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Global Quantitative and Derivatives Strategy
15 July 2014

Framework for Regional Equity Allocation

Country Selection based on Fundamental, Macro and Technical Signals

A new systematic framework for regional equity allocation is initiated in this report. Ten uncorrelated traditional and proprietary signals that show predictive ability for allocating across country equity markets are introduced and their robustness is examined under various economic regimes.

Dispersion Adjusted Earnings Yield *(Fundamental)* - High valuation dispersion in a cheap market offers an effective entry point and provides greater opportunity to unlock equity value. This approach provides a substantial improvement over traditional valuation. The signal ranks countries by their dispersion adjusted earnings yield.

Bond Yield Anchored Dividend Spread *(Fundamental)* - Conventional dividend yield signal is refined by anchoring both its level and dispersion around its country's bond yield.

Real Interest Rate *(Macro)* - Countries with higher relative long term real interest rates, a proxy for expected rate of return, are favored.

Relative Style *(Macro)* - Outperformance of Growth over Value indicates greater investor confidence in the market. Countries with high momentum in their Growth-Value spread are preferred.

Risk-Adjusted Currency Momentum *(Macro)* - Weaker currency helps a country's stock market by making its goods, services and financial assets cheaper to foreigners. Countries with weakening risk-adjusted currencies are preferred.

Free Liquidity *(Macro)* - Money growth in excess of the amount needed to support economic activity tends to boost asset prices. Countries with higher increase in money supply relative to output are favored.

Leading Economic Indicator *(Macro)* - Rising LEI indicates strengthening economic activity. Countries with higher LEI are likely to outperform.

Earnings Sentiment Trend *(Sentiment)* - This confirming signal uses under-reaction in analysts' opinions for country selection. Countries with improving earnings sentiment are expected to outperform.

Absolute Equity Momentum *(Technical)* - Countries with high equity momentum are preferred over those with low momentum. Further, the signal uses a country's absolute momentum, a simple but an effective way of implicitly hedging potential momentum reversals from the extreme left tail of the price distribution.

Implied Volatility *(Technical)* - Market declines are usually accompanied by a spike in volatility. This contrarian signal exploits investor overreaction by favoring countries with a larger spike in implied volatility.

The overall model portfolio yields an IR of 1.6, hit rate of 67%, t-stat of 7.3 and IC of 11.9%, while exhibiting effectiveness across longer investment horizons. Additionally, a modular portfolio construction approach was utilized enabling one to target different levels of risk and tilt the portfolio toward desired themes.

Global Quantitative Strategy

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See page 67 for analyst certification and important disclosures, including non-US analyst disclosures.

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Past performance is not indicative of future returns

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Introduction

In this report a new framework for regional equity allocation is introduced. More specifically, various fundamental, macro, technical and sentiment signals for country selection are examined in detail. The framework or Country Rotation Model (CRM) covers 14 liquid developed markets.

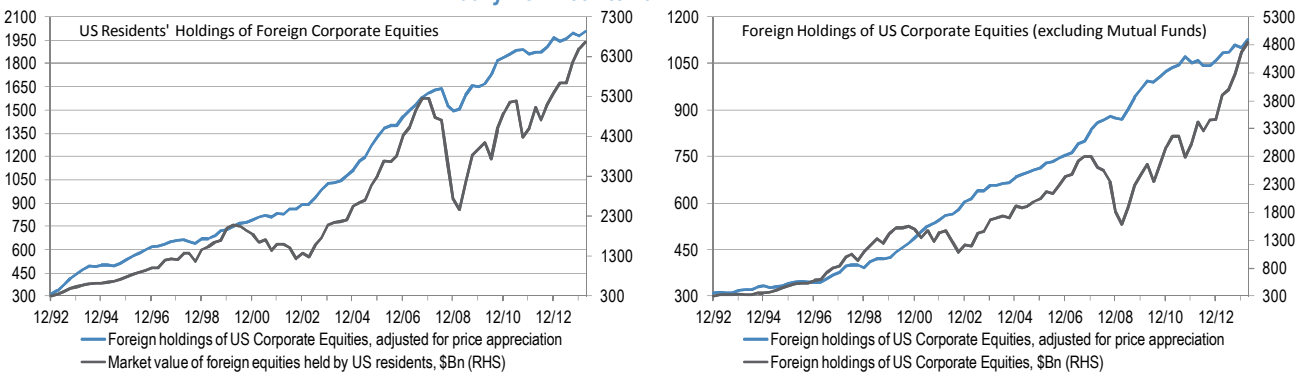
The report is divided into three sections. In the first section, Motivation, the discussion spotlights the importance of country selection for an investment process. The second section, Model Overview, covers the skeletal framework of the model, summarizes the country signals, discusses the country model's performance and includes critical assessment of its sensitivity to market environment and choice of countries. The third section, Strategies, is the core of the report focusing on the rationale of ten signals (valuation, macro, technical/sentiment) used in the model, the environment in which they will work or fail and their back test performance.

Motivation

A salient feature of the financial markets is the increasing global capital flows including cross-border flows into equity markets…in other words, globalization

While quarter-to-quarter cross-border inflows into equities can be volatile due to fluctuations in risk appetite, the longer term trend is for increasing diversification of holdings by investors, both in the US and abroad. In the US, for instance, the Federal Reserve estimates that the size of foreign equities held by US resident has skyrocketed from $314 billion in 1992Q4 to $6,654 billion in 2014Q1, a compound annual growth rate of 15% annually (see Figure 1). After deflating for the increase in global stock prices, the growth rate of purchase remains impressive at 9% per annum. Meanwhile, foreigners have also been actively acquiring US corporate equities. Over the same interval, direct ownership of US equities by rest of the world increased from $308 billion to $4,840 billion along with stakes in Mutual Funds (roughly 62% equities) rising from $17 billion to $1,034 billion. In all, after adjusting for price appreciation in US equities, foreign acquisition has risen at a robust rate of 7% per annum. As Figure 1 shows, even after a recession or a crisis, the demand for international equities by US residents and vice versa only slowed down temporarily.

Figure 1: Adjusted For Price Appreciation, US Residents' Holdings of Foreign Equities Has Grown at 9% Annually While Foreign Holdings of US Corporate Equities Has Grown About 7% Annually from 1992 to 2014



Source: Federal Reserve Board, J.P. Morgan Quantitative and Derivatives Strategy.

Given the rapid rise in two way capital flows into equities, it is not surprising that the financial industry has responded by offering products designed to meet investor

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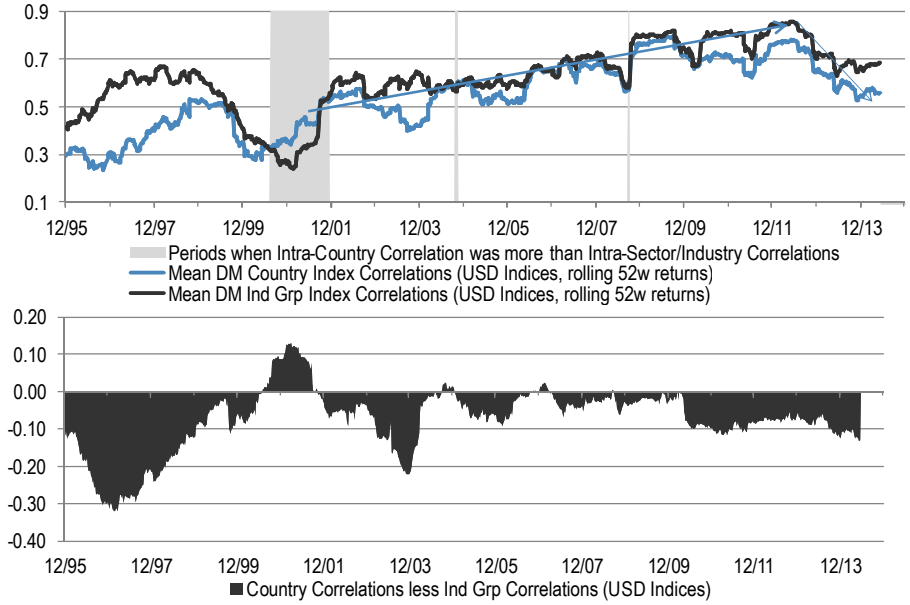
demand. According to JPM Quantitative and Derivatives team's latest ETF report[1], the global asset under management of ETFs is $2,445 billion – including equities and non-equities ETFs. Numerous global, regional and country-based US listed ETFs can be used by investors to express their opinion about an asset class. In sum, investors can now readily employ relatively small amount of capital in country selection strategies without taking large stock-specific exposures. Asset allocators are also increasingly using ETFs to express their views. The Country Rotation Model may be particularly useful to both of these investor groups.

Correlation of Country Indices – What Does It Reveal?

A standard way of measuring the size of the opportunity in *country index* selection is to track the average pair wise correlation among the countries – the lower the correlation the greater the differentiation and thus greater the opportunity

Just how big is the country selection opportunity? Figure 2 shows the average of pair wise correlations of weekly returns for 23 global developed markets (using MSCI definition). For comparison, we include the pair wise correlation of 24 industry groups. Two notable points from Figure 2 – one, the correlation among countries was on an upward trend between 2004 and 2009, flattened out 2010-2012 and has dropped rapidly for the past two years. The current average country correlation level is the same as that of October 2005. Two, average pair wise country correlations have usually been *below* average pair wise industry group correlations (similar result holds if we use 10 sectors instead of 24 industry groups). This suggests that at the *index level and among developed markets* country indices provide higher potential diversification than industry groups. However, the difference in diversification gain is nowhere near the levels seen in mid-1990s (see the bottom panel of Figure 2). Nonetheless, it is striking that since 2010 the gap between country —sector correlations has been unusually steady.

Figure 2: 23 Developed Markets - Pair Wise Indexes Correlation, Upward Trend Until Very Recently



The average is over 253=23*22/2 pair wise country correlations and 276=24*23/2 pair wise industry group correlations.
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Is the rising correlation among countries a result of tighter European integration? Not really; as Figure 3 shows, the rise in correlation among country indices has been

[1] Exchange Traded Funds (ETFs) 2014 J.P. Morgan Global ETF Handbook, May 2014.

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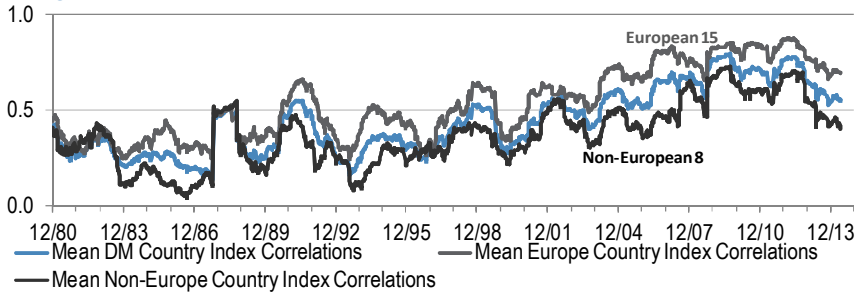
The correlation among country indices has dropped in the last two years…and is expected to move towards pre-crisis levels due to diverging country monetary and fiscal policies

rising outside Europe as well. It is true, however, that the intra-region correlation among countries has been higher in Europe than elsewhere. Note the declining correlation among countries since mid-2012. Among European countries the trailing 52-week correlation among countries has dropped to 0.70 now from 0.87 in June of 2012 while for Non-European eight countries (Australia, Canada, Hong Kong, Israel, Japan, New Zealand, Singapore and US) it fell to 0.40 from 0.70 in mid-2012. Unless an unforeseen crisis hits the market, we expect that in the next few years the continued divergence in monetary and fiscal policies across the countries will result in country correlations to stabilize around the pre-crisis levels. As a result, the importance of country selection is expected to increase.

Figure 3: It Is Not Just About Europe - Rising Pair Wise Correlation Has Risen Among Non-European Countries Also. However, at Least Since 1983, European Countries Have Had Higher Average Pair Wise Correlation with Each Other



Source: J.P. Morgan Quantitative and Derivatives Strategy.

Importance of Country as a Driver of Stock Returns

An alternate way to measure the importance of country selection is to measure its importance as a driver of stock returns

An alternate way to measure the importance of country selection is to measure its importance as a driver of stock returns. A multi-factor regression is used to estimate the importance of country as a driver of global stock returns.

The excess return of firm k that is domiciled in country C and belongs to industry I is assumed to be driven by four unobservable factors plus stock-specific return.

$$r(k, C, I, t) = r(G,t) + r(C,t) + r(I,t) + r(S,k,t) + e(k,t) \qquad t=1,2,\ldots,T$$

r(G,t) is a *global* return that is common to all stocks; r(C,t) is the stock's *"pure" country* return, r(I,t) is the stock's *"pure" industry* return, r(S,t) is the stock's *"pure" style* return and e(k,t) is the *stock specific* return. The style return is composed of return from Value, Momentum and Size. Using a regression approach each of these "pure" returns attributable to global factor, country factor, industry factor, style factor and stock-specific factor are estimated. An important assumption regarding the estimation is how the stock-specific or idiosyncratic return is identified. Some researchers assume that the cap-weighted sum of idiosyncratic error be zero, giving greater weight to large cap stocks. However, since we have included size as a factor, our identification assumption for idiosyncratic error is that its simple average adds to zero.

Our universe is the stocks of MSCI 23 developed markets (roughly 1,585 stocks currently and on average 1,451 over 1994-2014). In this section the results of the analysis are provided. *Additional details of the regression approach can be found in the Appendix.*

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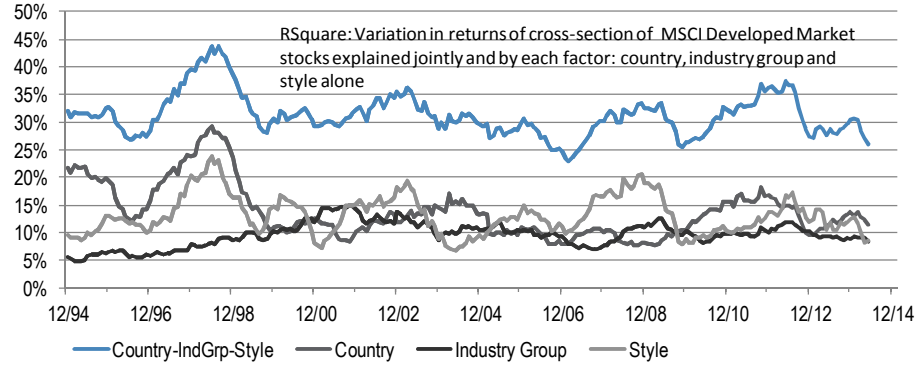
On average since 1994, 31% of the variation of excess stock returns has been explained by country, sector and style, while the remaining 69% on average has been explained by stock-specific effects.

We analyze the variation of cross section of excess stock returns in two steps – first, by breaking down the variation between style and country-industry groups jointly. Figure 4 reports the R-Square of country-sector-style joint regression, country-industry group regression and style alone regression. On average, over 1994-2014, 31% of excess stock return variation is explained by country-industry group-style factors – the contribution of country-industry group is about 2/3rd and style is 1/3rd. The remaining variation comes from stock-specific and other global factor returns.

Figure 4: On Average, 31% of Cross-Sectional Variation In MSCI Developed Markets Is Explained by Country-Industry Group-Style. About Two-Third of That (20%) Is Attributable to Variation in Country-Industry, One-Third to Style (Value, Momentum, Size)



Rolling 12-month average of regression R-Square. Last data point as of May 31, 2014.
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Currently, country, industry and style are contributing about the same in explaining cross-sectional excess stock return variation of developed markets

Variation in stock returns of developed markets explained by country versus industry group, on average, over 1994-2014 shows a larger contribution of the variations in "pure" country returns prior to 1999. Since then the contribution of industry group has increased – particularly during the 2000-2001 and 2007-2009. From 2009-2011 country effect was dominant factor in explaining stock returns, due to increased country decoupling following the financial crisis. Over the entire period the contribution of country and industry is about equal. Currently the contribution of the country is slightly higher than industry and style.

Which tilt matters more, Country or Industry? Currently, the potential gain is about the same

The "pure" country and "pure" industry group returns can be used to assess whether tilting a global portfolio by only country is more advantageous than tilting it by industry. This is done by calculating Mean Absolute Deviation (MAD) for country and industry group. Country MAD is equal to the return an investor would make if she were to make the "perfect foresight" investment, going long countries with positive "pure" returns and short countries with "negative" pure returns.

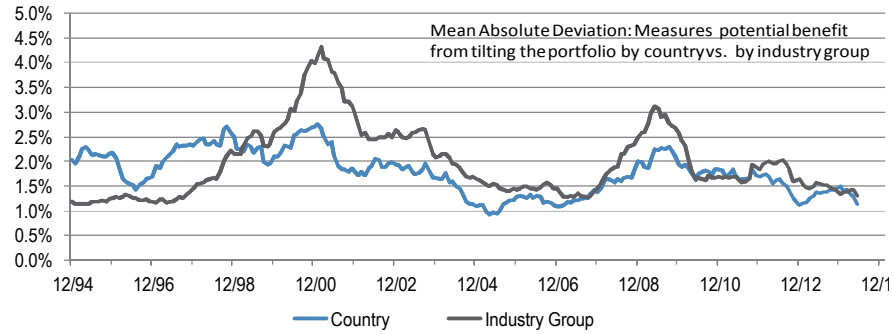
$$MAD(Country) = \sum_{C=1}^{23} w(C, t-1) * abs\big(r(C,t)\big)$$

$$MAD(Industry) = \sum_{I=1}^{24} w(I, t-1) * abs(r(I,t))$$

MAD carries information different from R-Square since its less concerned in explaining the dispersion of stock returns – its value depends on how much potential gain is achievable by getting the individual country and industry tilts right. Figure 5 shows the 12-month moving average of country MAD and industry MAD based on the three-factor regression. Not surprisingly, the benefit of industry tilt over country

tilt was largest during the TMT bubble of early 2000s and during the financial bubble/bust/recovery of 2008-2009. Interestingly, as was the case in the early part of the bull market of 2003-2006, the Country MAD and Industry MAD have almost converged.

Figure 5: The Benefit of Industry Tilt Was Less Than Country Prior to 1999. Industry Tilt Would Have Especially Mattered More During the TMT Bubble and Financial Crisis. Currently Both Country and Industry Tilts Are in Their Lowest Historical Range of the Past Two Decades



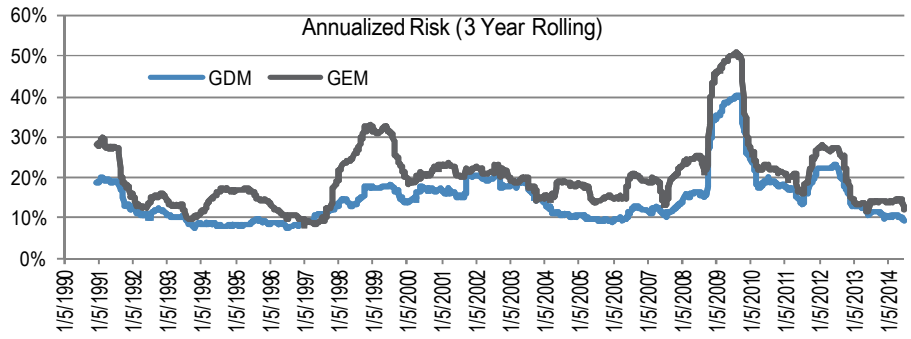
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Do Emerging Markets Mix Well With Developed Markets? Probably Not

Should a single country model include allocation to both emerging and developed markets? Probably not, in our opinion

We conclude this section addressing one of the issues facing anyone building a country rotation framework: should emerging markets and developed markets be included in the same model? Emerging markets, based on MSCI defined universe, will double the assets from 23 to 46 countries and if they could be treated as part of the same asset class, the gain in breadth and would increase the portfolio information ratio. On the other hand, in a recent paper, Bekaert and Harvey[2] argue that despite the increased correlation it does make sense to segregate global equities into "developed" and "emerging" buckets. Their main argument is that "emerging markets are still not fully integrated into world capital markets" and "part of the increase in correlation is due the higher beta of the emerging market index, making emerging markets high return but risky investments."

Figure 6: Emerging Markets Volatility Is Almost Always Higher Than Developed Markets; on Average the Ratio of Volatilities Is 1.40 during 1991 to 2014



Source: J.P. Morgan Quantitative and Derivatives Strategy.

[2] Bekaert, Geert and Harvey, Campbell R., Emerging Equity Markets in a Globalizing World (May 20, 2014). Available at SSRN: http://ssrn.com/abstract=2344817 or http://dx.doi.org/10.2139/ssrn.2344817

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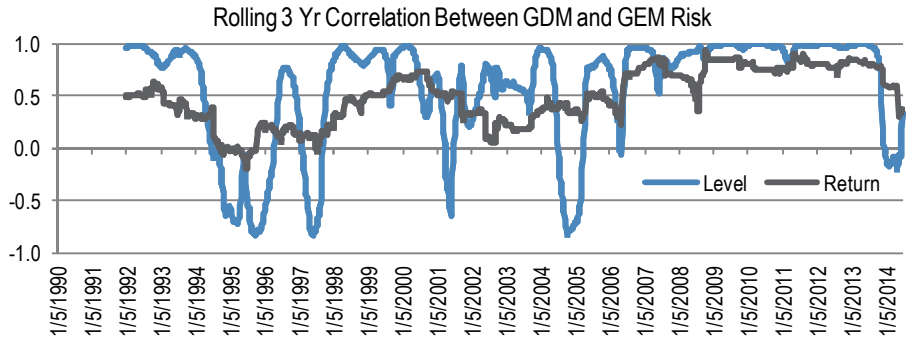
By definition, assets within the same class should have similar long term (or at least medium term) characteristics like volatility, liquidity, regulatory features and drivers of performance. Figure 6 compares the volatility of emerging market index with the developed market index. On average emerging market's volatility is 40% higher than developed market's volatility.

The level and the change in emerging and developed market volatilities have been more synchronized in the post-crisis years but that appears to be changing. Figure 7 shows that the correlation of emerging market and developed market volatilities normally fluctuates between 0.0 and 0.5. Post crisis, the correlation has been close to 0.7 to 0.8 for volatility returns and even higher for levels.

Figure 7: Correlation Between Developed Market and Emerging Market Was Unusually High Post-Financial Crisis but Appears to Be Returning to a More Normal Level



Source: J.P. Morgan Quantitative and Derivatives Strategy.

Difference in characteristics of the model drivers, fundamentals as well as technicals, could be large when comparing developed and emerging markets

Besides the difference in the characteristics of the asset classes, we were also concerned about the availability of common drivers used to predict relative performance of the countries. Predictors like bond yields, exchange rates, implied volatility and money supply are not always comparable across developed and emerging markets. Even technical factors like momentum behave very differently. As an example, we considered a weekly trade based on MSCI developed market index and MSCI emerging market index. If the market had risen the previous 3 months, we take a long position in the asset for the next one week. If the market had declined the previous 3 months, we take a short position. The difference in performance of the developed and emerging market indices for this technical trade is remarkable. The emerging markets index has advanced more than10 times as much as the developed markets index, though with greater volatility. The IR of the Developed Market index strategy is 0.16 while that of the Emerging Market index strategy is 0.66. On the other hand, if the trading rule is based on 12-month momentum, the reverse holds true – developed markets are better timed using longer term momentum compared to emerging markets.

In summary, keeping the two asset classes separate when building a country framework is more optimal in our opinion.

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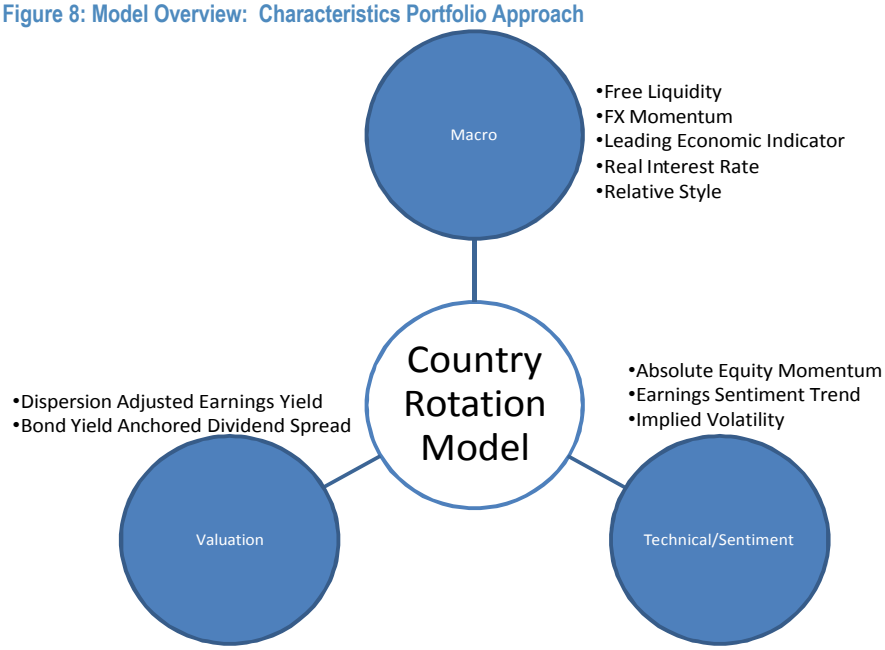
Regional Equity Framework

Country Model

Conceptually, the country rotation model (CRM) in this report follows the conventional practice of integrating three thematic groups: Macro, Valuation and Sentiment to arrive at country rankings. However, the factors or signals or strategies (these terms are used interchangeably in the report) in these buckets use a mixture of conventional and non-conventional techniques. In addition, for each signal the rationale which gives insight into situations in which a single signal may or may not work is provided.

The illustration (Figure 8) below provides an overall structure of the model with a list of signals for each group. Each signal is selected to create a portfolio of country indices in order to capture a particular characteristic. The goal is to blend characteristics which provide, on average, positive but uncorrelated returns. This modular construction enables the model to be scalable since additional themes or new signals within existing groups can be included and be readily implemented without redoing the whole model unlike a joint multivariate approach. Furthermore, risk control can be embedded more intuitively in such a structure since risk from each signal can be individually as well as collectively managed.

Figure 8: Model Overview: Characteristics Portfolio Approach



Source: J.P. Morgan Quantitative and Derivatives Strategy.

In our opinion, this "characteristic portfolio" approach is an efficient way of handling the biggest challenges of macro strategies — the asset breadth is very narrow — every asset position carries a significant fraction of the portfolio risk. In our model, we trade 14 liquid developed equity markets: Australia (AU), Canada (CA), Switzerland (CH), Germany (DE), Spain (ES), France (FR), United Kingdom (GB), Hong Kong (HK), Italy (IT), Japan (JP), Netherlands (NL), Sweden (SE), Singapore (SG) and United States (US). Please note that the stated country acronyms will be used throughout the paper. Also, to see the list of ETFs for these countries and their

liquidity information, please see 2014 J.P. Morgan Global ETF Handbook, May 2014.

To manage risk, we adopt a two-step approach: *one*, for each signal, scale country positions to achieve a target risk without distorting the strategy's relative view; *two*, assign weight to the thematic basket based on number of independent signals

In a traditional quantitative equity framework, one would normally construct a set of baskets, for instance deciles, and select a long and a short decile/basket for the cash-neutral trade. Usually each basket would hold 50 or more names which are equally weighted. Having such a wide asset breadth along with the equal weighted approach allows for diversification and prevents potential large performance drawdown due to a few incorrect bets. Macro strategy, on the contrary, gets traded in a less forgivable environment since incorrect bets in a few countries can cause substantial negative impact due to limited number of assets being traded. As a result, we have adapted a simple risk management process on two prongs: scaling positions based on a targeted risk and weight allocation to each thematic basket based on the number of independent signals being run.

