

Optimal Momentum: A Global Cross Asset Approach

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October 1, 2011

Abstract

Momentum is widely accepted among academic researchers as one of the strongest return generating factors, yet it remains largely unknown by the investing public. This paper explores that dichotomy by examining momentum from a practical point of view. Using exchange traded fund data from 2002 through 2010, we compare industry, style and geographic applications of momentum. Global stock index funds using four geographic regions give the best momentum results, but with a high level of volatility.

Instead of lowering portfolio volatility by the usual method of adding fixed income securities to our momentum portfolio, we take an alternative approach of integrating fixed income into the momentum process itself. Fixed income securities become active in the portfolio only when they exhibit stronger momentum than equities. This creates a regime change overlay with momentum used for tactical, as well as strategic, asset allocation. The results are extraordinary risk adjusted returns at a reasonable level of volatility. Adding fixed income and other diversifying assets, such

¹ <http://www.optimalmomentum.com> This is an updated version of the second place winning paper of the 2011 NAAIM Wagner Awards for Advancements in Active Investment Management. Thanks to Tony Cooper for his helpful comments and Pierre Chretien for his kind assistance.

as gold, to momentum-based portfolios gives substantially more improvement than it does to non-momentum portfolios.

We validate eight years of ETF momentum results with thirty-four years of index data. On this longer data set as well, cross asset momentum substantially increases risk adjusted returns and significantly enhances the benefits of global diversification.

We show momentum to be a practical, powerful and parsimonious method for global asset allocation and portfolio construction. When used with selective diversification across different asset classes, momentum may also be an attractive enhancement to traditional mean variance portfolio optimization.

1. Introduction

Momentum is the tendency of investments to exhibit persistence in their price performance. Practitioners sometimes call it relative strength investing. Cowles and Jones (1937) offered the first published research on momentum when they demonstrated that, from 1920 to 1935, stocks that exceeded the median return of all stocks in one year tended to exceed it also in the following year. Momentum surfaced again in the literature when Levy (1967), using weekly closing data on 200 NYSE stocks sorted into deciles for the 1960 to 1965 test period, showed stocks that did well in prior 26 week periods also did well in subsequent 26 week periods.

It was not until the early 1990s, however, that momentum started capturing significant attention from the academic community following a seminal study by Jegadeesh and Titman (1993). They used data from 1963 through 1990 to show that price momentum based on 6 to 12 month past

time periods (interestingly the same time periods found to be optimal by Cowles and Jones and then Levy) provided significant positive abnormal profits. This was not consistent with an efficient market scenario in which no investment strategy based solely on publicly available information is supposed to outperform the market. If markets are efficient, no one should be able to profit in the end by investing in stocks that have done well recently.

Ideas from the newly emerging field of behavioral finance, however, helped explain how the momentum anomaly could exist. By now having logical reasons that could give credence to its validity, momentum started attracting considerable research attention from academics after publication of the Jegadeesh and Titman (1993) paper. Since then, the benefits of momentum investing have been found to extend back to the 1890s (Chabot et al 2009), as well as forward in time (Jegadeesh and Titman 2001, Wong 2008, Asness et al 2009), thus mitigating data mining concerns.

Over the past eighteen years, more than 300 published articles have established the fact that momentum effects exist in nearly all securities, sectors, markets, and asset classes. Momentum is not explained by size or value/growth factors. Momentum profits have been found to be remarkably stable across sub- periods since 1926 (Grundy and Martin 2001). Positive momentum effects have been found in international markets (Rouwenhorst 1998 and 1999, Chui et al 2000, Chan et al 2000), industries (Moskowitz and Grinblatt 1999, Asness et al 2000), size/value/growth style differentiations (Hong et al 1999, Lewellen 2002, Chen and DeBondt 2004, Clare et al 2010), global stock indices (Asness et al 1997, Haidkjaer 1997, Borraj and Swaminathan 2006, Griffen et al 2005), and other asset classes,

such as commodities, currencies and global bonds (Blitz and Vliet 2008, Okunev and White 2000, Asness et al 2009, Faber 2010).

There has been so much research showing that momentum works, academics no longer doubt its value. Schwert (2003) explored all known market anomalies and declared momentum as the only one that has been persistent and that has survived since publication. Using over 80 years of data, Fama and French (1996, 2008) showed that momentum is significantly stronger than size or value/growth factors. They call momentum “...the center stage anomaly of recent years” and “...an anomaly that is above suspicion.”

