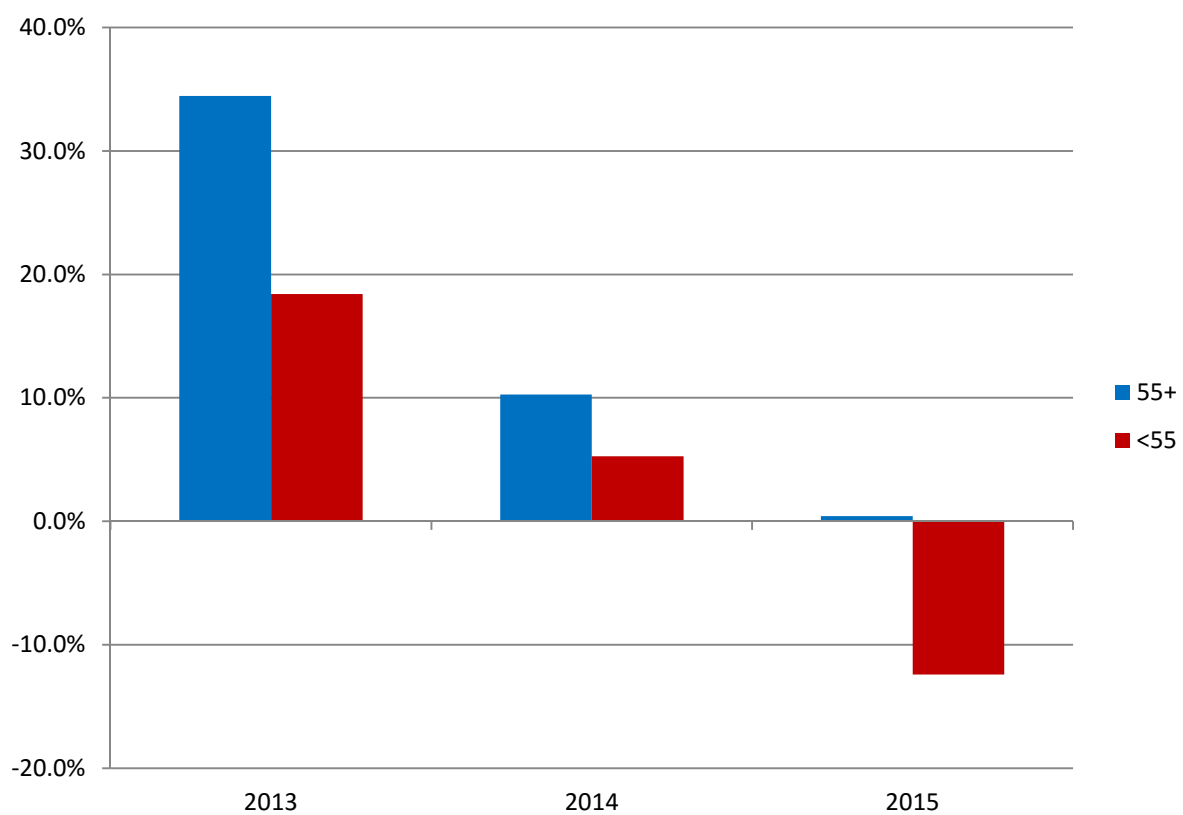
Appendix J – Large Cap, 2 Groups

Return to Master Score for 2 Groups

Scores <55, 55+

Large Cap Stocks

Monthly Rebalance 2013-2015



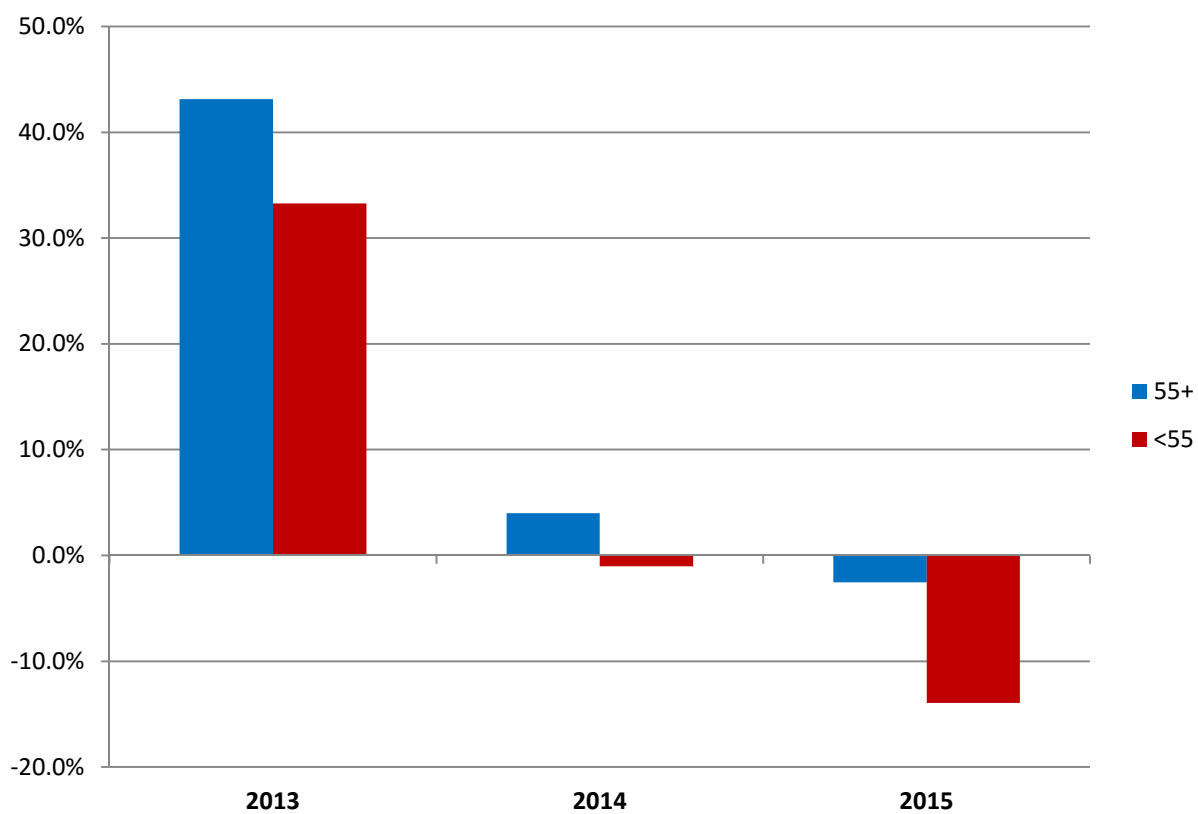
Appendix K – Small Cap, 2 Groups

Return to Master Score for 2 Groups