Let us look at the first point. Each signal provides expected raw scores or views of the developed world for the subsequent month. We can convert these views to relative views by simply subtracting out the average view. In other words, each view is transformed to a distance from the common cross sectional average (relative to country peers). The conviction level associated with the asset (or country) is the magnitude of its deviation from the average. The further away a country is from the consensus, the stronger the conviction on the view or bigger the trade size.

$$h = v - \bar{v} = v - \frac{1}{n}\sum_{i=1}^{n} v_i$$

At this point, if the risk of the signal is unconstrained, the expected return of the signal at time t is simply $h(t-1) * E(ret(t))$. However, macro trading requires certain risk control process to be put in place to avoid unintended risk exposure. For instance, controlling risk in a long-short portfolio by constraining position size of one country at a time is not sensible since equity market volatilities can differ widely among countries and such an approach will not take spillover of risk from one country to another into account either. A very simple methodology was adopted to address this issue. The risk matrix (Σ) was generated based on historical returns, rather than using forward looking risk measures such as implied volatilities and scaled the latest positions according to the expected (ex-ante) risk level[3].

$$h^* = \left(\frac{risk\ target}{expected\ risk}\right) * h = \left(\frac{risk\ target}{\sqrt{h'\Sigma h}}\right) * h$$

In all the back tests discussed in the report, unless otherwise stated, a 1% risk target was used.

Since our focus is on factor and strategies for country selection and less on portfolio construction, we have kept the weighting scheme as simple as possible

As aforementioned, there are three thematic groups in the country rotation model. Rather than equal weighting them to construct the final portfolios, the weights were adjusted to reflect the number of strategies included in each basket (Table 1). This is a naive approach to portfolio construction, close to equal weighting of factors or strategies; ideally the correlations among the strategies should be considered when combining them. Since the financial crisis, there has been considerable research devoted to dynamic weighting schemes that can: one, dial up or dial down a factor's

[3] In our experience complicated methodologies to manage risk have only marginable benefit over a risk matrix calculated using historical returns appropriately weighted.

weight based on the future expected regime; and two, anticipate the time varying correlation among factors to manage risk (for instance, predict risk-on, risk-off environments). If the country rotation model discussed here exhibits reasonably good properties with a simple scheme, addition of a sensible dynamic weighting scheme could lead to improvement in managing country exposures.

Table 1: Thematic Sleeve Weight Allocation – In Proportion to Number of Signals

	Macro	Valuation	Technical/Sentiment
Weight	50%	20%	30%

Source: J.P. Morgan Quantitative and Derivatives Strategy.

Summary of Signal

There are ten signals in the Country Rotation Model, classified into 3 types of strategies: Valuation, Macro, and Technical/Sentiment. Below is a brief summary of the signals.

Valuation Strategies: Valuation strategies assume that asset prices will revert to their fair value. The challenging aspect of building a valuation signal is to identify a catalyst that can help time the reversion to fair value.

1. *Dispersion Adjusted Earnings Yield* — High valuation dispersion in a cheap market offers an effective entry point and provides greater opportunity to unlock equity value. This approach provides a substantial improvement over traditional valuation. The signal ranks countries by their dispersion adjusted earnings yield. When valuation dispersion across countries converges, however, this signal can lose its efficacy due to less opportunity for differentiation.

2. *Bond Yield Anchored Dividend Dispersion* — Conventional wisdom uses dividend yield as a measure of equity valuation. This notion can be refined by anchoring both the level and the dispersion of a country's dividend yield around its bond yield. The signal favors countries with higher bond yield adjusted stock dividend dispersion.

Macro Strategies: The common theme in the five signals that fall under this canopy is the use of macroeconomic rationale in country selection.

3. *Real Interest Rate* — Countries with higher relative long term real interest rates, a proxy for expected rate of return, are favored. While the signal is effective over the long run, it can struggle when aggressive monetary policy keeps nominal rates low even as the economy strengthens.

4. *Relative Style* — Outperformance of Growth over Value indicates greater investor confidence in the market. Countries with high momentum in their Growth-Value spread are preferred. The signal faces headwinds during deep Value snapbacks.

5. *FX Momentum* — Weaker currency helps a country's stock market by making its goods, services and financial assets cheaper to foreigners. Countries with weakening risk-adjusted currencies are preferred. Currency moves unrelated to fundamentals pose risk to this trade.

6. *Free Liquidity* — Money growth in excess of the amount needed to support economic activity tends to boost asset prices. Countries with higher increase in money supply relative to output are favored. The relationship weakens when extreme risk aversion prevents liquidity driven rallies.

7. *Leading Economic Indicator* — Rising LEI indicates strengthening economic activity. Countries with strengthening LEI are likely to outperform. The signal works best when fundamentals like earnings and economic growth are driving the market; it will do less well otherwise.

Technical/Sentiment Strategies:

8. *Absolute Equity Momentum* — Countries with high equity momentum are preferred over those with low momentum. Further, the signal uses a country's absolute momentum, a simple but an effective way of implicitly hedging potential momentum reversals from the extreme left tail of the price distribution. Signal may struggle in the unlikely event of a prolonged sell off.

9. *Earnings Sentiment Trend* — This confirming signal uses under-reaction in analysts' opinions for country selection. Countries with improving earnings sentiment are expected to outperform. However, the signal may be less effective around market inflection points, when analyst opinions may not be as reactive.

10. *Volatility* — Market declines are usually accompanied by a spike in volatility. This contrarian signal exploits investor overreaction by favoring countries with a larger spike in implied volatility. This contrarian relationship may weaken when the underlying driver of volatility unfolds slowly.

Pair wise correlation among the ten signals is low

Table 2 below shows pair wise correlation among the signals. Most of the pair wise correlations are low, suggesting each signal is capturing a different driver of relative country returns. Additionally, from a portfolio construction point of view, the healthy orthogonality among the signals should results in better diversification.

Table 2: Pair Wise Correlations of Country Rotation Model Signals (1993-2014) Are Low

	Macro					Valuation		Sentiment		
	Real Interest Rate	Relative Style	FX Momentum	Free Liquidity	Leading Economic Indicator	Dispersion Adj Earnings Yield	Bond Yield Anchored Dividend Spread	Absolute Equity Momentum	Earnings Sentiment Trend	Implied Volatility
Real Interest Rate		11.4%	7.5%	-9.5%	4.4%	37.0%	-20.9%	11.0%	1.4%	-2.9%
Relative Style			9.2%	4.8%	-12.9%	7.9%	-9.7%	3.8%	-2.0%	4.1%
FX Momentum				-2.2%	7.2%	-13.6%	0.4%	16.0%	4.8%	-2.0%
Free Liquidity					11.9%	-20.5%	10.7%	7.8%	17.2%	10.5%
Leading Economic Indicator						-13.4%	12.0%	16.8%	4.8%	6.8%
Dispersion Adj Earnings Yield							-23.6%	-1.2%	-2.4%	-4.2%
Bond Yield Anchored Dividend Spread								-5.9%	13.3%	-0.5%
Absolute Equity Momentum									2.5%	-8.1%
Earnings Sentiment Trend										3.5%
Implied Volatility										

Source: J.P. Morgan Quantitative and Derivatives Strategy.

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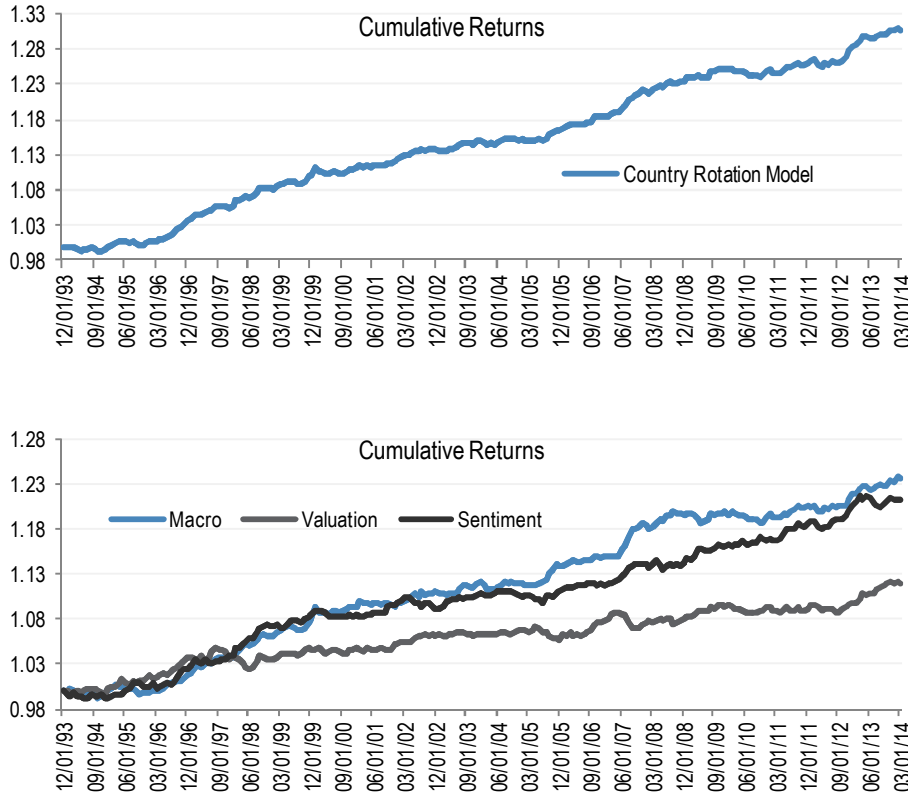
Model Performance

Figure 9 shows the cumulative performance of the Country Rotation Model and the three main arms.

Figure 9: Model Performance - Monthly Rebalance, Normalized with 1% Target Risk



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Table 3 summarizes the key statistics for the Macro, Valuation and Technical/ Sentiment strategy arms – details for individual signals are shown in the Appendix.

Table 3: Performance Statistics – Monthly Rebalance, Normalized with 1% Target Risk

Basket	StartDate	EndDate	Avg IC	T-Stat	Hit Rate	Turn Over	Avg Ann Ret	Ann StdDev	IR
Macro	31-Dec-93	31-Mar-14	9.1%	5.30	61%	175%	1.07%	0.91%	1.18
Valuation	31-Dec-93	31-Mar-14	5.3%	2.98	58%	132%	0.58%	0.87%	0.66
Sentiment	31-Dec-93	31-Mar-14	9.1%	4.77	62%	359%	0.96%	0.91%	1.06
Country Rotation Model	31-Dec-93	31-Mar-14	11.9%	7.27	67%	202%	1.34%	0.83%	1.61

IR	AU	CA	CH	DE	ES	FR	GB	HK	IT	JP	NL	SE	SG	US
Valuation	-0.02	0.38	0.11	0.58	0.02	0.46	0.23	-0.12	0.34	0.51	-0.10	0.36	0.46	0.07
Macro	-0.02	0.30	-0.01	0.52	-0.10	0.25	0.32	0.64	0.38	0.46	0.55	0.47	0.55	0.28
Sentiment	0.03	0.10	0.35	0.02	0.40	0.43	0.40	0.77	0.12	0.42	0.08	0.05	0.86	0.27
Country Rotation	-0.08	0.47	0.07	0.68	0.13	0.60	0.43	0.61	0.48	0.71	0.33	0.43	0.83	0.32

Hypothetical back test performance is based on 14 country total return indices. No transaction cost is assumed.
Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

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Model Analysis

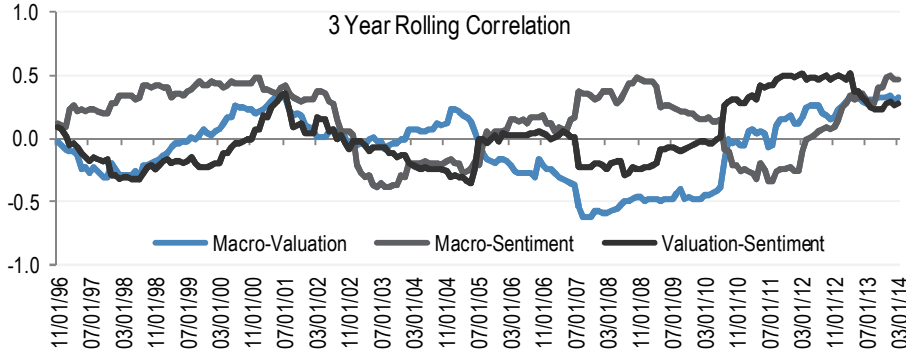
How correlated are the three different groups of thematic strategies? We categorized each underlying signal based on its data source and inherit characteristics. Data sources varied from government bond yields to cross-sectional dispersion of earnings yields among stocks within a country.

Table 4: Thematic Basket Pair-wise Correlations

Correlation Pair	11/30/96-3/31/14	11/30/96-12/31/99	1/1/00-12/31/08	1/1/09-3/31/14
Macro-Valuation	-7.5%	-15.3%	-7.8%	-2.2%
Macro-Sentiment	14.6%	30.9%	12.1%	9.0%
Valuation-Sentiment	0.5%	-18.5%	-6.7%	24.4%

Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Figure 10: Thematic Basket Pair-wise Rolling 3 Year Correlations



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

On average, the pairs, macro-valuation and valuation-sentiment are well diversified although in the past 5 years, the valuation-sentiment pair displayed significant increase in correlation of 24.4%. The rolling 3 year correlation shows that the trend has been slowly declining. On the other hand, the macro-sentiment pair showed higher correlation on average, 14.6%, but there has been a significant decline in the past 5 years. Generally, these three thematic groups of strategies are well diversified based on historical performance.

Additionally, the following table breaks down their performance based on the VIX level. At the CRM model level, better performances were delivered when VIX was around its long term average of 20. However, at individual arm level, performance characteristics varied. The macro group was flattish at high VIX level but at long term average level, it delivered attractive payoffs. The sentiment group, on the contrary, did well during the high VIX periods. Generally, it produced pretty consistent performance across different VIX sleeves. The valuation bucket was more effective during lower VIX periods.

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Table 5: Performance Breakdown Based on VIX

VIX Range	Country Rotation Model	Macro	Sentiment	Valuation
12.34< VIX	2.3%	1.8%	1.0%	1.7%
13.57< VIX <=12.34	1.0%	0.4%	0.7%	1.1%
15.66< VIX <=13.57	1.3%	1.1%	1.2%	0.8%
17.15< VIX <=15.66	0.6%	0.0%	1.5%	0.2%
19.53< VIX <=17.15	2.1%	1.3%	1.5%	1.2%
21.62< VIX <=19.53	2.6%	1.9%	1.8%	1.3%
23.64< VIX <=21.62	1.5%	1.7%	0.7%	0.2%
25.03< VIX <=23.64	0.8%	1.3%	0.3%	-0.2%
29.68< VIX <=25.03	1.0%	0.8%	0.3%	0.3%
VIX >=29.68	1.0%	0.0%	2.8%	1.0%

Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

There are numerous ways to stress test the model. First, we performed sensitivity analysis against two aspects: asset sensitivity and portfolio breadth sensitivity. The first analysis was carried by removing one country at a time and reconstructing the portfolio with the target risk of 1%. This shows the performance dependence on a particular country over time.

Table 6: Stress Test – Country Sensitivity

IR	All	AU	CA	CH	DE	ES	FR	GB	HK	IT	JP	NL	SE	SG	US
Macro	1.18	1.19	1.15	1.23	1.13	1.28	1.14	1.16	1.05	1.15	1.05	1.12	1.04	1.03	1.14
Valuation	0.66	0.67	0.62	0.69	0.58	0.66	0.63	0.65	0.90	0.64	0.48	0.70	0.60	0.59	0.67
Sentiment	1.06	1.09	1.04	1.01	1.09	1.01	1.01	1.03	0.89	1.10	1.05	1.10	1.06	0.89	1.04
Country Rotation Model	1.61	1.59	1.57	1.71	1.52	1.64	1.52	1.58	1.52	1.54	1.46	1.57	1.52	1.38	1.53

% Difference	All	AU	CA	CH	DE	ES	FR	GB	HK	IT	JP	NL	SE	SG	US
Macro	1.18	0.8%	-2.0%	4.9%	-4.3%	8.6%	-3.0%	-1.7%	-10.8%	-2.6%	-11.1%	-5.0%	-11.3%	-12.7%	-3.1%
Valuation	0.66	1.3%	-6.8%	4.7%	-12.9%	-0.4%	-4.6%	-1.0%	35.9%	-3.8%	-27.2%	6.0%	-9.3%	-10.8%	0.9%
Sentiment	1.06	3.3%	-1.9%	-4.1%	3.1%	-4.2%	-4.8%	-2.1%	-15.4%	3.6%	-0.2%	4.1%	0.1%	-16.2%	-1.5%
Country Rotation Model	1.61	-1.6%	-2.5%	5.7%	-5.5%	1.9%	-5.9%	-2.2%	-5.6%	-4.6%	-9.7%	-2.9%	-5.8%	-14.5%	-5.1%

Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

The two countries that had the most influence at the composite model level were Japan and Singapore. Removal of these two countries reduced the IR by 9.7% and 14.5% respectively, which corresponds to an IR of 1.46 and 1.52. The valuation bucket was sensitive to Hong Kong, whose removal increased the IR by 36% and the omission of Japan detracted the performance by 27%.

Secondly, composite model sensitivity was evaluated against asset breadth, by randomly selecting a pre-determined number of countries, ranging from 4 to 8. The long-short portfolio was reconstructed for each pre-determined selection and the process was repeated over many iterations. Table 7 reports the average IR and maximum drawdown of each iteration along with their standard deviations.

For instance, random selection of 8 countries resulted in an average IR of 1.16 with a standard deviation of 0.18. Therefore, with 8 assets the probability of IR ranging between 0.98 and 1.34 is ~67%. Overall, the model held up relatively well and as expected, the performance increased with the decreasing standard deviation as the breadth of assets increased.

Table 7: Stress Test - Pooled Back-test

	IR (Average)					Maxium Drawdown (Average)				
Pooled Size	4	5	6	7	8	4	5	6	7	8
Macro	0.56	0.67	0.70	0.80	0.92	-2.2%	-1.9%	-2.0%	-1.8%	-1.7%
Valuation	0.40	0.44	0.45	0.54	0.52	-2.6%	-2.5%	-2.5%	-2.3%	-2.3%
Sentiment	0.56	0.61	0.64	0.75	0.81	-2.0%	-2.0%	-1.8%	-1.6%	-1.5%
Country Rotation Model	0.73	0.85	0.99	1.05	1.16	-1.9%	-1.7%	-1.5%	-1.4%	-1.4%
	IR (Stdev)					Maxium Drawdown (Stdev)				
Pooled Size	4	5	6	7	8	4	5	6	7	8
Macro	0.23	0.22	0.22	0.19	0.17	0.9%	0.6%	0.6%	0.6%	0.5%
Valuation	0.21	0.21	0.22	0.19	0.20	0.9%	0.6%	0.6%	0.6%	0.5%
Sentiment	0.25	0.26	0.22	0.21	0.18	0.7%	0.8%	0.5%	0.4%	0.3%
Country Rotation Model	0.31	0.24	0.25	0.19	0.18	0.7%	0.5%	0.4%	0.4%	0.4%

Source: Bloomberg, J.P. Morgan

Valuation Strategies

Valuation is considered a lynchpin strategy in any country rotation model but it is probably one of the more difficult strategies since valuation works only episodically and can be difficult to time

One of the popular strategies at a macro strategist's disposal is a country valuation trade. Popular valuation metrics are trailing and forward earnings yield, dividend yield, book yield, operating and free cash flow yield, EV-to-EBITDA etc. Investors use these measures to identify undervalued and overvalued assets and take long and short positions accordingly. However, at the same time using a valuation approach can lead to several challenges: what is the fair price of a company's stock or a country index? Assuming the fair price is known, how long does it take for the security to converge to its fair price if the current price has deviated from it? The issue becomes more confounded when markets are driven by investors' sentiment or risk appetite, overriding fundamental valuations. For example, markets can stay overvalued for a considerable amount of time, pushing expensive assets to become more expensive until eventually market correction takes place. Conversely, cheap markets can get cheaper inflicting considerable pain on investors who got in early. The sting can be especially sharp to those who have borrowed (leveraged) to invest. As the famous English economist Keynes, chastened by unfavorable outcomes to some of his financial bets, once said "The market can stay irrational longer than you can stay solvent."

In the next two sections we present valuation metrics that have been adjusted to circumvent some of the shortcomings of typically used valuation metrics. The first is Dispersion Adjusted Earnings Yield, followed by Bond Yield Anchored Dividend Spread.

Dispersion Adjusted Earnings Yield

Signal Motivation: *High valuation dispersion in a cheap market offers an effective entry point and provides greater opportunity to unlock equity value. This approach provides a substantial improvement over traditional valuation. The signal ranks countries by their dispersion adjusted earnings yield. When valuation dispersion across countries converges, however, this signal can lose its efficacy due to less opportunity for differentiation.*

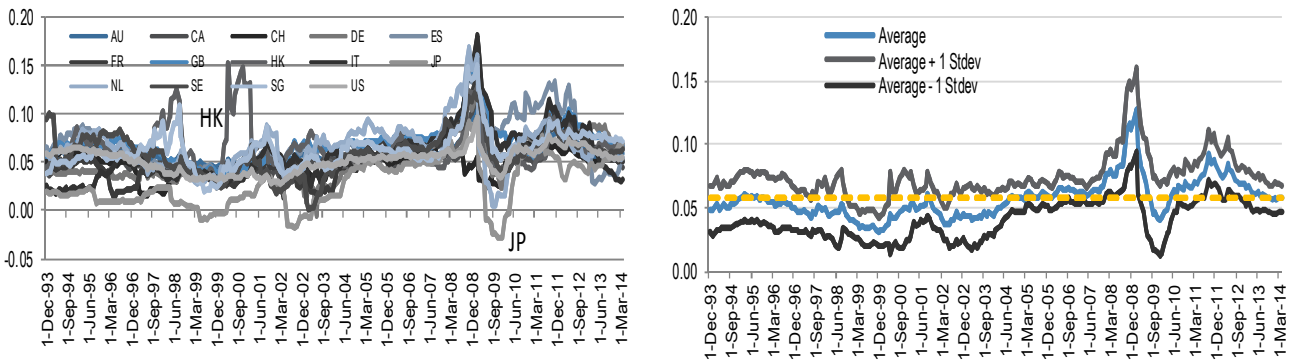
Dispersion Adjusted Earnings Yield provides a substantial improvement over traditional valuation

Historical 12 months earnings yield is a readily available and transparent valuation metric. Further, the signal is constructed by adjusting the earnings yield with the dispersion of the underlying stock level valuations. High valuation dispersion in a cheap market offers an effective entry point and provides greater opportunity to

unlock equity value. This approach provides a substantial improvement over traditional valuation.

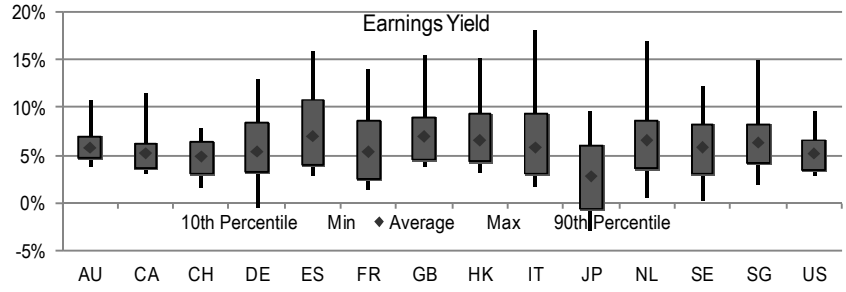
We begin by reviewing some key characteristics of earnings yields. Generally, as Figure 11 shows, historical yields among the major markets have moved in a similar fashion, except during periods of high volatility when yields have displayed higher cross-sectional dispersions (as seen in the past two recessions). Besides this generalization, yields also reveal interesting and unique traits for each country. For instance, as evident in Figure 11, historically US has had a historical (from 1993) earnings yield of around 5% (~20x PE), and it reached close to 10% (~10x PE) at the depth of the last financial crisis, driven by falling prices. Since then earnings yield has reverted back close to its historical average. On the other hand, traditionally Japan has had a lower earnings yield than those of its peers but nonetheless has displayed higher fluctuation in yield. Furthermore, several Euro zone countries, particularly Spain (ES) and Italy (IT), have had on average higher yields than those of US and Japan.

Figure 11: Historical Earnings Yields: They Generally Move Together, Except During Periods of High Volatility When Cross-Sectional Dispersion of Yields Is High



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Figure 12: Historical Earnings Yield Characteristics (1993-2014)



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Several factors — earnings payout ratio, risk appetite, risk-free rates and expected earnings growth — explain the difference in earnings yield across countries

What explains the difference in average earnings yield across countries? Gordon growth model suggests that there are several factors: the earnings payout ratio (what fraction of the cash flow from businesses is being returned to investors as dividends?), the risk premium investors demand (how strong is investor risk appetite?), the risk-free interest rate (the benchmark against which risky asset returns are evaluated) and the expected growth rate in earnings (what is the long term growth in earnings?). Analyzing each of these factors is beyond the scope of this report.

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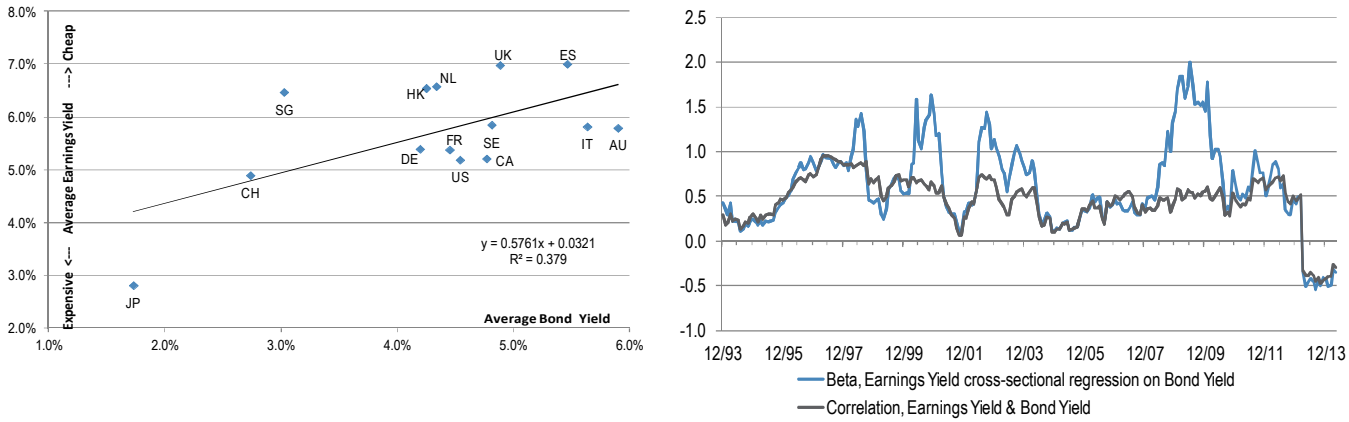
However, we briefly review the *cross-sectional* relationship between earnings yield and bond yield (in the US the *time series* link between earnings and bond yield is informally called the Fed Model).

