

Searching For Alpha: Digging For Dividends

QUARI - Quality with A Reliable Income

- **High Yield is not Enough** — Income investing has returned to the forefront of investors' minds, but yield alone is not enough. Maximum Yield is not necessarily the Optimum Yield and a more selective approach to income investing is required.
- **Income vs. Capital Gains** — Yield is not the only factor to consider when it comes to income investing; capital protection is also key to ensure a consistent pool from which to draw income.
- **What is QUARI?** — QUARI is a 6-step process where the goal is to achieve a more optimal global income stream through trading-off yield for a more acceptable level of risk and downside protection.
- **Income and Capital Gains** — The QUARI strategy has delivered above benchmark yield but with low correlation to a generic dividend yield strategy. At its core, QUARI is a concentrated, high conviction income generating strategy where our empirical analysis shows that it has delivered 35bps per month income – outperforming both bonds and the global equity benchmark.
- **Efficient Portfolio Construction** — Signal generation is one aspect that we consider but we also examine QUARI performance in the context of risk efficient portfolio construction. Using minimum variance, as an example, we show practically how an implementable strategy can be constructed from the QUARI signal process.

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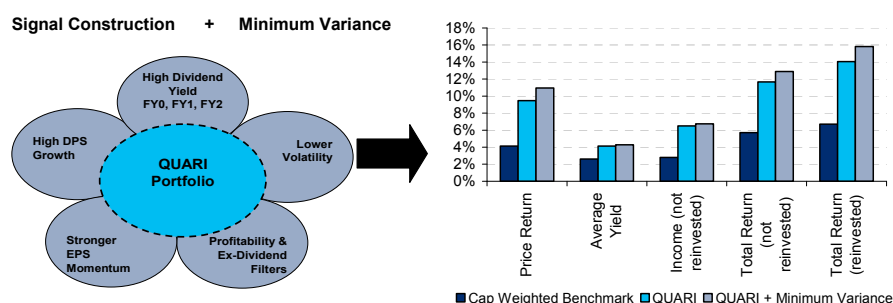
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Figure 1. QUARI – Stock Selection + Minimum Variance Portfolio Construction



Source: Citi Research

See Appendix A-1 for Analyst Certification, Important Disclosures and non-US research analyst disclosures.

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Introduction

**Income investing has returned to the
forefront of investors' minds...**

With greater emphasis being placed on capital protection and, as a consequence, Quality investing as we have progressed through the various global crises of recent years, dividends and income have returned to the forefront of investors minds.

Indeed, throughout the Global Financial Crisis (GFC) a company's ability to pay a dividend or maintain a payout policy has been viewed as a sign of strength. At this time, and whilst macro has been dominant, Dividend Yield was highly correlated with Quality - Figure 3.

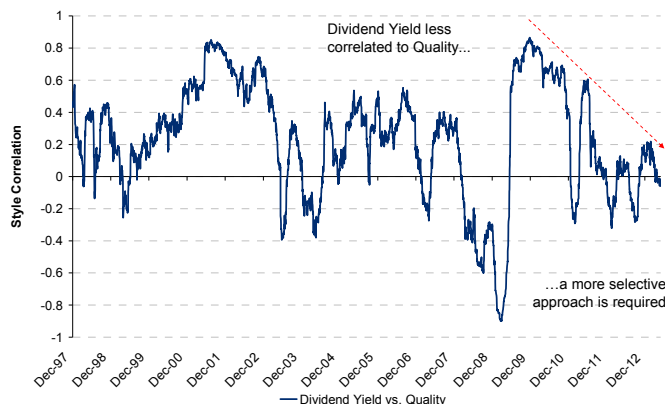
**...but yield alone is not enough.
Maximum Yield is not necessarily the
Optimum Yield...**

Dividend Yield is no longer seen as the pure defensive play it was deemed to be at the height of the GFC. This has caused Dividend Yield and Quality to become relatively uncorrelated and implies that incorporating a view on Quality/Low Risk into the stock selection process should bring diversification and more attractive risk adjusted returns.

This has particularly been the case in Europe where heightened fragility and style volatility have been caused by, amongst others, uncertainty around sovereign debt obligations in the periphery.

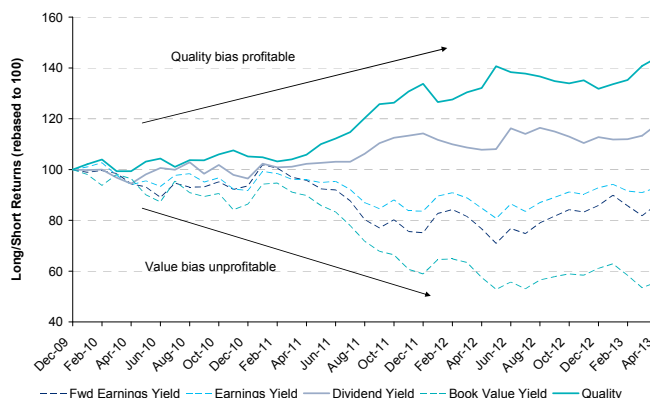
One can in fact conclude that throughout this period there has been a clear divide across Value factors with consistent outperformance resulting from exposure to 'Quality biased' valuation metrics (i.e. Dividend, Free Cash Flow...) and with drawdowns and higher volatility from the more cyclical metrics (Earnings, Book Value...).

Figure 2. 60 Day Long/Short Style Return Correlation, MSCI Europe



Source: Citi Research

Figure 3. Long/Short Style Returns Since 2009 – MSCI Europe



Source: Citi Research

**...and a more selective approach to
income investing is required.**

This flight to Quality coincided with a marked increase in the proportion of return variability that can be explained by macro factors, and consequently there have been recent periods when the buying of 'pure' Dividend Yield has been highly profitable due to an inherent Quality bias. With the macro influence perhaps beginning to fade and with Dividend Yield becoming less/unrelated to Quality, it is our opinion that this is no longer the case – i.e. yield alone is not enough - and that a more selective approach to Dividend Yield investing is required.

What we do

Yield is not the only factor to consider when it comes to income investing...

To begin with it is important to stress the difference between yield and income. Whilst focusing on high yield stocks will have a strong influence on income, there are other factors to take in consideration that can aid the total income generated by a portfolio. A high yield that is driven by the denominator (price) rather than the numerator (dividend) could be exposed to value traps and, consequently, not deliver a reliable and sustainable physical income over the longer term due to falling prices, unsustainable dividends etc.

...capital protection is also key to ensure a consistent pool from which to draw income

We are not only looking for income above and beyond that of the benchmark but are, equally, looking to minimize risk and focus on capital protection. This can be achieved by tilting the portfolio towards financial strength, quality and lower risk factors. Whilst we do not produce a score and rank all stocks in the same manner as, say, a Piotroski screen, we develop a systematic, stepwise selection process to identify stocks that exhibit more desirable Quality and Low Risk attributes in addition to their yielding characteristics.

We look to exploit longer term benefits of income investing rather than cyclical opportunities emerging from the underlying macro

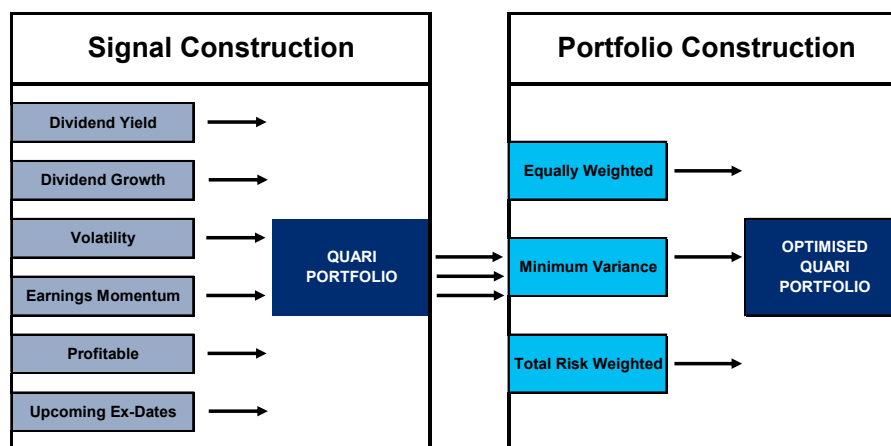
The aim of this research is therefore to exploit the longer term benefits of income investing, not to just maximize the yield of the portfolio itself, as opposed to targeting cyclical yield opportunities that present themselves at different points of the cycle according to the underlying macroeconomic conditions.

Essentially, we are prepared to trade off some of the *maximum yield* to produce a more *optimal yield*, resulting in a higher Quality portfolio with a more acceptable level of risk and downside protection. In turn, this delivers a higher and more sustainable actual realized income than a pure yield portfolio.

To achieve a more optimal income we trade off yield for a more acceptable level of risk and downside protection.

We refer to our six step stock selection process as Quality with a Reliable Income - QUARI.

Figure 4. QUARI – Stock Selection and Portfolio Construction Process



Source: Citi Research

QUARI – QUALity with A Reliable Income

6-step signal screening process

+

Risk efficient portfolio construction

For each step in the process we provide statistics on the incremental value provided by incorporating the filter in question and a rational argument for its inclusion and finish by providing further analysis on implementing the portfolio using alternative, more risk efficient portfolio construction techniques like Minimum Variance and Equal Risk Contribution. For reference, we provide a top level breakdown of returns for each of Europe, North America, Japan and developed AsiaPac in the appendices.

Our research touches on two areas that are perhaps overlooked, particularly amongst academics, when it comes to income investing by:

- **Incorporating Volatility** – we use volatility both as an alpha source in the screening process and also as a means of constructing a more risk efficient portfolio via Minimum Variance optimization.
- **Focusing on ex-Dividends** – if a stock has previously been held in the portfolio but goes on to fail the screening process, we hold on to the stock through its ex-Dividend date when that date falls in the following month to ensure we receive the related income.

QUARI has delivered above benchmark yield with low correlation to a generic dividend yield strategy

What we find of particular interest is that whilst the QUARI portfolio delivers a significantly higher yield than that of the benchmark, the optimized portfolio is relatively uncorrelated to a simple dividend yield portfolio.

Using the MSCI World as our benchmark, our final QUARI portfolio uses the six step screening process outlined above, combined with Minimum Variance portfolio construction.

What we find

Our backtesting results show that the strategy has significantly outperformed both an equally weighted and market cap weighted benchmark with alpha generated from both legs of the model. See Figure 5 on next page.

Concentrated, high conviction income portfolio...

Despite considerable breadth reduction – the final optimized portfolio holds an average of 65 stocks - capital gains (price returns) are improved from 4.1 to 10.9% with volatility falling to 12.9% from 15.8%.

...has generated 35bps per month income – outperforming both bonds and the equity benchmark

The average monthly income generated by the portfolio is 36bps versus 19bps for the benchmark which translates to 6.8% vs. 2.8% annualised income¹. This is also considerably higher than the total returns generated from a risk free/low risk alternative – 10 year US Treasuries.

Year-to-date the portfolio has delivered 10.8% price returns with 1.5% income and has delivered positive total returns in 17 out of 18 years of our empirical tests – 2008 being the exception – although in that years losses were substantially reduced to 28.9% versus 39.5% for the benchmark.

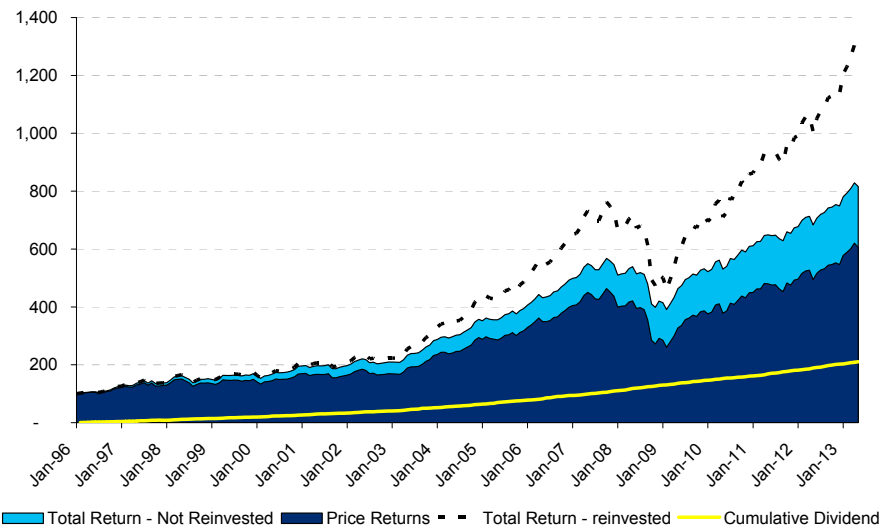
High tracking error is not indicative of the lower risk objectives of QUARI...

Whilst we have presented results of the QUARI portfolio alongside that of the benchmark we are of the opinion that this kind of model fits more with benchmark unconstrained strategies as its objectives of reliable income and capital preservation tend to move it away from the MSCI World benchmark and, hence, give it a higher tracking error that is not indicative of the objective of the screening process.