Scores <55, 55+

Small Cap Stocks

Monthly Rebalance 2013-2015



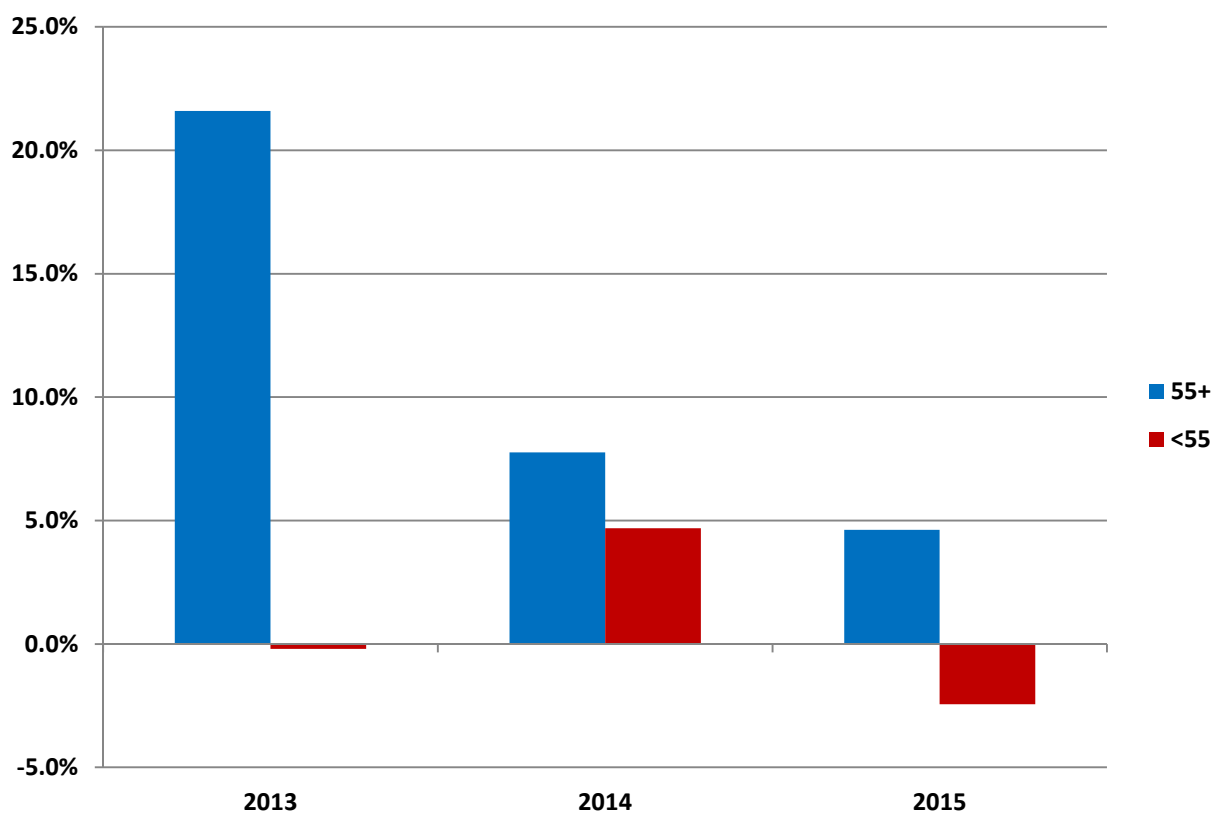
Appendix L – Mega Cap, 2 Groups

Return to Master Score for 2 Groups

Scores <55, 55+

Mega Cap Stocks

Monthly Rebalance 2013-2015



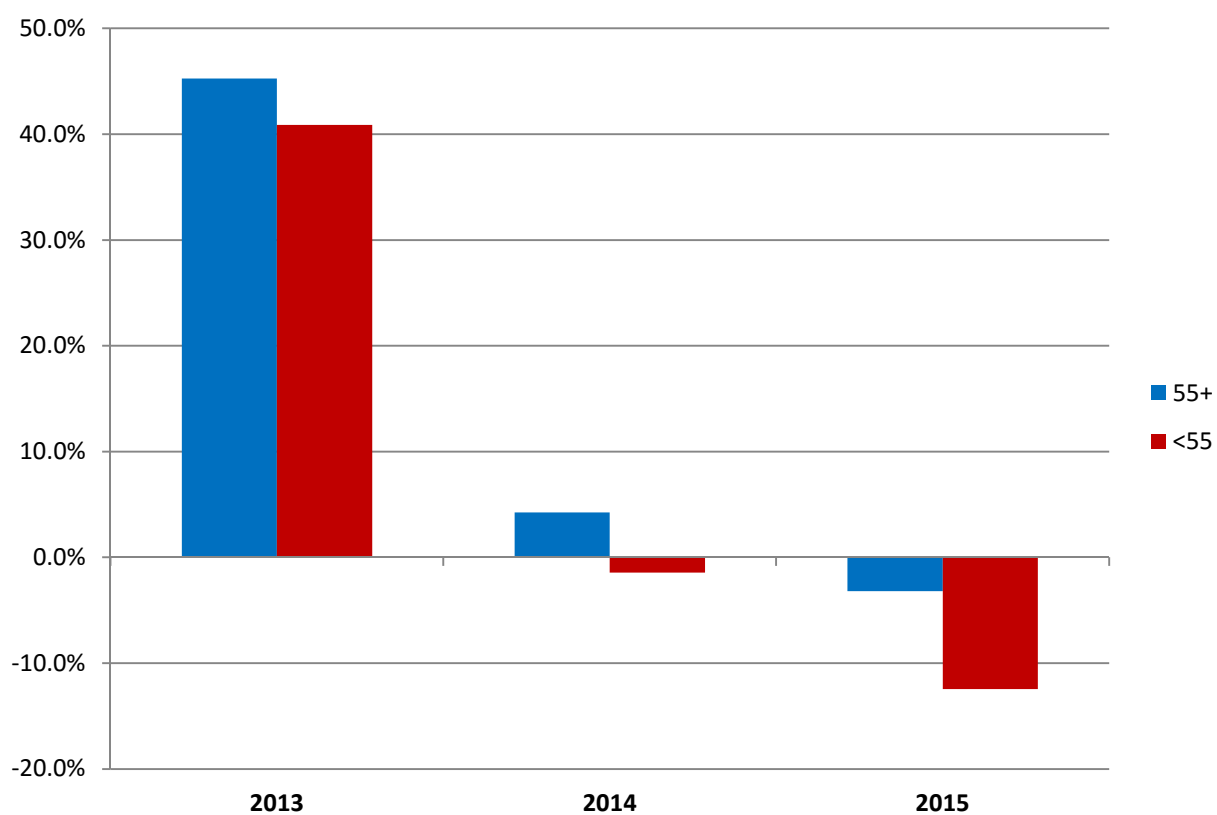