Recently there is an unusual inversion in the relationship of earnings yield and bond yield – normally the beta is positive; it has been negative since March 2013. Lower bond yields are not pushing relative valuations higher – a symptom of a deflationary threat in many of the markets, in our opinion

Left chart in 13 illustrates the long-term relationship between the average bond yield and average earnings yield of the 14 countries. The 0.58 beta of bond yield regressed on earnings yield is consistent with the Gordon model – countries with higher bond yield are, over a long period, likely to have higher earnings yield. As mentioned above, bond yield is just one of the drivers of earnings yield, so it is not surprising that the data points are not clustered tightly around the regression line. The right chart plots the beta of the regression for each month along with the correlation. The unusual period when beta was above 1.5 began around November 2008 and fell below 1 after June 2010. Since the earnings yield is trailing 12-month, the spike in volatility reflects higher sensitivity to bond yield during the financial crisis and its immediate aftermath. The recent inversion of the beta and correlation implying that countries with lower bond yield have higher earnings yield (are cheaper) is unusual – a symptom of the deflationary threat, in our opinion. A combination of economic weakness and quantitative easing is pushing down the bond yield in those countries where the valuations are very already cheap.

Figure 13: Historical Earnings Yields and Bond Yields (1994-2014): Unusual Inversion Currently



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Despite complicated dynamics between valuation and other variables, country rotation models typically include simple valuation ratios as a signal. The expectation is that valuation will mean revert to fair value over time

As the analysis above shows, the relationship between a country's earnings yield and its drivers is time varying and difficult to model because of uncertainty about future earnings growth, pay off ratio and bond yield. Rather than trying to model this relationship, most country rotation models (CRMs) choose a simple valuation ratio as signal – the implicit expectation is that valuation mean reverts to fair value over time. But does a simple earnings yield signal actually work? If an investor were to trade straightforward earnings yields (buy/sell relative high/low earnings yields countries) on a monthly frequency, the strategy would have achieved IR of -0.03 over the last 20 years (see Figure 14).

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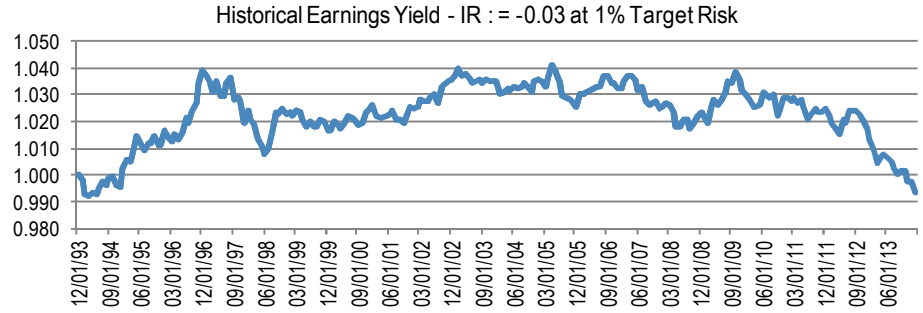
But a simple earnings yield signal has a flat to slightly down return profile with an IR = -0.03 over the last 20 years

Figure 14: Not Compelling: Historical Earnings Yield Performance – Normalized, 1% Risk Target

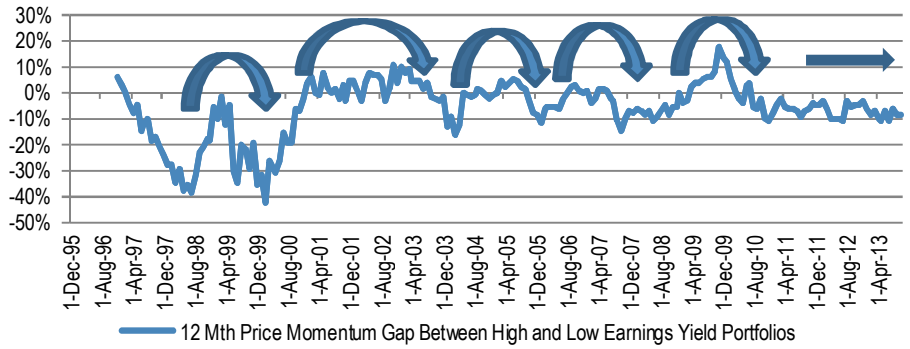


Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Why has a simple earnings yield model struggled recently? The price momentum spread of the cheap and expensive groups suggests that in the post-Financial crisis world mean reversion in valuations has been painfully slow

Moreover, while the signal had positive performance in early years, it generated a substantial loss recently, resulting in an IR of -0.51 over the last 5 years. This recent loss is mainly driven by incorrect relative bets on Switzerland, Netherlands and US. Why has there been a large performance degradation of the signal in recent years? Historically, with the earnings yield signal, the loss years were relatively short and were usually followed by profitable years. One way to investigate this phenomenon is to track the price trends between the following two groups: a basket consisting of relatively cheap valuation countries and a second basket of relatively expensive valuation countries. Figure 15 shows the spread between the average 12 month price momentum of the cheap long basket and the expensive short basket.

Figure 15: Mean Reversion: Price Momentum Spread between Cheap and Expensive Countries



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Unlike late 1990s when the TMT bubble led to valuation failure, the recent struggle of valuation signal is due to the uneven and excruciatingly slow economic recovery across countries

One notable historical pattern evident from Figure 15 is the mean reversion in the price momentum of these two country groups in the period 2000 to 2010. The underlying hypothesis of valuation trade hinges on this very characteristic: assets with attractive valuations become more expensive over time and vice versa. However, as the multi-year global recovery has taken a place in recent years, this price reversion has not materialized. Countries with low earnings yield (expensive) have enjoyed steadfast price appreciation more than their high earnings yield (cheap) peers. The behavior of price momentum gap of the two country groups in the last 5 years has been unusual compared to prior history. This tells us that if we were to use this historical trend as a guide for the future, we expect an eventual mean-reversion in prices (including perhaps a sharp price correction). However, *mean-reversion could be a long wait*. Even value managers' nightmarish years of late 1990s included a mean reversion bounce in 1998-99 and eventual return to a more normal mean reversion pattern.

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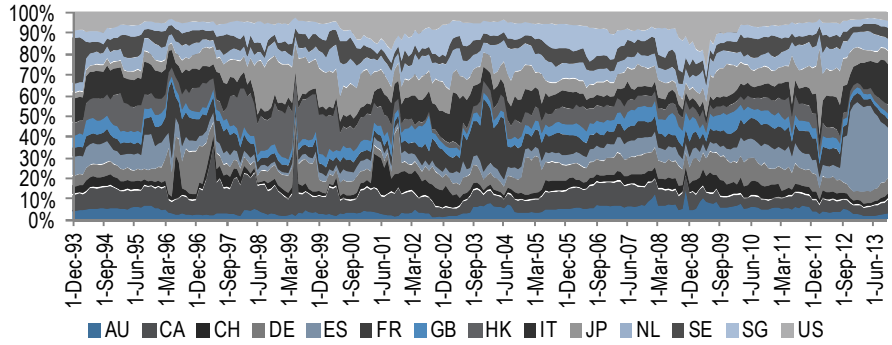
One simple way to mitigate the pitfalls of a traditional earnings yield signal is by incorporating the cross-sectional valuation dispersion – effective indicator to time the valuation cycle

The challenge is to introduce a methodology that mitigates the type of drawdown we see in Figure 15. We have found out that one effective way to mitigate this problem is to adjust the country level valuation with the valuation dispersion of underlying equities in the index. Our research suggests that valuation dispersion is an effective indicator to time the valuation cycle. Figure 16 shows relative dispersions among the markets we trade and reveals its very dynamic nature.

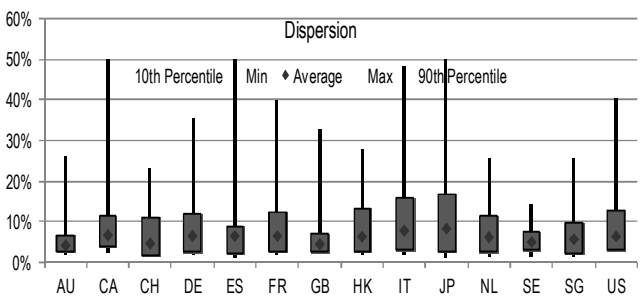
Figure 16: Relative Earnings Yield Dispersion Is Dynamic

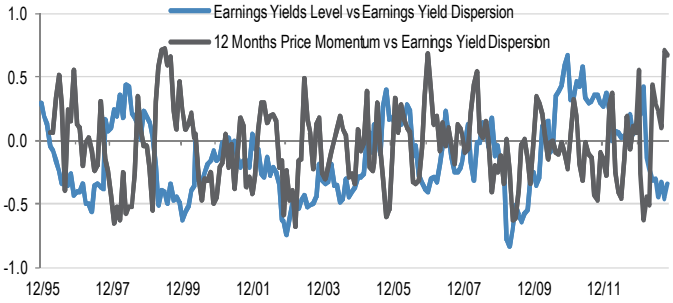


Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Spain and Italy have had relatively large valuation dispersions recently whereas US has seen significant reduction in earnings yield dispersion. As expected, earnings yield dispersions tend to be more stable during calm market periods. One issue with using dispersion to adjust valuation is that a few stocks can display extreme earnings yields usually due to significant changes in price; further, this issue is accentuated if the sample size is small.

Figure 17: Earnings Yield Dispersion and Rank Correlations among EY Level, EY Dispersion and 12 Month Price Momentum





Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

To manage outliers, we truncated raw data relative to the mean. In addition, countries' dispersions were capped in order to make sensible adjustment to raw earnings yield. On average, as Figure 17 (right chart) shows, earnings yield dispersion showed negative relationship (~ -12% rank correlation) with earnings yield level and almost no relationship to the 12 month price momentum (~ -3% rank correlation). In other words, earnings yield dispersion carries additional information not found in equity valuation or momentum.

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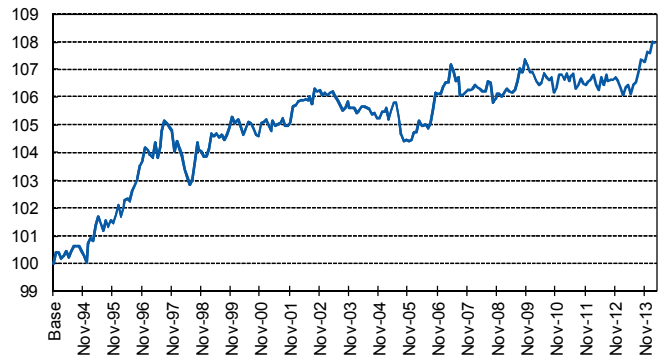
Table 8: Dispersion Adjusted Earnings Yield - Normalized with 1% Risk Target

Total Period: 12/31/1993 to 4/30/2014 Portfolio Statistics				
Portfolio	Ann Return	Ann St Dev	IR	% Out Perf.
AU	-0.01%	0.09%	-0.11	50.41%
CA	0.01%	0.18%	0.05	50.82%
CH	0.01%	0.19%	0.05	49.18%
DE	0.09%	0.15%	0.59	56.15%
ES	0.03%	0.25%	0.10	49.18%
FR	0.01%	0.08%	0.16	50.82%
GB	0.04%	0.08%	0.48	56.56%
HK	-0.06%	0.42%	-0.15	50.41%
IT	0.07%	0.22%	0.34	53.69%
JP	0.15%	0.31%	0.47	53.69%
NL	-0.03%	0.16%	-0.21	47.13%
SE	0.06%	0.15%	0.37	50.41%
SG	0.08%	0.25%	0.31	57.38%
US	0.01%	0.08%	0.14	52.87%

Long Short Signal Statistics Dispersion Adjusted Earnings Yield				
	Ann Ret	IR	Ann St Dev	% Out Perf.
Long/Short	0.4%	**0.43**	0.9%	53%
	T-Stat	**Avg IC**	**Turnover**	**Avg Assets**
Long/Short	1.95	4.1%	53%	14



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Bond Yield Anchored Dividend Spread

Signal Motivation: *Conventional wisdom uses dividend yield as a measure of equity valuation. This notion can be refined by anchoring both the level and the dispersion of a country's dividend yield around its bond yield. The signal favors countries with higher bond yield adjusted stock dividend dispersion.*

Companies pay dividends for many reasons: to attract income seeking investors; to signal persistence of earnings and/or a lack of better internal use of cash; and lastly to mitigate agency problem – prevent managers from investing cash in sub-optimal projects that are not in shareholders' interest

Companies pay dividends for many reasons. Dividends support a firm's stock price by attracting income-seeking investors that would not purchase the firm's equity if no dividends were paid. For behavioral reasons or due to investors' circumstances, the certainty of cash payment now could be more attractive than any capital gain that may be realized later if the company retained its earnings instead. Also, presence or lack of dividends is perceived as a signal about the management's inside view about availability of positive value added projects and robust earnings stream in the future. Lastly, if a firm did not pay dividend out of its earnings and continued to accumulate cash, it could pose a so-called agency problem – managers or agents flush with cash would be tempted to invest shareholders' or principals' money in low margin or risky projects (i.e. empire building) instead of letting shareholders choose investment outside the firm with superior risk-return profile.

Rational investors should only care about the total returns earned by an asset.
Dividend yield as a valuation measure for stock selection makes sense when the universe of stocks has similar outlook (or probability distribution) for price appreciation

Dividend yield is the ratio between the cash dividend paid to shareholders divided by the price of the stock. Based on the discussion above, firms with higher dividend yield should generally be preferable to firms with lower dividend yield, *provided* both the firms have similar outlook for future capital appreciation. Rational investors would probably include both the expected total returns as well as the uncertainty associated with the price appreciation into consideration when comparing two stocks. In addition, the sustainability of dividend payments is also an important factor for those investors who give higher preference to current income. All these considerations suggest that when investors use dividend yield as a valuation measure (how much should one pay today to receive dividends over the next few years?) they must first narrow their universe to stocks that are similar in nature. Confining to stock selection within a sector is one approximate way to achieve this goal. Other

approaches may combine various growth metrics with dividend yield to select stocks, a type of growth at reasonable price (GARP-like) strategy.

Two additional issues with analysis of country dividend yield: one, sector composition; two, bond yield (the opportunity cost of investing in dividend paying stocks)

Application of dividends as a tool for asset selection becomes even more complicated when we consider country indices selection, the topic of this research note. At least two new concerns need to be addressed – one, the differences in the sector composition of the countries and two, the country-specific dissimilarities, most important of which is captured by the interest rate differential, which can potentially create a large wedge in the opportunity cost of investing in bonds versus dividend paying equities. Countries with higher bond yield should, all other things being equal, have a more difficult time attracting funds to dividend paying stocks.

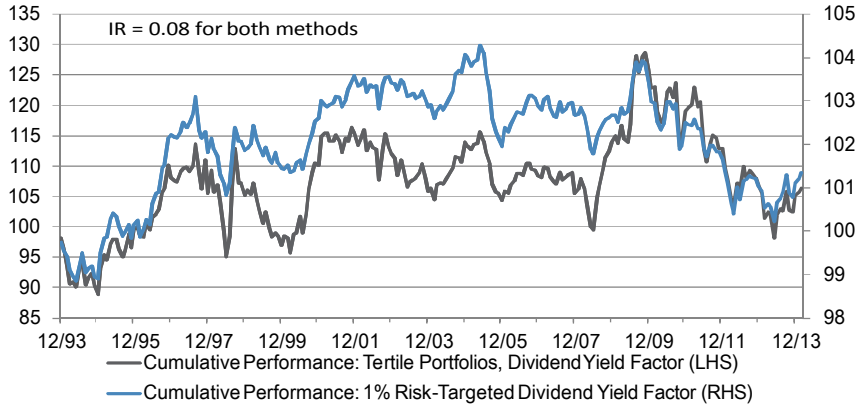
The simple dividend yield country selection signal does not work well historically, particularly recently

A simple dividend yield signal would rank countries by their dividend yield – countries with higher dividend yield are preferred over countries with lower dividend yield. Representing dividend yield of country j as DY_j the following formula shows the calculation of score for country k.

$$Score(k) = DY_k - (\sum_{j=1}^{14} DY_j)/14$$

As mentioned above, this signal suffers from a sector bias. A country where low or zero dividend paying sectors are overrepresented is likely to be always underweight or held short even if these sectors are high growth. Conversely, a country dominated by high dividend paying mature sectors such as consumer staples would be favored persistently as long as the sector trades at a reasonable multiple. Some would argue that this is okay – stable cash payments to investors should be rewarded as long as price also remains relatively stable. However, historical back tests over the past twenty years negate this point of view. Figure 18 shows that the simple dividend yield signal applied to the universe of 14 countries results in an IR of just 0.08. For completeness, the figure shows both the tercile (long top tercile countries and short bottom tercile countries) and risk adjusted performance of the signal.

Figure 18: Back-test of Long High Dividend Yield - Short Low Dividend Yield Strategy Gives an IR of Just 0.08



Source: J.P. Morgan Quantitative and Derivatives Strategy.

Adjusting Dividend Yield for sector composition could be one solution to the weak performance of the signal

One solution to the problem of differing sector composition of countries is to compare a country's dividend yield to the average of the 14 developed markets' dividend yield *after adjusting* for the size of the country's sectors. This is how that could be done. For country k, suppose $w_k(s)$ is the market capitalization weight of

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the sectors (for brevity we have suppressed the implicit time subscript in this discussion). The country-k weights-adjusted developed market dividend yield $WtADY_k$ is calculated as follows:

$$WtADY_k = \sum_{s=1}^{10} w_k(s) * (\sum_{j=1}^{14} DY_j(s)/14)$$

where $DY_j(s)$ is the dividend yield for sector s of country j. By construction, summing over subscript s, $\sum_{s=1}^{10} w_k(s) = 1 \; for \; each \; country \; k$. Essentially we are asking what would the average dividend of the universe of countries look like if in every month the relative weight of the sectors was identical to that of country k.

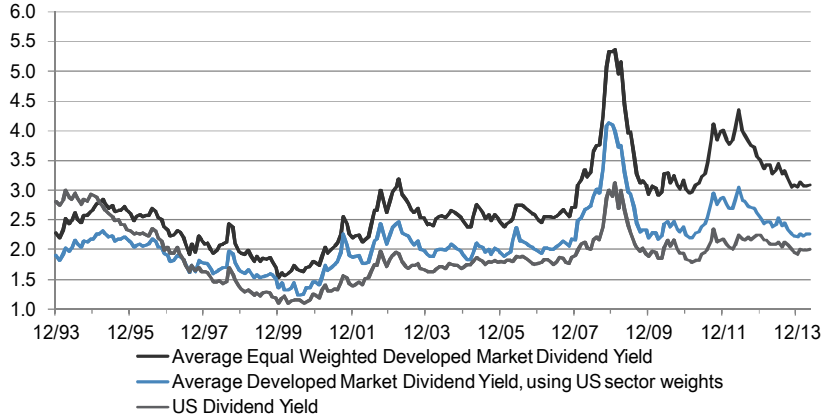
The sector-adjusted score used for ranking country is simply

$$AdjScore(k) = DY_k - WtADY_k$$

…though the sector-adjustment helps, it fails to completely remove the dividend yield bias

While adjusting for sector biases helps, it does not eliminate the systematic bias in dividend yield. For instance taking United States as an example, figure 19 shows the unadjusted country dividend yield (the lowest line), the sector-adjusted dividend yield (the middle line) and the simple average dividend yield (highest line). While the sector adjustment reduces the bias somewhat, the US market continues to look expensive since 1997 to present i.e. US dividend yield is lower than both approaches.

Figure 19: The US Looks Expensive on Dividend Yield Since 1997, Even If Adjustment Is Made for Sector Composition



Source: J.P. Morgan Quantitative and Derivatives Strategy.

Consequently the back test results after applying sector adjustment still remain less than satisfactory as shown in figure 20. While the IR has improved to 0.15 from 0.08, the recent performance of the factor remains weak.

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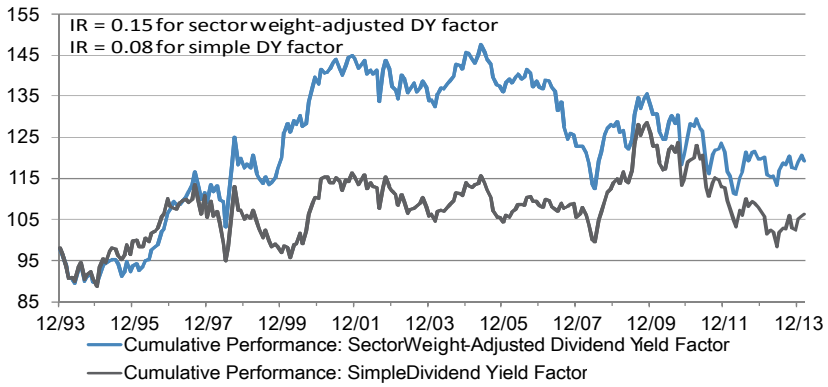
Figure 20: Using Sector Weight-Adjusted Dividend Yield Factor Helps Marginally But Factor Performance Remains Weak, Particularly After 2005



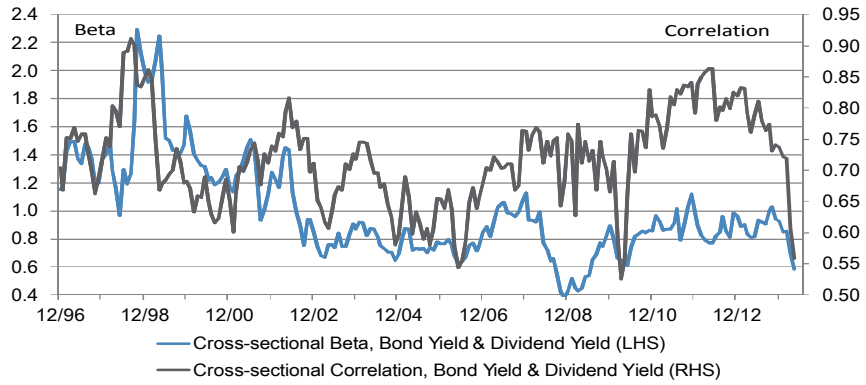
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Sector weight-adjusted Dividend Yield signal is an improvement over plain vanilla Dividend Yield signal but the signal IR at 0.15 is still not compelling – recent performance also remains poor

Dividend Yield correlation with Bond Yield has fallen but has not turned negative as was the case with Earnings Yield

In the previous section, we had looked at the relationship between earnings yield and bond yield (Figure 21) and shown that the beta and correlation between the two had inverted from normally positive to negative recently. Dividend Yield is more stable than Earnings Yield since firms are loathe to discontinue or change dividends too much unless it is absolutely necessary (e.g. very large losses). Thus while the beta and correlation of Dividend Yield with respect to Bond Yield have fallen recently they are not negative (compare Figure 21 to Figure 13).

Figure 21: Dividend Yield Correlation with Bond Yield Has Fallen but Has Not Turned Negative



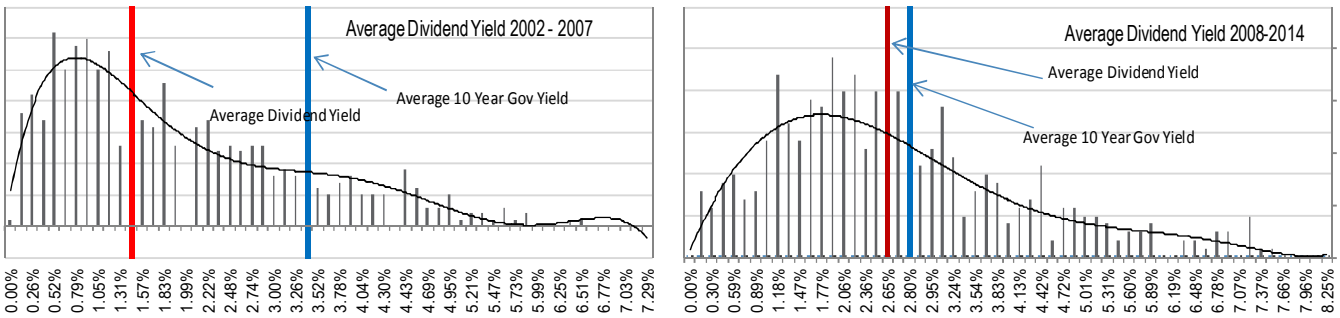
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Just like the Earnings Yield signal, in constructing the Dividend Yield signal we exploit the distribution of the dividend yield of the stocks within the index. The key difference is that we have used the country 10-year bond yields as anchor in estimating whether a country is relatively over- or under-valued.

As Figure 21 above illustrates, historically there has been a positive relationship between a country's dividend yield and its bond yield. Despite being somewhat weaker, this relationship has continued to hold up since the Financial crisis. In our opinion, one likely reason for this is the "income-feature" of dividend paying equities and bonds. Furthermore, as shown in Figure 22 the Financial Crisis caused a right shift in the distribution of US stock dividend yields. In fact, the average US stock's dividend yield during 2002-07 period was ~1.5% versus ~2.5% in the 2008-14 period. Importantly, the Bond Yield Anchored Dividend Spread signal exploits the

time-varying aspects of a country's stock dividend yield distribution, and not just the mean.

Figure 22: The Distribution of US Stock Dividend Yields Pre-Crisis Shifted Right Relative to Its Bond Yield Anchor After the Crisis



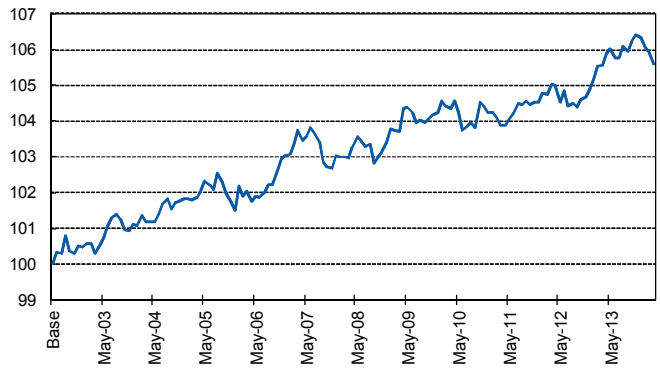
Source: J.P. Morgan Quantitative and Derivatives Strategy.

In the back-test of the signal (performance statistics shown in Table 9), the history starts in May 2002 because we have used forward Dividend Yield as the input to the signal construction. The results going back to 1993 are very similar in the case of historical Dividend Yield signal.

Table 9: Performance Stats: Bond Yield Anchored Dividend Spread Signal With Target Risk 1%

Total Period: 05/31/2002 to 4/30/2014 Portfolio Statistics				
Portfolio	**Ann Return**	**Ann St Dev**	**IR**	**% Out Perf.**
AU	0.00%	0.15%	0.03	50.70%
CA	0.10%	0.23%	0.44	48.59%
CH	0.03%	0.14%	0.24	45.77%
DE	0.03%	0.13%	0.21	47.89%
ES	-0.02%	0.23%	-0.09	52.11%
FR	0.06%	0.10%	0.56	59.15%
GB	-0.01%	0.09%	-0.07	49.30%
HK	0.05%	0.22%	0.22	48.59%
IT	0.00%	0.18%	-0.02	49.30%
JP	0.05%	0.33%	0.15	47.18%
NL	-0.01%	0.14%	-0.10	51.41%
SE	0.05%	0.18%	0.29	51.41%
SG	0.11%	0.22%	0.48	54.23%
US	0.04%	0.16%	0.26	52.82%

Long Short Signal Statistics Bond Yield Anchored Dividend Spread Signal				
	Ann Ret	**IR**	**Ann St Dev**	**% Out Perf.**
Long/Short	0.5%	**0.58**	0.8%	56%
	T-Stat	**Avg IC**	**Turnover**	**Avg Assets**
Long/Short	**1.98**	6.1%	56%	14



Source: J.P. Morgan Quantitative and Derivatives Strategy.