It may seem odd that there are now abundant opportunities for small cap and value oriented investing, but very few for momentum investing, which represents a much stronger anomaly. There are reasons why momentum, despite its acceptance by the academic community, has received relatively little attention from the investing public. First, there is the inertia associated with new investment ideas. The first index mutual fund was offered in 1976. According to Morningstar, by 1986 there were only 13 index funds. That number grew to 126 in 1996 and 550 in 2006.

Another possible reason for investor indifference toward momentum is that some investors confuse momentum with growth, short-term price acceleration, or generalized trend following.² Investors may also want to avoid the high volatility of momentum investing when applied to individual stocks.

² Momentum refers to relative price strength over a specific (usually 6 to 12 months) formation period combined with systematic entry and exit rules, whereas growth involves strength in earnings over non-specific time periods.

AQR Capital Management constructed a broad based momentum index using a universe of the largest 1000 U.S. companies. Each quarter they select the top one-third for their momentum portfolio based on relative strength over the preceding 12 months with a one-month lag. According to Berger et al (2009), from June 1980 until April 1990, the AQR Momentum Index showed an annual rate of return of 13.7% with an annual volatility of 18.6%. Over the same period, the Russell 1000 Index had an annual return of 11.2% and volatility of 15.7%. Even though the AQR Momentum Index had a 22% higher return than the Russell 1000 index during this ten year period, it also had 18% more volatility. Loss averse investors may be fearful of high volatility. The Russell 1000 has been subject to occasional equity dips in excess of 50%. Investment products based on individual stock momentum, like the AQR momentum Index, may have even greater equity drawdowns.

Liquidity concerns are another factor that may deter investors from momentum investing. In August 2007, when the Federal Reserve undertook aggressive market intervention, a number of large hedge funds were suddenly and simultaneously subject to heavy redemptions. Some of these were momentum funds. This mass liquidation caused a sharp equity drop among momentum programs. Over \$100 billion was lost during this one week.

Volatility and liquidity risks associated with individual stock momentum help explain why there are few momentum based investment products in today's marketplace, especially ones based on individual stock momentum. The Rydex/SGI Long Short Momentum Fund (RYSRX) began trading in April 2002. It focuses, however, on industry momentum. PowerShares

DWA Technical Leaders (PDP), PowerShares DWA Developed Markets Technical Leaders (PIZ), and PowerShares DWA Emerging Markets Technical Leaders (PIE) began trading in March 2007. These utilize a combination of industry and individual stock momentum. The AQR Small Cap Momentum Fund (ASMOX), AQR Momentum Fund (AMOMX), and AQR International Momentum Fund (AIMOX) are mutual funds based on individual stock momentum. They began only in July 2009. Two additional exchange traded funds using individual stock momentum, one sponsored by Russell Investments and the other by Invesco PowerShares, are currently in SEC registration.

Even though momentum research involving individual stocks has been plentiful and useful for establishing the validity of momentum, a different approach toward momentum may give better results and lead to more investor interest. Studies have shown improved results from individual stock price momentum by adding other momentum related factors. For example, Bonencamp et al (2009) show that excess momentum profits on individual stocks are 50% higher if one combines operating cash flow momentum with price momentum. Lewellen (2002) and Chen and DeBondt (2004) present evidence that momentum with respect to style can be stronger than momentum applied to individual stocks. Moskowitz and Grinblatt (1999, 2004) make the same point with regard to industry momentum. Asness et al (2009) compare momentum across a variety of asset classes and markets. They find a number of other asset classes that outperform individual U.S. equities based on momentum.

In the past, it has been difficult from a practical point of view to apply momentum to anything other than individual securities. Many mutual funds

have redemption restrictions or fees, which thwart fund switching based on momentum. The ETF market, however, can provide a convenient and effective means of implementing momentum strategies. ETFs generally have lower operating expenses, more trading liquidity, and a more efficient tax structure than mutual funds. There are now over 1100 ETFs and ETNs with total assets exceeding \$1 trillion. There is pricing history going back to July 2002 for fixed income ETFs, and several years earlier for equity exchange traded funds sorted by industry, style, and geographic area. We can easily compare and combine these in ways that are suitable for momentum investing.

2. Data and Methodology

The first decision with respect to momentum is the portfolio formation period to use. Results have been universally good for a 6 to 12 month look back ranking period. In accordance with many research papers, we will use six months.³ Momentum investing often displays high volatility, and a six month formation period should have less volatility than a longer time frame.⁴ It should also have a variance that is more constant.