Appendix M – No Dividends, 2 Groups

Return to Master Score for 2 Groups

Scores <55, 55+

Liquid Universe – Non Dividend Paying Stocks Only

Monthly Rebalance 2013-2015



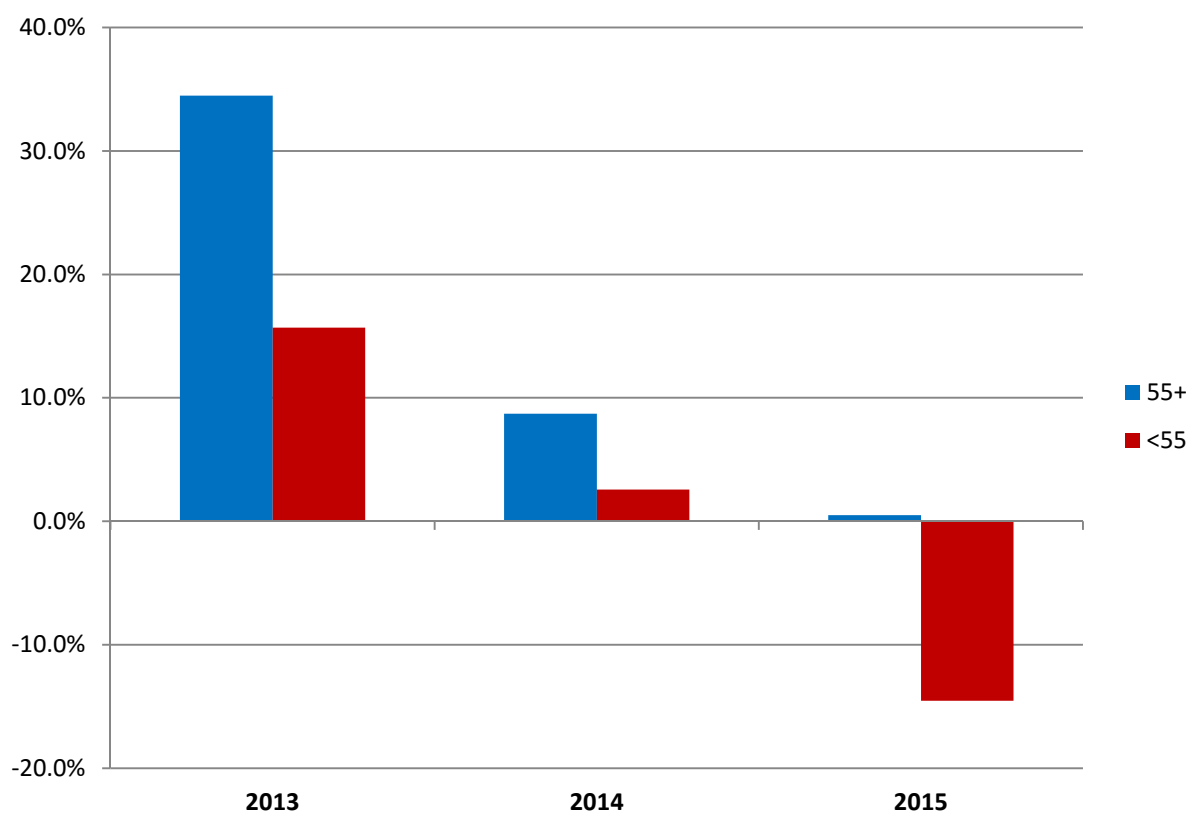
Appendix N – Dividends, 2 Groups

Return to Master Score for 2 Groups