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Macro Strategies

Real Interest Rate

***Signal Motivation**: Countries with higher relative long term real interest rates, a proxy for expected rate of return, are favored. While the signal is effective over the long run, it can struggle when aggressive monetary policy keeps nominal rates low even as the economy strengthens.*

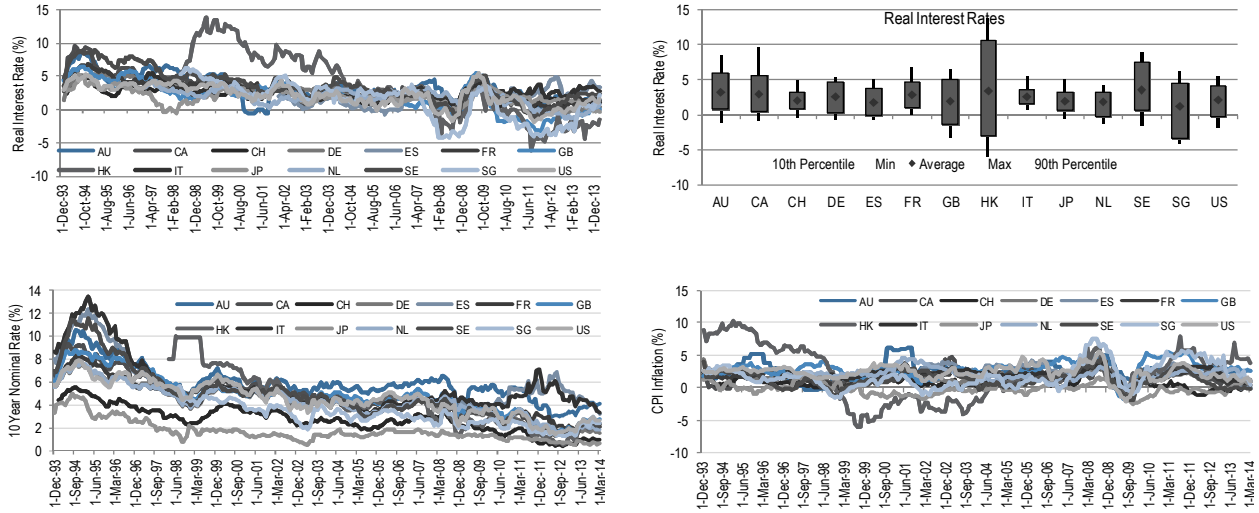
Strength of an economy is reflected by its real rate of return

The hypothesis behind this signal is a straightforward one. Weak economies are typically associated with low interest rates and conversely, strong economies can sustain high interest rates. If an economy is weak, there is less demand for capital, due to diminished incentives for corporate sector to expand and this puts downward pressure on rates. Additionally households reinforce the downward pressure on interest rates by cutting spending and increasing savings. Meanwhile, the central bank counteracts the weak economy by lowering the short term interest rate in order to encourage business to borrow and spend on capital goods and hiring labor. After a period of low interest rates, the economy starts recovering. Firstly, investors start withdrawing money from safe low return (often government) debt and begin to take more risk by putting their savings directly into equities. Secondly, businesses begin to compete for capital to fund expansion, bidding up the interest rate. Furthermore, the central bank, concerned about nascent inflationary pressures gradually switches gears, favoring higher interest rates, and making it more expensive to borrow. In this context, high interest rates can be thought of as a feature of strengthening economies.

Real rate of interest is typically a good approximation of the expected return to investment in the economy

Since actual economic activity is related, on average, with the real rate of return expected by businesses and households, it seems appropriate to use real interest rates to build the signal. For purposes of this report, the Fisher equation for calculating the expected real rate of return was employed, i.e. the real interest rate is equal to the difference between 10 yr bond yield (nominal rate) and the CPI (inflation). Despite its shortcomings, the real interest rate is generally accepted as a reasonable approximation of expected real rate of return for an economy in the long term.

Figure 23: Global Real Interest Rates, Nominal Interest Rates and Inflation



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

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Real interest rates track the strong growth in 1990s, the pause in growth in early 2000s and return to growth, albeit moderate, in the mid-2000s

As Figure 23 clearly shows the general direction of real interest rates has been downwards, mainly driven by nominal interest rates, less so by inflation. High nominal interest rates in early 90's have come down steadily, dropping on average for the fourteen countries from 6.8% in 1990s to 3.9% in 2000s and about 2.5% in the current decade. Meanwhile inflation rates have been more or less contained, dropping from 2.5% in the 1990s to 1.7% in 2000s and averaging about 2.2% in this decade. Inflation collapsed as the global economies entered the Financial Recession, with the negative growth experienced by a majority of countries being reflected in low to negative inflation. To fight the economic slowdown, many central banks, especially the US Fed, aggressively advocated low interest rate polices, pegging the short-end of yield curves close to zero. Real interest which averaged 4.4% in 1990s and 2.1% in 2000s averages just 0.3% in the current decade.

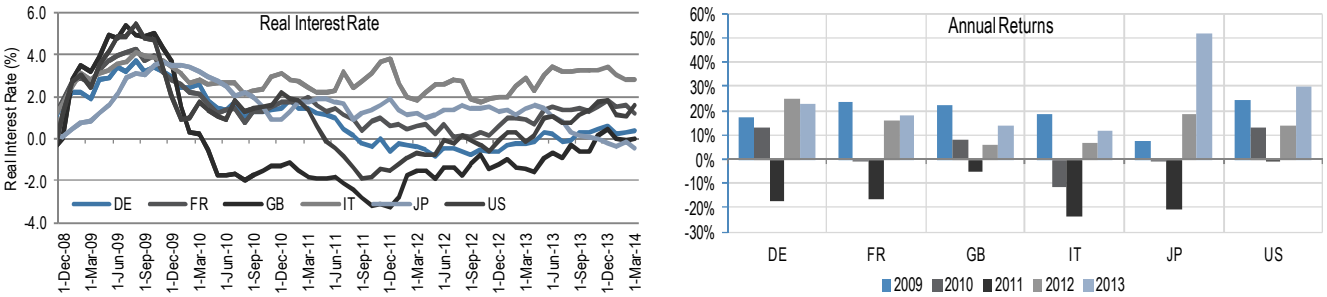
Central bank aggressive targeting of the longer end of the yield curve has disconnected real growth and real interest rate

Since the Financial Recession, additional mechanisms like the Troubled Asset Purchasing Program (TARP, Oct 2008) and Quantitative Easing (QEs, Nov 2008, Nov 2010, Sep 2011) in the US, Long-Term Refinancing Operation (LTRO, Sep 2012) in the Euro zone, Asset Purchase Facility (APF, Jan 2009) in the UK and Abenomics (various QE measures, starting Dec 2012) in Japan have been used to keep the *long term interest rates* low. Traditionally central banks did not directly target the long term interest rates, but fear of deflation has prompted unconventional measures. In return, investors have gained confidence and equity markets have seen steady appreciation. However, the unusual activity of the central banks has caused the real interest rate signal (see below) to struggle in recent years. Basically, the normal linkage between the strength of economy and real interest rate has been broken for several years since the adoption of the unconventional policies (zero interest rate environment). Low real interest rates have no longer represented weak economies, especially in a relative term.

European debt crisis is a good example of how default risk and safe haven status rather than economic growth became the driver of real interest rates in some countries

A good example of this broken linkage is the European debt crisis which took place in the period 2010-2011. As the possibility of defaults in peripheral countries in Europe loomed and the talk of austerity measure in troubled countries faced impasse, investors sought safe assets, primarily German Bunds. Consequently, the German yields dropped; meanwhile weaker economies such as Italy and Spain faced rising interest rates due to the government bond sell-off. The charts below show real interest rates and annual equity market returns since 2009.

Figure 24: US vs. European Countries: Real Interest Rates and Annual Stock Market Returns

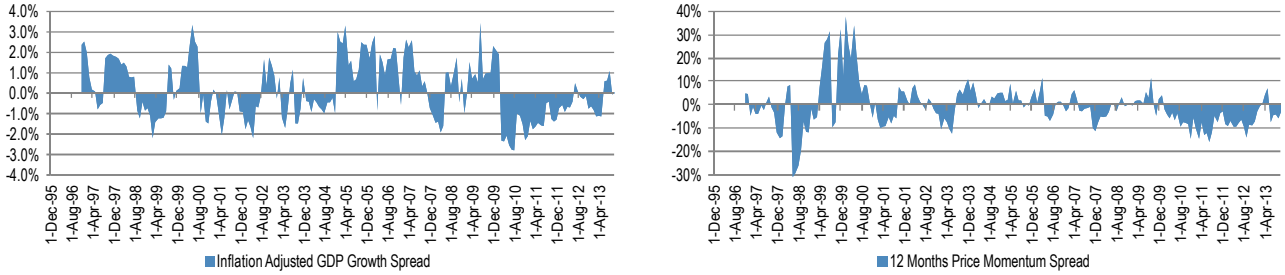


Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

This issue can be analyzed in a more systematic fashion from two angles: macro and market levels. We first created two baskets: high and low real interest rate baskets based on the median real interest rate among the countries we trade. For each basket, we measured average inflation adjusted (real) GDP year-on-year growth rate and

average 12 month price momentum. The following charts illustrate spreads between the high and low real rate baskets.

Figure 25: Inflation Adjusted GDP Growth Spread and 12 Month Price Momentum Spread of the High and Low Real Interest Rate Baskets – Negative Spreads Unusually Long After 2009



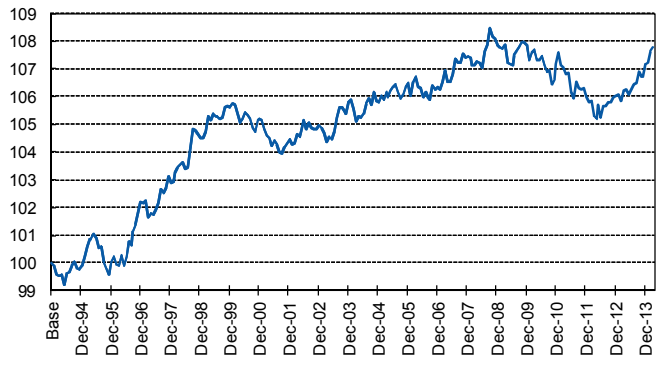
Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Prior to 2009, the historical average spread of inflation adjusted GDP growth rate had been 0.4%, and subsequently has averaged -0.5%. This reiterates the fact that countries with more aggressive monetary easing measures (with lower nominal and real interest rates) exhibited higher growth. The spread of 12-month price momentum reinforces the same message. The historical spread average had been 0.9% prior to 2009 and -4.8% since then. The countries with lower real interest rates have enjoyed stronger rallies in their equity markets. The more aggressive stance from the ECB since mid-2013 may be normalizing the relationship of relative real growth and relative real interest rate of Euro zone with respect to other countries. Similar phenomena may be occurring with BOJ and between Japan's relative growth and relative interest rates.

Table 10: Real Interest Rate Signal - Normalized with 1% Risk Target

Total Period: 1/31/1994 to 4/30/2014 Portfolio Statistics				
Portfolio	**Ann Return**	**Ann St Dev**	**IR**	**% Out Perf.**
AU	-0.03%	0.17%	-0.20	44.67%
CA	0.03%	0.14%	0.23	49.59%
CH	-0.03%	0.19%	-0.16	47.95%
DE	0.01%	0.09%	0.07	50.00%
ES	-0.06%	0.25%	-0.25	30.33%
FR	-0.01%	0.07%	-0.14	48.77%
GB	0.01%	0.12%	0.09	49.18%
HK	0.15%	0.43%	0.35	41.80%
IT	-0.02%	0.14%	-0.13	40.57%
JP	0.22%	0.31%	0.71	57.79%
NL	-0.02%	0.10%	-0.17	40.57%
SE	0.13%	0.29%	0.45	54.51%
SG	0.05%	0.23%	0.20	46.31%
US	-0.01%	0.10%	-0.12	48.36%

Long Short Signal Statistics Real Interest Rate Signal				
	Ann Ret	**IR**	**Ann St Dev**	**% Out Perf.**
Long/Short	0.4%	**0.41**	0.9%	51%
	T-Stat	**Avg IC**	**Turnover**	**Avg Assets**
Long/Short	1.86	3.2%	64%	14



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

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Relative Style

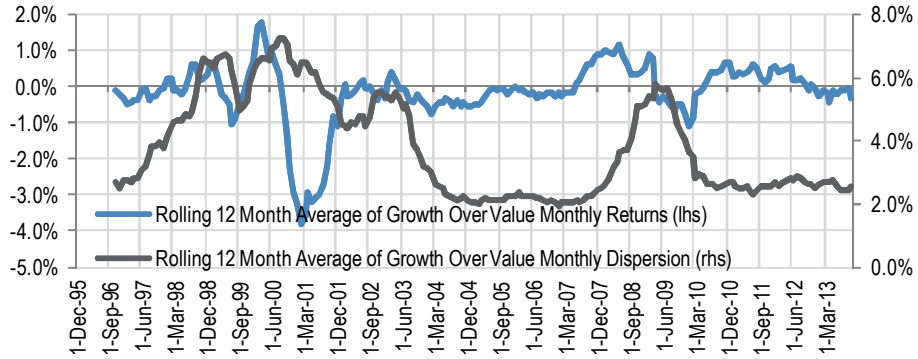
***Signal Motivation**: Outperformance of Growth over Value indicates greater investor confidence in the market. Countries with high momentum in their Growth-Value spread are preferred. The signal faces headwinds during deep Value snapbacks.*

Relative Style Signal uses Growth-to-Value spread performance to predict country performance

Empirical analysis shows that in the long run a portfolio based on buying value stocks, rebalanced periodically, outperforms a similar portfolio based on buying growth stocks. However, since the beginning of this bull market in 2009 as the market has gone up in fits and starts, Russell 1000 Growth index is up 153% compared to 141% gain in Russell 1000 Value Index. That works out to be 2.1% annualized excess performance for Growth. To make matters more confusing, the hit ratio, i.e. the percentage of months Value[4] has *beaten* Growth, favors Value at 73%. So while Value beat Growth more consistently, the size of Growth outperformance was on average larger.

Investors are well aware that predicting the timing of the rotation between the two styles is a very elusive exercise: a style bias can persist for a long time until a sudden shift takes a place. Rather than basing a strategy that depends on timing the preferred style, a simple signal is suggested: prefer countries with stronger short-term momentum in Growth compared to momentum in Value.

Figure 26: Growth over Value – Country Average and Cross-Sectional Dispersion: Shows Rapid Style Reversal After the Tech Recession, Less Dramatic Reversal After the Financial Crisis



Source: Bloomberg, MSCI, J.P. Morgan Quantitative and Derivatives Strategy.

Two sharpest Value-Growth style reversals in the last 20 years happened during the tech recession and the financial crisis

We begin with an exploration of relative performance of Value and Growth over the past 20 years. Figure 26 shows that the monthly performance of Growth-to-Value return spread (average over 14 countries) on a rolling 12 months average basis along with the cross-sectional dispersion over the countries. One of the most dramatic style rotations occurred around the 2001 tech recession. Leading into it, the market favored Growth countries on the back of forecast growth potential of the tech industries. After the tech crash, investors sought countries with attractive valuations and by early 2002, the market had a slight tilt towards Value. However, the cross-sectional dispersion reveals that it was not until early 2004 that the market was in favor of Value across the board. Less dramatic style rotation occurred during the

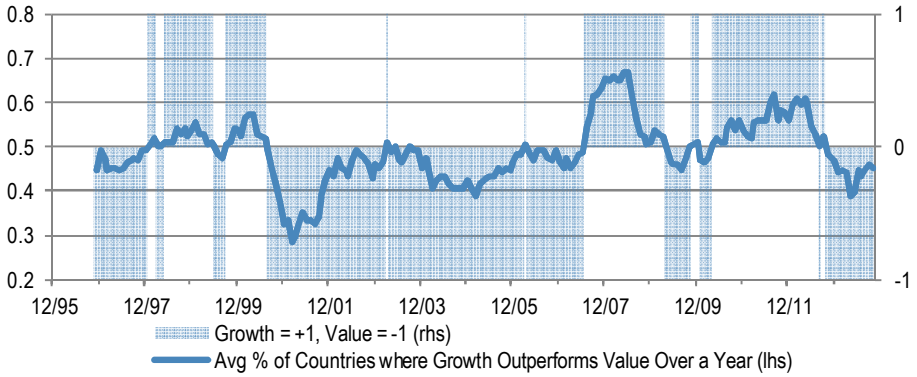
[4] We use country MSCI Value and Growth Indices in constructing the signal. Value is based on book/price, 12-month forward earnings to price ratio and dividend yield. Growth is based on long-term forward eps growth rate, current internal growth rate, long-term historical eps growth trend and long-term historical sales per share growth trend.

financial crisis. As the financial crisis unfolded, there was a shift towards Value but as the markets went into the expansionary state, the Growth, albeit in a smaller scale, was favored by the investors. In the past 1-2 years, Value has been in favor and the cross sectional dispersion has been low.

There is persistence in Value and Growth regimes during normal market conditions

Figure 27 represents this information in another way by monitoring the percentage of countries (out of 14 developed markets in the model) which show Growth over Value outperformance on a 12 month rolling basis. Periods of one sided Value or Growth performance are usually concentrated around crises – most of the time the percentage of countries with Value or Growth outperforming lie within 40% to 60% range.

Figure 27: Growth over Value: Style Persistence



Source: Bloomberg, MSCI, J.P. Morgan Quantitative and Derivatives Strategy.

Growth style momentum is more effective than Value style as a predictor of one-month forward country returns (i.e. directional trade)

At country level, Table 11 shows that short-term Growth style momentum is far more effective than Value style momentum at predicting one month forward returns – the notable exception being Spain and the UK where neither style is compelling. Growth style momentum is especially effective for Canada, Switzerland, Japan, Sweden, Singapore and the US.

Table 11: Growth and Value Style 3 Month Momentum - Beta, T-Stat of Directional Trade

Growth	AU	CA	CH	DE	ES	FR	GB	HK	IT	JP	NL	SE	SG	US
Beta	0.06	0.05	0.11	0.05	0.02	0.06	0.00	0.06	0.04	0.09	0.08	0.07	0.09	0.06
Tstat	1.83	2.23	2.80	1.43	0.56	1.83	0.04	1.54	1.22	2.83	1.82	2.73	2.44	1.85

Value	AU	CA	CH	DE	ES	FR	GB	HK	IT	JP	NL	SE	SG	US
Beta	0.03	0.06	0.04	0.03	0.05	0.04	-0.01	-0.02	0.02	0.10	0.03	0.05	0.04	0.02
Tstat	0.97	1.59	1.71	0.87	1.46	1.22	-0.15	-0.66	0.55	2.85	0.92	1.12	1.18	0.66

Source: Bloomberg, MSCI, J.P. Morgan Quantitative and Derivatives Strategy.

The results are not very surprising since Growth momentum usually coincides with price momentum trend. Growth style momentum was effective until 2008 as a directional trade. However, as a relative trade among developed markets, it is less effective and more importantly, it is sensitive to the look back window used to compute the Growth trend. The Value style momentum, on the other hand, was a less compelling factor, for both directional and relative trades.

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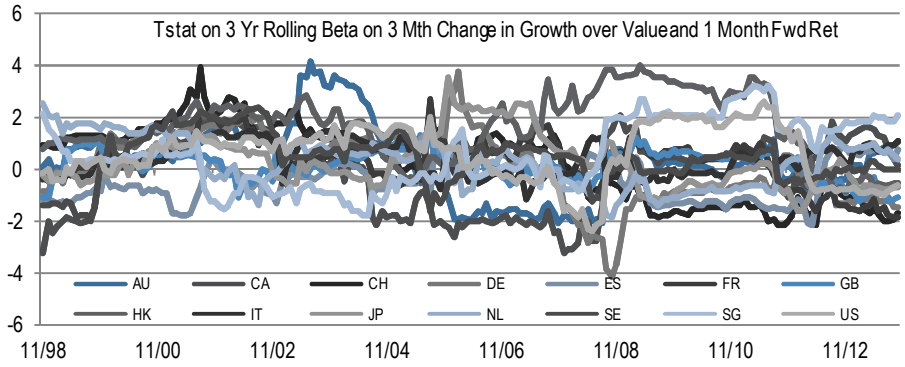
Figure 28: T-Statistics: Style Spread vs. 1 Month Fwd Ret, 3 Yr Rolling



Source: Bloomberg, MSCI, J.P. Morgan Quantitative and Derivatives Strategy.

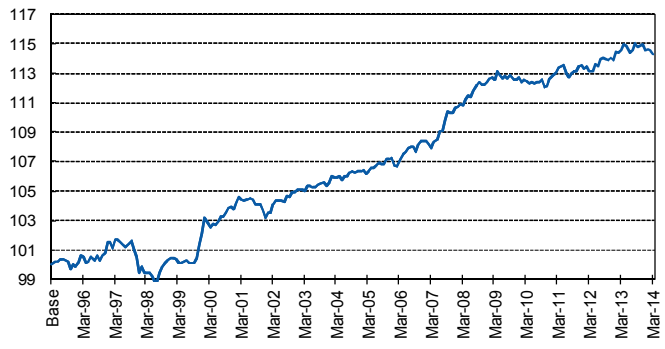
While Growth-to-Value spread is predictive for relative country selection, neither style in isolation is as effective

Table 12 considers the spread of Growth momentum over Value momentum as predictor of forward returns and finds it to be more robust.

Table 12: Relative Growth Over Value Signal - Normalized with 1% Risk Target

Total Period: 4/30/1995 to 4/30/2014 Portfolio Statistics				
Portfolio	Ann Return	Ann St Dev	IR	% Out Perf.
AU	0.05%	0.16%	0.30	54.39%
CA	0.03%	0.19%	0.17	52.19%
CH	0.04%	0.17%	0.24	51.32%
DE	0.03%	0.15%	0.16	53.95%
ES	-0.02%	0.25%	-0.08	47.81%
FR	0.02%	0.13%	0.16	53.95%
GB	0.04%	0.09%	0.47	53.95%
HK	0.16%	0.30%	0.54	54.39%
IT	0.02%	0.27%	0.09	52.63%
JP	0.03%	0.20%	0.13	53.95%
NL	0.10%	0.20%	0.53	54.39%
SE	0.16%	0.32%	0.50	56.58%
SG	0.05%	0.34%	0.16	52.63%
US	0.00%	0.08%	-0.01	52.63%

Long Short Signal Statistics Relative Growth Over Value Signal				
	Ann Ret	IR	Ann St Dev	% Out Perf.
Long/Short	0.7%	**0.75**	0.9%	60%
	T-Stat	**Avg IC**	**Turnover**	**Avg Assets**
Long/Short	3.26	7.6%	217%	14



Source: Bloomberg, MSCI, J.P. Morgan Quantitative and Derivatives Strategy.

Currency Momentum

Signal Motivation: *Weaker currency helps a country's stock market by making its goods, services and financial assets cheaper to foreigners. Countries with weakening risk-adjusted currencies are preferred. Currency moves unrelated to fundamentals pose risk to this trade.*

Equity markets are influenced by international flow/trade of good and services, as well as capital

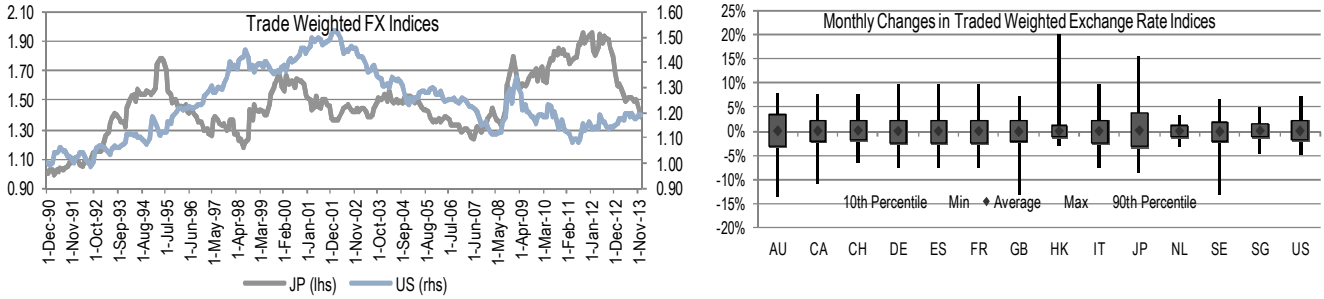
Numerous exogenous factors influence a country equity market. For instance, if a country's economy relies heavily on commodity production, there potentially exists a positive linkage between the country's equity market performance and the global demand of commodity. If a country has substantial dependence on export driven industries, the global demand for the country's products may dominate its equity market performance. If a country has strong economic ties with neighboring

countries, for example as a financial lender, the health of these peripheral countries matters to the domestic equity market. Additionally, the value of the country's currency is important since a cheap currency provides price advantage and competitiveness. These are a few examples that highlight exogenous forces that affect equity market performance.

Trade-weighted FX index better captures the value of a country's currency and its influence on equity market compared to a single bilateral FX rate

In this section, the linkage between foreign exchange and equity markets is examined. Rather than using a bilateral benchmark exchange rate (i.e. against US dollar), an index based on multilateral exchange rates weighted by the amount of bilateral trade is employed. The significance of mutual influence among the countries is well captured by this index. Constructing a linkage between this index and its respective equity market provides an elegant way of looking at the domestic market from a global context – see Figure 29.

Figure 29: Trade Weighted FX Indices



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Similar forces can dislocate currency and equity markets providing opportunity to exploit the linkage

Trade weighted exchange rate indices contain a rich set of information that link trade and capital flow to equity market movements. For example, the Japanese trade weighted index in Figure xx shows that the recent intervention by Bank of Japan to target inflation and reignite growth in domestic businesses, a significant proportion of which are either directly dependent on exports or are linked to exporters, can be clearly observed through a sharp decline in the Yen index (JP). The peak of the index was reached on September 2011 (1.95) and by end of 2013 had declined by 28.8%, reaching an index value of 1.39. The Japanese government's commitment to bring the economy out of its deflation cycle is clearly channeled through a drastically weakened currency.

Another example is the US dollar (US). Prior to the financial crisis, the dollar had gone through a cycle which had an appreciation phase from early 1990 to early 2000 followed by a depreciation phase until the latest recession. As the crisis unfolded, there was initial appreciation in currency due to flight to quality: USD (US), JPY (Japan) and CHF (Switzerland) are considered safe haven currencies, which is usually a self-fulfilling investor reaction during stressful periods. However, because of three conflicting forces, namely zero-interest rate policy, lack of opportunities outside the US and US safe haven status, the dollar has moved in a range bound manner. Furthermore, the currency has remained relatively stable possibly due to the US Fed, in a radical departure from past practices, having bought public and private assets through the quantitative easing programs. The QE programs have provided support to both equity and fixed income markets, thus preventing foreign capital flow from drying up.

Movement in trade weighted exchange rate index is inversely related to the corresponding country's forward equity return

The bottom line is that the exchange rate indices carry important information about the economy and policies and hence their moves have significant implications to their corresponding equity markets. A simple univariate regression can be run to understand the relationship between historical currency and forward equity returns:

$$r_i(t, t+1) = \alpha + \beta * twfx_i(t, t-12) + \varepsilon$$

$r_i(t, t+1)$ is the one-month forward equity market return for country i and $twfx_i(t, t-12)$ is the 12-month percentage change in the trade-weighted exchange rate index for country i.