We will use exchange traded fund monthly total return data provided by Yahoo.com from July 2002 through December 2010 for performance evaluation purposes. We will examine and compare momentum in the areas

³ For a non-exhaustive list, see Levy (1967), Jegadeesh and Titman (1993), Rouwenhorst (1998), Hong et al (1999), Moskowitz and Grinblatt (1999), Chui et al (2000), Bhorj and Swaminathan (2001), Griffin et al (2005), and Hvidkjaer (2006).

⁴ Looking at comparables to our research structure, Clare et al (2010) show standard deviations from 6, 9 and 12 month formation periods using long only, style based momentum portfolios with monthly reevaluations, while Faber (2010) shows similarly derived standard deviations for industry and global asset class momentum portfolios. A six month formation period has the lowest standard deviation in all three studies.

of style, industry, and geography. For some of the portfolios, we also use two fixed income funds that began trading in July 2002. These necessitate our performance reporting starting date of January 2003.

In order to achieve realistic results, we subtract estimated transaction costs of .2% per fund switch from all momentum portfolios. Based on the number of switches done, the annual reduction in ETF returns ranges from .39% to .53%, which is not significant.

Our benchmarks for comparison are the Russell 1000 exchange traded fund (IWB), representing the US equities market, and the AQR Momentum Index, representing momentum applied to individual stocks. To be consistent with our data, we subtracted AQR's estimated annual transaction costs of .7% from the AQR Index. For each momentum portfolio, we will select the top 33-50% of funds each month based on which funds have shown the strongest gains during the prior six months.

Our first momentum portfolio uses investment style. It holds the following funds segregated by size and value/growth factors:

Style Portfolio

- iShares S&P 500 Value Index (IVE)
- iShares S&P 500 Growth Index (IVW)
- iShares S&P MidCap 400 Value Index (IJJ)
- iShares S&P MidCap 400 Growth Index (IJK)
- iShares S&P SmallCap 600 Value Index (IJS)
- iShares S&P SmallCap 600 Growth Index (IJT)

Our next momentum portfolio holds the nine standard industry sectors:

Industries Portfolio

Materials Select Sector SPDR (XLB)
Energy Select Sector SPDR (XLE)
Financial Select Sector SPDR (XLF)
Industrials Select Sector SPDR (XLI)
Technology Select Sector SPDR (XLK)
Consumer Staples Select Sector SPDR (XLP)
Utilities Select Sector SPDR (XLU)
Health Care Select Sector SPDR (XLV)
Consumer Discretionary Select Sector SPDR (XLY)

Our final momentum portfolio uses geographic diversity. There are several issues to consider when constructing geographic based portfolios. First, larger capitalization markets like the U.S. may not receive enough portfolio weight if many countries are used. For example, if the top eighteen countries are used, Italy, with 1.1% of the world's float adjusted capitalization, would receive just as much portfolio consideration as the U.S., which has 41.6%. Furthermore, capitalization weightings may change over time. Transaction costs will also be higher if a number of individual countries ETFs are used.

A solution to these problems is to use regional geographic funds. These aggregate and give capitalization weightings to the countries in each region. Regional funds also change their country weightings as the relative market capitalizations change. The developed market regional funds are as follows with their current country allocations:

iShares S&P Europe 350 Index (IEV): United Kingdom 33%, France 15%, Switzerland 12%, Germany 11%, Spain 6%, Sweden 5%, Italy 5%, Netherlands 4%, others 9%.

iShares MSCI Pacific ex-Japan Index (EPP): Australia 64%, Hong Kong 22%, Singapore 12%, others 2%.

We will use these two regional funds, as well as ETFs of the United States and Japan. These are the top two countries in terms of world market capitalization. This gives us a portfolio consisting of thirteen major developed countries and a number of smaller ones. By using this regional geographic approach, we can achieve a good balance of granularity, idiosyncratic diversity, and geographic integration.

Regions Portfolio

North America	iShares Russell 1000 (IWB)
Europe	iShares S&P Europe 350 (IEV)
Asia	iShares MSCI Japan (EWJ)
Pacific	iShares MSCI Pacific ex-Japan (EPP)

3. Results

Table 1 lists the results of the momentum and benchmark portfolios. We also list performance results for equal weight, non-momentum based style, industry and regional portfolios for comparison purposes. These equal weight portfolios are rebalanced monthly, just as are the momentum portfolios. They can help us see if momentum portfolio outperformance is really due to momentum, or can be attributed instead to other factors, such as portfolio rebalancing profits due to mean reversion.⁵ We have not accounted

⁵ Booth and Fama (1992) show that regular portfolio rebalancing can capture mean reversion returns and add an annual 50-100 basis points to a balanced portfolio.

for taxes, which would reduce the returns of both the momentum and equal weight portfolios.