¹ We look at the sum of the individual monthly income payments (i.e. not compounded) generated by the model over the backtest period and annualise this relative to the starting level.

...we see the model more aligned to total
return, benchmark unconstrained
strategies

Figure 5. QUARI Portfolio Returns (Using Minimum Variance)



Source: Citi Research

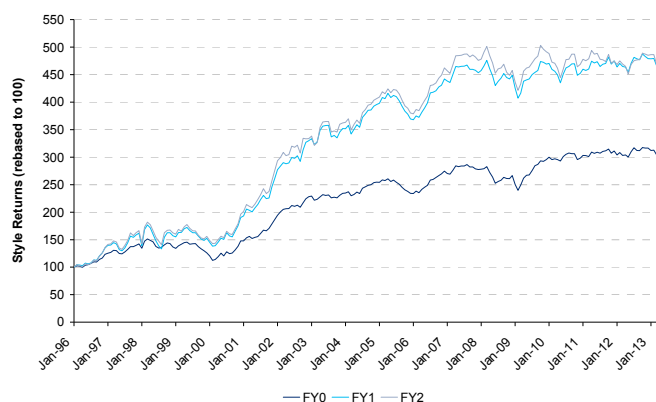
Dividend Yield: Income and Capital Gains

Does income investing 'work'?

The first question we pose, and one with perhaps an obvious answer to the vast majority of investors, is whether Dividend Yield 'works' from an empirical perspective.

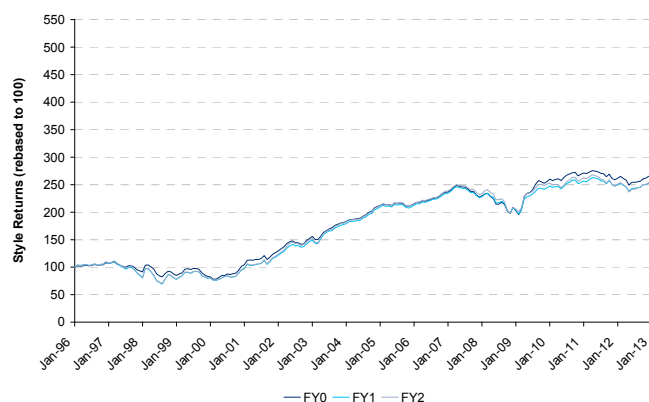
To answer this question we run simple backtests using the MSCI World index as our base universe, partitioning the universe into quintiles based on each of FY0, FY1 and FY2 Dividend Yield.

Figure 6. Cumulative Performance of Long/Short Dividend Yield Portfolios, MSCI World



Source: Citi Research, Worldscope, IBES

Figure 7. Cumulative Relative Performance of High Yield Portfolios, MSCI World



Source: Citi Research, Worldscope, IBES

Higher Yield and lower drawdowns generate above benchmark income

The results clearly show that significant returns are possible from both a long/short and relative perspective across each of the three Dividend Yield metrics presented. It is also comforting to know that drawdowns are limited, so in addition to generating above benchmark income, the price returns/capital protection provided by Dividend Yield investing also looks attractive.

One should, however, note that before 2002 there are no FY1 and FY2 DPS forecasts available in IBES for American Stocks which explains the divergence of the wealth curves in Figure 6 before this point. Post 2002 the three wealth curves are highly correlated.

Figure 8. Performance Statistics – Dividend Yield, MSCI World (Equally Weighted)²

	Low Yield	P2	P3	P4	High Yield	Long/Short	Long Relative
FY0							
Annualised Return	5.3%	3.7%	8.4%	10.4%	12.1%	6.4%	5.7%
Annualised Volatility	18.9%	17.5%	16.0%	17.0%	20.4%	8.6%	9.6%
Sharpe/Information Ratio	0.28	0.21	0.52	0.61	0.59	0.74	0.59
Hit Rate	56%	57%	60%	62%	63%	61%	60%
FY1							
Annualised Return	2.1%	4.0%	7.8%	9.6%	11.8%	9.2%	5.4%
Annualised Volatility	19.0%	17.3%	16.9%	17.6%	21.7%	12.7%	11.6%
Sharpe/Information Ratio	0.11	0.23	0.46	0.55	0.54	0.72	0.47
Hit Rate	55%	55%	59%	62%	64%	60%	63%
FY2							
Annualised Return	2.0%	4.6%	7.8%	9.6%	11.8%	9.3%	5.5%
Annualised Volatility	19.0%	16.9%	17.1%	17.6%	22.0%	13.2%	11.7%
Sharpe/Information Ratio	0.10	0.27	0.46	0.54	0.53	0.71	0.47
Hit Rate	54%	57%	61%	61%	62%	58%	63%

Source: Citi Research, Worldscope, IBES

² Please note that FY1 and FY2 backtests do not include US stocks before 2002.

Whilst quintile returns are fairly monotonic across each of the tests presented above, it seems that focusing on the top two quintiles provide the most attractive returns from a risk adjusted perspective.

**A solid foundation, but further attention
is needed on volatility and capital
protection**

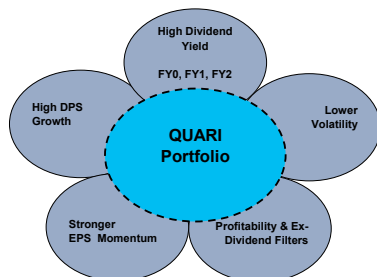
From this one can conclude that Dividend Yield does indeed have some predictive ability on future stock market returns. Although risk adjusted returns only reach a maximum of 0.75 from a long short perspective, there is clearly significant alpha available from Dividend Yield investing and, although these are only standalone factors, they are more than satisfactory building blocks for an investable portfolio. Our aim is to further improve these returns from both an absolute and risk adjusted perspective by trading off a portion of the yield for additional capital protection.

Signal Construction

QUARI – The Building Blocks

In the following section we present six simple screening steps to achieve a higher Quality, higher conviction income portfolio with reduced volatility. The aim is to achieve above benchmark income with below benchmark volatility.

Figure 9. QUARI Signal Construction



Source: Citi Research

To achieve our goal we build on our existing DGARP approach³ and present a six step 'knockout' model, each aimed at targeting dividends, risk or financial strength/quality, which screens for stocks with:

- **High Dividend Yield** – (Dividends) in top two quintiles of a simple, composite Dividend Yield factor
- **High Dividend Growth** – (Dividends/Financial Strength/Quality) remove bottom two quintiles two year trailing Dividend Growth
- **Lower Volatility** – (Risk) remove top quintile six month price volatility
- **Earnings Momentum** – (Financial Strength/Quality) have greater than median earning momentum according to the 1mth change in FY1/FY2 EPS
- **Profitability** - (Financial Strength) exclude Loss Makers
- **Upcoming Ex Dividends** – (Dividends) ensure we hold stocks the model has recently favoured through their ex-dividend date

All backtests are in USD, based on the MSCI World universe and rebalanced on a monthly basis. The long portfolio consists of all stocks that satisfy the cumulative 'knockout' steps with the short portfolio being all other stocks. Relative returns are presented versus an equally weighted benchmark.

Step One [Dividend Yield Filter]

The first step in our stock selection process is somewhat obvious – to achieve a dividend yield in excess of that of the benchmark. To do this we create an equally weighted, multi factor Dividend Yield model, winsorizing each of the FY0, FY1 and FY2 Dividend Yields and then taking the linear average of the three signals as the input into our first 'knockout'.

Importantly, and to handle the issue of IBES data being unavailable for US stocks pre 2002, we take an average of all the data points that are available for a given stock at any point in time. As a consequence, the model will only use the trailing/reported yield z-scores for US stocks before 2002.

Stocks that appear in the top two corresponding quintiles are assigned to the portfolio and equally weighted.

Whilst there are clearly alternative ways of incorporating dividend yield filters into the signal construction process⁴, we use a blend of both trailing and forecast dividend yield to avoid unjustly penalizing stocks that may have had restrictions placed on shareholder distribution or have faced short term headwinds with regards to fulfilling their 'usual' dividend obligations⁵.

³ [What Works in Equity Markets, Risk On \(At the Moment\), Citi Research, 6th February 2012](#)

⁴ Our colleagues in strategy use a CDS adjusted dividends screen, for example. See Appendix for further information.

⁵ For example, many banks have had restrictions placed on dividend distribution from policymakers during the recent financial crises.

1) Focus on yield...

...select top 2 quintiles of stocks on yield

Better than benchmark income and capital gains...

This results in an average portfolio size of 622 from an average benchmark of 1605, or 38.7% of the benchmark. Whilst this number should in theory be 40%, in practice, particularly in the earlier years of the backtests, there are stocks that do not provide the necessary Dividends Per Share data that are required in the factor calculation⁶.

This simple screen produces a portfolio that significantly outperforms both the short portfolio and the benchmark.

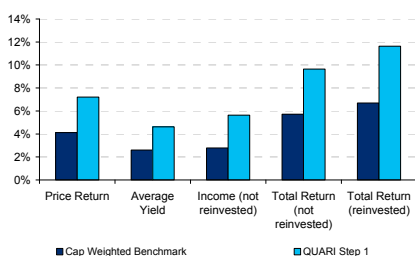
...but cyclical brings with it higher than benchmark volatility

Figure 10. QUARI Step 1, Performance Statistics (Equally Weighted Total Returns)

	Pass	Fail	Pass v Fail	Pass (Relative)
Annualised Return	11.6%	5.4%	5.9%	5.1%
Annualised Volatility	18.9%	17.4%	8.1%	8.4%
Sharpe/Information Ratio	0.61	0.31	0.72	0.60
Hit Rate	64%	57%	55%	63%
Average Stocks Held	622	982		

Source: Citi Research

Figure 11. Return Breakdown (Annualised)



Source: Citi Research

From an absolute perspective, there are also improvements to both annualised and risk adjusted returns. This is driven by across the board improvements with improvements to yield, annualised income and capital gains. Volatility is higher than that of the benchmark, but the excess volatility is something we intend to address in future steps.

⁶ This is not an issue more recently with the 5 year average standing at ~40%.

Step Two [Dividend Growth Filter]

2) Target superior dividend growth

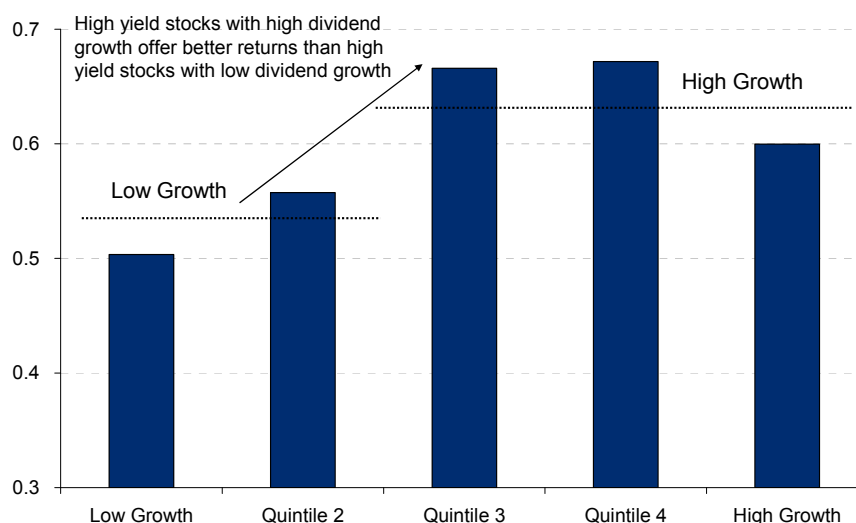
Overlaying dividend growth smoothes some of the cyclicity of the 'pure' yield portfolio

The next filter we apply to the screening process is the Growth aspect our model, targeting stocks with superior Dividend Growth.

Our previous research⁷ suggests that high dividend yielding companies that, at the same time, are able to grow their dividends offer a strong and consistent alpha. Whilst it holds true that income investors have generally been rewarded, it is also widely accepted that the outperformance is cyclical and that there are distinct periods when Dividend Yield strategies do not deliver attractive returns.

Overlaying a simple DPS growth factor can help smooth and achieve more robust returns. For the second 'knockout' in our selection process we consequently introduce a Dividend Growth factor, specifically looking at two year DPS Growth.

Figure 12. Dividend Growth, Sharpe Ratio – Post Step One High Yield Screen



Source: Citi Research

Remove stocks appearing in the bottom 2 quintiles of dividend growth

If we condition the investable universe to be just the subsection of high yield stocks produced in step one, above, then a relatively monotonic distribution occurs. This implies that focusing on the higher Dividend Growth stocks within the high yield subsection should produce improved returns, adding a layer of confidence to our hypothesis of achieving better risk adjusted returns by focusing on a combination of both Dividend Yield and Dividend Growth.

The 'step 2' portfolio consequently filters out stocks that appear in the bottom two quintiles of the Dividend Growth factor in addition to passing the selection criteria for step 1. Stocks are, again, equally weighted.