Scores <55, 55+

Liquid Universe – Dividend Paying Stocks Only

Monthly Rebalance 2013-2015



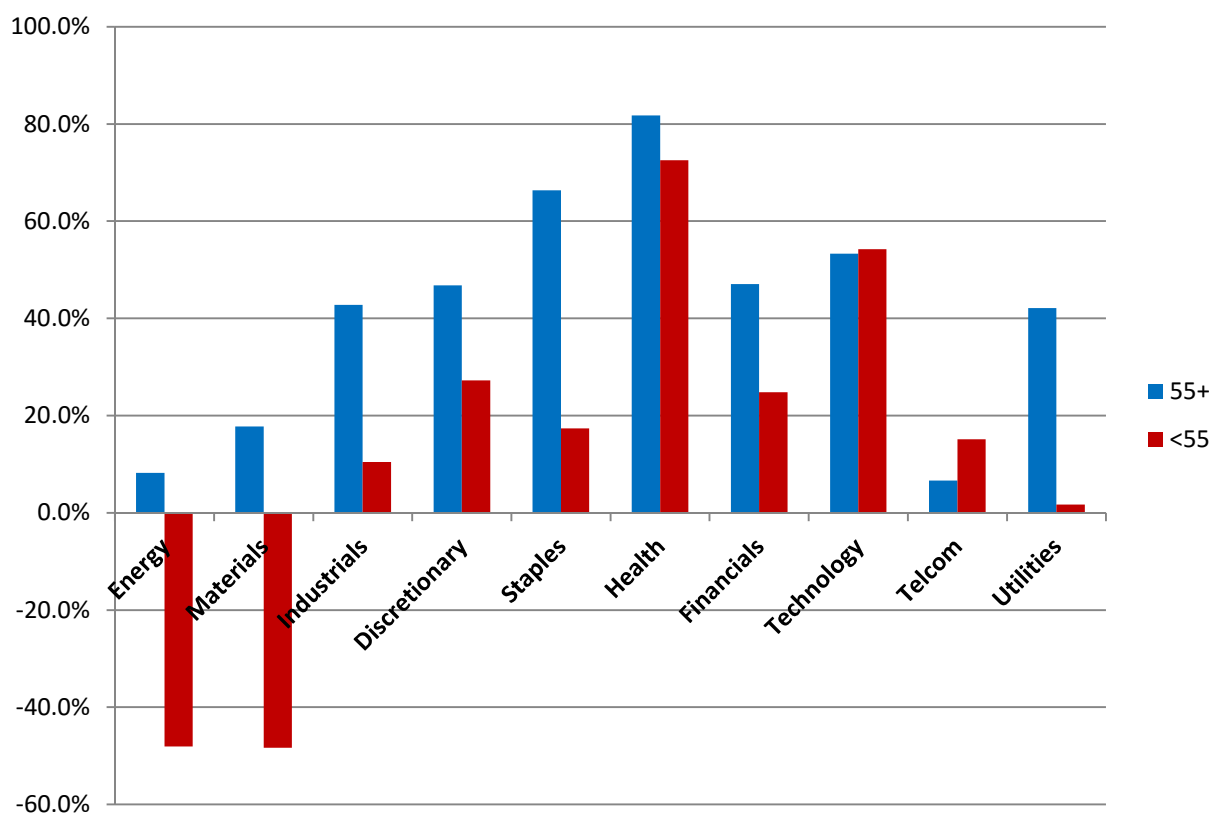
Appendix O – Sectors, 2 Groups

Return to Master Score for 2 Groups

Scores < 55, 55+

Liquid Universe – Analysis by Sectors (GICs)