Table 1: Momentum Statistics: January 2003 – December 2010

	Annual Return	Standard Deviation	Sharpe Ratio	Maximum Drawdown*	Number of Funds
Russell 1000	8.4	15.4	0.39	-51.0	1 of 1
AQR Momentum	8.5	16.4	0.37	-47.4	1 of 1
Style Momentum	9.5	18.3	0.39	-51.0	2 of 6
Style Equal Weight	11.2	17.4	0.49	-50.4	6 of 6
Industry Momentum	9.3	15.3	0.45	-43.3	3 of 9
Industry Equal Weight	10.0	15.2	0.49	-49.2	9 of 9
Regions Momentum	12.0	17.7	0.52	-54.3	2 of 4
Regions Equal Weight	12.0	17.8	0.52	-54.2	4 of 4

*Maximum drawdown is the greatest peak to valley equity erosion on a month end basis.

Table 1 results show that the AQR Momentum portfolio of individual stocks had the same return with a somewhat higher annual standard deviation than the Russell 1000 Index during the eight-year test period. The Style momentum portfolio had a higher return than both the Russell 1000 and AQR portfolios, but the volatility was also higher than both of them. Additionally, the equal weight, non-momentum Style portfolio outperformed the Style momentum portfolio and both benchmark portfolios. Outperformance by the equal weight Style portfolio demonstrates the value of monthly portfolio rebalancing rather than momentum, with respect to Style. Even though the AQR has outperformed the market index on a longer term basis, on a risk adjusted basis, as evidenced by their annual Sharpe ratios, neither the AQR nor the Style momentum portfolios offer any advantage over the market index during this eight-year period.

The momentum portfolio sorted by industry is the first one with better than benchmark performance. During this time, it had a modestly higher return at the same level of volatility as the market. However, the equal weight, non-momentum Industry portfolio showed better performance than the Industry momentum portfolio. This makes it likely that the Industry momentum portfolio outperformed primarily due to portfolio rebalancing rather than to momentum forces.

With geographic momentum, we see the best improvement in performance over the U.S. market. The performance of the Regions momentum portfolio, however, is not much different from that of the equal weight Regions portfolio. Geographic diversification rather than momentum seems to be the cause of outperformance here. In addition, the regional portfolios, both momentum and equal weight, have high volatility.

4. Risk Reduction

The usual method of reducing the risk of an equity portfolio is by adding non-correlated, diversifying assets to the portfolio. Fixed income instruments are commonly used for this purpose. They provide both safety and stability. Traditionally, 60% equities and 40% fixed income has been regarded as a balanced portfolio. However, there are some problems with this approach. First, the risks associated with equities and fixed income are not equalized using the above 60/40 allocation. Historically, equities have had an annual standard deviation of around 15%, while the standard deviation of ten-year treasury notes has been around 5%. If we square both to arrive at their variances, equities have nine times the variance of treasury notes. To have true risk parity in equities and treasury notes, we would need

to have around 70% of portfolio assets in treasury notes rather than just 40%.

Looking at our data over the past eight years, the mean variance efficient tangency portfolio would have had 65% of its assets in treasury notes and 35% in the Regions momentum portfolio, if we were using it. This is in line with the longer term allocation given above for a risk parity balanced portfolio of treasury notes and equities. Such a heavy fixed income allocation, however, would likely lead to low future portfolio returns. Furthermore, the current yield on ten treasury year notes is in the region of 2%, which is its lowest level of the past thirty years. This implies an even lower return from fixed income in the years to come and further reduces the attractiveness of having a substantial allocation to fixed income securities.

However, there is an alternative way to use fixed income securities to reduce the risk of a momentum portfolio. We can include fixed income ETFs in the momentum portfolio itself. In market environments that are favorable to equities, momentum would not usually select fixed income funds as active investments, since their prior six-month returns would be lower than the return of equities. This would keep lower return fixed income funds from having a depressing effect on our portfolio returns. It is when equity returns are weak relative to fixed income returns (such as in bear market environments) that momentum based positions would be taken in fixed income funds. This would create a timing effect related to market environment. In addition to its strategic asset allocation value, momentum applied to a combination of geographic region and fixed income funds can function as a trend following method of global tactical asset allocation (GTAA).