Table 13: Directional Trade: 1 Month Forward Ret Regressed on YoY Trade Weighted FX Index

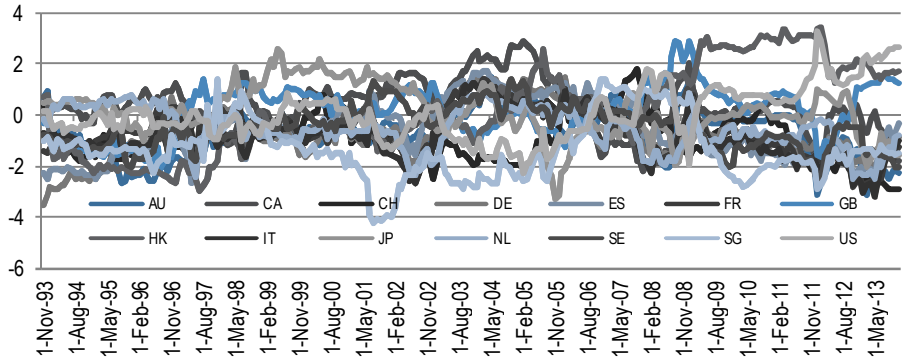
	AU	CA	CH	DE	ES	FR	GB	HK	IT	JP	NL	SE	SG	US
Beta	-0.04	0.04	-0.14	-0.10	-0.09	-0.10	0.04	-0.05	-0.14	-0.01	-0.12	-0.09	-0.28	0.08
T-Stat	-1.59	1.03	-2.81	-1.85	-1.65	-2.19	1.09	-0.61	-2.38	-0.39	-1.32	-1.60	-2.73	1.67

Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

The regression results in Table 13 show that change in trade-weighted index is useful in predicting near term performance of the corresponding country's equity market. The majority of the betas have a negative sign which intuitively makes sense. There are two arguments as to why one may expect a negative relationship. Firstly, depreciation of the currency makes a country more competitive since its products can be exported at a cheaper price. Secondly, the equity market of a country with weaker currency has a higher chance of attracting capital inflow, since its assets priced in foreign currency appear cheaper. In other words, a weaker currency makes both goods and services, and assets of a country more attractive to foreigners and is likely to influence equity prices.

Figure 30 tracks the rolling T-statistics of the regressions to examine the stability of the above delineated relationship. For most countries the T-stat is significant and reasonably stable.

Figure 30: 3 Year Rolling T-Stat: 1 M Forward Ret Regressed on YoY Trade Weighted FX Index



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Another indication that exchange rate related factor carries information about the equity market can be examined by comparing the volatility of the two markets. For instance, one of the most popular leveraged strategies is the currency carry trade — buying currencies of high interest rate countries funded by borrowing currencies of low interest rate countries. However, the excess returns gained over a long period by

harvesting carry risk premium can be lost quickly when the carry "unwinding" takes place during which high interest rate currencies are sold and low interest rate safe heaven currencies are bought. In practice, carry unwinding is usually related to a turning point in the global economy with differential effects on various economies and their equity markets.

Movement in currency volatility is usually related to that of equity volatility

To see how equity market volatility and currency volatility are related, consider the following equation:

$$equityVol_i(t) = \alpha + \beta_1 * equityVol_i(t-1) + \beta_2 * equityVol_i(t-2) + \beta_3 * twfxVol_i(t) + \varepsilon(t)$$

The frequency used is monthly. The volatilities are based on the past 22 day daily change in equity price and the trade weighted currency index. We have added 2 monthly lags for equity volatility to adjust for serial correlation of volatility.

Tables 14 and 15 show the betas and the T-statistics of the above regression for each country.

Table 14: Beta of Equity vs. Trade Weighted FX Volatilities

Beta	AU	CA	CH	DE	ES	FR	GB	HK	IT	JP	NL	SE	SG	US
EquityVol(t-1)	0.25	0.52	0.47	0.47	0.48	0.51	0.52	0.33	0.48	0.19	0.52	0.43	0.28	0.54
EquityVol(t-2)	0.13	0.06	-0.03	0.01	-0.06	-0.04	-0.01	0.17	-0.02	0.00	0.03	0.12	0.18	-0.03
tw FxVol(t)	0.83	0.92	1.19	1.61	1.93	1.60	0.78	3.25	1.59	1.37	2.02	0.91	1.57	1.45

Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Table 15: T-Stat of Equity vs. Trade Weighted FX Volatilities

T-Stat	AU	CA	CH	DE	ES	FR	GB	HK	IT	JP	NL	SE	SG	US
EquityVol(t-1)	4.29	7.49	7.29	6.99	7.67	8.11	7.62	5.35	6.15	3.43	6.73	6.47	4.09	6.76
EquityVol(t-2)	2.26	0.98	-0.46	0.16	-1.07	-0.66	-0.11	2.49	-0.11	0.05	0.47	1.90	2.76	-0.48
tw FxVol(t)	10.54	5.82	6.25	6.24	6.85	6.28	3.53	3.99	2.02	11.43	4.39	4.86	6.31	3.25

Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Equity and currency volatilities can diverge at times, typically during carry unwinding phases

It is obvious that equity and currency volatilities have linear relationship and the T-statistics of the regression are significant in all cases. Further more, the beta of currency volatility is greater than one in most cases, a reflection of the fact that volatility of equity markets is usually higher than that of currency markets. However, there are times when some countries' currencies have displayed extreme movements. For instance, as Figures 31 and 32 show currency volatilities of JP, AU and CA have an extreme multiple of 1.9x, 2.5x and 2.4x respectively at times during the last 20 years (based on month-end data). These currency volatility spikes are usually accompanied by carry unwinding. In the construction of the signal, these volatility spikes are compensated by risk adjusting the currency index growth trend.

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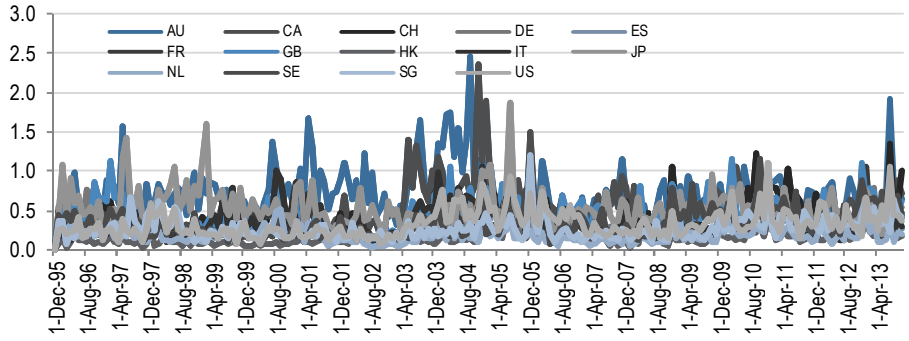
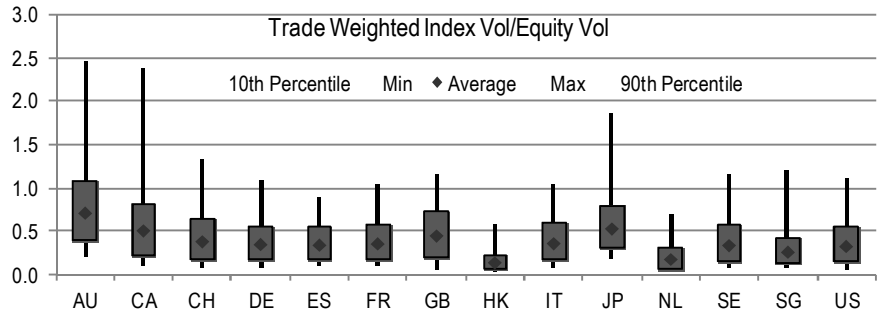
Figure 31: Annualized Trade Weighted FX Volatility over Annualized Equity Index Volatility



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Figure 32: Statistics for Trade Weighted Index Volatility over Equity Volatility



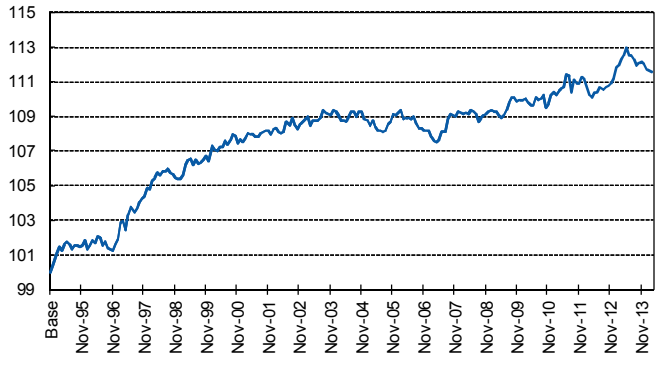
Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Lastly, Table 16 summarizes back-test results of the Currency Momentum Signal.

Table 16: FX Based Strategy - Normalized with 1% Risk Target

Total Period: 12/31/1994 to 4/30/2014 Portfolio Statistics				
Portfolio	**Ann Return**	**Ann St Dev**	**IR**	**% Out Perf.**
AU	0.04%	0.15%	0.26	55.17%
CA	-0.05%	0.15%	-0.31	47.84%
CH	-0.02%	0.17%	-0.12	45.26%
DE	0.04%	0.11%	0.34	53.02%
ES	0.00%	0.16%	-0.01	47.84%
FR	0.04%	0.08%	0.48	59.05%
GB	0.04%	0.15%	0.27	53.02%
HK	0.20%	0.50%	0.40	56.03%
IT	0.05%	0.15%	0.36	54.31%
JP	0.06%	0.34%	0.17	55.17%
NL	0.06%	0.10%	0.63	57.33%
SE	-0.03%	0.17%	-0.17	47.84%
SG	0.15%	0.24%	0.63	58.62%
US	-0.02%	0.17%	-0.11	55.60%

Long Short Signal Statistics FX Based Strategy				
	Ann Ret	**IR**	**Ann St Dev**	**% Out Perf.**
Long/Short	0.6%	**0.61**	0.9%	55%
	T-Stat	**Avg IC**	**Turnover**	**Avg Assets**
Long/Short	2.70	4.9%	55%	14



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

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Free Liquidity

***Signal Motivation**: Money growth in excess of the amount needed to support economic activity tends to boost asset prices. Countries with higher increase in money supply relative to GDP are favored. The relationship weakens when extreme risk aversion prevents liquidity driven rallies.*

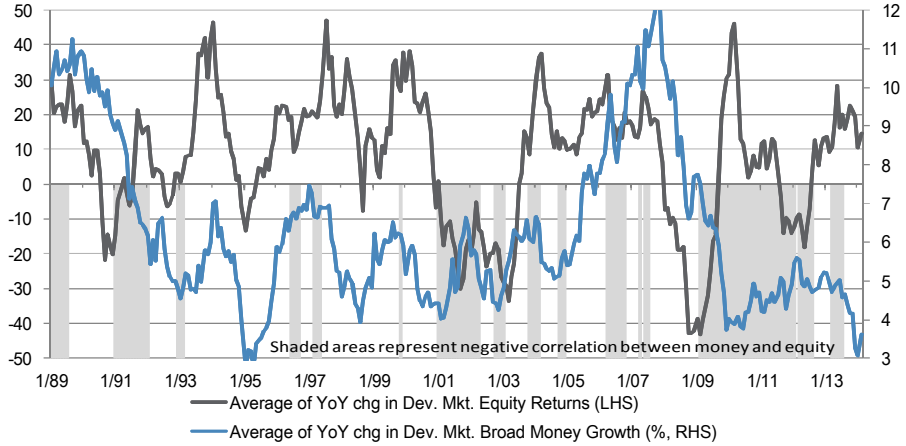
Macro Liquidity is an important driver of asset prices

Intuitively it seems obvious that a healthy growth in money supply should be an important precondition for a pick up in asset prices. When monetary policy is easy and rates are low, the opportunity cost of holding cash goes up while cost of leverage goes down; investors seek higher yield and shift savings from cash to risky assets. An important exception to this supposition are periods of high risk aversion when investors worry more about capital preservation and less about return. Conversely, when money supply or credit growth is tight, borrowing costs rise, profitable opportunities for companies shrink while the risk-reward balance for investors becomes less attractive.

Correlation between money (M2), output and equity market varies over the business cycle

How well does this hypothesis hold up in reality? Figure 33 plots the performance of equity market (average of year-on-year change in 14 developed economies) against the growth in money supply (average of year-on-year change in money supply). The relationship between year-on-year change in money growth and equity performance is more nuanced than the simple hypothesis described above. As Figure 33 shows the correlation between money growth and equity markets varies over time - sometimes it is negative (shaded area) for an extended period of time, at other times the negative correlation is fairly short lived. Overall, the correlation is positive about 60% of the time and negative 40% of the time. It is notable that periods of extended negative correlation are generally associated with economic stress as in 1990-92, 2001-02 and 2008-12.

Figure 33: Year-on-year Money Growth and Equity Performance Positively Correlated 60% of the Months — Periods of Negative Correlation (40%) Generally Associated with Economic Stress



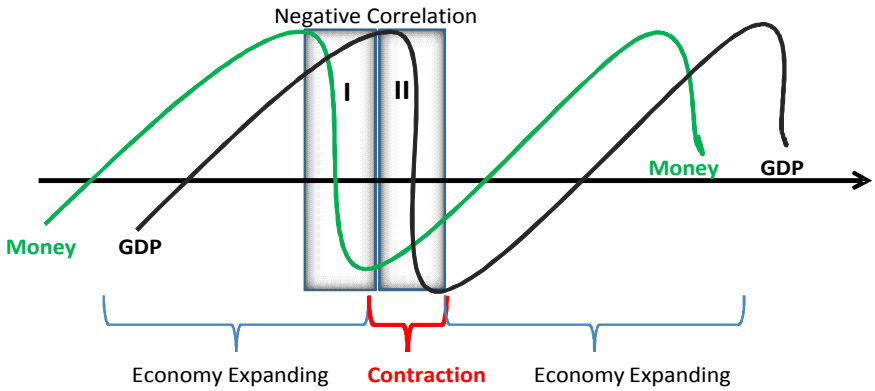
Source: J.P. Morgan Quantitative and Derivatives Strategy.

The causal relationship between money (M2) and output (and by extension the equity market) is two sided. In other words, money influences growth, while growth feeds back into change in money

One way to understand this time varying joint behavior is to note that the relationship between money and output is not one sided – the causal relationship runs both ways. Figure 34 shows a stylized description of how money and GDP interact over an economic cycle. During the expansionary phase of the cycle, money and output (and by implication the equity market) are increasing, and the correlation between the two is positive. As the economic cycle matures and monetary policy tightens, economic

momentum holds up for a while — for investors this is a dangerous zone since forecasters and analysts are usually optimistic at this stage, often downplaying the negative risks of the monetary tightening. The correlation between money and output/equity prices becomes negative at this stage. Eventually economic growth falters and so does the stock market, usually several months before economic weakness is transparent. For a brief period positive correlation between money and equity may reemerge, but usually by then monetary policy starts easing, and money and output again get negatively correlated until a new expansion phase sets in.

Figure 34: Stylized Interaction between Money and GDP/Equity Market: Positive Correlation More Often than Negative but Likely Negative During Periods of Economic Stress



Source: J.P. Morgan Quantitative and Derivatives Strategy.

Obviously, our stylized description is only an approximation of reality. However, it does suggest that if we are building a country selection signal based on money growth we either anticipate the cyclical turning points across countries (a tall ask) or at a minimum adjust money growth to take into account its interaction with the economic output or GDP, the latter approach is used as the signal's building block.

Free Liquidity or Marshallian-K is the change in the ratio of Money Stock to GDP. Free Liquidity is likely to be positively correlated with future change in the equity market

Free Liquidity or Marshallian-K is typically defined as the change in the ratio of broad money supply and nominal GDP and is expected to be positively related to future performance of the equity market. The intuition behind this hypothesis suggests that money growth, *not* devoted to mundane GDP related transactions, is available or "freed up" for use in asset markets. An increase in Free Liquidity implies that money supply is growing faster than economic growth and thus generating excess liquidity (over and above transaction needs), which under normal circumstances should be positive for equities. Conversely, if GDP is growing faster than money supply, there is less money available to asset markets and this should be deflationary for asset prices.

In Figure 34, when money growth is slowing and GDP is still growing (box I), Free Liquidity will turn negative which is what we want – the signal would anticipate a decline in equity market reflecting future slowdown in the economy. When money supply picks up and GDP is still slowing (box II in Figure 34), Free Liquidity will start rising. Again, Free Liquidity should start anticipating the upturn in economic growth hopefully in sync or a little bit ahead of a likeminded equity market.

In a nutshell that is the hypothesis behind the Free Liquidity signal. However, reality rarely follows neat plot lines. The lead-lag between money growth and economic output varies. Stock markets have a mixed record in anticipating economic

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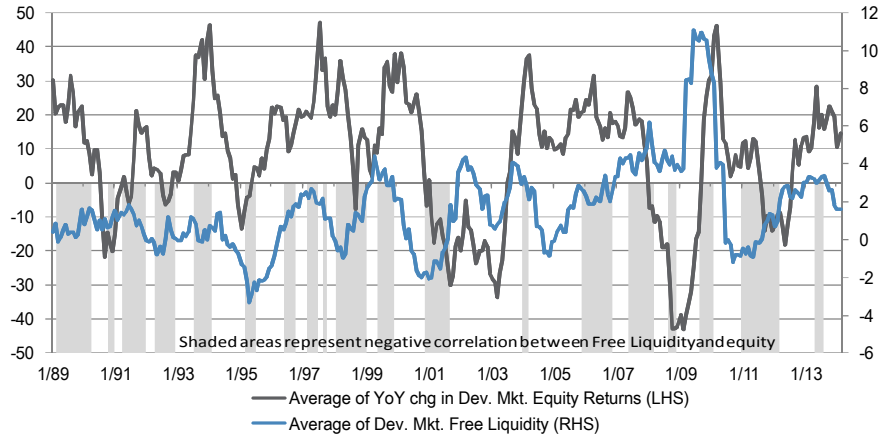
downturns[5]. How closely does Free Liquidity track equity market? Figure 35 plots Free Liquidity versus 12-month change in equity market (similar to Figure 33 above except we replace money growth with Free Liquidity). The percentage of positive and negative correlations does not change a great deal, the split is still around 60% and 40% respectively.

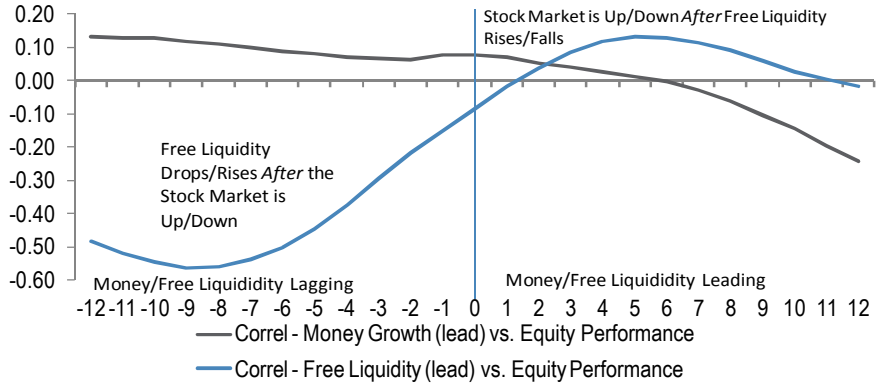
Figure 35: When Free Liquidity Is Used Instead of Money, Periods of Negative Correlation with Equity Market Are Less Concentrated (More Dispersed)



Source: J.P. Morgan Quantitative and Derivatives Strategy.

As expected, replacing money growth with Free Liquidity reduces the *duration* of negative correlation with equity returns during periods of economic stress as the GDP in the denominator helps anticipate stock market reversals. The shaded areas are more interspersed than before. Another implication of using Free Liquidity is seen in Figure 36 which shows that Free Liquidity has a longer lead for the equity market compared to year-on-year money growth. For instance, given that money supply data is typically released with a 2-3 month lag, the Free Liquidity signal exhibits enough of a lead (4-6 months) to the equity market (where their correlation is positive and rising), as compared to Money Growth where the lead dissipates soon after its data release.

Figure 36: Free Liquidity Leads Equity Market by 5 to 6 Months



Source: J.P. Morgan Quantitative and Derivatives Strategy.

[5] Nobel laureate economist Paul Samuelson wryly remarked in a 1966 Newsweek magazine column, "Wall Street indexes predicted nine of the last five recessions!".

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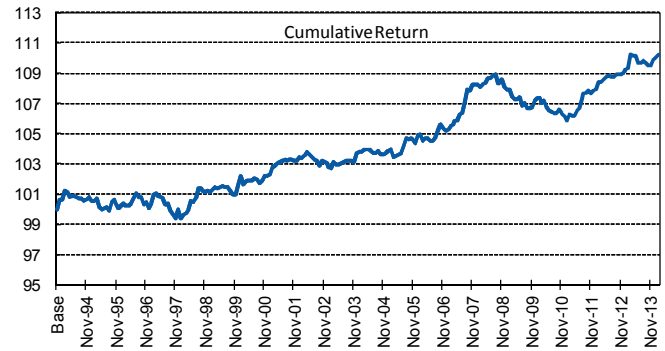
Signal construction involves lagging both GDP and money data by three months and also taking into account differences in volatilities across countries. GDP is available with a 3-month lag except for Sweden and Switzerland which come with a 4 months lag; Money Supply is available with 3 month lag. In Table 17 we report the back results by country and for the total long/short portfolio based on this signal targeting ex-ante 1% risk. An IR of 0.56, win ratio of 56% and generally consistent performance after 1998 makes Free Liquidity an attractive signal. In the typical stock selection framework (5 long countries / 5 short countries) the IR of the long/short portfolio is 0.44 while the win ratio is about the same at 56%.

Table 17: Performance Statistics: Free Liquidity Factor With Target Risk of 1%

Total Period: 12/31/1993 to 3/31/2014 Portfolio Statistics				
Portfolio	**Ann Return**	**Ann St Dev**	**IR**	**% Out Perf.**
AU	-0.07%	0.18%	-0.39	45.90%
CA	0.01%	0.18%	0.08	52.87%
CH	0.03%	0.26%	0.13	52.05%
DE	0.08%	0.21%	0.40	50.41%
ES	0.04%	0.24%	0.16	49.18%
FR	0.01%	0.14%	0.09	48.36%
GB	0.03%	0.18%	0.16	49.59%
HK	0.08%	0.30%	0.27	52.46%
IT	0.04%	0.27%	0.16	50.82%
JP	-0.03%	0.31%	-0.09	45.90%
NL	0.00%	0.16%	0.03	48.36%
SE	0.04%	0.27%	0.16	52.05%
SG	0.12%	0.25%	0.48	56.56%
US	0.06%	0.18%	0.34	55.74%

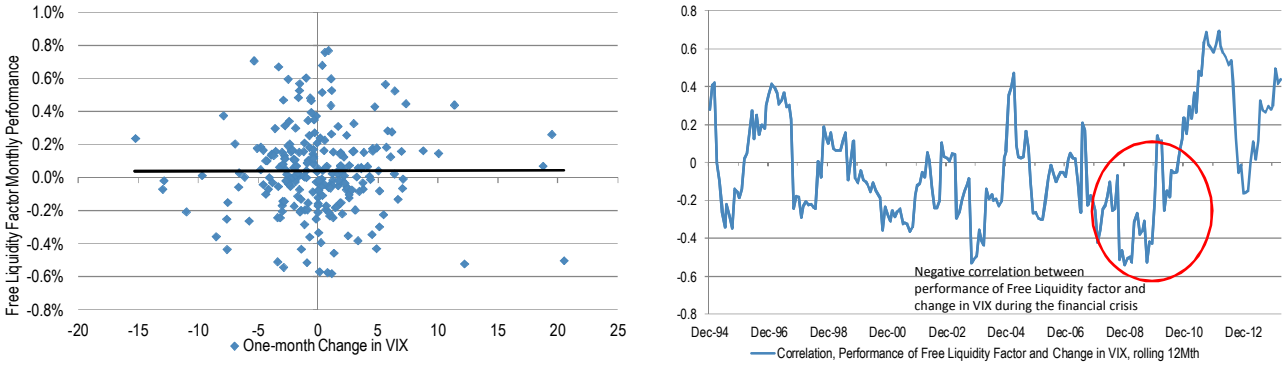
Long Short Signal Statistics Free Liquidity Signal				
	Ann Ret	**IR**	**Ann St Dev**	**% Out Perf.**
Long/Short	0.5%	0.56	0.9%	**56%**
	T-Stat	**Avg IC**	**Turnover**	**Avg Assets**
Long/Short	**2.50**	3.4%	56%	14



Source: J.P. Morgan Quantitative and Derivatives Strategy.

The maximum drawdown of the strategy occurred from August 2008 to January 2011, a period of extreme risk aversion covering the developed market financial melt down as well as government debt crisis in the Euro zone. In this atypical downturn the lead-lag relationships between monetary stimulus, economic cycle and relative equity performance were unstable. On average, the factor was long UK, France, Italy, Netherlands and Canada while being short Germany, Spain, Sweden, Australia and Singapore. In this risk-averse environment, Sweden, Hong Kong and Singapore outperformed Euro zone countries even though the strength of Free Liquidity in these countries over this period was lower. In general there is no long term relationship between market volatility and the performance of the signal. To illustrate this, Figure 37 plots the rolling correlation between change in VIX and the Free Liquidity performance. The average rolling correlation is close to zero, however at times of stress, like 2000-01 and 2008-10, the correlation can drop to a low of about -0.5.

Figure 37: The Long Term Correlation between Free Liquidity Factor and Changes in VIX Is Zero But the Correlation Became Negative During the Financial Crisis



Source: J.P. Morgan Quantitative and Derivatives Strategy.

Leading Economic Indicator

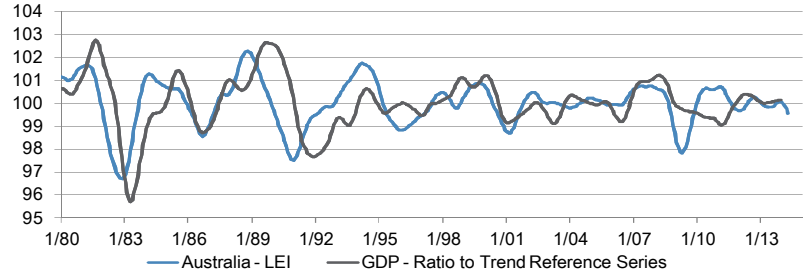
Signal Motivation: *Rising LEI indicates strengthening economic activity. Countries with higher LEI are likely to outperform. The signal works best when fundamentals like earnings and economic growth are driving the stock market.*

OECD Leading Economic Indicators are a good factor to capture the general economic cycle as a driver of equity markets

One of the least controversial drivers of equity markets is the general condition of the economy, including its current and future trajectory. The difficulty is that in real time the state of the economy is not known – it takes several months before an accurate assessment of the strength of the economy becomes recognized. Leading economic indicators (LEIs) are a natural solution to this dilemma - by construction they are designed to predict the economic cycle. Indeed, lagging stock market return is typically part of most LEIs. The Organization for Economic Co-operation and Development (OECD) uses a consistent methodology to construct composite leading indicators[6] (CLIs) for its member countries and large developed markets. The LEIs or CLIs as OECD prefers to call them, track economic growth with a lead of 5 to 6 months. There are three versions of CLIs produced by OECD out of which one of them, the *amplitude adjusted* CLI (de-trended series), is optimized to have reasonably consistent turning point lead over the reference GDP series. For this reason we have used it to build this signal.

In Figure 38, as an example, there is a plot of detrended Australian GDP versus Amplitude Adjusted LEI. Based on correlations of lead-lag LEIs with the GDP series, Australian LEI leads the GDP series by 7 to 8 months.

Figure 38: Example: Australia LEI and GDP, Both Detrended. The LEI Leads by 7 to 8 Months



Source: J.P. Morgan Quantitative and Derivatives Strategy.