Monthly Rebalance 2013-2015



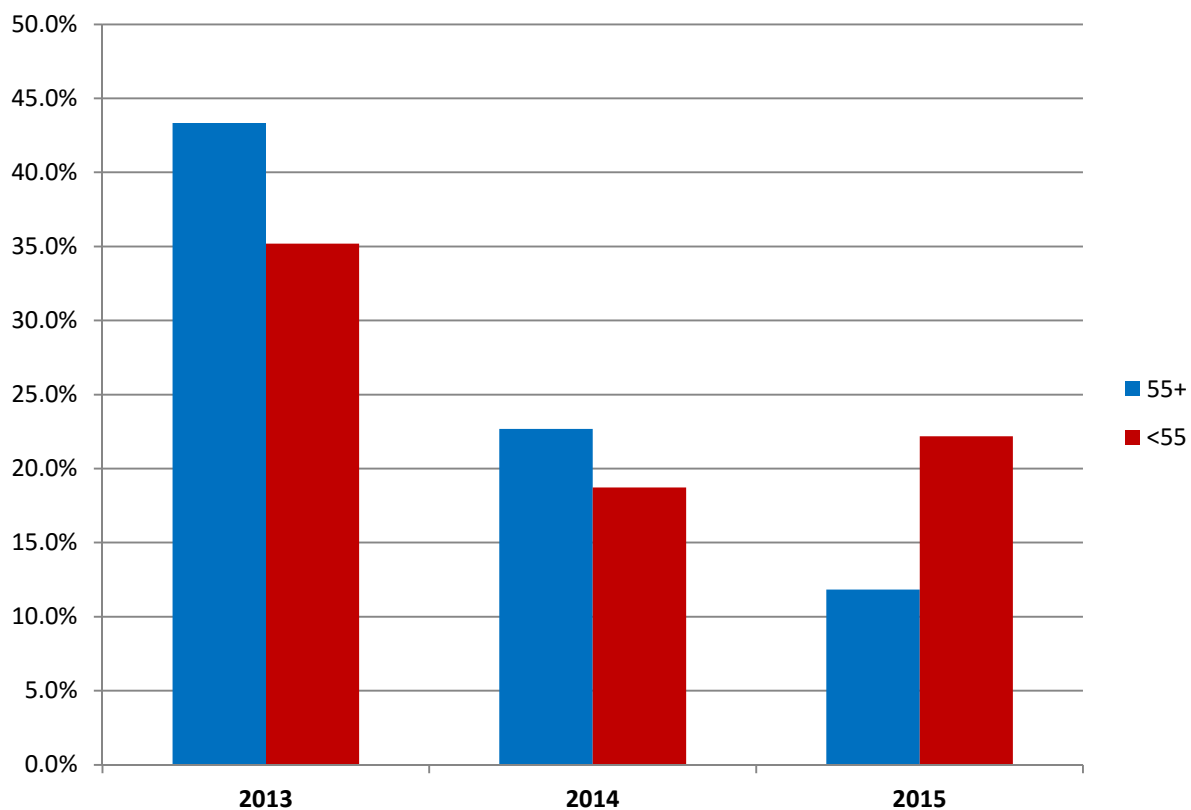
Appendix P – Up Markets, 2 Groups

Return to Master Score for 2 Groups

Scores <55, 55+

Liquid Universe – Up Markets Only

Monthly Rebalance 2013-2015



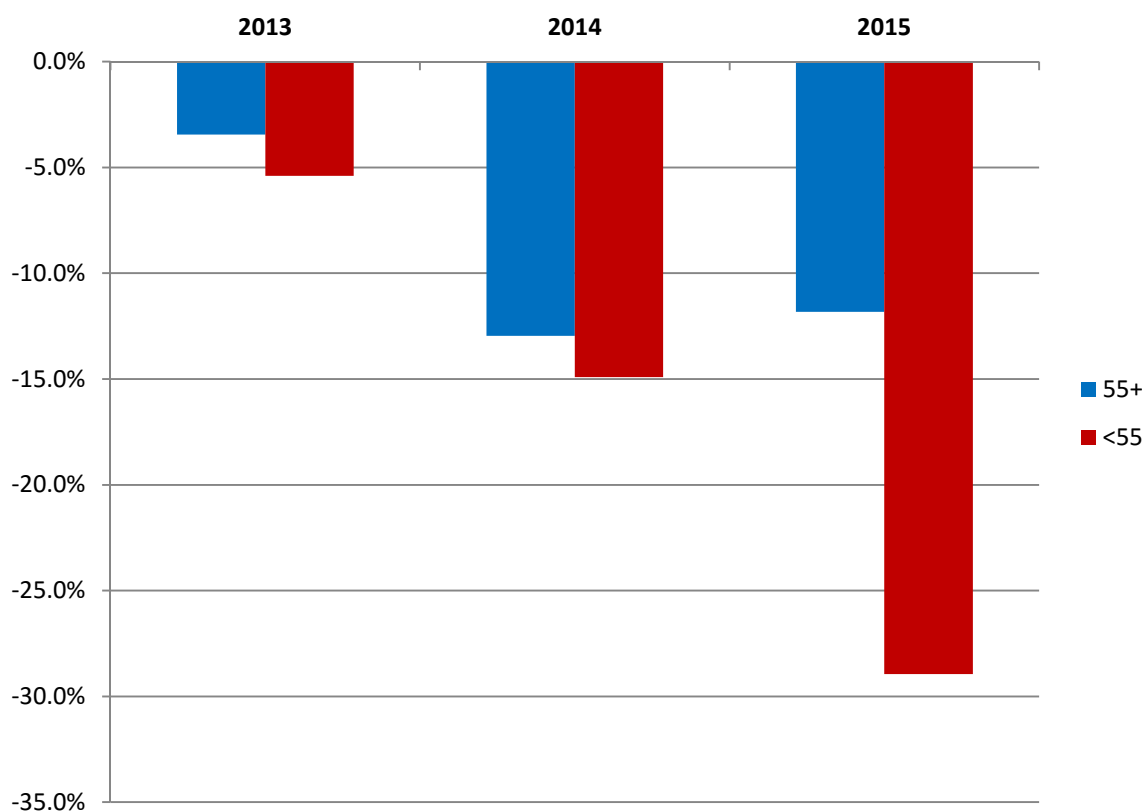
Appendix Q – Down Markets, 2 Groups

Return to Master Score for 2 Groups

Scores <55, 55+