We will use short and intermediate term fixed income securities, since they historically have better reward to risk characteristics than long-term bonds. The two Treasury note exchange traded funds of short and intermediate duration that began trading in July 2002 are:

iShares Barclays 7-10 Year Treasury (IEF)
iShares Barclays 1-3 Year Treasury (SHY)

We will add both to our best performing momentum portfolio, which is the one based on geographic regions. Table 2 presents the results with an appropriate benchmark for comparison.

Table 2: Regional Momentum

	Annual Return	Standard Deviation	Sharpe Ratio	Maximum Drawdown	Number of Funds
Regions + Notes	17.1	12.3	1.12	-12.1	2 of 6
Regions	12.0	17.7	0.52	-54.3	2 of 4

Adding fixed income to our Regions momentum portfolio dramatically reduces portfolio volatility. The standard deviation falls from 17.7 to 12.3, a 31% reduction in volatility from the Regions portfolio before the inclusion of treasury notes. The annual rate of return rises to 17.1% from 12.0% because there are fewer losses to recoup. The maximum equity drawdown falls to 12.1%, which is an impressive 78% reduction from the 54.3% drawdown of the Regions momentum portfolio without treasury notes. The new Sharpe ratio of 1.12 is extraordinary. Incorporating fixed income funds

into our momentum portfolio improves results in every respect. Cross asset diversification dramatically brings momentum to life.

5. Additional Diversification

Since there is so much value added from diversification using treasury notes, it might prove worthwhile to look at incorporating other non-correlated assets into our Regions momentum portfolio. Gold and commodities typically have a low cross correlation to both equities and bonds. There are two reasons we will use gold rather than commodities as our diversifier. First, gold functions as a de facto currency as well as a commodity. The other reason we prefer gold is that, according to Bauer and McDermott (2010), gold functions as a safe haven with respect to bonds and equities, as well as a hedge and diversifier. A safe haven is an asset that remains uncorrelated or negatively correlated with another asset or portfolio in times of market stress or turmoil. Most cross correlations that are low under normal circumstances increase toward unity during times of market stress. Gold and short-term treasury notes, as safe harbors, are less susceptible to this.

Even before the run up in gold prices over the past few years, Hiller et al (2006) show that traditional stock/bond portfolios perform significantly

better when you add precious metals to them. Below are the results from incorporating gold into our Regions/Notes momentum portfolio:⁶

Table 3: Regional Momentum with Gold

	Annual Return	Standard Deviation	Sharpe Ratio	Maximum Drawdown	t stat	Number of Funds
Regions+Notes+Gold	18.8	11.9	1.29	-7.2	4.14	2 of 7
Regions+Notes	17.1	12.3	1.12	-12.1	3.63	2 of 6

By adding gold, portfolio risk and maximum drawdown decrease, while the rate of return increases. Gold is indeed a good diversifier for the Regions/Notes momentum portfolio.

Here is how the yearly returns from our Regions momentum portfolio with treasury notes and gold compare to the yearly returns of the Regions momentum portfolio without notes and gold:

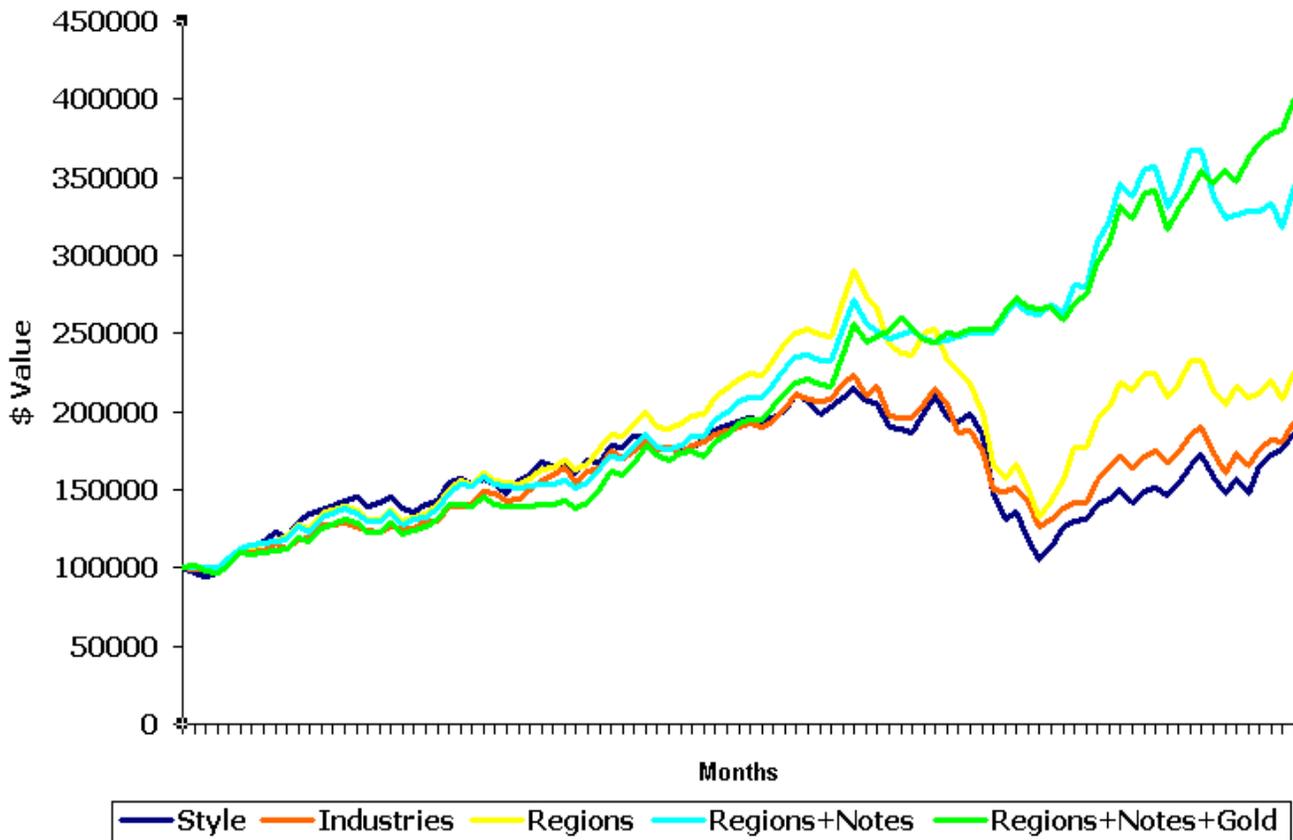
⁶ SPDR Gold Shares (GLD) price data extends back to November 2004. Because this fund simply holds gold bullion in London, we use a proxy for the price of GLD prior to November 2004 by measuring monthly changes in the London gold price and subtracting pro-forma GLD fund expenses.

Table 4: Momentum Portfolios Annual Returns

	Regions+Notes+Gold	Regions
2003	33.0	34.7
2004	8.1	15.5
2005	10.0	13.9
2006	25.8	24.8
2007	28.6	20.4
2008	9.7	-37.3
2009	20.0	34.9
2010	16.3	0.2
Average	18.8	13.4

The Regions momentum portfolio with notes and gold never shows a yearly loss. In 2008, the Regions momentum portfolio was down 37% for the year, while the Regions/Notes/Gold momentum portfolio gained 10%. Not only are the returns significantly higher with cross asset diversification, but the results are more consistent as well. Momentum within a global cross asset framework provides clearly superior performance to one dimensional momentum portfolios.

**Figure 2: Comparative Momentum Portfolios
January 2003 – December 2010**



6. Portfolio Optimization

These results indicate that asset allocation and portfolio formation using cross asset class momentum may be an attractive alternative to traditional mean variance optimization with its attendant estimation risk problems. The covariances used with mean variance optimization usually remain stable over time, but expected returns are not so predictable. Some portfolio managers seek to minimize estimation risk problems by constructing minimum variance portfolios, but this leads to a loss of information with respect to returns. Momentum portfolios, on the other hand, focus on returns while managing risk through relative strength rotation. They eliminate the

need for complicated, error prone resampling techniques or Bayesian adjustments often used to construct mean variance portfolios.

Momentum is self-correcting and more forgiving as a portfolio formation tool; the future does not need to be like the past in order for there to be robust momentum results. Momentum simply adapts to what is. Momentum will not select assets as investments if they stop performing well relative to other portfolio assets.