[6] OECD leading indicators: http://stats.oecd.org/Index.aspx?DataSetCode=MEI_CLI

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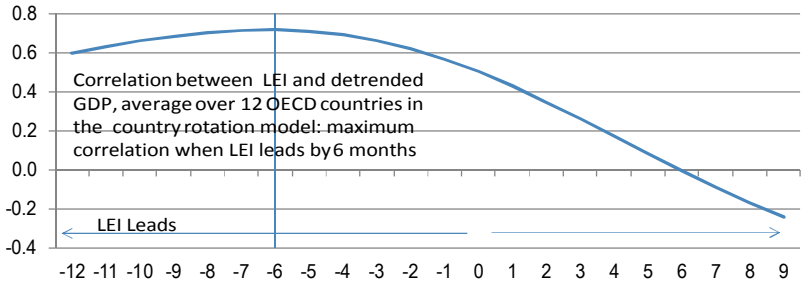
Hong Kong and Singapore are excluded for this signal since an OECD constructed LEI is unavailable

In Figure 39, average correlation of LEI and GDP are shown with the average taken over 12 countries in the OECD (excluding Hong Kong and Singapore which are not OECD members).

Figure 39: On Average LEIs Lead GDP by 6 Months

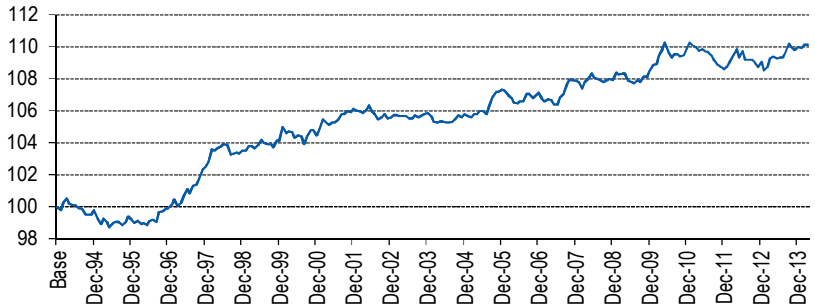


Source: J.P. Morgan Quantitative and Derivatives Strategy.

A simple momentum trade in LEI produces a country long-short portfolio with IR 0.55 and monthly hit ratio of 54%

Since the LEIs are already optimized to capture the turning point of the economy, we suspected that little transformation would be needed to use them as a factor. As the OECD reports the LEI with two months lag, the data was adjusted accordingly. A simple model taking momentum in the LEIs as driver of the stock market produces fairly consistent performance with an IR of 0.55 and a hit ratio of 54% - Figure 40

Figure 40: Momentum in OECD LEI as a Signal For Country Selection Results in a Solid IR of 0.55 and a Hit Ratio of 54%



Source: J.P. Morgan Quantitative and Derivatives Strategy.

Fly in the ointment: LEIs are subject to revision as better estimates of underlying macro series become available

However, there is one problem in using the OECD LEIs as is. Astute readers may be aware that any indicator based on macroeconomic time series is subject to revision in the months following the release as new information allows the statistical offices to provide more accurate estimates of underlying macroeconomic data. Signals based on financial real time data do not suffer from such a hind sight bias since they are very rarely revised, if at all. The hindsight bias in macro data can be particularly problematic for leading indicators which are explicitly optimized to identify turning points in the economy. For this reason, it makes sense to use real time data for such an indicator. Fortunately, month-by-month vintage data for LEIs is available and was used to conduct the back test. One short coming of this data is that history is relatively short – starting in January 2001 instead of December 1993 which was used for most of our factors. Nonetheless, an accurate assessment of the predictive power of the factor requires using real time data.

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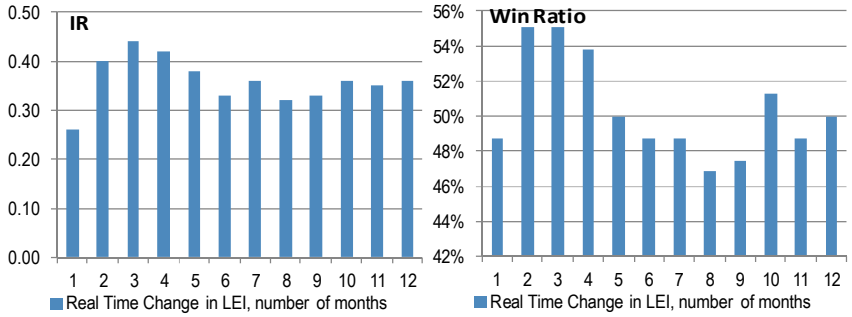
Figure 41: Using Real Time Data for Back Test (2001-2014): Performance Based on Changes in LEI to Predict Relative Stock Market Performance - Works Best for Shorter Term Change in LEI



Source: J.P. Morgan Quantitative and Derivatives Strategy.

Using real time data suggests shorter term change in LEI is optimal for predicting stock market

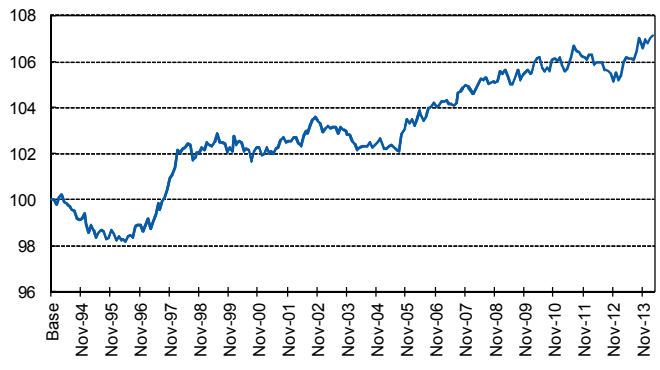
Figure 41 shows the result of using real time data – the back test is conducted using 1-month to 12-month change in the Amplitude Adjusted Composite Leading Indicators as they were reported at that point in time. The one-month change still results in a positive IR but the win ratio is less than 50%. The result for 2-month and 3-month change in LEI is higher and the win ratio is well above 50%.

The performance statistics of Leading Economic Indicator signal is in Table 18.

Table 18: Performance Statistics: Leading Economic Indicator Signal With Target Risk of 1%

Total Period 12/31/1993 to 4/30/2014 Portfolio Statistics				
Portfolio	Ann Return	Ann St Dev	IR	% Out Perf.
AU	0.02%	0.19%	0.11	50.82%
CA	0.07%	0.22%	0.34	50.00%
CH	-0.02%	0.21%	-0.08	55.33%
DE	0.05%	0.18%	0.27	52.05%
ES	0.02%	0.24%	0.09	50.00%
FR	-0.02%	0.13%	-0.13	48.36%
GB	0.00%	0.11%	-0.04	45.90%
HK				
IT	0.05%	0.30%	0.16	51.23%
JP	0.09%	0.35%	0.25	50.82%
NL	-0.01%	0.11%	-0.06	48.77%
SE	0.02%	0.34%	0.07	50.41%
SG				
US	0.04%	0.15%	0.25	49.18%

Long Short Signal Statistics Leading Economic Indicator Signal				
	Ann Ret	IR	Ann St Dev	% Out Perf.
Long/Short	0.3%	**0.41**	0.8%	55%
	T-Stat	**Avg IC**	**Turnover**	**Avg Assets**
Long/Short	**1.87**	3.1%	55%	14



Source: J.P. Morgan Quantitative and Derivatives Strategy.

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Technical/Sentiment Strategies

Technical/Sentiment factors are the residual factors driving country rotation – not explicitly related to macro developments or fundamentals. Their performance is rationalized by investor behavior like over reaction, under reaction, herding etc

Absolute Equity Momentum and Implied Volatility are Technical signals, and Earnings Sentiment Trend is a Sentiment signal. They are covered in this section of the report and round up the Country Rotation Model. In a sense, Technical/ Sentiment factors are the residual drivers of the model – these are factors that are not directly linked to either macro developments or fundamentals. The efficacy of these factors is rationalized by investor psychology – sentiments like overreaction or under reaction to new information, investor overconfidence, herding behavior etc. Recent research suggests that many of these observed behaviors can be explained as the consequence of rational allocation of investors' attention to cope with the immense amount of market, industry and stock-specific information being generated continuously. So for instance, overreaction to a piece of bad news (e.g. bankruptcies) is more likely in high volatility period than in a low volatility period.

Absolute Equity Momentum

***Signal Motivation**: Countries with high equity momentum are preferred over those with low momentum. Further, the signal uses a country's absolute momentum, a simple but effective way of implicitly hedging potential momentum reversals from the extreme left tail of the price distribution. Signal may struggle in the unlikely event of a prolonged sell off.*

Price momentum, as the name inherently suggests, is based on the persistence of returns. In fact, the effectiveness of price momentum depends on past winners continuing to win and similarly past losers continuing to lose. In a stable, trending market environment, this strategy is known to deliver attractive performance. However, its risk lies in the occasional significant draw-downs at market inflection points, with losses which can at times exceed profits accumulated over several prior years. In our experience, this problem arises due to a pre-determined look-back window for the trend estimation (normally 12 months), which cannot adapt easily to a sudden shift in market sentiment. Having a shorter-window is a potential solution, but it is likely to capture price reversal effects rather than momentum effects.

A simple Price Momentum signal applied to the 14 developed markets appears ineffective: it worked for a few years (1996-98), underperformed till 2002 and has been flat since then

How well or poorly does a simple 12 month price momentum signal for country selection perform? Table 19 summarizes the key performance statistics for the signal. The back-test shows that a simple price momentum has yielded very small profit for the last 20 years or so, generating an IR of 0.14. As the return table shows, on a relative basis, Sweden (SE) has delivered compelling performance along with Switzerland (CH) and Spain (ES) to a lesser extent. But countries such as Canada (CA), Germany (DE), Great Britain (GB) and Hong Kong (HK) have detracted value.

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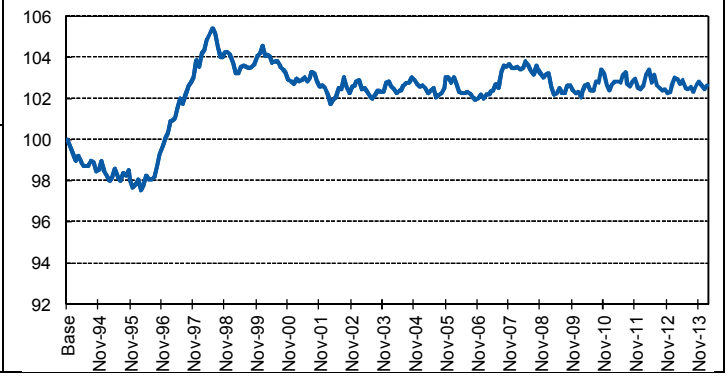
Table 19: Performance Statistics: 12 Month Price Momentum – Normalized with 1% Risk Target

Total Period: 12/31/1993 to 3/31/2014 Portfolio Statistics				
Portfolio	Ann Return	IR	Ann St Dev	% Out Perf.
AU	0.0%	0.05	0.2%	48%
CA	-0.1%	-0.35	0.3%	46%
CH	0.1%	0.31	0.2%	55%
DE	-0.1%	-0.30	0.2%	52%
ES	0.1%	0.29	0.4%	52%
FR	0.0%	-0.08	0.1%	51%
GB	-0.1%	-0.39	0.1%	42%
HK	-0.1%	-0.29	0.4%	46%
IT	0.0%	-0.10	0.4%	51%
JP	-0.1%	-0.14	0.4%	49%
NL	0.0%	0.00	0.2%	50%
SE	0.3%	0.76	0.4%	56%
SG	0.1%	0.12	0.4%	51%
US	0.1%	0.23	0.2%	55%

Long Short Signal Statistics Simple 12 Month Price Momentum				
	Ann Ret	IR	Ann St Dev	% Out Perf.
Long/Short	0.1%	**0.14**	1.0%	53%
	T-Stat			**Avg Assets**
Long/Short	**0.62**			14



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Extended price momentum improves on simple price momentum as a country selection strategy but the performance of the signal has not been persistent

There have been numerous alternatives that attempt to address the unexpected price reversal such as price momentum with one month price reversal, price momentum with time-varying window, conditioned price momentum, etc. In our earlier work on Extended Price Momentum[7] relating to US *stock selection*, we introduced some well known techniques along with new ones we found to be valuable. Commonly, at market inflection points, unexpected large outperformance of assets that are expected to underperform (due to strong negative price momentum) is the culprit driving the loss in performance. One popular alternative is to extend 12 month price momentum by incorporating a one month price reversal component, which is then scaled by recent return volatility. This essentially suppresses the size of bets for countries with high level of uncertainty. This reconstruction delivers better performance but incurs much higher turnover (204% vs. 95% on annual basis).

Table 20 shows the key performance statistics of the Extended Price Momentum Signal used for country selection. Although the extended momentum version provides a positive performance since the latest financial crisis (annual return of 0.4% with 1% targeted annual risk), it had underperformed most of the prior ten years. These models highlight difficulties facing price trend following strategies for country selection.

[7] Enhanced Price Momentum, Viewing Price Momentum through the Lens of Market Breadth and Depth, 28 September, 2012.

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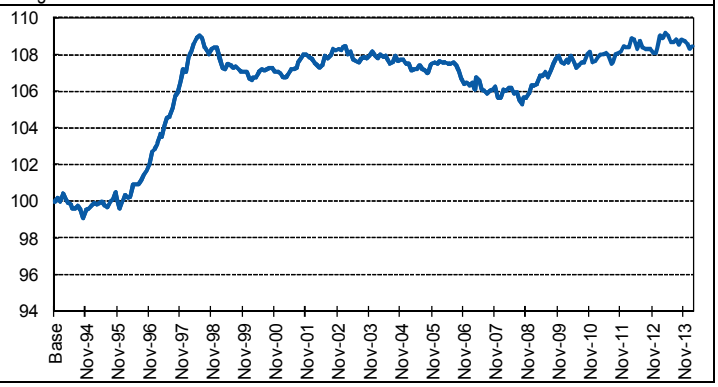
Table 20: Performance Statistics: Extended Price Momentum (Volatility Adjusted 12 Month Price Momentum with One Month Reversal) - Normalized with 1% Risk Target

Total Period: 12/31/1993 to 3/31/2014 Portfolio Statistics				
Portfolio	Ann Return	IR	Ann St Dev	% Out Perf.
AU	0.2%	0.62	0.3%	60%
CA	0.0%	0.01	0.3%	47%
CH	0.1%	0.43	0.3%	53%
DE	0.1%	0.16	0.7%	58%
ES	0.2%	0.38	0.5%	56%
FR	0.0%	-0.29	0.1%	44%
GB	0.0%	-0.32	0.2%	43%
HK	-0.1%	-0.23	0.4%	43%
IT	0.1%	0.27	0.3%	55%
JP	-0.1%	-0.16	0.4%	49%
NL	0.0%	-0.10	0.3%	50%
SE	-0.2%	-0.46	0.4%	44%
SG	0.1%	0.25	0.4%	53%
US	0.1%	0.37	0.2%	53%

Long Short Signal Statistics Extended Price Momentum				
	Ann Ret	IR	Ann St Dev	% Out Perf.
Long/Short	0.4%	**0.46**	0.9%	52%
	T-Stat			**Avg Assets**
Long/Short	**2.05**			14

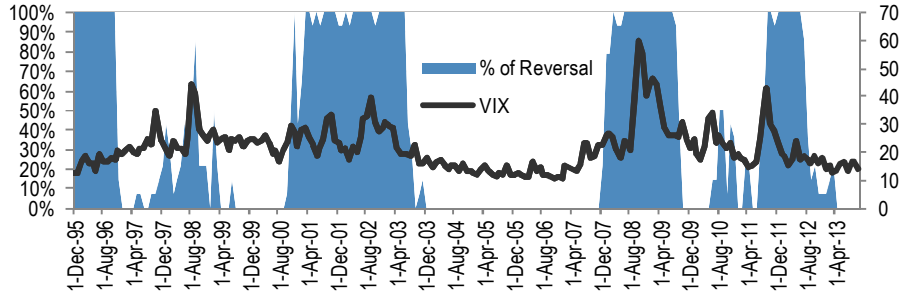


Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Absolute Momentum combines the traditional price momentum with a simple but effective hedge or insurance to cover times when abrupt market reversal could potentially lead to large losses

Furthermore, the research report, *Enhanced Price Momentum (Sep 2012),* discussed a signal that takes *absolute* values of price momentum of stocks and constructs long/short portfolios based on them. This is a naïve and indirect way of hedging unexpected relative outperformance of the countries residing in the left-tail of the joint price momentum distribution. In other words, if countries that have shown strong negative price momentum suddenly exhibit relatively superior performance compared to their peers (i.e. during sharp market reversals), this new construction actually benefits from that exposure since it will take long position in those countries. Figure 42 below illustrates the percentage of long/short cash neutral positions that differ from those of simple price momentum. For instance, if the figure shows 100%, this is a negated (i.e. completely opposite in sign) portfolio of traditional price momentum.

Figure 42: % of Absolute Price Momentum Portfolio That Is Different from Simple Price Momentum Portfolio



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Difference between traditional and absolute momentum increases at higher VIX levels

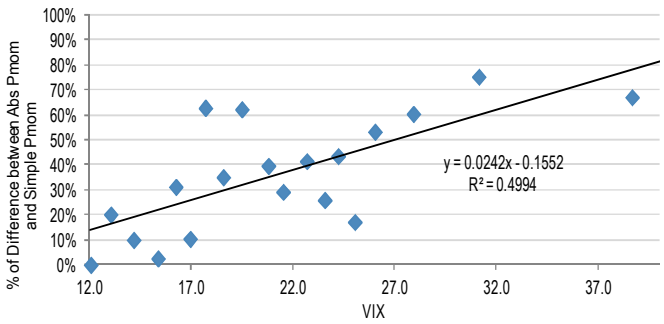
To further explore the difference in the behavior of absolute and traditional price momentum under alternate volatility regimes, we divided the historical level of VIX into 20 groups (approximately 11 observations in each bucket) and computed the corresponding average percentage differences between the two strategies. The result

indicates that there is a linear relationship between these two data sets, producing R-Square of 0.5 – see right panel in Figure 43. As market uncertainty rises (using VIX as a global risk sentiment), we are likely to buy countries that we would sell under the traditional price momentum signal.

In other words, we would long some countries with sharp price declines as fear mounts and the signal would position for potential market turnarounds. This also indicates a downside of this signal. If the market, on a relative basis, goes through a prolonged decline, our long "chronic loser" positions can result in significant losses.

Figure 43: VIX vs. Diff in Performance of Absolute PMOM and Simple PMOM

VIX Range (twentiles)	% of Diff between Abs Pmom and Pmom	VIX Range (twentiles)	% of Diff between Abs Pmom and Pmom
VIX > 12.06	0%	20.79 <= VIX < 21.52	29%
12.06 <= VIX < 13.05	20%	21.52 <= VIX < 22.68	42%
13.05 <= VIX < 14.17	10%	22.68 <= VIX < 23.56	26%
14.17 <= VIX < 15.37	3%	23.56 <= VIX < 24.22	44%
15.37 <= VIX < 16.24	31%	24.22 <= VIX < 25.04	17%
16.24 <= VIX < 16.95	10%	25.04 <= VIX < 26.03	53%
16.95 <= VIX < 17.70	63%	26.03 <= VIX < 27.92	60%
17.70 <= VIX < 18.58	35%	27.92 <= VIX < 31.14	75%
18.58 <= VIX < 19.49	62%	31.14 <= VIX < 38.67	67%
19.49 <= VIX < 20.79	40%	38.67 <= VIX < 59.89	



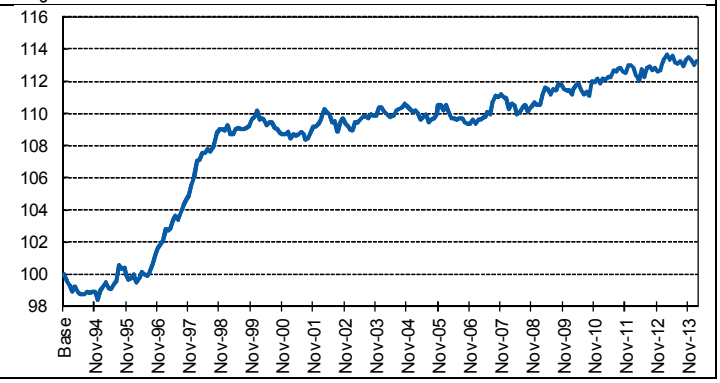
Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Overall, the absolute price momentum signal generated an attractive performance compared to aforementioned two strategies. It produced IR of 0.63 with annual turnover of 128%. Equally important, the cumulative performance of the signal is more persistent and incurs lower drawdown than the other momentum strategies discussed above.

Table 21: Performance Statistics: Absolute Price Momentum Signal - Normalized with 1% Risk Target

Total Period: 12/31/1993 to 4/30/2014 Portfolio Statistics				
Portfolio	**Ann Return**	**Ann St Dev**	**IR**	**% Out Perf.**
AU	0.01%	0.16%	0.06	53.28%
CA	-0.02%	0.14%	-0.11	46.31%
CH	0.05%	0.14%	0.39	52.87%
DE	-0.03%	0.13%	-0.27	46.72%
ES	0.08%	0.24%	0.33	52.87%
FR	0.02%	0.08%	0.18	51.64%
GB	0.01%	0.09%	0.13	52.87%
HK	0.15%	0.31%	0.50	53.69%
IT	0.05%	0.26%	0.18	53.28%
JP	0.04%	0.34%	0.12	50.82%
NL	0.01%	0.12%	0.05	49.59%
SE	0.03%	0.29%	0.11	52.46%
SG	0.18%	0.24%	0.74	59.43%
US	0.02%	0.14%	0.16	53.28%

Long Short Signal Statistics Absolute Equity Momentum Signal				
	Ann Ret	**IR**	**Ann St Dev**	**% Out Perf.**
Long/Short	0.6%	**0.63**	1.0%	57%
	T-Stat	**Avg IC**	**Turnover**	**Avg Assets**
Long/Short	**2.81**	5.5%	128%	14



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

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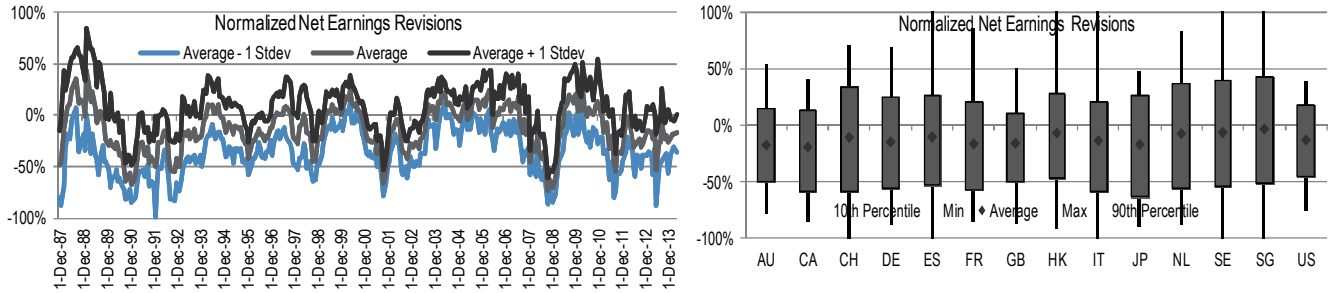
Earnings Sentiment Trend

***Signal Motivation**: This confirming signal uses under-reaction in analysts' opinions for country selection. Countries with improving earnings sentiment are expected to outperform. However, the signal may be less effective around market inflection points, when analyst opinions may not be as reactive.*

Earnings Sentiment Trend signal captures the momentum trend in forward earnings revisions. It is a popular strategy, especially among stock investors as it summarizes the opinion of a pool of informed individuals, bringing together unique and valuable insight. As expected, revisions tend to be higher during earnings season as new company information is made public. However, revisions outside of earnings periods also carry valuable information.

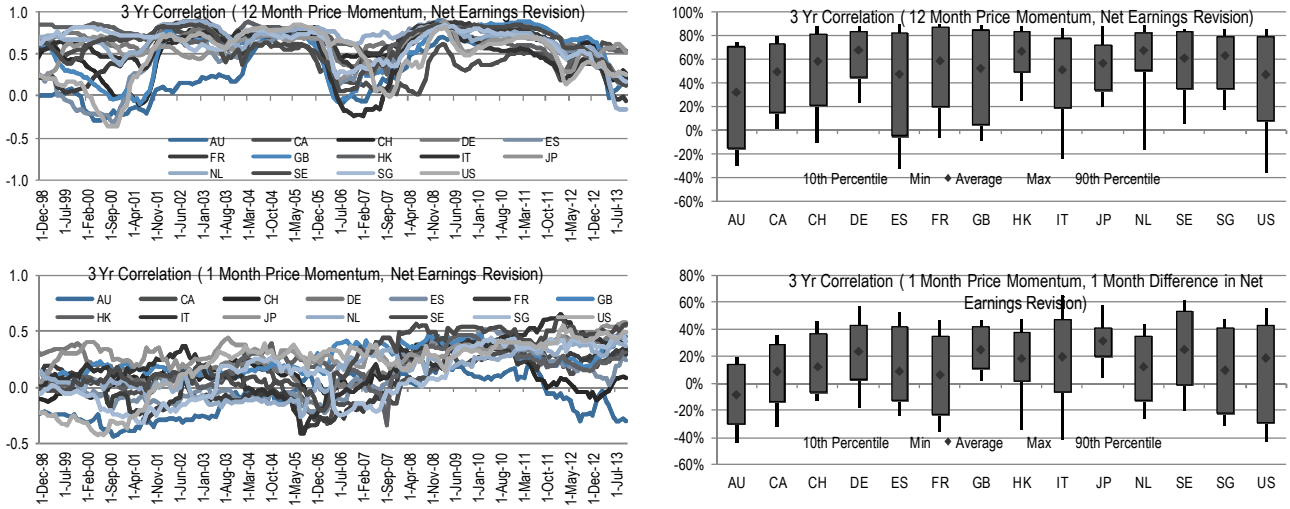
Figure 44: Normalized Earnings Sentiment (Level and 1 Month Difference)



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Careful observation reveals that earnings sentiment shares a lot of similarities with stock momentum, as analysts may often use stock price to confirm their view. For instance, periods of positive earnings sentiment coincides with strong markets, while, negative earnings sentiment periods are more aligned with market downturns.

Figure 45: Correlation between Earnings Sentiment and Price Momentum



Source: Bloomberg, DataStream, J.P. Morgan Quantitative and Derivatives Strategy.

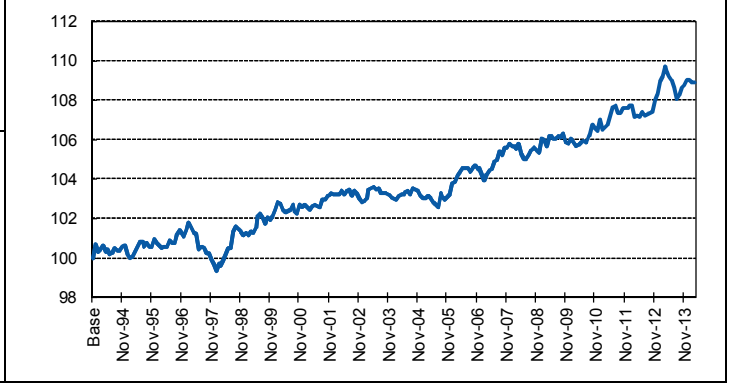
The above charts show 3 year rolling correlation between 12 months price momentum and earnings sentiment as well as that of 1 month price momentum and

month-over-month change in earnings sentiment. The former shows a positive relationship between earnings sentiment and long-term momentum across most countries, where Germany showed highest average correlation (70%) and Australia the lowest (32%). The latter illustrates that by incorporating the change in earnings sentiment, the positive relationship to short-term momentum (as well as long-term momentum, not shown in above charts) wanes, making it a differentiated yet still predictive signal for country selection.