Liquid Universe – Down Markets Only

Monthly Rebalance 2013-2015



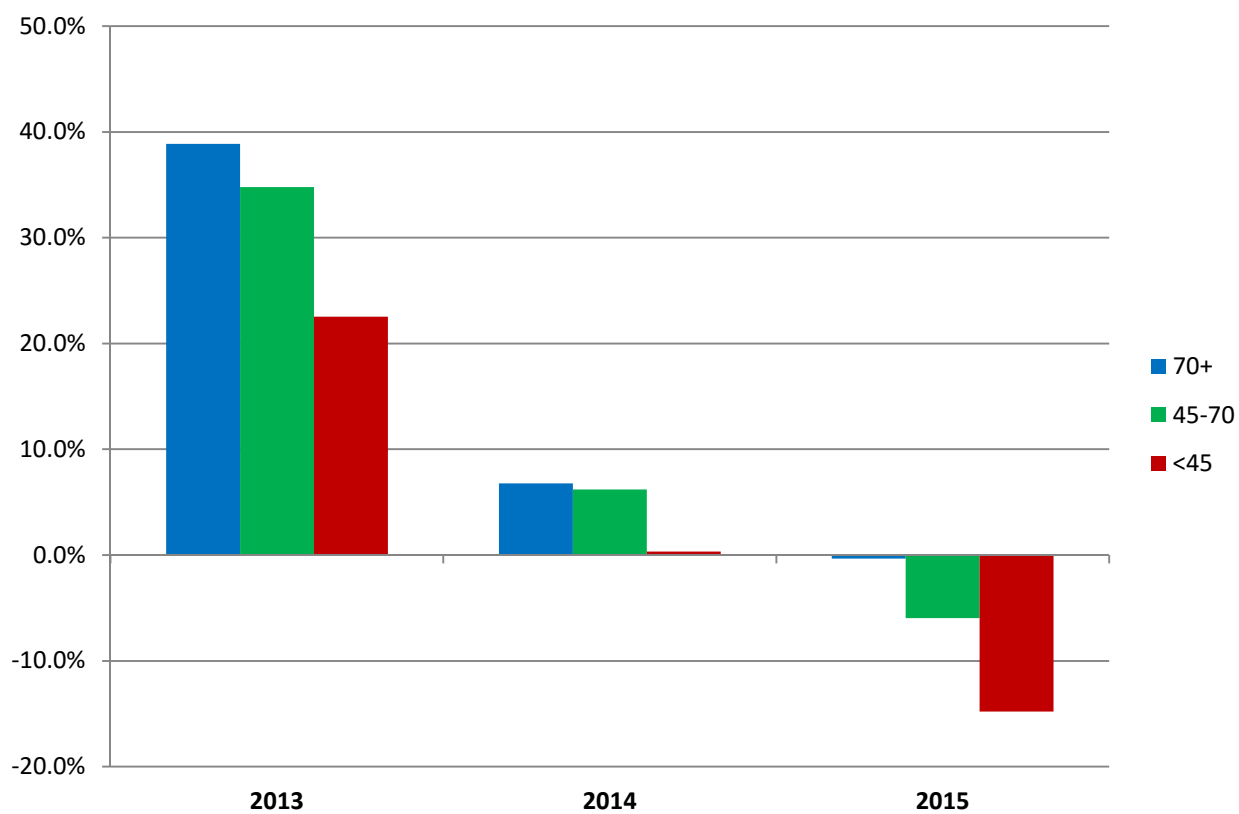
Appendix R – Technical Dimension, 3 Groups

Return to Technical Score Across 3 Groups

Scores <45, 45-70, 70+

Liquid Universe

Monthly Rebalance 2013-2015



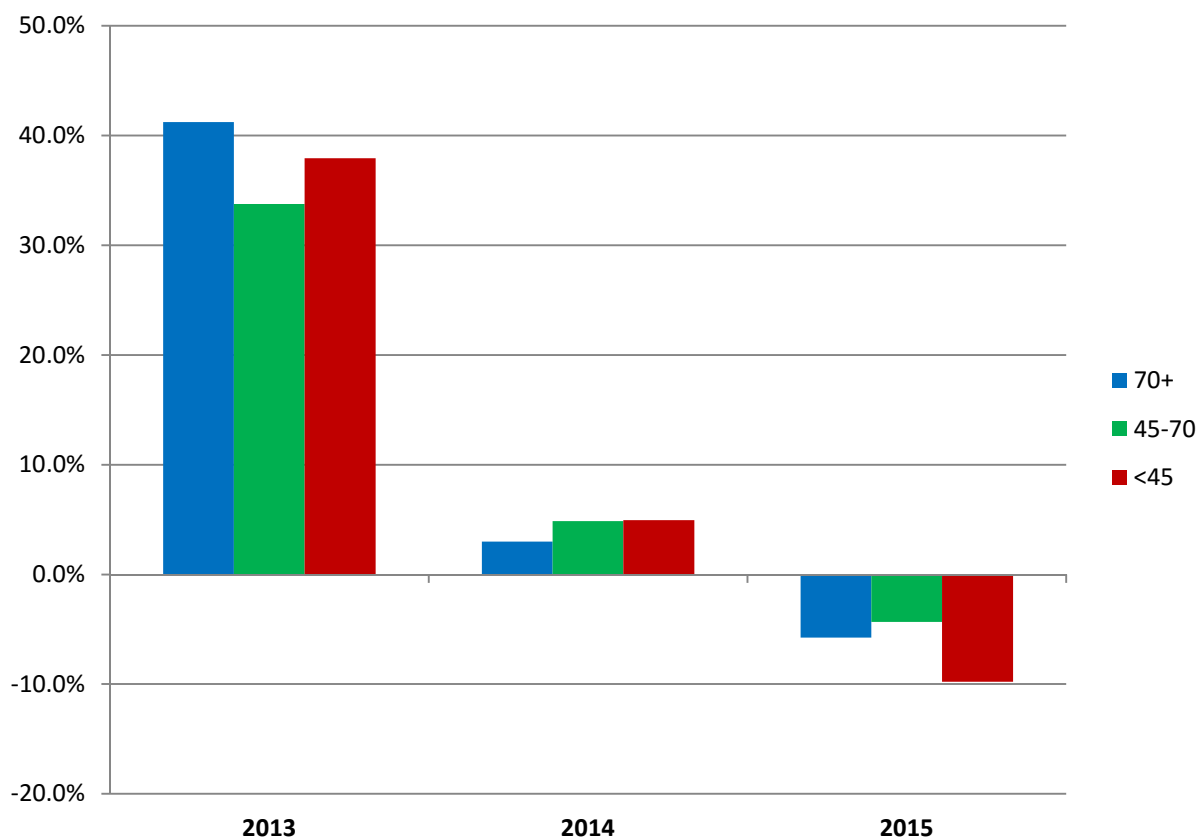
Appendix S – Fundamental Dimension, 3 Groups