Lower yield but improved price returns result in higher income

This second filter further concentrates the average portfolio size to 375 stocks, or around 24% of the benchmark. This breadth reduction results in an incremental improvement to both long and relative returns with corresponding improvements to underlying Information Ratios with a marginal decrease in volatility.

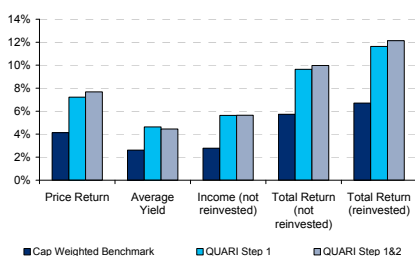
⁷ [What Works in Equity Markets, Risk On \(At the Moment\), Citi Research, 6th February 2012](#)

Figure 14. QUARI Step 1&2, Performance Statistics (Equally Weighted Total Returns)

	Pass	Fail	Pass v Fail	Pass (Relative)
Annualised Return	12.1%	6.5%	5.3%	5.5%
Annualised Volatility	18.6%	17.7%	7.0%	8.2%
Sharpe/Information Ratio	0.65	0.37	0.76	0.67
Hit Rate	65%	56%	59%	61%
Average Stocks Held	375	1230		

Source: Citi Research

Figure 13. Return Breakdown (Annualised)



Source: Citi Research

Absolute returns are also increased with minimal additional volatility, resulting in further improvements to the Sharpe Ratio

Average portfolio yield is reduced but remains well above that of the average benchmark yield. However, as previously discussed, yield alone is not sufficient when it comes to income investing. The improved capital protection provided by adding this second step to the process has had the desired effect of increasing the actual realized dollar income.

That is, the trade-off for this reduced yield is a strong improvement to capital gains and consequent higher income generation – one of our original objectives. This is also something we see when applying each of the additional steps in the QUARI signal construction process

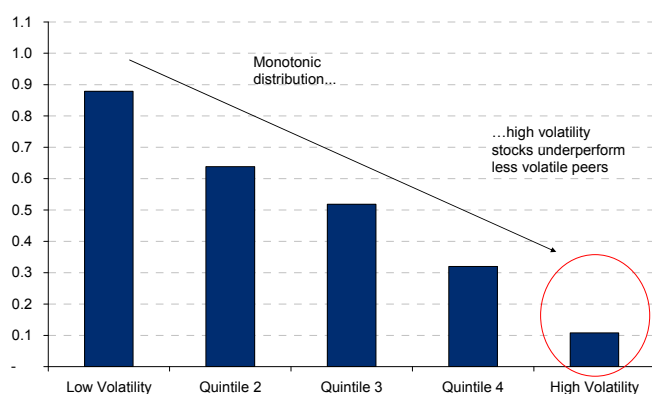
Step Three [Volatility Filter]

3) Avoid higher risk

Whilst consistent yield is clearly paramount to income investing, a consistent pool of capital from which to draw that income is, perhaps, of equal importance. A logical way of achieving a greater level of capital protection is to avoid stocks at the 'risky' end of the volatility spectrum – the third step in our stock signal construction process.

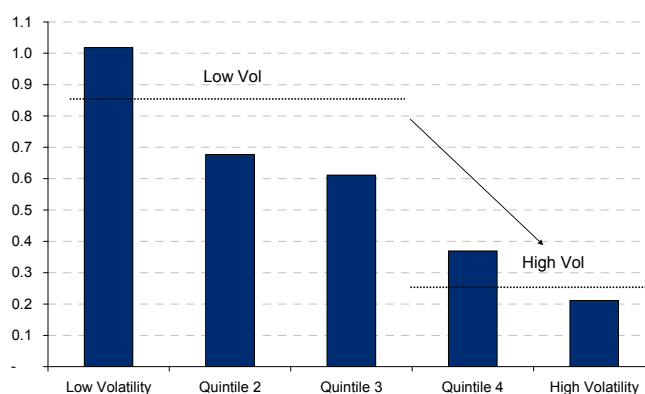
Whilst there are alternative processes that could achieve similar results⁸, in this case want to keep at least some of the low volatility constraints in our signal construction

Figure 15. Volatility, Sharpe Ratio MSCI Europe



Source: Citi Research

Figure 16. Volatility, Sharpe Ratio - Post Step One High Yield Screen



Source: Citi Research

Clear benefits associated with lower volatility...

...we consequently remove the most 'risky' stocks...

...and significantly reduce overall portfolio volatility whilst improving price returns and income

The above charts show a clear underperformance of high volatility stocks compared to their low volatility peers regardless of whether we look at the whole benchmark (Figure 15) or condition the universe by the high yield subsection determined in step one (Figure 16)

We therefore look to remove the most volatile stocks in the investable universe from our portfolio. To achieve this we simply remove the top quintile of stocks by volatility from the investable universe. i.e. to qualify for step three, stocks must satisfy the selection criteria for the first two steps and also not be in the top quintile/the most volatile part of the universe according to six month volatility. We limit the filter to the top quintile here to maintain portfolio breadth.

Results

This further reduces the size of the average portfolio to 337 stocks, although there is a clear improvement in volatility so the volatility filter is achieving its objective despite the more concentrated portfolio.

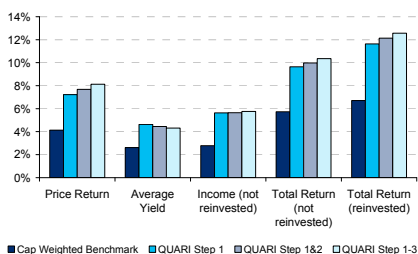
⁸ We further utilize volatility via Minimum Variance optimization within our final portfolio construction

Figure 18. QUARI Step 1-3, Performance Statistics (Equally Weighted Total Returns)

	Pass	Fail	Pass v Fail	Pass (Relative)
Annualised Return	12.6%	6.5%	5.2%	5.6%
Annualised Volatility	16.7%	18.2%	7.2%	7.3%
Sharpe/Information Ratio	0.75	0.36	0.73	0.77
Hit Rate	68%	55%	58%	61%
Average Stocks Held	337	1268		

Source: Citi Research

Figure 17. Return Breakdown (Annualised)



Source: Citi Research

Adding the volatility constraint marginally reduces average portfolio yield to 4.3% or 1.7x that of the benchmark. However, the improved capital protection provided by removing more volatile stocks from the portfolio results in the annualised income increasing to 5.8%, over double that of the benchmark. There is also a strong improvement in the portfolios capital gains, moving up to 8.1% annualised from 4.1% for the benchmark - Figure 17.

Step Four [Earnings Momentum Filter]

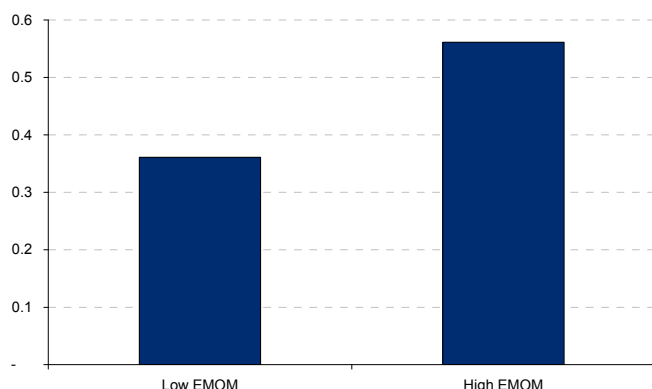
4) Target positive analyst sentiment

Earnings Momentum – gives some confidence dividend is sustainable and avoids stocks on which analysts are less optimistic

Whilst we do not enforce any direct filters based on dividend sustainability or payout ratios, we are of the opinion that if a high yield stock has been growing its dividend (i.e. it has passed step two of our selection process) then it needs to also be showing signs of growth in future earnings to actually ensure it will be able to continue to pay this growing dividend to shareholders.

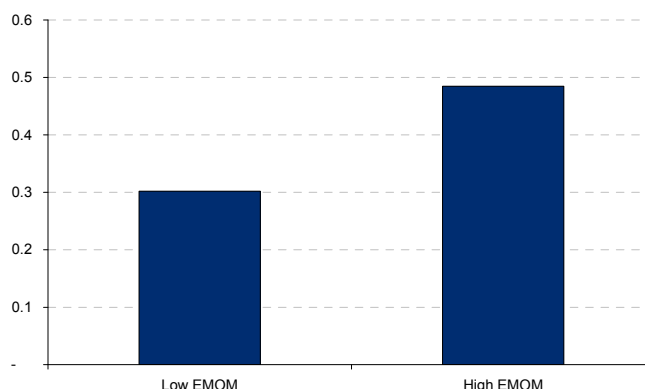
To achieve this, we look at a stocks' Earnings Momentum, using an equally weighted blend of the one month change to FY1 and FY2 EPS forecasts. This has the added benefit of moving us away from stocks on which analysts are, relatively, less optimistic on earnings.

Figure 19. Earnings Momentum, Sharpe Ratio MSCI Europe



Source: Citi Research

Figure 20. Earnings Momentum, Sharpe Ratio - Post Step One High Yield Screen



Source: Citi Research

The two above charts highlight the fact that partitioning both the benchmark or the high yield conditioned subsection (step one) by this Earnings Momentum factor results in a portfolio that outperforms its low Earnings Momentum alternative.

Target stocks with better than benchmark Earnings Momentum

The resulting next step in our signal construction process is to introduce an Earnings Momentum filter. To qualify for the step four portfolio, stocks must satisfy each of the three previous selection criteria and, additionally, have greater than market median Earnings Momentum.

Results

Portfolio size is reduced to an average of 162 stocks yet volatility is lower than that achieved in step three. Sharpe and Information Ratios consequently improve and hit 0.86.

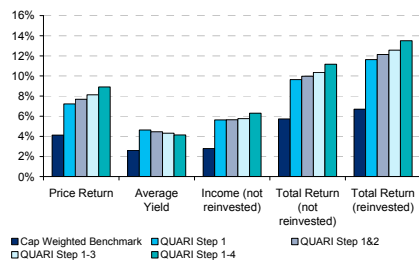
Yield is again decreased but significant improvements to income and capital gains are achieved

Figure 21. QUARI Step 1-4, Performance Statistics (Equally Weighted Total Returns)

	Pass	Fail	Pass v Fail	Pass (Relative)
Annualised Return	13.5%	7.2%	5.4%	6.4%
Annualised Volatility	16.2%	17.9%	7.2%	7.5%
Sharpe/Information Ratio	0.83	0.40	0.74	0.86
Hit Rate	67%	56%	62%	64%
Average Stocks Held	162	1443		

Source: Citi Research

Figure 22. Return Breakdown (Annualised)



Source: Citi Research

As we further refine the portfolio, average portfolio yield again drops but remains well ahead of the benchmark at 4.1%. The reduced volatility, accompanied by a strong increase in capital gains/price returns (up to 8.9%, Figure 22), however, results in further improvements to annualised income despite the falling yield. At 6.3% this is well over double that of the benchmark, providing an equivalent average of 35bps income per month.

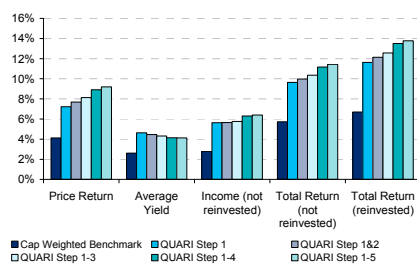
5) Profitability

Whilst we have no view on loss makers from an alpha perspective....

...removing loss makers from the portfolio removes uncertainty....

and improves absolute and risk adjusted returns

Figure 23. Return Breakdown (Annualised)



Source: Citi Research

Step Five [Remove Loss Makers]

The next step in our signal construction process is not concerned with either adding alpha or specifically reducing volatility, it is more concerned with uncertainty and, specifically, how one classifies loss makers.

Loss makers can be viewed in two ways. 1) as turnaround stories or 2) as extreme value stocks. In this instance we are not concerned with trying to differentiate between the two, so rather than run the risk of being involved with these 'tail risk' stocks, we simply remove them from the final portfolio.

Step five in our process is, therefore, to simply remove any stocks from the portfolio which have passed the previous four selection criteria that have either announced negative earnings in their last annual results or that consensus is forecasting negative earnings for in either FY1 or FY2.

This has a small effect on each of returns, volatility and portfolio income. Although both income and capital gains are marginally improved, this is incidental and is more of a function of the returns profile provided by removing loss makers as opposed to us taking a calculated view on loss makers from an alpha perspective.

Results

Portfolio size is reduced to an average of 147 stocks yet volatility, at 16%, is again lower than that achieved in any previous step with the Sharpe Ratio reaching 0.86.