Table 22: Performance Statistics: Earnings Sentiment Trend Signal - Normalized with 1% Risk Target

Total Period: 12/31/1993 to 4/30/2014 Portfolio Statistics				
Portfolio	Ann Return	Ann St Dev	IR	% Out Perf.
AU	0.00%	0.18%	0.00	49.18%
CA	0.00%	0.22%	0.02	51.23%
CH	0.02%	0.18%	0.10	53.69%
DE	-0.01%	0.14%	-0.07	52.05%
ES	0.07%	0.26%	0.29	52.05%
FR	0.03%	0.11%	0.30	55.33%
GB	0.03%	0.12%	0.25	52.46%
HK	0.12%	0.30%	0.41	52.05%
IT	0.00%	0.28%	-0.01	48.77%
JP	0.05%	0.26%	0.20	43.85%
NL	0.01%	0.18%	0.05	50.00%
SE	-0.04%	0.28%	-0.15	47.95%
SG	0.14%	0.28%	0.51	57.38%
US	-0.01%	0.16%	-0.09	53.28%

Long Short Signal Statistics Net Earnings sentiment Trend Signal				
	Ann Ret	IR	Ann St Dev	% Out Perf.
Long/Short	0.4%	**0.49**	0.9%	55%
	T-Stat	**Avg IC**	**Turnover**	**Avg Assets**
Long/Short	**2.23**	3.6%	448%	14



Source: Bloomberg, J.P. Morgan Quantitative and Derivatives Strategy.

Implied Volatility

Signal Motivation: *Market declines are usually accompanied by a spike in volatility. This contrarian signal exploits investor overreaction by favoring countries with a larger spike in long term implied volatility. This contrarian relationship may weaken when the underlying driver of volatility unfolds slowly.*

In this section we propose a country selection signal based on relative implied volatility among countries

A wide variety of assets including individual stocks, bonds and commodities use volatility as a trading signal[8]. Stock market volatility and its performance are typically inversely related in the same period – a decline in stock index is contemporaneously accompanied by a spike in volatility and vice versa. The intensity of the negative correlation between volatility and returns varies over time and also by country. For instance, Figure 46 shows that the correlation between 1-month *realized* volatility (based on daily returns) and monthly equity returns for each of the countries at lag 0 (same month) is significantly negative over the period 1980-2014. The t-statistics[9] of the sample correlation varies between -3.6 (Japan) to -9.2 (Germany). The correlation between volatility and returns is much smaller (in absolute terms) once volatility and returns are not coincident (i.e. at lag -1 or +1).

[8] Please see "Systematic Strategies Across Asset Classes, Risk Factor Approach to Investing and Portfolio Management", Marko Kolanovic and Zhen Wei, December 2013, pgs 44-49 for many examples of volatility based strategies.

[9] t-stat = r*sqrt(n-2)/sqrt(1-r*r) where r is the sample correlation and n is observations (n=411)

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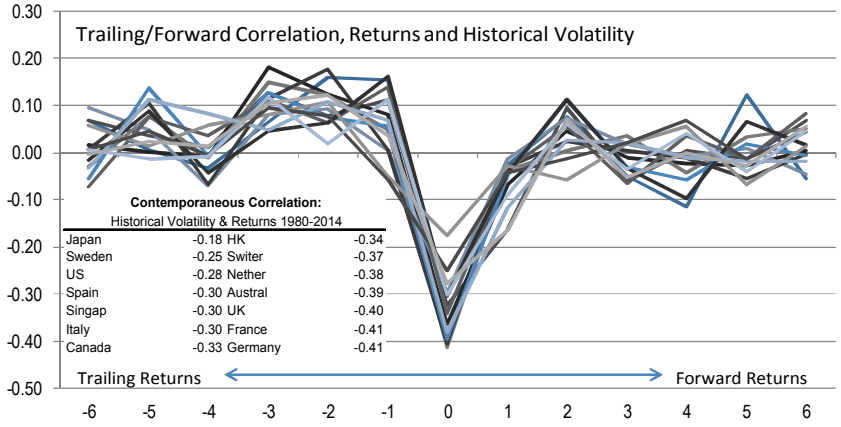
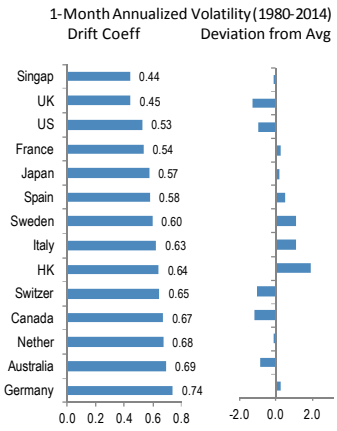
Interestingly the correlation between 1-month volatility and *trailing* returns is moderately positive over the period with correlation being significant (t-stat > 2) for eight out of fourteen countries at three month lag. This suggests that for most countries in our sample, higher returns are followed by a drop in volatility and negative returns are followed by a spike in volatility.

Figure 46: Correlation between Monthly Returns and Monthly Change in 1-Month Historical Volatility (Jan-1980 to Apr-2014)



Source: J.P. Morgan Quantitative and Derivatives Strategy.

On average, stock markets of English speaking countries and Switzerland have had lower historical volatility in the years 1980 to 2014



Average long run historical volatility mean reverts faster in Singapore, UK, and US; it is slowest in Germany, Australia and Netherlands

Furthermore, stock market volatilities have a fair degree of stickiness – it seems meaningful to think of certain countries "on average" having higher market volatility compared to others for extended period of time. As the figure in the sidebar shows, over the period 1980-2014, relative to the 14 country average, volatility was higher for Hong Kong, Sweden, Italy, Spain and Germany and below for mostly English-speaking countries.

More importantly, volatility tends to persist. To estimate the long-run persistence coefficient of volatility a simple autoregressive (AR) regression on monthly data was used and countries were then ranked by the AR beta[10]. Based on this measure, the persistence of volatility is the lowest for Singapore, UK, US, France and Japan (low sum of AR coefficients), i.e. volatility decreased back to its long term average relatively quickly and the highest for Germany, Australia, Netherlands, Canada and Switzerland (higher sum of AR coefficient). Notice that the sum of AR coefficients is all positive and sufficiently lower than 1, ranging between 0.44 and 0.74. The coefficient should be expected to be below 1, otherwise (at least theoretically) volatility could drift to infinity. The lower the drift coefficient, the faster the effect of any temporary rise in volatility will dissipate and decay back to historical mean. This persistence measure describes the long run behavior of the stock markets of these countries - at any point in time country specific factors could result in faster or slower dampening of volatility than suggested by the drift coefficient.

[10] To be precise, one should estimate ARCH model using daily returns to estimate the persistence parameters. In practice we found the long run unconditional volatility of country returns implied by the ARCH model difficult to reconcile with average volatility in sample data. For simplicity, we estimated AR(1), AR(2), AR(3) and AR(4) on monthly volatility to get a rough estimate of volatility persistence. The statistical significance of coefficients suggested that AR(2) is the best model.

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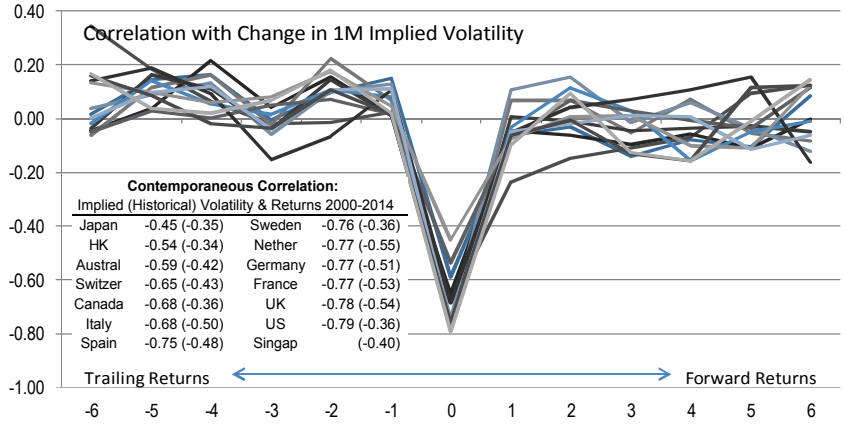
Implied volatility is more highly correlated with trailing and contemporaneous equity returns, though its history is shorter

With the growing availability of option contracts on country index, it is easy to extend the analysis from historical volatility to implied volatility derived from the price of at-the-money (ATM) contracts. Implied volatility is available for all countries except Singapore with the data for nine countries starting in August 2000. Implied volatility, despite shorter history, can be used to carry out analysis similar to the one above done for historical volatility. Interestingly, the negative correlation between contemporaneous returns and implied volatility is much stronger than correlation of returns and historical volatility shown in Figure 47. It shows the lead/lag correlation between change in 1-month implied volatility and returns. It is striking how large the discrepancy between the implied and historical correlations with returns is for the US, Sweden and Japan. Over this shorter period 8/2000-2/2014, the average correlation between monthly returns and historical volatility is -0.44 while that of monthly returns and implied volatility is -0.69. We also note that the positive correlation between the trailing returns and implied volatility holds just like it did with historical volatility and is a bit higher.

Figure 47: Contemporaneous Correlation between *Implied Volatility* and Equity Returns Is More Negative and Significant than Historical Volatility and Returns



Source: J.P. Morgan Quantitative and Derivatives Strategy.

Like historical volatility, implied volatility displays mean reversion with coefficients of autoregressive regressions adding to less than one. However, the speed of reversion is slower than that of the historical volatility. While the historical volatility drift coefficients ranged between 0.44 and 0.74 (regression from 1980-2014), the implied volatility drift parameters range from 0.73 to 0.88 (regression 2000-2014).

Volatility signal: long countries with large jump in implied volatility, short those with the smallest change

The fact that historical and implied volatilities tend to mean revert and are contemporaneously negatively correlated with market returns, suggest a way of constructing a country selection signal. A spike in volatility should coincide with a decline in equity prices. As volatility reverts, its decline will be in proportion to its previous period spike. Because volatility and returns are inversely related, the country with higher volatility is likely to perform better than a country with lower volatility in the prior month. Figure 48 displays the back-test performance of this signal – long countries with higher than average spike in implied volatility and short countries with lower than average spike in implied volatility.

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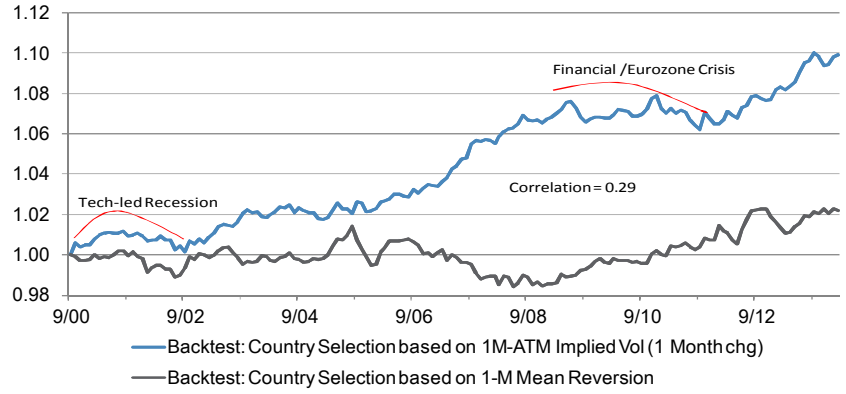
Figure 48: Two Hypothetical Back-Tests: 1. Volatility Based: Long Countries with Larger than Average Jump in Implied Volatility; Short Those with Smaller than Average Jump. 2. Mean Reversion: Long Countries with the Smaller Monthly Return and Short Countries with Larger Monthly Return. Implied Volatility Works Much Better.



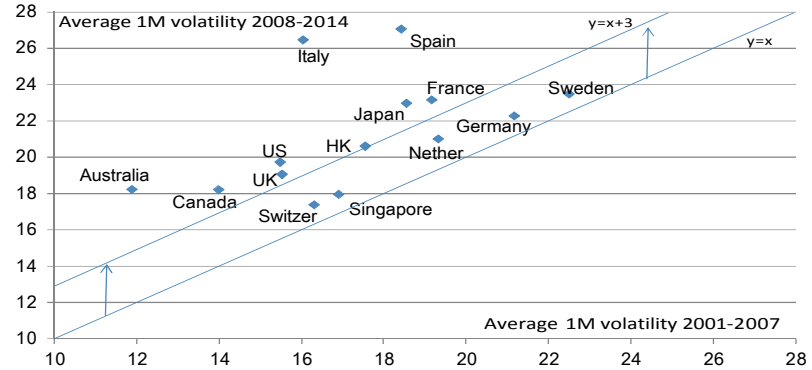
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Could the excess return from implied volatility simply be mean reversion of returns in disguise? Figure 48 also plots the performance of a simple short term mean reversion signal where countries that have done badly in the prior one month are held long while outperforming countries are held short. While the two strategies are correlated at times, the long term correlation is only 0.29. So what else can explain the performance of the volatility signal? One plausible explanation is that investing in countries experiencing a spike in volatility earns a premium because investors need to be compensated for taking the risk that volatility could keep rising instead of mean reverting.

Volatility ranking and mean reversion can be affected by country specific or global events

Mean reversion of volatility may not happen quickly during a recession or a crisis when the negative surprises are persistent. For instance, volatility in Italy and Spain jumped much higher than the other countries in recent post-Financial Crisis years. Investor anxiety regarding the ballooning public debt in Italy and Spain, along with rising worry about an imploding Euro currency union led to sustained higher than average jump in volatility. Figure 49 plots pre-Crisis (2001-2007) and post-Crisis (2008-2014) average 1-month annualized volatility of the countries in the model. If a country was on the line "y=x", its average volatility would be unaffected by the crisis. No country can claim that honor - all of them are above this line.

Figure 49: Shift in Implied Volatility For Italy and Spain After the Financial Crisis (2008-2014) Far Exceeded the Average Country's Increase in Volatility from Pre-Crisis (2001-2007) Level



Source: J.P. Morgan Quantitative and Derivatives Strategy.

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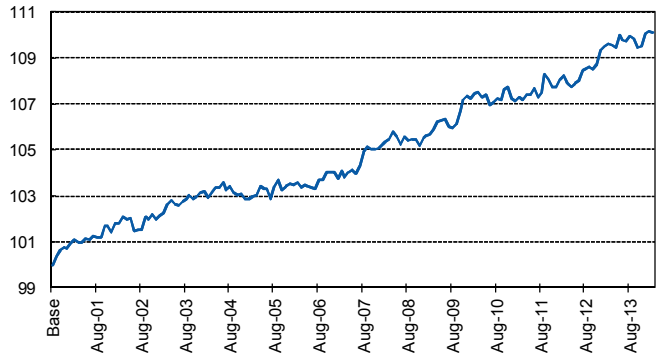
Excluding Italy and Spain, the average volatility of the remaining twelve countries was 3% higher post-Crisis compared to pre-Crisis. After accounting for this "crisis-induced" shift in volatility - Australia, Canada, UK, US, Japan and France saw their volatility rise above average (over the line "y=x+3") while Switzerland, Singapore, Netherlands, Germany and Sweden had less than average elevation in volatility. Figure 49 shows that from 2008 to 2012 volatility struggled, likely due to higher persistence or less mean reversion in volatility.

Lastly, Table 23 summarizes the back-test results of the Implied Volatility signal for selecting countries.

Table 23: Performance Statistics: Implied Volatility Signal With Target Risk of 1%

Total Period: 9/30/2000 to 3/31/2014 Portfolio Statistics				
Portfolio	**Ann Return**	**Ann St Dev**	**IR**	**% Out Perf.**
AU	-0.01%	0.16%	-0.09	50.62%
CA	0.04%	0.24%	0.16	24.07%
CH	0.01%	0.14%	0.08	55.56%
DE	0.04%	0.14%	0.26	56.17%
ES	0.06%	0.26%	0.24	53.70%
FR	0.04%	0.06%	0.63	55.56%
GB	0.04%	0.08%	0.49	54.94%
HK	0.20%	0.34%	0.59	55.56%
IT	-0.03%	0.14%	-0.21	17.28%
JP	0.18%	0.35%	0.50	56.79%
NL	0.00%	0.12%	-0.04	50.00%
SE	0.07%	0.20%	0.33	37.04%
SG				
US	0.09%	0.11%	0.83	53.09%

Long Short Signal Statistics Implied Volatility Signal				
	Ann Ret	**IR**	**Ann St Dev**	**% Out Perf.**
Long/Short	0.7%	0.91	0.8%	64%
	T-Stat	**Avg IC**	**Turnover**	**Avg Assets**
Long/Short	**3.34**	8.3%	340%	14



Source: J.P. Morgan Quantitative and Derivatives Strategy.

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Future Research Ideas

Other country selection signal ideas worth exploring:

- Level of coupling/decoupling between developed and emerging markets (i.e. using foreign revenue exposures)
- Relationship between short and intermediate term price momentum trends
- Examination of flow data within equities and across asset classes
- Gauging risks within a country based on less-dominant drivers (i.e. using specialized big data), as core drivers could have been priced in
- Estimating crowding/risk concentration within a market using statistical methods
- Change in Purchasing Managers Index as a better leading economic indicator
- Examination of non-conventional bottom-up stock data for country selection (i.e. information from options market, short interest information)
- Term structure of implied volatility as a forward looking risk measure
- Expansion of signals to cross-asset timing (i.e. equity-bond linkage)

Appendix

Performance Analysis - Alternate Specifications to the Country Model

In this section, the performance of several variations of the Regional Equity Framework is presented. The underlying signals in all the models below are the same. The difference in these models along several other dimensions:

1. Coverage:
    a. 14 developed markets (full model)
    b. G7: Canada, France, Germany, Italy, Japan, UK, US
2. Return Series:
    a. Total Return Index (MSCI)
    b. ETF (Exchange Traded Funds)
3. Risk Management:
    a. Target 1% Risk (countries are not equal weighted, long-short basket are cash neutral, but not equally sized).
    b. No explicit risk is targeted. Long/Short Baskets with equal weighted 5 long and 5 short countries (tercile-based portfolios).
4. Rebalance Frequency:
    a. Monthly – default approach covered in this report.
    b. Quarterly - Reported statistics are the average of three models quarterly rebalances done starting in January, February and March.
    c. Semi-Annual - Reported statistics are the average of six model semi-annual rebalances, starting in January, February, March, April, May and June.

Table 24: Performance of Full Model, Target 1% Risk, Monthly Rebalance: Comparison of Total Return Index versus ETF-based Returns

Full Model (Monthly)	Factor	Avg IC	T-Stat	Hit Rate	Turn Over	Avg Ann Ret	Ann StdDev	IR
Total Return Index - Target 1% Risk	Valuation	5.3%	2.98	58%	132%	0.58%	0.87%	0.66
	Macro	9.1%	5.30	61%	175%	1.07%	0.91%	1.18
	Sentiment	9.1%	4.77	62%	359%	0.96%	0.91%	1.06
Model	**Country Rotation Model**	**11.9%**	**7.27**	**67%**	**202%**	**1.34%**	**0.83%**	**1.61**
ETF - Target 1% Risk	Valuation	3.9%	2.23	55%	127%	0.44%	0.90%	0.49
	Macro	7.4%	4.11	57%	158%	0.91%	1.00%	0.91
	Sentiment	5.1%	2.92	57%	326%	0.62%	0.95%	0.65
Model	**Country Rotation Model**	**9.0%**	**5.03**	**59%**	**184%**	**1.03%**	**0.93%**	**1.12**

Source: J.P. Morgan Quantitative and Derivatives Strategy.

Table 25: Performance of Full Model, Tercile Portfolios, Monthly Rebalance: Comparison of Total Return Index versus ETF-based Returns

Full Model (Monthly)	Factor	Avg IC	T-Stat	Hit Rate	TurnOver	Avg Ret LS	StdDev Ret LS	IR	StdDev Ret L	StdDev Ret S	Avg Ret P1	Avg Ret P2	Avg Ret P3
Total Return Index - Tricile	Valuation	5.9%	3.61	62%	20%	0.58%	2.49%	0.80	4.95%	4.48%	0.80%	0.50%	0.22%
	Macro	9.5%	5.20	66%	27%	0.82%	2.46%	1.16	4.63%	4.68%	0.98%	0.36%	0.16%
	Sentiment	9.1%	3.81	61%	59%	0.65%	2.67%	0.85	5.03%	4.32%	0.93%	0.26%	0.28%
Model	**Country Rotation Model**	**12.7%**	**6.01**	**65%**	**36%**	**0.92%**	**2.40%**	**1.34**	**4.78%**	**4.39%**	**1.04%**	**0.33%**	**0.12%**
ETF- Tricile	Valuation	4.7%	2.86	59%	19%	0.52%	2.85%	0.64	5.80%	5.38%	0.81%	0.44%	0.29%
	Macro	7.5%	4.49	64%	24%	0.88%	3.04%	1.00	5.89%	5.36%	1.01%	0.39%	0.13%
	Sentiment	4.8%	3.50	58%	53%	0.66%	2.94%	0.78	5.94%	5.34%	0.93%	0.32%	0.27%
Model	**Country Rotation Model**	**9.8%**	**4.92**	**62%**	**32%**	**0.90%**	**2.85%**	**1.09**	**5.94%**	**5.19%**	**1.03%**	**0.37%**	**0.13%**

Source: J.P. Morgan Quantitative and Derivatives Strategy.

Table 26: Performance of Full Model, Target 1% Risk, Monthly Rebalance, Total Return Index: Comparison of Individual Signals

Full Model (Monthly) - Target 1% Risk	Factor	Avg IC	T-Stat	Hit Rate	Turn Over	Avg Ann Ret	Ann StdDev	IR
Macro	Real Interest Rate	3.2%	1.86	51%	64%	0.37%	0.90%	0.41
	Relative Style	7.6%	3.26	60%	217%	0.71%	0.95%	0.75
	FX Based	4.9%	2.70	55%	99%	0.57%	0.93%	0.61
	Free Liquidity	3.4%	2.44	56%	194%	0.48%	0.88%	0.54
	LEI	3.1%	1.87	55%	146%	0.34%	0.83%	0.41
Valuation	Dispersion Adj Earnings Yield	4.1%	1.95	53%	80%	0.38%	0.88%	0.43
	Dividend Yield Spread	6.1%	1.98	56%	154%	0.46%	0.80%	0.58
Sentiment	Abs 12 Mth Pmom	5.5%	2.81	57%	128%	0.61%	0.99%	0.62
	Net Earnings Revision Trend	3.6%	2.23	55%	448%	0.42%	0.85%	0.49
	Volatility	8.3%	3.34	64%	340%	0.72%	0.79%	0.91
	Valuation	5.3%	2.98	58%	132%	0.58%	0.87%	0.66
	Macro	9.1%	5.30	61%	175%	1.07%	0.91%	1.18
	Sentiment	9.1%	4.77	62%	359%	0.96%	0.91%	1.06
Model	**Country Rotation Model**	**11.9%**	**7.27**	**67%**	**202%**	**1.34%**	**0.83%**	**1.61**

Source: J.P. Morgan Quantitative and Derivatives Strategy.

Table 27: Performance of Full Model, Target 1% Risk, Monthly Rebalance, ETF Returns: Comparison of Individual Signals

Full Model, ETF, Monthly, Target 1% Risk	Factor	Avg IC	T-Stat	Hit Rate	Turn Over	Avg Ann Ret	Ann StdDev	IR
Macro	Real Interest Rate	1.6%	1.21	49%	60%	0.24%	0.88%	0.27
	Relative Style	7.1%	2.89	59%	213%	0.72%	1.04%	0.70
	FX Based	3.5%	1.57	54%	94%	0.35%	0.98%	0.36
	Free Liquidity	2.6%	1.98	53%	176%	0.42%	0.96%	0.44
	LEI	4.2%	2.22	53%	141%	0.45%	0.92%	0.49
Valuation	Dispersion Adj Earnings Yield	3.4%	1.62	53%	75%	0.32%	0.89%	0.36
	Dividend Yield Spread	4.6%	1.25	52%	154%	0.33%	0.90%	0.36
Sentiment	Abs 12 Mth Pmom	3.0%	2.22	52%	113%	0.50%	1.01%	0.49
	Net Earnings Revision Trend	2.2%	1.60	55%	409%	0.31%	0.87%	0.35
	Volatility	4.2%	1.64	55%	340%	0.38%	0.85%	0.45
	Valuation	3.9%	2.23	55%	127%	0.44%	0.90%	0.49
	Macro	7.4%	4.11	57%	158%	0.91%	1.00%	0.91
	Sentiment	5.1%	2.92	57%	326%	0.62%	0.95%	0.65
Model	**Country Rotation Model**	**9.0%**	**5.03**	**59%**	**184%**	**1.03%**	**0.93%**	**1.12**

Source: J.P. Morgan Quantitative and Derivatives Strategy.

Table 28: Performance of G-7, Target 1% Risk, Monthly Rebalance, Total Return Index: Comparison of Individual Signals

G7 (Monthly) - Target 1% Risk	Factor	Avg IC	T-Stat	Hit Rate	Turn Over	Avg Ann Ret	Ann StdDev	IR
Macro	Real Interest Rate	4.2%	2.03	53%	79%	0.43%	0.96%	0.45
	Relative Style	5.1%	1.36	56%	186%	0.27%	0.86%	0.31
	FX Based	1.5%	1.38	51%	84%	0.28%	0.90%	0.31
	Free Liquidity	3.8%	1.56	54%	145%	0.30%	0.87%	0.35
	LEI	3.0%	1.60	52%	121%	0.32%	0.89%	0.36
Valuation	Dispersion Adj Earnings Yield	9.1%	2.94	60%	70%	0.58%	0.88%	0.65
	Dividend Yield Spread	3.0%	1.26	51%	109%	0.31%	0.84%	0.37
Sentiment	Abs 12 Mth Pmom	2.8%	1.60	52%	109%	0.32%	0.90%	0.35
	Net Earnings Revision Trend	2.3%	0.50	53%	354%	0.09%	0.85%	0.11
	Volatility	9.1%	2.51	59%	275%	0.54%	0.79%	0.68
	Valuation	8.4%	3.32	60%	104%	0.68%	0.92%	0.74
	Macro	7.8%	3.38	54%	156%	0.69%	0.92%	0.75
	Sentiment	8.1%	2.96	55%	287%	0.58%	0.88%	0.66
Model	**Country Rotation Model**	**11.9%**	**5.01**	**61%**	**171%**	**1.01%**	**0.91%**	**1.11**

Source: J.P. Morgan Quantitative and Derivatives Strategy.

Table 29: Performance of G-7, Target 1% Risk, Monthly Rebalance, ETF Returns: Comparison of Individual Signals

G7 ETF (Monthly) - Target 1% Risk	Factor	Avg IC	T-Stat	Hit Rate	Turn Over	Avg Ann Ret	Ann StdDev	IR
Macro	Real Interest Rate	2.7%	1.23	49%	75%	0.28%	1.04%	0.27
	Relative Style	4.7%	1.47	52%	180%	0.33%	0.98%	0.34
	FX Based	0.4%	0.45	51%	80%	0.11%	1.04%	0.10
	Free Liquidity	3.3%	1.13	52%	133%	0.24%	0.95%	0.25
	LEI	5.2%	2.08	52%	118%	0.43%	0.93%	0.46
Valuation	Dispersion Adj Earnings Yield	7.6%	2.23	59%	67%	0.47%	0.95%	0.49
	Dividend Yield Spread	0.4%	0.55	49%	109%	0.15%	0.92%	0.16
Sentiment	Abs 12 Mth Pmom	2.0%	1.92	53%	99%	0.41%	0.97%	0.43
	Net Earnings Revision Trend	-0.2%	-0.42	50%	328%	-0.08%	0.91%	-0.09
	Volatility	2.1%	0.34	52%	275%	0.08%	0.87%	0.09
	Valuation	6.4%	2.22	59%	102%	0.43%	0.88%	0.49
	Macro	7.5%	3.05	54%	144%	0.68%	1.01%	0.68
	Sentiment	3.2%	1.61	53%	264%	0.32%	0.88%	0.36
Model	**Country Rotation Model**	**9.5%**	**3.81**	**58%**	**159%**	**0.84%**	**0.99%**	**0.85**

Source: J.P. Morgan Quantitative and Derivatives Strategy.