7. Robustness Check

ETF data for backtesting purposes is limited to the past eight years, which is not a long time for drawing financial conclusions. However, the underlying indices for the funds in our portfolio extend back to at least the mid-1970s. As a check on the robustness of our conclusions, we will reexamine our Regions/Notes/Gold momentum portfolio using thirty-four years of index data from January 1977 through December 2010. Our equity index data, covering total returns of the US, Europe, Japan and Pacific ex-Japan markets, comes from MSCI. For fixed income, we use 5-7 year treasury and 1-3 year US government indices from Barclays Capital. For gold, we calculate monthly changes in the London afternoon gold fix provided by Bundesbank. Returns are before transaction costs or taxes. As before, the top two funds will be selected each month based on six-month momentum. Table 5 lists summary performance statistics of the various indices over this 34-year period.

Table 5: Index Results 1/1/77 – 12/31/10

	Annual Return	Standard Deviation	Sharpe Ratio	Max Monthly Drawdown
US	12.0	15.4	0.42	-50.7
Europe	13.9	17.4	0.48	-59.0
Pacific	15.0	22.5	0.42	-60.6
Japan	10.8	21.9	0.24	-61.1
Gold	9.1	19.1	0.17	-24.3
5 Yr Notes	7.7	4.3	0.46	-4.8
2 Yr Notes	7.1	2.9	0.49	-3.4

Table 6 provides similar information for an equally weighted mix of the equity indices, an equally weighted mix of all the indices, and the Regions/Notes/Gold momentum portfolio.

Table 6: Momentum and Equal Weight Portfolio Results

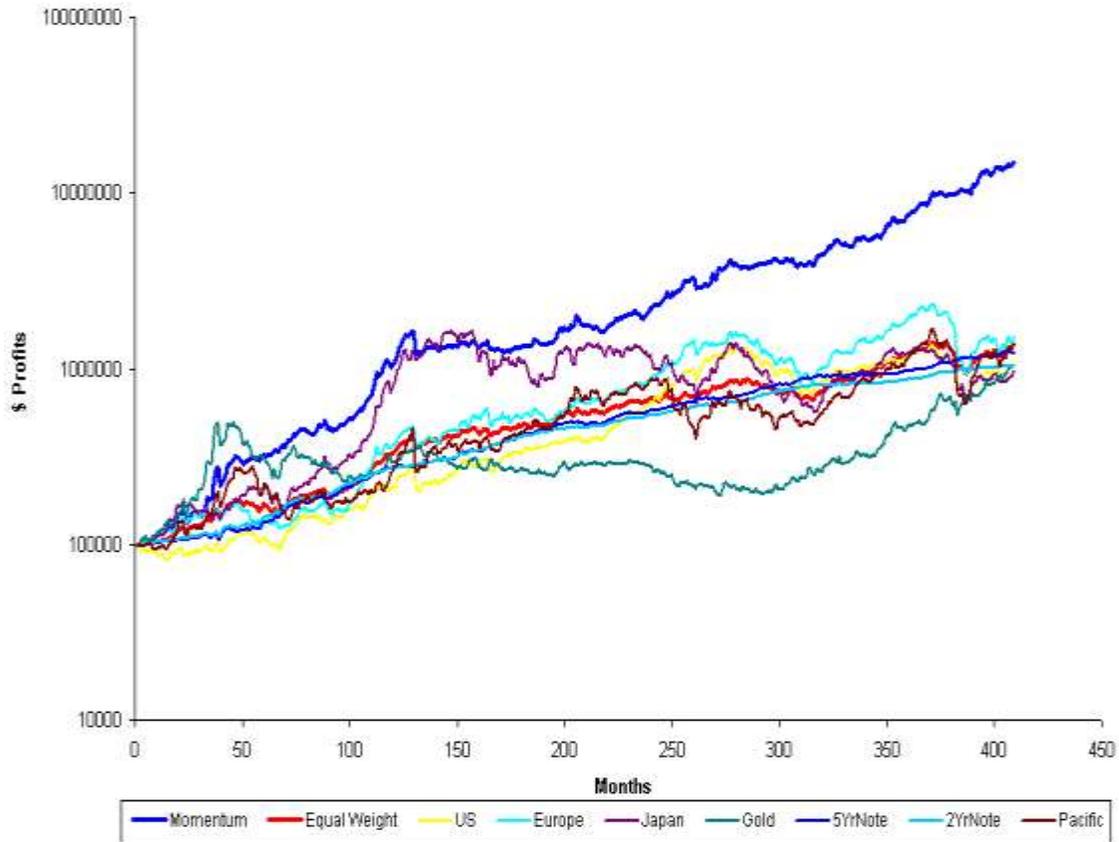
	Annual Return	Standard Deviation	Sharpe Ratio	Max Monthly Drawdown	t statistic
1/1/77-12/31/10					
Regions+Notes+Gold	19.3	15.2	0.81	-25.2	6.82
Equal Weight – All Indices	10.8	9.9	0.48	-30.9	6.04
1/1/77-12/31/93					
Regions+Notes+Gold	23.3	17.9	0.76	-25.5	4.88
Equal Weight – All Indices	14.4	10.1	0.59	-12.8	5.55
1/1/94-12/31/10					
Regions+Notes+Gold	15.5	12.1	0.93	-17.3	4.96
Equal Weight – All Indices	7.2	9.7	0.38	-30.9	2.97