Figure 24. QUARI Step 1-5, Performance Statistics (Equally Weighted Total Returns)

	Pass	Fail	Pass v Fail	Pass (Relative)
Annualised Return	13.8%	7.2%	5.6%	6.7%
Annualised Volatility	16.0%	17.9%	7.2%	7.5%
Sharpe/Information Ratio	0.86	0.40	0.77	0.89
Hit Rate	67%	56%	64%	64%
Average Stocks Held	147	1458		

Source: Citi Research

Average portfolio yield remains flat at 4.1% but increased price returns marginally improve annualised income to 6.4%.

6) Ex-Dividend Dates

We simply hold stocks on which the model has been bullish through to their ex-Dividend date

Step Six [Hold Through ex-Dividend Dates]

The final step in our signal construction process looks to enhance the income generated by the process around ex-Dividend dates.

Again, we are not taking a view on how this affects volatility; the goal here is to make sure that stocks in the final portfolio are held through their ex-dividend date to lock in the related income. This has the added benefit of taking advantage of any abnormal returns leading in to the ex-Dividend date.

To achieve this we simply keep hold of stocks that were in the portfolio in month-end $t-1$ but are not in the month-end t portfolio that have announced an ex-dividend date for the coming month $t+1$. i.e. Stocks are predominantly held in the portfolio for income reasons so if the model has taken a view on a given stock for the previous month and it is due to go ex-dividend in the coming month then we apply an override to force the model to hold these stocks through the month of their ex-dividend date.

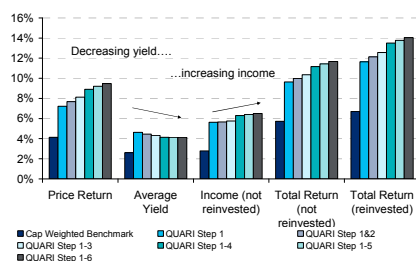
For example:

- Stock A generates a buy signal from the model on 30th April 2013. It is consequently held for the duration of May 2013.
- On 31st May 2013, a sell signal is generated by the model and Stock A is consequently removed from the portfolio.
- However, as Stock A is due to go ex-dividend on 13th June 2013 and is re-introduced into the portfolio (i.e. is it not sold) and held through June 2013.

This step re-introduces an average of 7 stocks per month into the portfolio that would otherwise have been sold has the desired effect of increasing the actual income generated by the portfolio without impacting the overall portfolio yield.

As this is the final step in the process we do not provide a results summary here, but provide a more detailed analysis in the following section.

Figure 25. Return Breakdown (Annualised)



Source: Citi Research

QUARI – Quality with a Reliable Income

Approximately 10% of the benchmark
held generate a consistent income with
higher conviction

After applying each of the six selection criteria we are left with an average portfolio size of 155 stocks to make up Quality with a Reliable Income (QUARI) portfolio. This equates to approximately 10% (the 'top decile') of the MSCI World investable universe. Volatility is well below that of the benchmark, despite the significant breadth reduction. This gives us confidence that the resultant portfolio provides a higher Quality portfolio with higher conviction of sustainable income.

Results

Double benchmark returns with
comparable volatility...

Figure 26. QUARI Step 1-6, Performance Statistics (Equally Weighted Total Returns)

	Pass	Fail	Pass v Fail	Pass (Relative)
Annualised Return	14.0%	7.1%	5.9%	6.9%
Annualised Volatility	16.1%	17.9%	7.2%	7.5%
Sharpe/Information Ratio	0.87	0.40	0.82	0.92
Hit Rate	69%	56%	64%	67%
Average Stocks Held	155	1450		

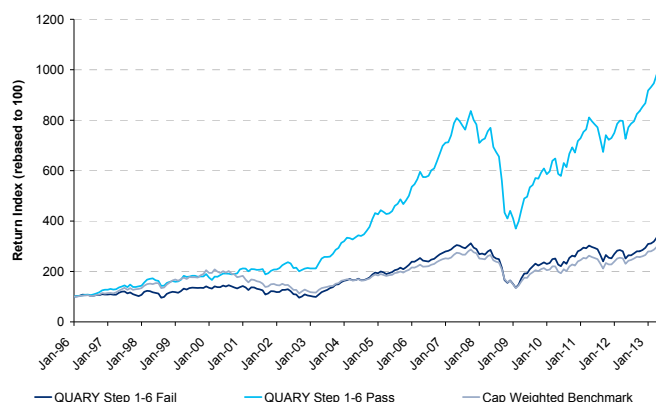
Source: Citi Research

...and improved income streams

Annualised returns are improved to 14.0% from 6.7% for the benchmark with significantly lower volatility (16.1% from 17.6%). This results in a more than doubling of the related Sharpe Ratios, increasing from 0.42 to 0.87, with positive returns generated in 69% of months since January 1996.

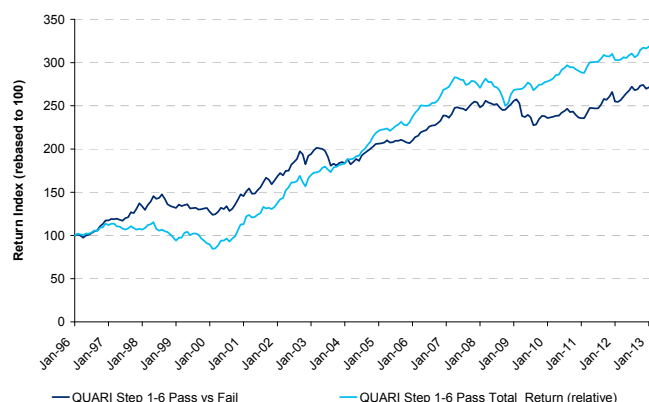
Risk adjusted returns are also in excess of 0.8 from both a long/short and relative perspective, with annualised returns of 5.9% and 6.9% respectively. Alpha is generated by both legs with the long portfolio outperforming whilst the short portfolio, i.e. stocks that do not pass the screening process, underperforms the benchmark.

Figure 27. QUARI Step 1-6, Cumulative Total Returns



Source: Citi Research

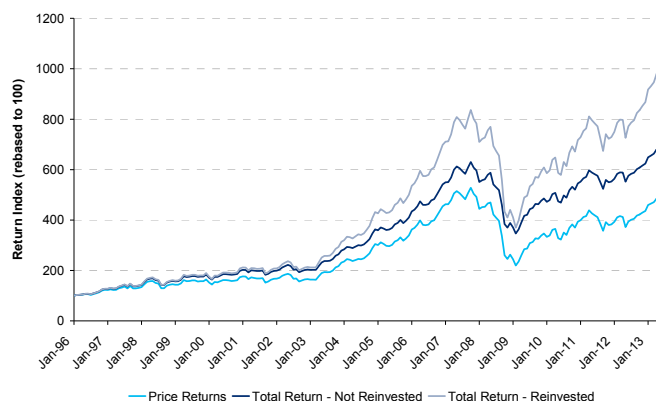
Figure 28. QUARI Step 1-6, Cumulative Relative Total Returns



Source: Citi Research

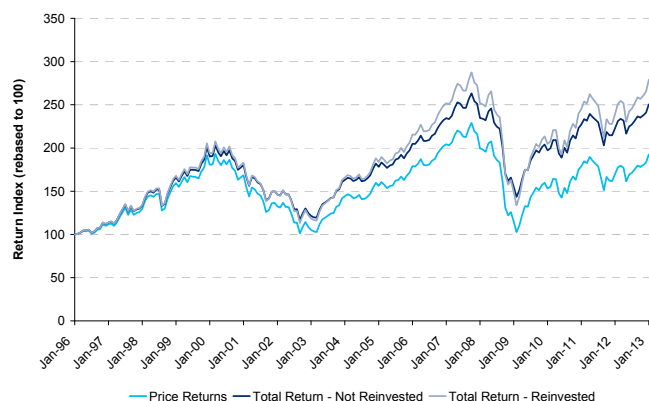
In fact, the QUARI portfolio outperforms the benchmark total return after stripping out the income generated by the dividend aspect of the portfolio. Price returns for the portfolio are an annualised 9.5% versus a 6.7% total return (reinvested) for the benchmark. This is clearly illustrated in Figure 29 to Figure 32.

Figure 29. QUARI Step 1-6 Performance (Equally Weighted Total Returns)



Source: Citi Research

Figure 30. Benchmark Performance (Cap Weighted Total Returns)



Source: Citi Research

Focusing further on the income aspect, the QUARI portfolio has an average yield of 4.1% (35bps per month) compared to 2.6% (19bps per month) for the benchmark. This translates into 6.5% of annualised income, well over double that of the benchmark 2.8%.

Turnover and Transaction Costs

Turnover is manageable and driven mainly by the Earnings Momentum filter...

Thus far we have solely been concerned with income and capital protection and have not been concerned with taking turnover constraints into account in any of the steps in the QUARI screening process.

That said the Earnings Momentum filter results in a significant increase in turnover. This is, however, justified by the improved risk adjusted returns the filter brings to the portfolio.

...although a Sharpe Ratio of almost double the benchmark is achieved post transaction costs

Turnover for the QUARI portfolio is an average 27% per month and, even after factoring in transaction costs at a fairly conservative 40bps, we still find results appealing. Post transaction costs, annualised returns of 12.6% are achieved with a minimal change in volatility, resulting in a Sharpe Ratio of 0.78 – almost double that of the benchmark.

Figure 31. QAURI, Performance Statistics Pre/Post Transaction Costs

	Benchmark	QUARI Pre T-Costs	QUARI Post-T-Costs
Ann. Total Return (reinvested)	6.7%	14.0%	12.6%
Ann. Volatility	15.8%	16.1%	16.1%
Sharpe Ratio	0.42	0.87	0.78

Source: Citi Research

For reference, removing the Earnings Momentum filter from the screening process results in annualised, post transaction cost returns and volatility of 12.3% and 16.5% respectively and an inferior Sharpe Ratio of 0.74.

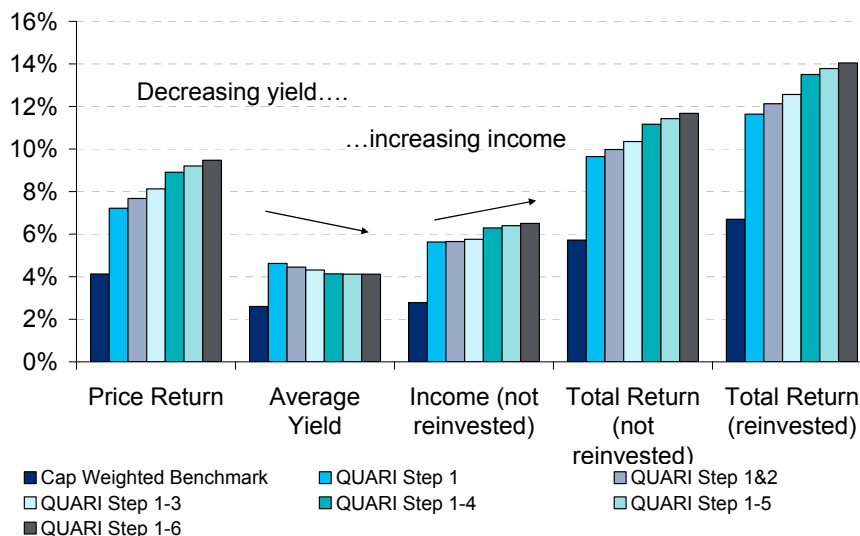
Income

Trading off yield for income...

...each step in the process reduces average portfolio yield but improves actual USD income...

Whilst the average yield of the portfolio decreases as we go through each step in the selection process, the additional price returns and lower volatility produced by the screening process result in a steady increase in annualised income. i.e. as we further refine the portfolio, although yield decreases we achieve our aim of improving the actual USD income received with each step of the process.

Figure 32. QUARI - Return Breakdown (Annualised)

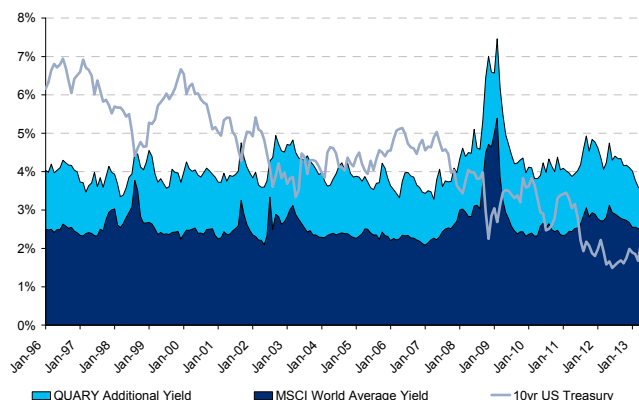


Source: Citi Research

...with the income generated beating total returns of 10 year US government bonds

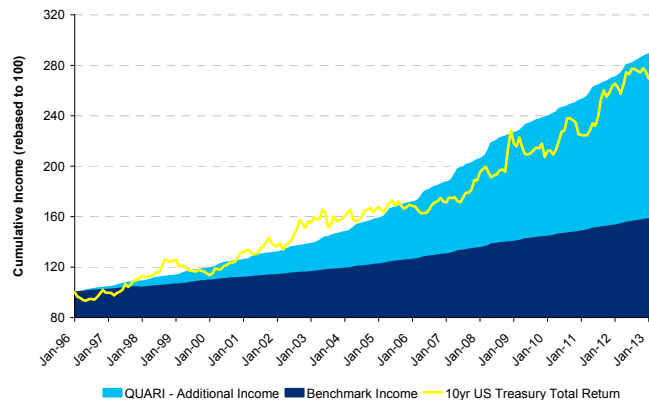
Another useful comparison to make is to compare the respective income streams of the QUARI portfolio and the benchmark to the total returns generated from a lower risk asset class – government bonds. In the below charts we use the yield and total return series from generic ten year US Treasuries as our lower risk asset⁹.