Return to Fundamental Score Across 3 Groups

Scores <45, 45-70, 70+

Liquid Universe

Monthly Rebalance 2013-2015



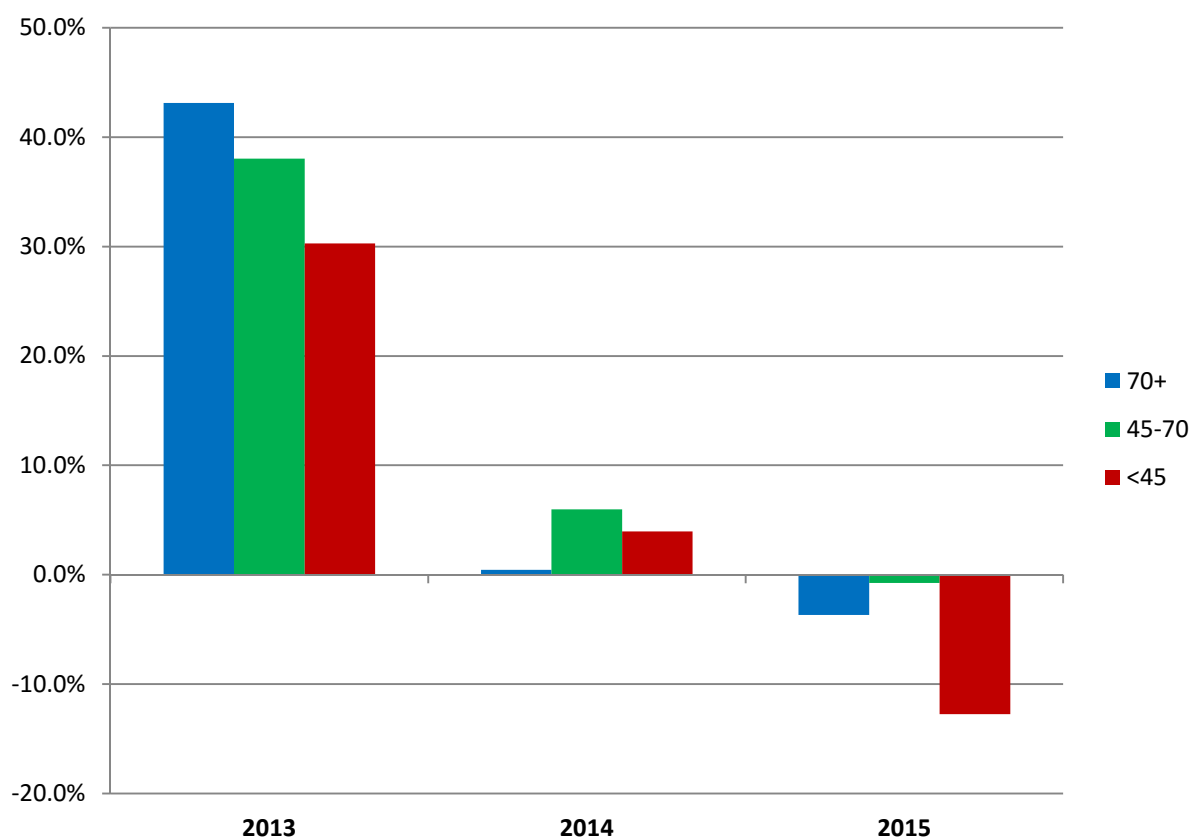
Appendix T – Momentum Dimension, 3 Groups