The equal weight portfolio of all the indices consists of 57% equities, 29% fixed income, and 14% gold. Its annual rate of return of 10.8% is the weighted average return of all the portfolio assets. This portfolio has a lower

volatility, a lower maximum drawdown, and a higher Sharpe ratio than any of the equity indices, which demonstrates the value of cross asset diversification. However, the Regions/Notes/Gold momentum portfolio has a substantially higher annual return (19.3% versus 10.8%) and Sharpe ratio (.81 versus .48) with a lower maximum drawdown (-25.2% versus -30.9%) than the all indices equal weight portfolio. This clearly demonstrates the synergistic value of combining momentum with cross asset diversification. Over this lengthy period, our simple momentum model applied to four geographic regions, treasury notes, and gold provides almost twice the rate of return as the all indices equal weight portfolio. It is also worth noting that much of the volatility from our Regions/Notes/Gold momentum portfolio is upside, rather than downside. This is evidenced by the skewness of the Regions/Notes/Gold momentum portfolio being -.41, versus -.71 for the all index equal weight portfolio. Negative skewness infers the potential for greater variance of negative rather than positive returns. Risk averse investors should prefer more positive (or less negative) skewness.

Not only is the robustness of these results impressive, but it should be noted that there has been a minimum of data mining used in achieving them. The simple six-month momentum framework we employ has been used successfully by dozens of prior research papers beginning with Levy (1967). Our portfolio of global equities, treasury notes, and gold is also nothing out of the ordinary. These extraordinary results from our simple approach should add to whatever doubts there are regarding the validity of the efficient market hypothesis.

Figure 3: Comparative Performance
January 1977 – December 2010 (log scale)



8. Further Research

Now that momentum is universally accepted as valid and beneficial, more research should focus on how to best utilize its potential in the marketplace. This paper is a pioneering effort toward that goal.

Given the continuing expansion of exchange traded funds into other asset classes and diverse investment products, there will likely be opportunities for further additions or substitutions to diversified momentum portfolios. Data mining issues notwithstanding, we are continuing our research in this area with encouraging results.

Momentum also holds promise as a simple and robust portfolio formation tool. It offers advantages when combined with other portfolio construction methods, such as traditional mean variance optimization. We are exploring this area as well with excellent preliminary results.

9. Summary and Conclusions

Our first task was to determine how to achieve the best investment results using momentum. During the eight-year period from January 2003 through December 2010, a simple momentum model applied to individual stocks, investment styles, industry groups, and geographic regions showed no real advantage over non-momentum investing. Geographic segmentation offered the best momentum results, but with high volatility.

In an effort to attenuate portfolio volatility, we added two Treasury note funds to the geographic regions momentum portfolio. The improvement in performance was dramatic. Adding fixed income through a relative strength momentum framework is a more efficient means of lowering portfolio volatility than doing so through a permanent allocation to fixed income funds. From within the momentum model, fixed income securities become active investments when equities are relatively weak, thus providing an automatic method of tactical asset allocation that is accurate in identifying regime changes. In addition to substantially lowering risk, diversifying with fixed income securities through momentum gives higher returns because there are fewer losses to recoup. Adding fixed income through momentum also curtails fixed income drag that reduces portfolio return during those times when fixed income is not necessary for portfolio risk reduction.

Finally, we saw how diversification with other non-correlated asset classes enhances the investment performance of momentum portfolios much more than it does non-momentum portfolios. Using eight years of ETF data and thirty-four years of index data, we saw much greater realization of the potential benefits of global geographic diversification through cross asset momentum. Non-correlated, diversifying assets, like treasury notes and gold, incorporated into geographically based regional momentum portfolios may be an ideal way to implement both strategic and tactical asset allocation in order to achieve extraordinary risk adjusted returns.

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