Figure 33. Yield, QUARI vs. Benchmark vs. US Treasuries



Source: Citi Research

Figure 34. Cumulative Income, QUARI vs. Benchmark & US Treasuries



Source: Citi Research

The income proportion of the QUARI portfolio provides remarkably similar returns to that of the total returns of or risk-free/lower risk asset, ten year US Treasuries.

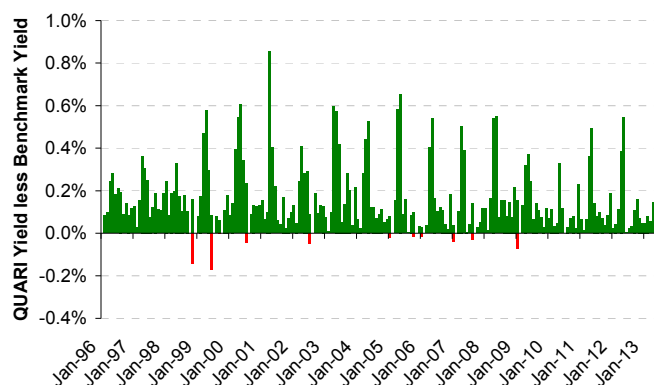
⁹ For US Treasuries we use the generic DataStream US Benchmark 10 Year Government Bond Index

Lower volatility is also evident (0.7% vs. 7.6%) with a hit rate of 100%¹⁰ compared to 59% for US Treasuries. i.e. Irrespective of any capital gains associated with the QUARI equity portfolio, we are able to generate more attractive returns than government bonds from both an absolute and risk adjusted perspective.

Monthly income improved by 16bps to 35bps, beating benchmark 94% of the time

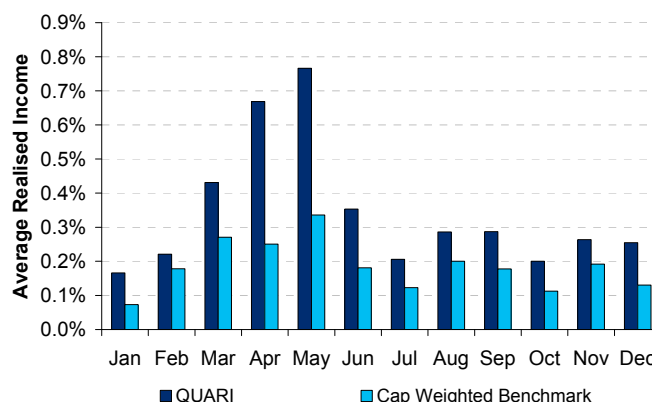
The average monthly income generated by the portfolio is also improved by 16bps in comparison to that of the benchmark, increasing from 19bps to 35bps. This income is higher than that of the benchmark 94% of the time over the course of our backtests (Figure 35).

Figure 35. Relative Monthly Income (QUARI vs. Cap Weighted Benchmark)



Source: Citi Research

Figure 36. Relative Monthly Income By Month (QUARI vs. Cap Weighted Benchmark)



Source: Citi Research

Although this improvement is evident in each month of the year, the relative income is accentuated around the typical 'final dividend' payment months where income reaches 70-80bps for the month against the benchmark 30-35bps.

QUARI generates above benchmark annual yield between March and June

Taking this one step further, the QUARI portfolio generates the equivalent of the entire year's benchmark income between the months of March and June alone. This would imply that, although a superior level of income is generated during the remainder of the year, focusing on QUARI stocks around the announcement of full year results and dividends is particularly beneficial.

The QUARI model is focused on maximizing income and, by definition; we do not consequently constrain the portfolio for either sector or country/regional exposures. This obviously results in sector and region bias throughout the duration of our empirical analysis.

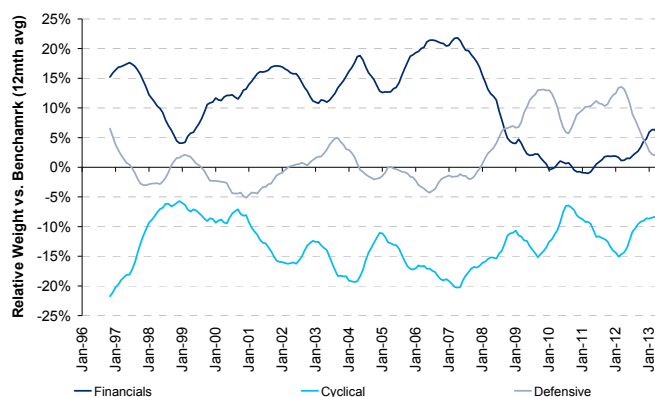
Region, Sector and Style Bias

General preference for defensives

One would intuitively categorize this kind of portfolio as lower risk/higher quality but, however, this is not always the case. Whilst it is of no surprise to see a general preference for defensive sectors since 2007/2008 /the onset of the global financial crises, it is more surprising that the model was relatively neutral on Defensives pre 2008 (Figure 37).

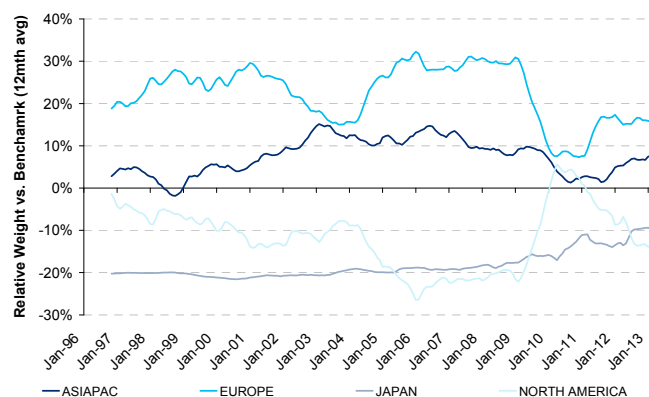
¹⁰ 100% hit rate by definition given total returns >= price returns and with income = total returns – price returns

Figure 37. QUARI Sectoral Breakdown vs. Equally Weighted Benchmark, 12mth Rolling Average



Source: Citi Research, MSCI

Figure 38. QUARI Regional Breakdown, vs. Equally Weighted Benchmark, 12mth Rolling Average



Source: Citi Research, MSCI

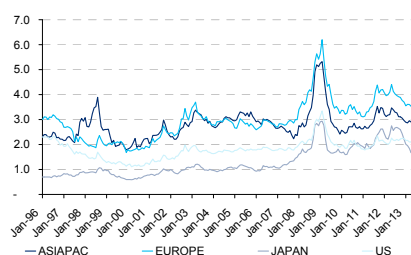
Preference for Financials pre 2007...

This obviously implies a similar theme for the rest of the market (i.e. Cyclical + Financials) but, as the chart suggests, Financials appear to provide the greatest variation in weights over time. However, prior to 2007 it is safe to state that Financials could be grouped together with Defensives, which has certainly not been the case since.

...and more defensive sectors since the GFC

One can consequently conclude that the QUARI portfolio is indeed Defensive but that, pre 2007 the lion's share of these defensive tilts were driven by exposure to Financials whereas since then they have been driven preferences for other Defensive sectors.

Figure 39. Regional Dividend Yields



Source: Citi Research, MSCI

From a regional perspective there is a much bigger divide with consistent underweights on both Japan and the US. In fact, due to the vastly inferior yields in Japan pre 2007 (Figure 39), only a handful of Japanese stocks pass the dividend yield screen, let alone the other five steps in the process. Whilst this clearly leads to a regional bias in the portfolio this is a bias we are happy to take as, historically, investors would not 'head to Japan' to look for yield. More recently spreads have, however, contracted and whilst generally remaining underweight more Japanese stocks have made it through the selection process and into the QUARI portfolio.

Whilst the US is also under-represented, although to a lesser extent, historically for the similar reasons, what immediately leaps to the eye are the spikes in proportion of US stocks held within the QUARI portfolio. This appears to be uniformly concentrated around Q4/FY results season in the US with the anomaly only appearing after step four in the selection process – the Earnings Momentum screen.

Underweight Japan due to relatively lower Japanese yields...

From this, we can reasonably assume the cause is the Full-Year effect and the rolling over of Earnings Estimates from FY1/FY2 to FY2/FY3 in the calculations used in step four. Whilst this will obviously be an issue across all of the four sub-regions, the effect is more concentrated in the US where the quarterly reporting cycle is more regimented than in the rest of the world. Elsewhere the effect is smoothed by reporting seasons spanning a number of months.

...overweight the higher yielding Europe and AsiaPac

With income and capital protection defining the investment process, clear and expected style biases emerge from the QUARI portfolio. Figure 40 shows inter-style correlation using each of our generic long only style portfolios and the QUARI portfolio.

Focus on capital protection brings tilts
towards Quality and Low Risk...

...although correlation with 'pure'
Dividend Yield is lower than expected

This gives us confidence that the
portfolio is focusing on more than just
yield...

...and more on maximizing income

Figure 40. Style Correlation (Calculated using Long Style Portfolio Relative Returns)

	QUARI	VALUE	PRICE MOM	EST. MOM	LOW RISK	SIZE	QUALITY	DIV YIELD
QUARI	-	-0.25	0.48	0.43	0.61	0.25	0.54	0.31
VALUE		-	-0.63	-0.61	-0.54	-0.62	-0.54	0.62
PRICE MOMENTUM			-	0.77	0.62	0.55	0.54	-0.25
ESTIMATES MOMENTUM				-	0.48	0.42	0.48	-0.39
LOW RISK					-	0.37	0.80	-0.04
SIZE						-	0.52	-0.27
QUALITY							-	-0.09
DIVIDEND YIELD								-

Source: Citi Research

Although this has not been the case throughout the GFC, Dividend Yield has historically more often been categorized as a Value factor and, consequently, has had a reasonably high correlation with Value (0.62). It is, therefore, interesting to observe that the QUARI portfolio is negatively correlated with Value and has a much lower correlation with Dividend Yield (0.31) despite the Dividend focus of the first two steps in the selection process.

This gives us confidence that the QUARI signal construction process is indeed focusing on more than pure yield and achieving its objective of a higher quality, lower risk portfolio with a sustainable income.

Positive correlations of the QUARI portfolio to Estimates and Price Momentum¹¹ can be explained by the model's Earnings Momentum filter, the portfolio is, in fact, less correlated to Dividend Yield than it is to both Quality and Low Risk. This gives us an added layer of confidence that the model's objective function is being achieved and that we are focusing more on maximizing actual USD income as opposed to maximizing yield.

We have included correlations to the underlying quality factors from our interactive style analysis tool¹² for reference.

Figure 41. Quality Factor Correlation (Calculated using Long Style Portfolio Relative Returns)

	QUARI	Earnings Certainty	ROE	Net Profit Margin	Margin Growth	Accruals	NOA
QUARI	-	0.53	0.53	0.25	-0.03	0.12	-0.36
Earnings Certainty		-	0.48	0.21	-0.12	-0.28	-0.25
ROE			-	0.63	0.09	0.08	-0.14
Net Profit Margin				-	0.19	0.07	-0.01
Margin Growth					-	0.20	0.44
Accruals						-	0.40
NOA							-

Source: Citi Research

From the above matrix it appears that the largest quality tilts of the QUARI portfolio come from Earnings Certainty and ROE. Higher earnings certainty would indeed imply a higher degree of clarity on future earnings and a consequent lower volatility – one of the aims of the signal construction process. It is, however, interesting to note that other quality factors are uncorrelated or, in fact, negatively correlated to the QUARI portfolio.

¹¹ Step 4 focuses on Earnings Momentum which has a strong positive correlation with Price Momentum (0.77)

¹² This takes the form of an excel add-in that clients can easily install on their desktop. Please contact the team if you wish to receive the tool – gqrlondon@citi.com.

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Portfolio Construction

Portfolio Construction: Minimizing Portfolio Volatility

Thus far we have focused on creating a model/investment process with the sole purpose of income maximization and Alpha generation within an equally weighted framework. The following section focuses on alternative portfolio construction techniques with the aim of improving annualised income by further reducing portfolio volatility.

Although step three of our stock selection process was focused on volatility, this was from an Alpha perspective and was more concerned with avoiding higher volatility stocks than reducing overall portfolio variance.