Return to Momentum Score Across 3 Groups

Scores <45, 45-70, 70+

Liquid Universe

Monthly Rebalance 2013-2015



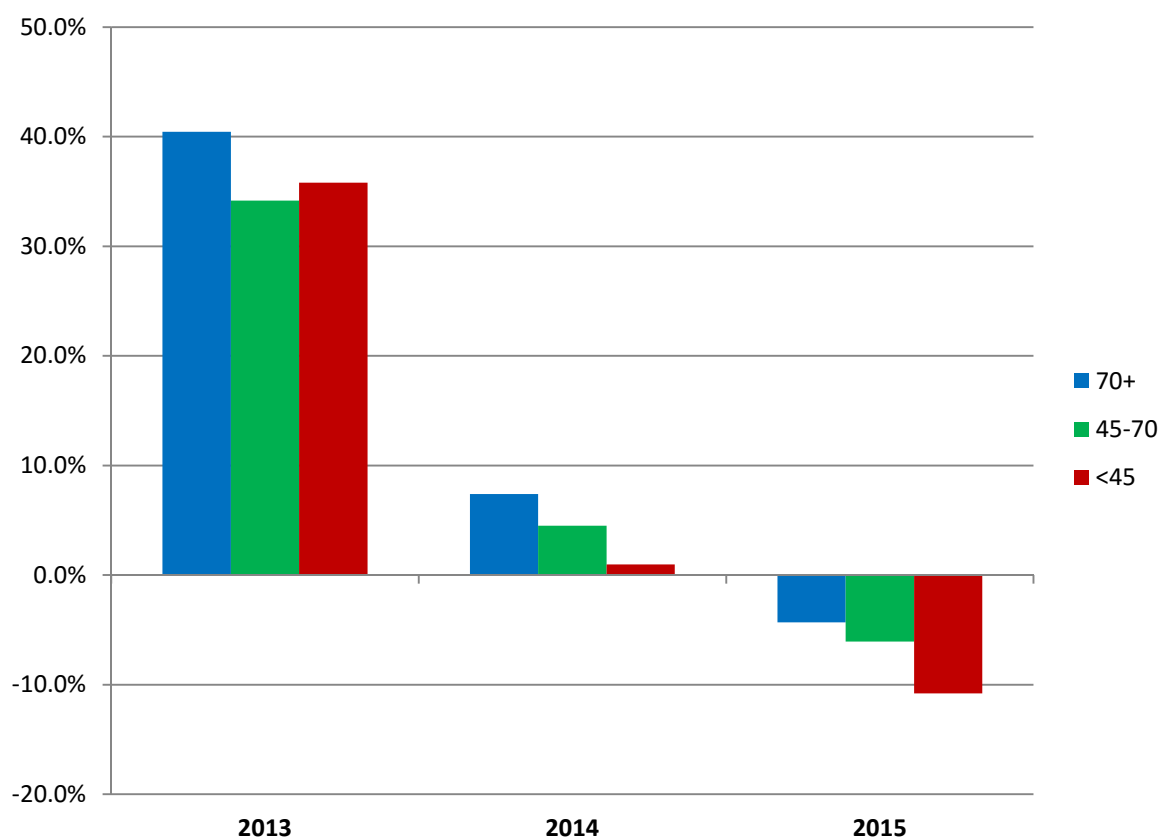
Appendix U – Sentiment Dimension, 3 Groups

Return by Sentiment Score Across 3 Groups

Scores <45, 45-70, 70+

Liquid Universe

Monthly Rebalance
2013-2015



Important Disclosures

FusionIQ “The publisher” of this document is not registered as an investment adviser with any federal or state regulatory agency. Rather, Publisher relies upon the “publisher’s exclusion” from the definition of “investment adviser” as provided under Section 202(a)(11) of the Investment Advisers Act of 1940 and corresponding state securities laws. All information here is presented for informational purposes.

Any returns presented herein are hypothetical and back-tested. Back-testing is done by retroactively applying a hypothesis to the historical data to obtain returns (scientific method) or finding variables in historical data that correlate to returns and developing a hypothesis from the historical data or applying any hypothesis to different time periods until favorable returns are discovered. Back-tested models are developed with the benefit of hindsight but might not have foresight of the future. Hypothetical returns do not reflect the macroeconomic risks of using the Strategy in a different time period or the financial risk of executing trades in a live portfolio which include the potential market impact on stock prices caused by buying or selling that could cause the model’s buy or sell prices to differ from the frictionless trades of the back-tested model. Although the information in the table gives you some idea of the historic risks involved in investing in the Strategy, **PAST HYPOTHETICAL PERFORMANCE IS NOT A GUARANTEE OF FUTURE RETURNS.**

The Back-testing feature provides a hypothetical calculation of how a portfolio of securities would have performed over a historical time period and these results do not represent returns that any investor actually attained. Back-tested results are calculated by the retroactive application of a model constructed on the basis of historical data and based on assumptions integral to the model which may be subject to losses. Back-tested performance is developed with the benefit of hindsight and has inherent limitations. Specifically, back-tested results do not reflect actual trading or the effect of material economic and market factors on the decision-making process. Back-tested results are presented gross of fees and do not include the effect of back-tested transaction costs, management fees, or expenses, if applicable.

NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE RESULTS SIMILAR TO THOSE SHOWN. ACTUAL RESULTS MAY SIGNIFICANTLY DIFFER FROM THE THEORETICAL RETURNS BEING PRESENTED. DIFFERENCES IN ACCOUNT SIZE, AGE OF CLIENTS, RISK TOLERANCE, TIMING OF TRANSACTIONS AND MARKET CONDITIONS PREVAILING AT THE TIME OF INVESTMENT MAY LEAD TO DIFFERENT RESULTS, AND CLIENTS MAY LOSE MONEY.