Low volatility has uses both during the Alpha phase and portfolio construction and we are firm advocates of utilizing low volatility both as part of a stock selection process and as part of the risk process. Below we apply two alternative portfolio construction techniques to the QUARI portfolio to produce more risk-efficient portfolios using Minimum Variance and a simple Total Risk Weighting.

Minimum Variance (MV)

The aim of this strategy is to obtain the lowest possible absolute risk given the covariance structure at any given point in time. Weights in the portfolio are driven by idiosyncratic variance and beta. Stocks with high idiosyncratic variance would cause the weight to tend towards zero.

The key difference between MV portfolio construction and Total Risk Weighting (TRW, below) is that MV takes into account co-variance where TRW does not and assumes constant correlations amongst stocks.

Corresponding to our previous research¹³, we try to avoid falling into the trap of data mining by applying minimal constraints to the optimizations in the Minimum Variance (MV) portfolio construction. To that extent we only apply one constraint – any single asset weight may not exceed 5% of the total portfolio.

Our final MV portfolio is not the 'pure' portfolio delivered from the optimization. Using the same intuition as step six in our stock selection process we apply an over-ride to the portfolio to ensure we hold stocks through any pending ex-Dividend dates to lock the related additional income into the portfolio.

To do this we perform MV optimization on the benchmark using only stocks that have passed all of the first five steps of our stock selection process as our investable universe.

Using the same logic as before, if a stock is within our investable universe, was held at the end of the previous month and has an ex-Dividend date pending in the coming month then, regardless of whether the stock is a buy or sell in the current portfolio we re-introduce (i.e. do not sell) the stock to the portfolio.

Since we have no prior view on the stock weight from our MV optimization we simply assign these ex-Dividend stocks a weight equal to the average weight of the stocks in the 'pure' MV portfolio, and then re-weight the portfolio accordingly.

Additional focus on risk as part of
portfolio construction...

...looking at both minimum variance and
total risk weighted implementation

With minimal constraints applied...

...Minimum Variance looks to achieve the
lowest possible absolute risk...

...although we again override the
process to hold ex-Dividend stocks
through their ex-Dividend date

¹³ [Low-Risk Equity Portfolios: More than Just Minimum Variance, Citi Research, 18th November 2010](#), [Low-Risk Portfolio Strategies: Sharpe Ratio Maximisation and Multi Asset Application, Citi Research, 9th March 2012](#)

Whilst this is not a 'pure' MV portfolio, it a reasonable proxy given the constraints. Essentially, we are happy to sacrifice what would be the optimal MV portfolio in exchange for the reduced complexity needed in the portfolio optimization without the additional constraints.

Total Risk Weighted (TRW)

Total Risk Weighted (TRW) portfolio construction does not require any optimization. Stock weights are simply proportional to the inverse of volatility.

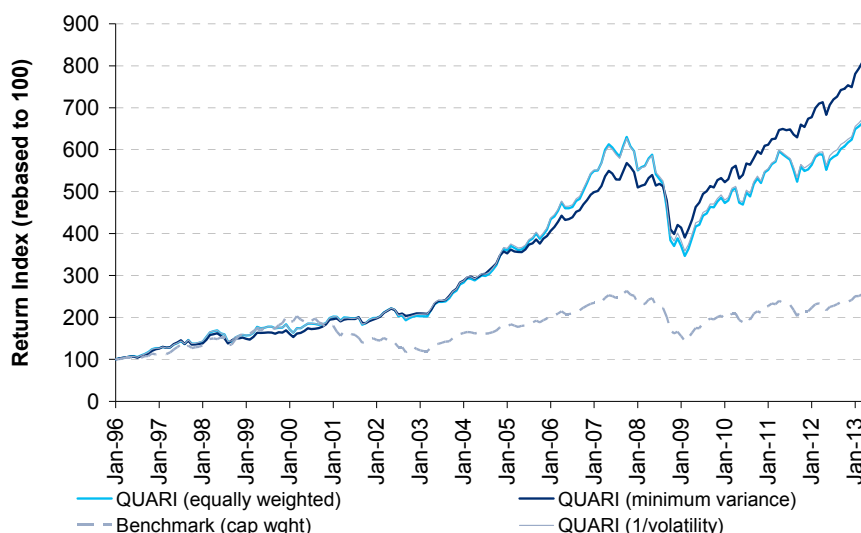
We construct our Total Risk Weighted portfolio by taking the stocks that have passed all six steps in our portfolio construction as our investable universe and weighting them according to the inverse of their volatility.

Whilst this approach is considerably less complex then Minimum Variance, as above, its limitation is that it does not take into account stock co-variance. That is, it uses only the diagonals from the covariance matrix which implicitly assumes constant correlation.

One thing is immediately apparent from the results – incorporating risk into portfolio construction in addition to the Alpha selection adds value to the process. Using Minimum Variance as part of portfolio construction has clear benefits whilst the Total Risk Weighted portfolio is almost identical to that of the equally weighted QUARI portfolio – in fact the differences cannot be seen on the chart below with the naked eye.

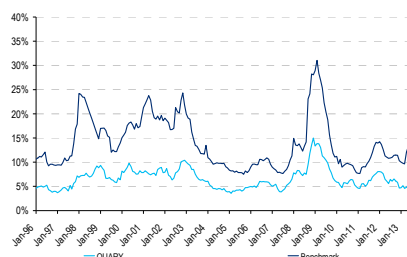
The signal construction process results in insufficient volatility breadth to have a meaningful impact...

Figure 42. QUARI, Total Returns (not reinvested) - Alternative Portfolio Construction Techniques



Source: Citi Research

Figure 43. Dispersion (StDev) of Stock Level Volatilities



Source: Citi Research

**...we therefore focus on Minimum
Variance optimisation**

One reason for this similarity could well be that the stocks that satisfy all six of the selection criteria, by definition, are likely to have a similar volatility profile. Indeed, Figure 43 clearly shows that the dispersion of the individual stock volatilities from the QUARI portfolio is around half that of the benchmark. This would imply that there is insufficient breadth in the volatilities of the QUARI portfolio for Total Risk Weighting portfolio construction to have a meaningful impact

Whilst one would expect the Total Risk Weighted QUARI portfolio to have a much closer tracking error to the equally weighted QUARI portfolio than its Minimum Variance alternative, it is a surprise to see this being so close.

In this instance, the breadth reduction caused by the screening process, and perhaps in particular the focus on Volatility, appears to almost make Total Risk Weighting 'redundant'.

Returns are almost identical to the equally weighted QUARI portfolio with a marginal reduction in volatility using Total Risk Weighting. For this reason the remainder of this analysis focuses purely on the Minimum Variance optimization for our final portfolio.

QUARI

QUARI:
Signal Screening Process
+
Minimum Variance optimization

Our final model is consequently an amalgamation of the QUARI signal construction process with Minimum Variance portfolio optimization. Given the inherent style tilts of the portfolio and it's focus on both income and capital preservation, we refer to the final model portfolio as QUARI – Quality with a Reliable Income.

Figure 44. QUARI Portfolio Statistics – Alternative Portfolio Construction Techniques

QUARI (equally weighted))	Price Return	Income (not reinvested)	Total Return (not reinvested)	Total Return (reinvested)
Annualised Returns	9.5%	6.5%	11.7%	14.0%
Annualised Volatility	16.0%		12.8%	16.1%
Sharpe Ratio	0.59		0.91	0.87
Hit Rate	61%		69%	69%
Number of Stocks	155			
QUARI (minimum variance)				
Annualised Returns	10.9%	6.8%	12.9%	15.8%
Annualised Volatility	12.9%		10.5%	13.1%
Sharpe Ratio	0.85		1.22	1.21
Hit Rate	69%		72%	72%
Number of Stocks	65			
QUARI (1/volatility)				
Annualised Returns	9.6%	6.5%	11.7%	14.1%
Annualised Volatility	15.0%		12.1%	15.1%
Sharpe Ratio	0.64		0.97	0.93
Hit Rate	67%		70%	70%
Number of Stocks	155			

Source: Citi Research

**Significantly reduction in volatility
despite breadth reduction...**

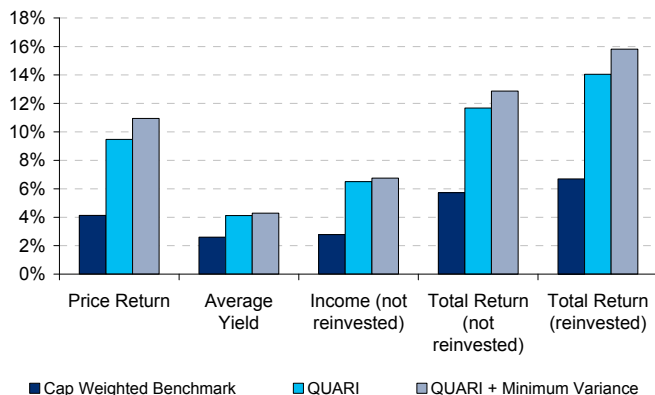
Using Minimum Variance optimization as the medium for portfolio construction, despite the ex-Dividend override, achieves the main objective function of lowering overall portfolio volatility.

**...with both improved income and capital
gains...**

Volatility is reduced from 16% to 12.9% despite the significant breadth reduction in the portfolio, falling from an average of 155 stocks equally weighted to 65 stocks using Minimum Variance. This alone would result in a considerable improvement to the Sharpe Ratio of the strategy but, coupled with annualised price returns increasing from 9.5% to 10.9% and annualised income hitting 6.8% from 6.5%, the Sharpe Ratio for the QUARI model (not-reinvested) improves to 1.22 from 0.91 with annualised returns of 12.9% and a hit rate of 70%.

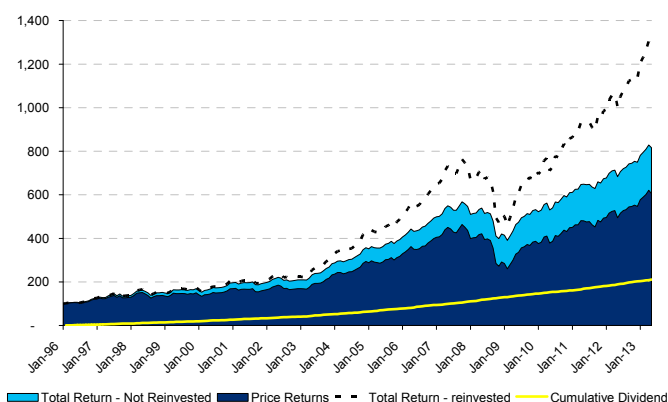
...result in Sharpe Ratios in excess of 1.2

Figure 45. Return Breakdown (Annualised)



Source: Citi Research

Figure 46. QUARI Portfolio Returns (Minimum Variance)



Source: Citi Research

In fact, improvements are evident across the board in comparison to both the pre-screened portfolio and the equally weighted benchmark. Incorporating Minimum Variance and ensuring we hold stocks coming into the ex-Dividend dates improves the average yield of the QUARI portfolio to 4.3% from 4.1% (2.6% for the cap weighted benchmark).

If we consider total returns with re-invested dividends, annualised returns are improved to 15.8% with a Sharpe Ratio of 1.21 and a hit rate of 72%.

1 negative year in our 18 year empirical study...

The portfolio has also held up well on a year by year basis and has only delivered negative total returns (not re-invested) in one of the eighteen years of our empirical tests (2008). Losses for that year are significantly reduced to 28.9% from 39.5% for the benchmark.

...although losses are vastly reduced in that year (2008)

Figure 47. Summary of Annual Performance, Portfolio vs. Equally Weighted Benchmark

Year	Income:		Price Returns		Total Return (not re-invested):	
	QUARI (min var)	Cap Weighted Benchmark	QUARI (min var)	Cap Weighted Benchmark	QUARI (min var)	Cap Weighted Benchmark
1996	3.6%	2.3%	20.4%	8.2%	24.0%	10.5%
1997	4.1%	2.2%	6.5%	-6.6%	10.6%	-4.4%
1998	4.1%	2.3%	7.8%	14.2%	11.8%	16.6%
1999	4.2%	2.2%	8.5%	15.7%	12.7%	17.8%
2000	4.4%	2.2%	12.2%	-3.0%	16.7%	-0.8%
2001	4.2%	1.7%	-4.0%	-11.9%	0.1%	-10.2%
2002	4.9%	1.9%	4.9%	-13.8%	9.8%	-11.9%
2003	6.6%	2.7%	36.9%	47.5%	43.5%	50.2%
2004	5.6%	2.4%	26.8%	22.3%	32.4%	24.7%
2005	4.8%	2.2%	8.0%	13.0%	12.8%	15.2%
2006	5.5%	2.4%	25.6%	20.2%	31.1%	22.6%
2007	4.7%	2.3%	9.5%	4.0%	14.2%	6.3%
2008	4.8%	2.3%	-33.3%	-44.7%	-28.5%	-42.4%
2009	6.0%	3.1%	32.5%	39.2%	38.5%	42.3%
2010	3.9%	2.4%	16.2%	15.6%	20.1%	17.9%
2011	4.8%	2.6%	9.8%	-11.2%	14.6%	-8.6%
2012	4.4%	3.0%	10.9%	13.6%	15.3%	16.6%
YTD	1.6%	2.2%	10.8%	10.4%	12.4%	12.6%

Source: Citi Research

Unconstrained Minimum Variance brings
high volatility...

...but double benchmark returns with a
Sharpe Ratio of 1 are still achieved after
fairly conservative transaction costs

Turnover and Transaction Costs

By construct, incorporating Minimum Variance optimization into the portfolio construction process with the limited constraints that we have applied can result in both concentrated portfolios and a significant increase in turnover.

This is indeed the case with the QUARI portfolio with turnover increasing to 45% per month from 27% for the raw, equally weighted QUARI portfolio.

After factoring in the same conservative transaction costs of 40bps, we still find risk adjusted returns in excess of 1 after applying Minimum Variance optimization to the QUARI portfolio. Post transaction costs, annualised returns are 13.4%, achieved with constant volatility, giving a Sharpe Ratio of 1.02.

Figure 48. QAURY, Performance Statistics Pre/Post Transaction Costs

	Benchmark	QUARI Pre T-Costs	QUARI Post-T-Costs
Ann. Total Return (reinvested)	6.7%	15.8%	13.4%
Ann. Volatility	15.8%	13.1%	13.1%
Sharpe Ratio	0.42	1.21	1.02

Source: Citi Research

Region, Sector and Style Bias

Incorporating a view on Volatility from a risk perspective in addition to an alpha perspective into the QUARI model results in changes to underlying style correlations.

Exposures to Size, Price and Estimates momentum remain consistent in comparison to the equally weighted QUARI approach. This can, again, be attributed to the Earnings Momentum filter included in the screening process.

Minimum Variance results in increased
correlation with Low-Risk and Quality...

Figure 49. Style Correlation (Calculated using Long Style Portfolio Relative Returns)

	QAURI (Min Var)	VALUE	PRICE MOM	EST. MOM	LOW RISK	SIZE	QUALITY	DIV YIELD
QUARI (Min Var)	-	-0.37	0.52	0.42	0.79	0.22	0.67	0.14
VALUE		-	-0.63	-0.61	-0.54	-0.62	-0.54	0.62
PRICE MOMENTUM			-	0.77	0.62	0.55	0.54	-0.25
ESTIMATES MOMENTUM				-	0.48	0.42	0.48	-0.39
LOW RISK					-	0.37	0.80	-0.04
SIZE						-	0.52	-0.27
QUALITY							-	-0.09
DIVIDEND YIELD								-

Source: Citi Research

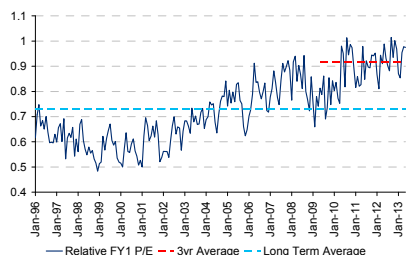
Correlations to Value styles, however, are increased from a negative perspective. i.e. Minimum Variance optimization of the QUARI model leads to a more expensive portfolio.

It is also worth noting that correlation to our Dividend Yield factor has markedly decreased and is sufficiently low to be uncorrelated/not significantly correlated to the Minimum Variance QUARI portfolio. i.e. despite the high income focus of the portfolio, it is not correlated to Dividend Yield. Whilst this may seem counter intuitive, this would imply that Dividend Yield is not the sole contributing factor behind the outperformance of income strategies.

...and tilt the QUARI further towards the
expensive end of the spectrum...

...further reducing correlation to 'pure'
Dividend Yield.

Figure 50. QUARI MV FY1 P/E vs. Benchmark Median FY1 P/E



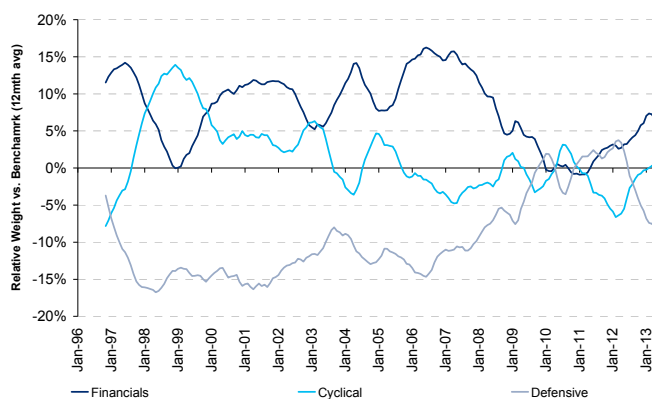
Source: Citi Research

The largest style tilts come from Quality and Low Risk. Whilst this was the case previously with the equally weighted QUARI approach, exposures have increased with correlations versus Low Risk and Quality reaching 0.79 and 0.67 respectively.

Whilst the portfolio trades at all time high valuations, both from an absolute perspective and relative to the benchmark median, there has not been a persistent re-rating since income investing returned to the fore and has fluctuated around its shorter term average for the past three years.

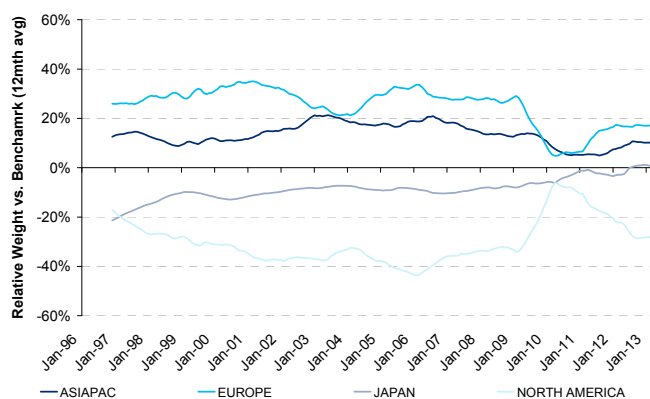
That said, the portfolio has almost never¹⁴ traded above that of the benchmark despite its Quality and Low Risk bias. One would perhaps be expecting to/willing to pay a premium for the return profile generated by the Minimum Variance QUARI portfolio so the fact that it generally trades on a cheaper multiple than the benchmark is of some comfort, despite appearing expensive compared to history.

Figure 51. Minimum Variance QUARI Sectoral Breakdown (Cap Weighted, Relative), 12mth Rolling Average



Source: Citi Research, MSCI

Figure 52. Minimum Variance QUARI Regional Breakdown (Cap Weighted, Relative), 12mth Rolling Average



Source: Citi Research, MSCI

From a region and sector perspective the Minimum Variance QUARI portfolio has less of an underweight on Japan and North America to the pre-screened portfolio and, last few months aside, has generally been overweight Japan over the past few years.

As one would intuitively expect, there has again been a general preference for since the onset of the Global Financial Crisis.

A high tracking error of 9% is perhaps misrepresentative...

QUARI should be viewed more as a benchmark unconstrained absolute return income strategy

Whilst we have presented results of the QUARI portfolio alongside that of the benchmark we are of the opinion that this kind of model fits in more with benchmark unconstrained strategies as its objectives of reliable income and capital preservation tend to move it away from the MSCI World benchmark.

For reference, and for those who are interested in comparing the realized portfolio returns to the benchmark, whilst absolute risk of the portfolio is considerably lower than that of the benchmark, there is a fairly sizable tracking error of 9%. This is perhaps misrepresentative of the aim of the strategy which should be viewed more as an absolute return income strategy.

¹⁴ Rarely - with the exception of two months, August 2012 and November 2012

Summary

QUARI aims to offer enhanced income and capital gains with low levels of absolute risk

We address 2 overlooked areas in income investing:

Volatility...

...and ex-Dividend dates

Whilst QUARI has produced above benchmark yield, the optimized portfolio has a low correlation with a 'pure' Dividend Yield portfolio...

...and confirms our view that yield alone is not enough when it comes to income investing

With continued high levels of interest in global dividend yield strategies we think our attempt at producing a concentrated and high conviction income portfolio should be of interest to quantitative and more fundamentally focused investors alike.

We believe our final optimal QUARI portfolio offers an attractive proposition to income investors. Backtesting showed annualised returns in excess of government bonds being generated from the income stream of the model (6.5%) whilst capital gains were over double that of the benchmark (10.9%) at around two thirds of its volatility (12.9%)¹⁵.

We think that our research touches on two areas that are perhaps overlooked, particularly amongst academics, when it comes to income investing by:

- **Incorporating Volatility** – we use volatility both as an alpha source in the screening process and also as a means of constructing a more risk efficient portfolio via Minimum Variance optimization.
- **Focusing on ex-Dividends** – if a stock has previously been held in the portfolio but goes on to fail the screening process, we hold on to the stock through it's ex-Dividend date when that date falls in the following month to ensure we receive the related income.

What we find of particular interest is that whilst the QUARI portfolio has delivered a significantly higher yield than that of the benchmark, the optimized portfolio is relatively uncorrelated to a simple dividend yield portfolio. Despite the significantly improved income generated by the portfolio, both annually and on a monthly basis, the largest style exposures are driven from tilts towards Low Risk and Quality.

Given the makeup of the alpha screening process and the mechanics of minimum variance portfolio construction this is not wholly unexpected but, contrary to what one may intuitively expect, the actual yield of the portfolio (i.e. focusing on the high yield end of the universe) seems to be less influential on total USD income generated than applying constraints on volatility at both the alpha and portfolio construction phase. This also gives the portfolio its inherent Quality bias.

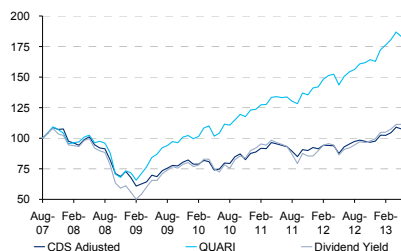
Going forward we intend to publish periodic updates to the Minimum Variance optimized QUARI portfolio but please contact the team for the complete list of stocks passing the initial signal construction process.

¹⁵ Past performance does not guarantee future results.

Appendix – Performance Versus CDS Adjusted Dividends

It is also worth comparing the performance of the QUARI portfolio with other dividend focused strategies.

**Figure 53. QUARI, Dividend Yield & CDS
Adjusted Dividends, Cumulative Returns**



Source: Citi Research

Our strategists run a CDS Adjusted Dividends model¹⁶ that has proved popular over the past few years with the rise in popularity of income strategies, focusing not only on yield but also on credit markets. The aim is to steer investors away from stocks where the yield is tempting but where the combination of sovereign and company risks imply that the CDS trades at high levels.

Since the CDS model has been designed as a defensive strategy and as an alternative to 'pure' yield investing during what has been a period of heightened macroeconomic risk, it may be unfair to compare it directly with the QUARI which, by definition, has a different objective.

Our colleagues also stress that this strategy is best used in conjuncture with other factors and that the 'raw' portfolio should be used as an alternative to the dividend yield input in any stock selection process. Figure 53 clearly shows the close tracking error of this CDS adjusted strategy with the 'pure' dividend yield portfolio.

Another notable difference is the fact that the investable universe for the CDS adjusted yield portfolio is vastly reduced since the model is dependent upon CDS data being available for any given stock. In Europe, for example, this reduces the investable universe to around 200 stocks and, as with the nature of CDS data, results in a large cap bias.

Consequently, comparisons may be misleading but, for reference, we find that the QUARI portfolio has outperformed both a high Dividend Yield portfolio and the CDS adjusted model, particularly since the bottom of the market in March 2009.

Please contact jonathan.stubbs@citi.com for further information on this strategy.

¹⁶ See CGDO or CGDOGDYE INDEX on Bloomberg and, Global Equity Strategist, Global CDS Adjusted Dividends, Citi Research, 6th June 2012

Appendix – Regional Return Summary

Below we present a summary of the model returns for each of the 4 sub-regions – Europe, North America, Japan, Developed AsiaPac ex Japan. Since some parts of the portfolio are already very concentrated before applying Minimum Variance optimization, we present the results for all stocks that pass all six steps of our selection process *before* Minimum Variance portfolio construction.

For reference, we highlight the below points:

- **Europe** offered the highest annualised income of 7.7%, this is only marginally below the capital gains generated of 8.1% and generated an average of 41bps income per month. Volatility is high within the European portfolio with a highly concentrated portfolio – an average of only 27 stocks pass the screening process each month. This resulted in a Sharpe Ratio of 0.71 versus 0.43 for the equally weighted benchmark.
- Interestingly, the European portfolio underperformed the equally weighted benchmark in each of its down years, flying against the defensive aim of the screening process.
- **North America** The screening process reduced volatility considerably in the North American portfolio. Modest improvements to the annualised capital gains also drove the Sharpe Ratio up to 0.88.
- The portfolio generated an average monthly income of 26bps resulting in 5.3% of annualised income with an average holding of 51 stocks.
- **Japan** With an average portfolio size of 24 the six step model has minimal impact on volatility but returns were three times that of the equally weighted benchmark, resulting in a Sharpe Ratio improvement from 0.1 to 0.3.
- With the lowest yield it is not surprising to see the lowest annualised income coming from the Japanese portfolio, returning an average income of 17bps, or 2% annualised.
- **AsiaPac ex Japan** Decent returns are evident in AsiaPac ex Japan with the majority of returns being driven by a strong improvement to the price returns of the portfolio.
- Income was also improved to 6.4% annualised, 47bps per month but high volatility caused by an extremely concentrated portfolio (an average of 15 stocks are held) produces inconclusive Sharpe Ratios.

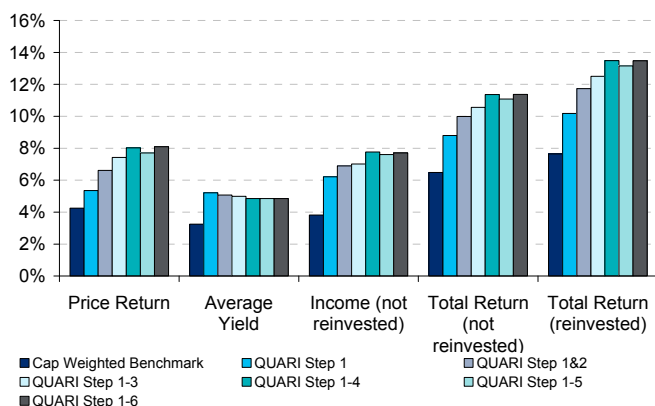
MSCI Europe

Figure 54. QUARI ex Minimum Variance Performance Statistics (Reinvested Total Returns, Equally Weighted)

	Pass	Fail	Pass v Fail	Pass (Relative)
Annualised Return	13.5%	8.4%	4.0%	3.8%
Annualised Volatility	19.0%	21.2%	8.0%	7.6%
Sharpe/Information Ratio	0.71	0.40	0.50	0.50
Hit Rate	63%	63%	59%	59%

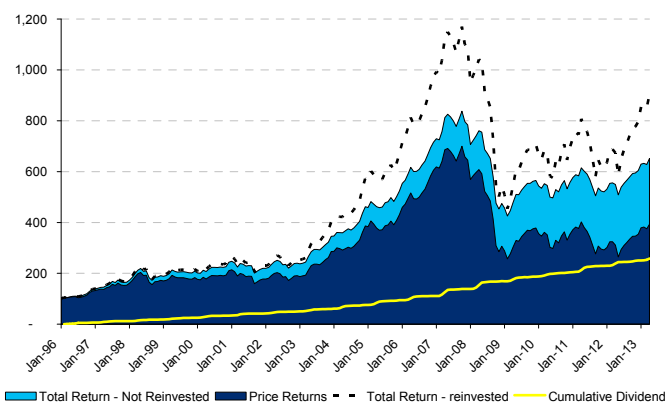
Source: Citi Research

Figure 55. Return Breakdown (Annualised), QUARI ex Minimum Variance



Source: Citi Research

Figure 56. Portfolio Returns (QUARI, ex Minimum Variance)



Source: Citi Research

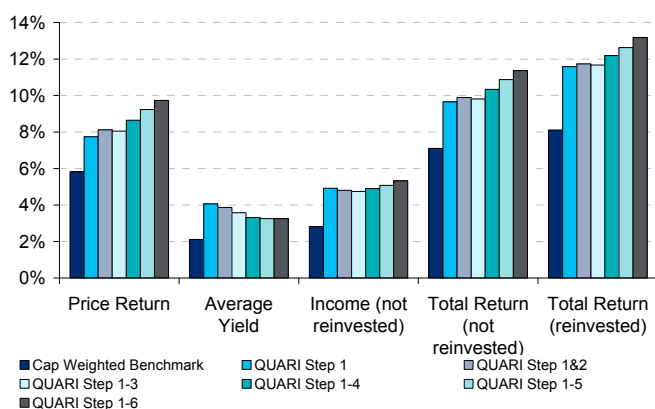
MSCI North America

Figure 57. QUARI ex Minimum Variance Performance Statistics (Reinvested Total Returns, Equally Weighted)

	Pass	Fail	Pass v Fail	Pass (Relative)
Annualised Return	13.2%	9.3%	2.4%	2.2%
Annualised Volatility	14.9%	18.8%	9.7%	8.8%
Sharpe/Information Ratio	0.88	0.49	0.25	0.25
Hit Rate	68%	60%	52%	52%

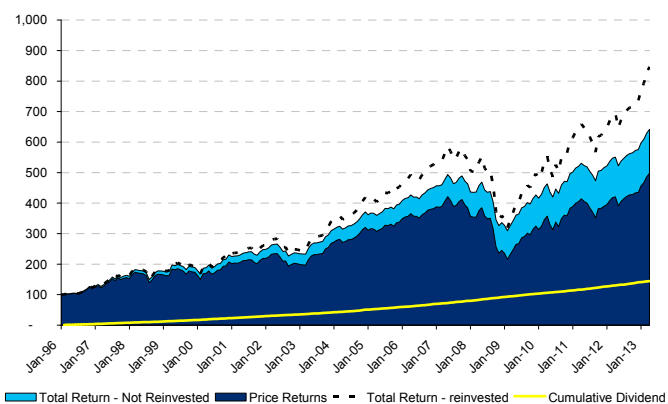
Source: Citi Research

Figure 58. Return Breakdown (Annualised), QUARI ex Minimum Variance



Source: Citi Research

Figure 59. Portfolio Returns (QUARI, ex Minimum Variance)



Source: Citi Research

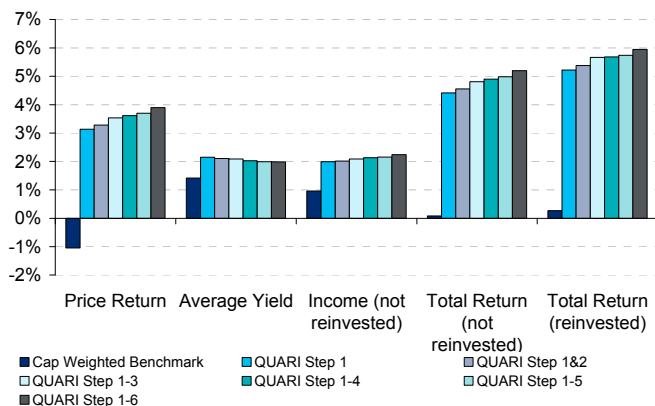
MSCI Japan

Figure 60. QUARI ex Minimum Variance Performance Statistics (Reinvested Total Returns, Equally Weighted)

	Pass	Fail	Pass v Fail	Pass (Relative)
Annualised Return	5.9%	1.6%	3.8%	3.5%
Annualised Volatility	20.1%	20.6%	8.7%	8.1%
Sharpe/Information Ratio	0.30	0.08	0.44	0.44
Hit Rate	56%	52%	59%	59%

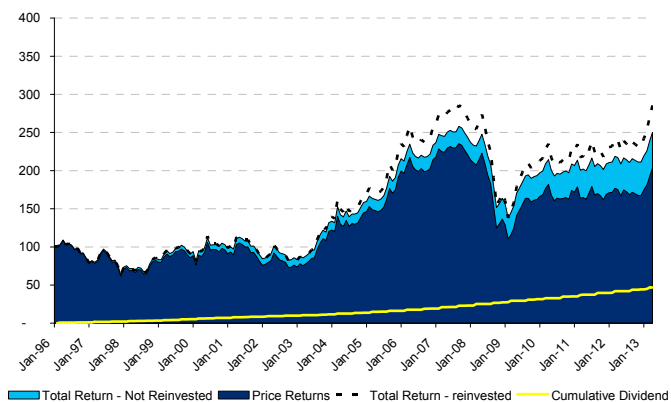
Source: Citi Research

Figure 61. Return Breakdown (Annualised), QUARI ex Minimum Variance



Source: Citi Research

Figure 62. Portfolio Returns (QUARI, ex Minimum Variance)



Source: Citi Research

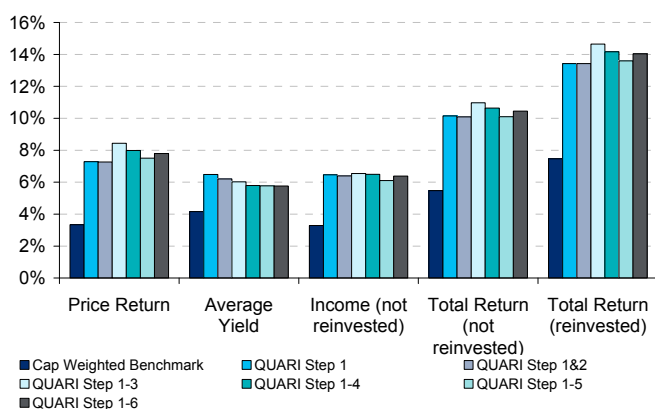
MSCI AsiaPac ex Japan

Figure 63. QUARI ex Minimum Variance Performance Statistics (Reinvested Total Returns, Equally Weighted)

	Pass	Fail	Pass v Fail	Pass (Relative)
Annualised Return	14.0%	6.9%	4.3%	3.8%
Annualised Volatility	21.8%	27.3%	13.8%	12.6%
Sharpe/Information Ratio	0.64	0.25	0.31	0.31
Hit Rate	66%	62%	61%	61%

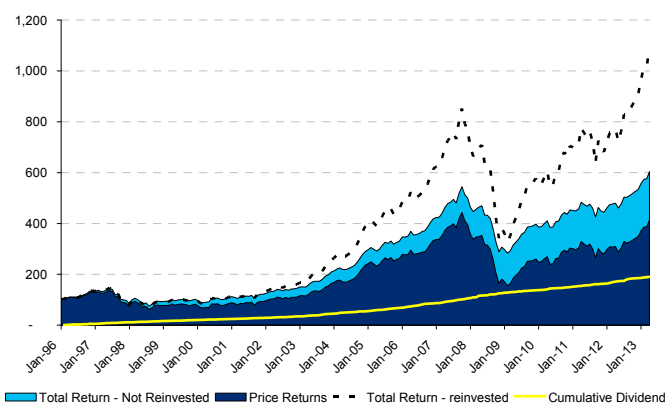
Source: Citi Research

Figure 64. Return Breakdown (Annualised), QUARI ex Minimum Variance



Source: Citi Research

Figure 65. Portfolio Returns (QUARI, ex Minimum Variance)



Source: Citi Research

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Figure 66. Global Quantitative Research Team *For informational purposes only*

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Notes

Notes

Appendix A-1

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Data current as of 30 Jun 2013	12 Month Rating			Relative Rating		
	Buy	Hold	Sell	Buy	Hold	Sell
Citi Research Quantitative World Radar Screen Model Coverage	30%	40%	30%			
% of companies in each rating category that are investment banking clients	34%	27%	24%			
Citi Research Quantitative Decision Tree Model Coverage	46%	0%	54%			
% of companies in each rating category that are investment banking clients	60%	0%	55%			
Citi Research Asia Quantitative Radar Screen Model Coverage	20%	60%	20%			
% of companies in each rating category that are investment banking clients	34%	26%	24%			
Citi Research Australia Radar Model Coverage	43%	0%	57%			
% of companies in each rating category that are investment banking clients	44%	0%	10%			

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Citi Research Quantitative Research World Radar Screen recommendations are based on a globally consistent framework to measure relative value and momentum for a large number of stocks across global developed and emerging markets. Relative value and momentum rankings are equally weighted to produce a global attractiveness score for each stock. The scores are then ranked and put into deciles. A stock with a decile rating of 1 denotes an attractiveness score in the top 10% of the universe (most attractive). A stock with a decile rating of 10 denotes an attractiveness score in the bottom 10% of the universe (least attractive).

Citi Research Asia Quantitative Radar Screen model recommendations are based on a regionally consistent framework to measure relative value and momentum for a large number of stocks across regional developed and emerging markets. Relative value and momentum rankings are equally weighted to produce a global attractiveness score for each stock. The scores are then ranked and put into quintiles. A stock with a quintile rating of 1 denotes an attractiveness score in the top 20% of the universe (most attractive). A stock with a quintile rating of 5 denotes an attractiveness score in the bottom 20% of the universe (least attractive).

Citi Research Australia Quantitative Radar Screen model recommendations are based on a robust framework to measure relative value and momentum for a large number of stocks across the Australian market. Stocks with a ranking of 1 denotes a stock that is above average in terms of both value and momentum relative to the stocks in the Australian market. A ranking of 10 denotes a stock that is below average in terms of both value and momentum relative to the stocks in the Australian market.

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For purposes of NASD/NYSE ratings distribution disclosure rules, a Citi Research Asia Quantitative Radar Screen recommendation of (1) most closely corresponds to a buy recommendation; a Citi Research Asia Quantitative Radar Screen recommendation of (2), (3), (4) most closely corresponds to a hold recommendation; and a recommendation of (5) most closely corresponds to a sell recommendation. An (NR) recommendation indicates that the stock is no longer in the screen.

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