Table 30: Performance of Full Model, Tercile, Monthly Rebalance, Total Return Index: Comparison of Individual Signals

Full Model (Monthly) - Tricile	Factor	Avg IC	T-Stat	Hit Rate	TurnOver	Avg Ret LS	StdDev Ret LS	IR	StdDev Ret L	StdDev Ret S	Avg Ret P1	Avg Ret P2	Avg Ret P3
Macro	Real Interest Rate	3.2%	1.39	53%	12%	0.23%	2.63%	0.31	4.88%	4.37%	0.70%	0.39%	0.47%
	Relative Style	7.7%	2.72	58%	36%	0.46%	2.53%	0.63	4.82%	4.82%	0.79%	0.56%	0.33%
	FX Based	4.9%	3.17	56%	17%	0.56%	2.68%	0.72	4.60%	4.66%	0.86%	0.51%	0.30%
	Free Liquidity	3.4%	1.97	55%	29%	0.27%	2.13%	0.44	4.39%	4.75%	0.67%	0.44%	0.40%
	LEI	3.1%	1.38	51%	25%	0.21%	2.37%	0.31	4.63%	4.54%	0.60%	0.59%	0.39%
Valuation	Dispersion Adj Earnings Yield	4.0%	2.12	57%	15%	0.35%	2.58%	0.47	5.06%	4.36%	0.71%	0.45%	0.35%
	Dividend Yield Spread	6.7%	3.01	61%	24%	0.55%	2.19%	0.88	4.45%	4.72%	0.72%	0.37%	0.17%
Sentiment	Abs 12 Mth Pmom	5.6%	3.17	58%	24%	0.62%	3.06%	0.70	5.35%	4.12%	0.73%	0.74%	0.10%
	Net Earnings Revision Trend	3.6%	2.43	56%	76%	0.38%	2.42%	0.54	4.65%	4.60%	0.74%	0.39%	0.37%
	Volatility	9.5%	2.92	59%	73%	0.59%	2.56%	0.79	4.89%	4.47%	0.44%	0.20%	-0.15%
	Valuation	5.9%	3.61	62%	20%	0.58%	2.49%	0.80	4.95%	4.48%	0.80%	0.50%	0.22%
	Macro	9.5%	5.20	66%	27%	0.82%	2.46%	1.16	4.63%	4.68%	0.98%	0.36%	0.16%
	Sentiment	9.1%	3.81	61%	59%	0.65%	2.67%	0.85	5.03%	4.32%	0.93%	0.26%	0.28%
Model	**Country Rotation Model**	**12.7%**	**6.01**	**65%**	**36%**	**0.92%**	**2.40%**	**1.34**	**4.78%**	**4.39%**	**1.04%**	**0.33%**	**0.12%**

Source: J.P. Morgan Quantitative and Derivatives Strategy.

Table 31: Performance of Full Model, Tercile, Monthly Rebalance, ETF Returns: Comparison of Individual Signals

Full Model ETF (Monthly) - Tricile	Factor	Avg IC	T-Stat	Hit Rate	TurnOver	Avg Ret LS	StdDev Ret LS	IR	StdDev Ret L	StdDev Ret S	Avg Ret P1	Avg Ret P2	Avg Ret P3
Macro	Real Interest Rate	1.8%	1.47	57%	11%	0.27%	2.90%	0.33	6.10%	5.04%	0.74%	0.43%	0.47%
	Relative Style	6.5%	3.67	62%	34%	0.67%	2.77%	0.84	5.99%	5.69%	0.85%	0.59%	0.18%
	FX Based	3.5%	3.13	60%	18%	0.64%	3.10%	0.71	5.92%	5.44%	0.93%	0.40%	0.29%
	Free Liquidity	2.7%	2.71	56%	26%	0.40%	2.33%	0.60	5.42%	5.56%	0.77%	0.41%	0.36%
	LEI	4.2%	2.64	55%	24%	0.45%	2.67%	0.59	5.33%	5.49%	0.75%	0.55%	0.30%
Valuation	Dispersion Adj Earnings Yield	3.4%	1.57	56%	14%	0.30%	3.03%	0.35	6.11%	5.09%	0.69%	0.46%	0.39%
	Dividend Yield Spread	5.1%	1.94	62%	24%	0.40%	2.47%	0.57	5.48%	6.43%	0.95%	0.55%	0.55%
Sentiment	Abs 12 Mth Pmom	3.1%	2.99	57%	21%	0.65%	3.39%	0.66	6.26%	5.16%	0.77%	0.70%	0.12%
	Net Earnings Revision Trend	2.2%	2.40	58%	69%	0.39%	2.55%	0.53	5.68%	5.48%	0.80%	0.31%	0.41%
	Volatility	5.2%	1.37	54%	73%	0.29%	2.73%	0.37	5.88%	5.79%	0.56%	0.48%	0.26%
	Valuation	4.7%	2.86	59%	19%	0.52%	2.85%	0.64	5.80%	5.38%	0.81%	0.44%	0.29%
	Macro	7.5%	4.49	64%	24%	0.88%	3.04%	1.00	5.89%	5.36%	1.01%	0.39%	0.13%
	Sentiment	4.8%	3.50	58%	53%	0.66%	2.94%	0.78	5.94%	5.34%	0.93%	0.32%	0.27%
Model	Country Rotation Model	9.8%	4.92	62%	32%	0.90%	2.85%	1.09	5.94%	5.19%	1.03%	0.37%	0.13%

Source: J.P. Morgan Quantitative and Derivatives Strategy.

Table 32: Performance of Full Model, Tercile, Quarterly Rebalance, Total Return Index: Comparison of Composite Signals

Full Model (Quarterly) - Tricile	Factor	Avg IC	T-Stat	Hit Rate	TurnOver	Avg Ret LS	StdDev Ret LS	IR	StdDev Ret L	StdDev Ret S	Avg Ret P1	Avg Ret P2	Avg Ret P3
	Valuation	10.7%	3.22	62%	42%	1.62%	4.53%	0.71	8.80%	8.65%	2.49%	1.32%	0.87%
	Macro	10.2%	2.88	65%	30%	1.46%	4.56%	0.64	9.53%	8.32%	2.29%	1.61%	0.83%
	Sentiment	6.1%	1.54	56%	54%	0.79%	4.60%	0.34	9.22%	8.25%	1.97%	1.58%	1.18%
Model	**Country Rotation Model**	**13.6%**	**3.87**	**64%**	**44%**	**1.82%**	**4.22%**	**0.86**	**9.10%**	**8.35%**	**2.62%**	**1.22%**	**0.81%**

Source: J.P. Morgan Quantitative and Derivatives Strategy.

Table 33: Performance of Full Model, Tercile, Semi-Annual Rebalance, Total Return Index: Comparison of Composite Signals

Full Model (Semi-Annual) - Tricile	Factor	Avg IC	T-Stat	Hit Rate	TurnOver	Avg Ret LS	StdDev Ret LS	IR	StdDev Ret L	StdDev Ret S	Avg Ret P1	Avg Ret P2	Avg Ret P3
	Valuation	8.2%	1.92	58%	49%	2.00%	6.56%	0.43	13.59%	12.82%	4.43%	3.16%	2.44%
	Macro	11.8%	2.88	66%	38%	2.82%	6.45%	0.62	14.62%	12.12%	4.77%	3.36%	1.94%
	Sentiment	4.5%	1.27	57%	55%	1.37%	6.62%	0.29	14.21%	12.31%	4.01%	3.42%	2.64%
Model	**Country Rotation Model**	**11.6%**	**2.47**	**60%**	**48%**	**2.62%**	**6.77%**	**0.55**	**14.11%**	**12.39%**	**4.76%**	**3.12%**	**2.14%**

Source: J.P. Morgan Quantitative and Derivatives Strategy.

Table 34: Performance of G-7, Tercile, Monthly Rebalance, Total Return Index: Comparison of Individual Signals

G7 (Monthly) - Tricile	Factor	Avg IC	T-Stat	Hit Rate	TurnOver	Avg Ret LS	StdDev Ret LS	IR	StdDev Ret L	StdDev Ret S	Avg Ret P1	Avg Ret P2
Macro	Real Interest Rate	3.9%	0.72	52%	12%	0.11%	2.49%	0.16	4.81%	4.10%	0.50%	0.38%
	Relative Style	5.1%	0.08	53%	29%	0.01%	2.45%	0.02	4.57%	4.65%	0.50%	0.49%
	FX Based	1.7%	2.08	56%	13%	0.37%	2.73%	0.47	4.46%	4.80%	0.65%	0.28%
	Free Liquidity	4.0%	0.69	52%	21%	0.09%	2.10%	0.15	4.33%	4.67%	0.50%	0.41%
	LEI	3.1%	0.67	51%	18%	0.10%	2.41%	0.15	4.47%	4.58%	0.50%	0.40%
Valuation	Dispersion Adj Earnings Yield	9.2%	2.83	58%	11%	0.44%	2.41%	0.63	4.68%	4.30%	0.65%	0.21%
	Dividend Yield Spread	3.9%	1.47	60%	18%	0.27%	2.20%	0.43	4.20%	5.05%	0.46%	0.19%
Sentiment	Abs 12 Mth Pmom	2.9%	1.45	52%	19%	0.25%	2.67%	0.32	4.83%	4.15%	0.57%	0.32%
	Net Earnings Revision Trend	2.1%	1.29	55%	58%	0.20%	2.46%	0.29	4.55%	4.49%	0.55%	0.34%
	Volatility	10.9%	2.35	62%	57%	0.46%	2.48%	0.64	4.96%	4.31%	0.30%	-0.16%
	Valuation	9.4%	3.39	58%	15%	0.53%	2.44%	0.75	4.44%	4.63%	0.69%	0.16%
	Macro	8.7%	2.84	58%	21%	0.47%	2.59%	0.63	4.51%	4.59%	0.66%	0.19%
	Sentiment	7.4%	1.99	54%	45%	0.34%	2.64%	0.44	4.78%	4.23%	0.60%	0.27%
Model	Country Rotation Model	13.4%	4.24	60%	30%	0.69%	2.52%	0.94	4.64%	4.38%	0.75%	0.07%

Source: J.P. Morgan Quantitative and Derivatives Strategy.

Table 35: Performance of G-7, Tercile, Monthly Rebalance, ETF Returns: Comparison of Individual Signals

G7 ETF (Monthly) - Tricile	Factor	Avg IC	T-Stat	Hit Rate	TurnOver	Avg Ret LS	StdDev Ret LS	IR	StdDev Ret L	StdDev Ret S	Avg Ret P1	Avg Ret P2
Macro	Real Interest Rate	2.8%	1.12	56%	11%	0.20%	2.72%	0.25	5.63%	4.68%	0.58%	0.39%
	Relative Style	4.7%	2.47	58%	27%	0.45%	2.74%	0.57	5.43%	5.35%	0.70%	0.25%
	FX Based	0.6%	2.27	58%	13%	0.49%	3.25%	0.52	5.45%	5.39%	0.74%	0.25%
	Free Liquidity	3.6%	1.18	56%	18%	0.19%	2.57%	0.26	5.09%	5.40%	0.59%	0.39%
	LEI	5.2%	2.59	56%	17%	0.45%	2.72%	0.57	5.16%	5.36%	0.70%	0.24%
Valuation	Dispersion Adj Earnings Yield	7.7%	1.71	58%	11%	0.30%	2.74%	0.38	5.47%	4.93%	0.63%	0.33%
	Dividend Yield Spread	0.9%	-0.11	45%	18%	-0.02%	2.73%	-0.03	5.08%	6.46%	0.55%	0.58%
Sentiment	Abs 12 Mth Pmom	2.1%	2.11	55%	16%	0.41%	3.03%	0.47	5.54%	4.92%	0.68%	0.27%
	Net Earnings Revision Trend	-0.4%	1.19	58%	52%	0.20%	2.67%	0.26	5.24%	5.24%	0.59%	0.39%
	Volatility	3.0%	0.79	51%	57%	0.18%	2.96%	0.22	5.76%	5.46%	0.35%	0.17%
	Valuation	6.9%	2.98	62%	14%	0.51%	2.68%	0.66	5.20%	5.29%	0.72%	0.21%
	Macro	8.5%	3.45	62%	19%	0.65%	2.94%	0.77	5.38%	5.13%	0.78%	0.13%
	Sentiment	1.4%	1.79	57%	40%	0.32%	2.77%	0.40	5.45%	4.98%	0.64%	0.32%
Model	Country Rotation Model	8.8%	3.03	63%	26%	0.59%	3.03%	0.67	5.47%	5.02%	0.75%	0.17%

Source: J.P. Morgan Quantitative and Derivatives Strategy.

Table 36: Performance of G-7, Tercile, Quarterly Rebalance, Total Return Index: Comparison of Composite Signals

G7 (Quarterly) - Tricile	Factor	Avg IC	T-Stat	Hit Rate	TurnOver	Avg Ret LS	StdDev Ret LS	IR	StdDev Ret L	StdDev Ret S	Avg Ret P1	Avg Ret P2
	Valuation	10.1%	2.23	59%	32%	1.03%	4.15%	**0.50**	8.40%	8.46%	1.85%	0.82%
	Macro	16.8%	3.81	65%	22%	1.52%	3.58%	**0.85**	8.45%	8.26%	2.06%	0.54%
	Sentiment	3.4%	1.16	54%	40%	0.48%	3.85%	**0.25**	8.70%	7.98%	1.61%	1.13%
Model	**Country Rotation Model**	**13.9%**	**3.19**	**64%**	**35%**	**1.31%**	**3.72%**	**0.70**	**8.52%**	**8.20%**	**1.97%**	**0.66%**

Source: J.P. Morgan Quantitative and Derivatives Strategy.

Table 37: Performance of G-7, Tercile, Semi-Annual Rebalance, Total Return Index: Comparison of Composite Signals

G7 (Semi-Annual) - Tricile	Factor	Avg IC	T-Stat	Hit Rate	TurnOver	Avg Ret LS	StdDev Ret LS	IR	StdDev Ret L	StdDev Ret S	Avg Ret P1	Avg Ret P2
	Valuation	11.5%	1.52	61%	37%	1.52%	6.35%	**0.34**	12.91%	12.87%	3.63%	2.10%
	Macro	21.8%	3.35	72%	28%	2.87%	5.51%	**0.74**	12.95%	12.60%	4.20%	1.33%
	Sentiment	2.0%	0.49	53%	42%	0.40%	5.84%	**0.10**	13.24%	12.29%	3.14%	2.75%
Model	**Country Rotation Model**	**15.3%**	**2.35**	**66%**	**37%**	**1.99%**	**5.48%**	**0.51**	**13.07%**	**12.44%**	**3.83%**	**1.83%**

Source: J.P. Morgan Quantitative and Derivatives Strategy.

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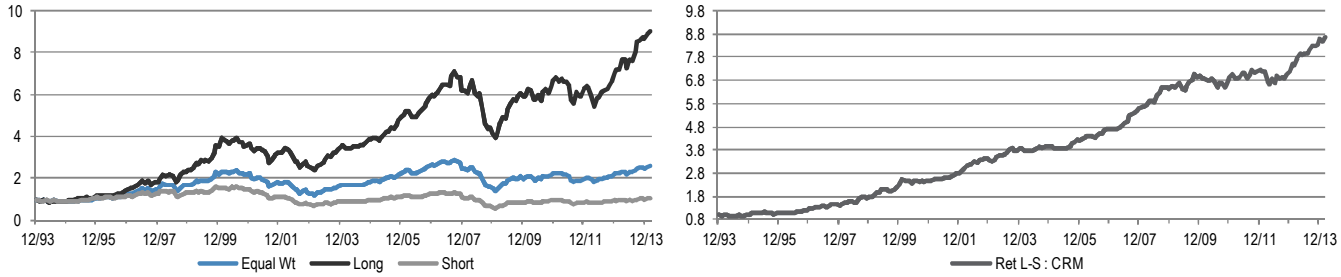
Long-only, Short-only and Long-Short Payoffs

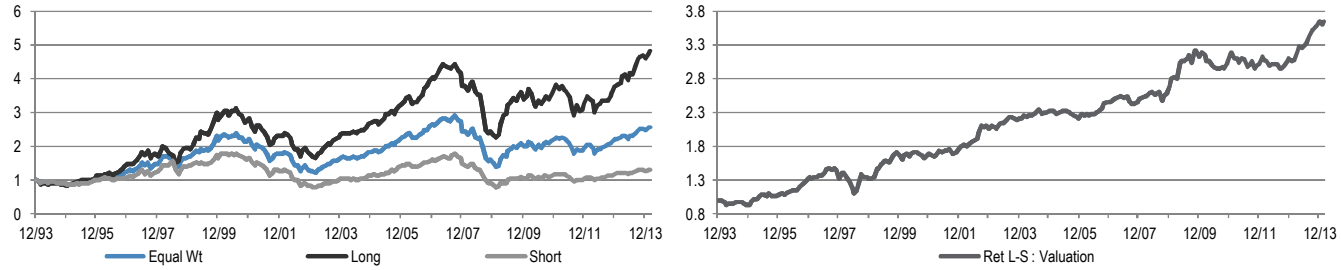
Using 14 Countries and Tercile based

Figure 50: Country Rotation Model



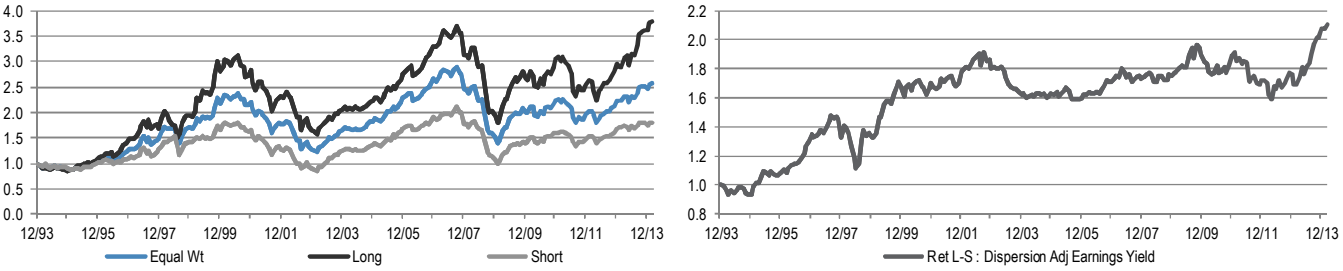
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Figure 51: Valuation Strategies



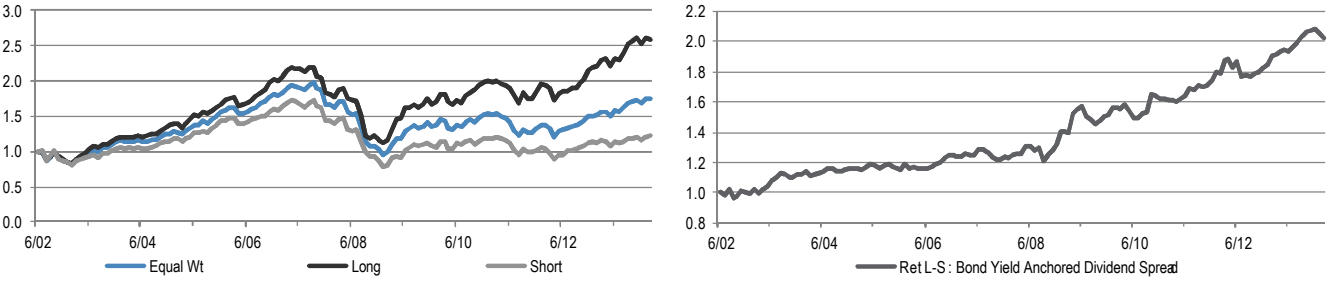
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Figure 52: Dispersion Adjusted Earnings Yield



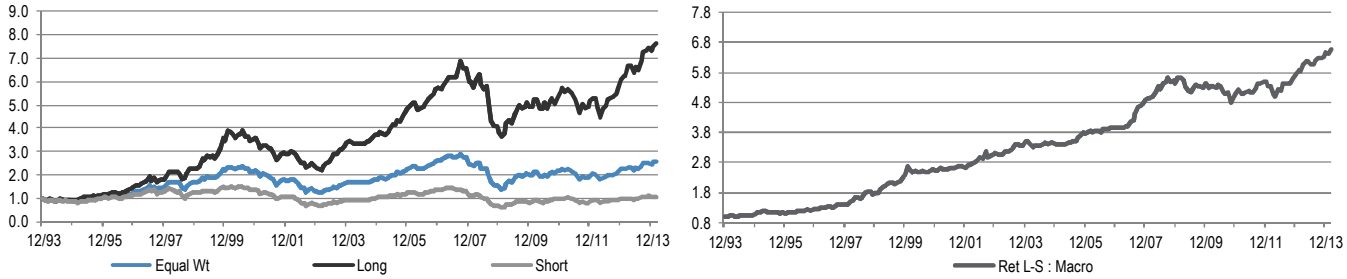
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Figure 53: Bond Yield Anchored Dividend Spread



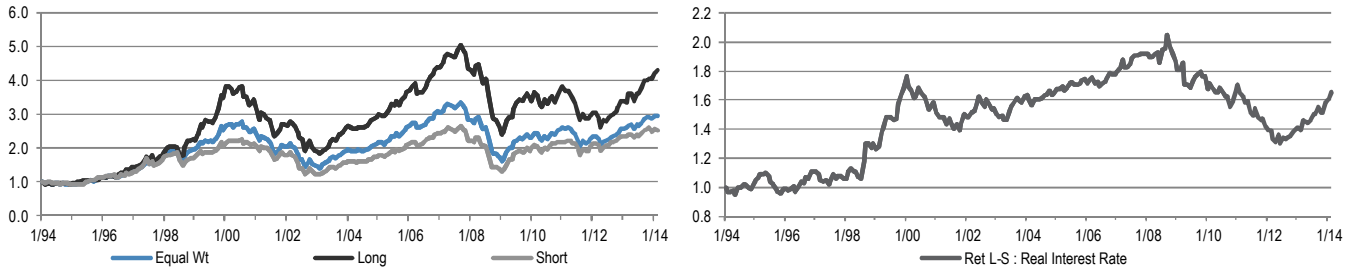
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Figure 54: Macro Strategies



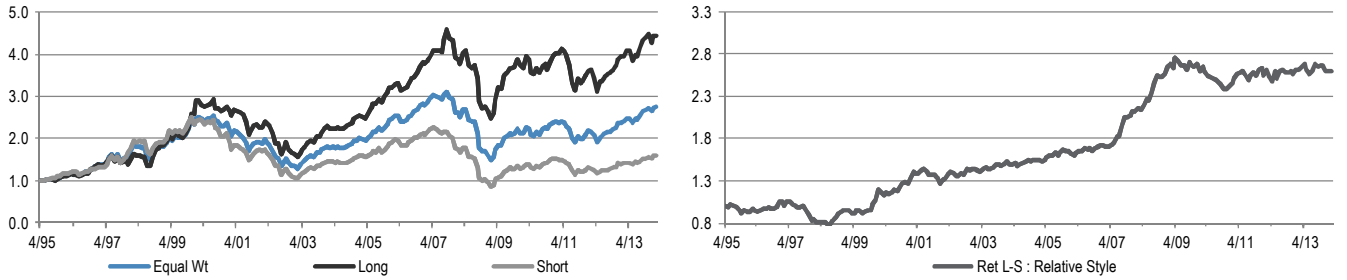
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Figure 55: Real Interest Rate



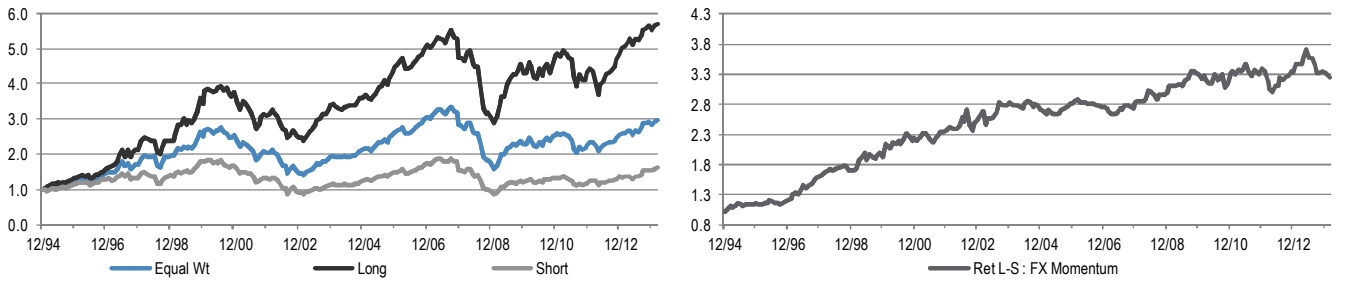
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Figure 56: Relative Style



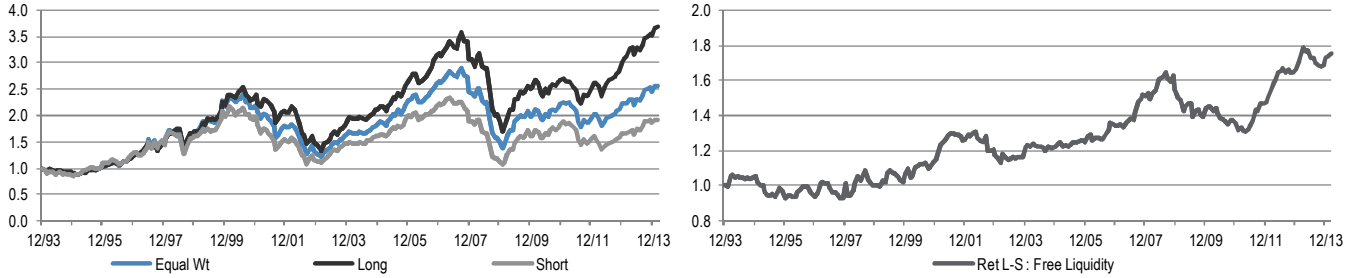
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Figure 57: Risk-Adjusted Currency Momentum



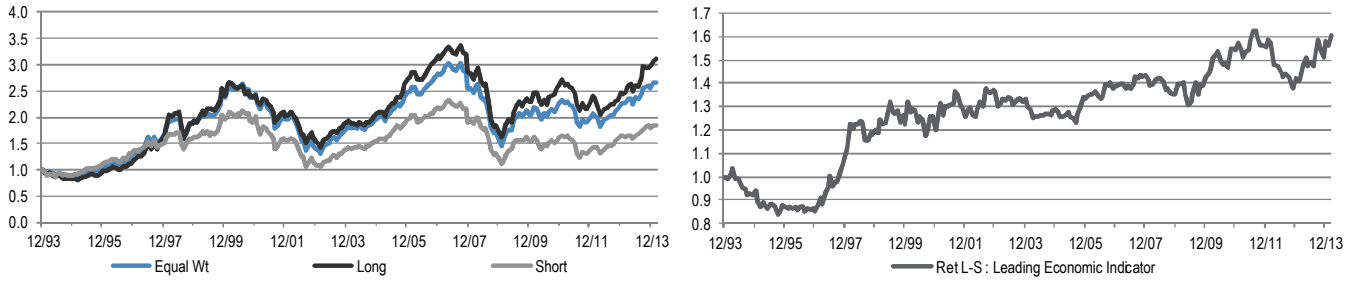
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Figure 58: Free Liquidity



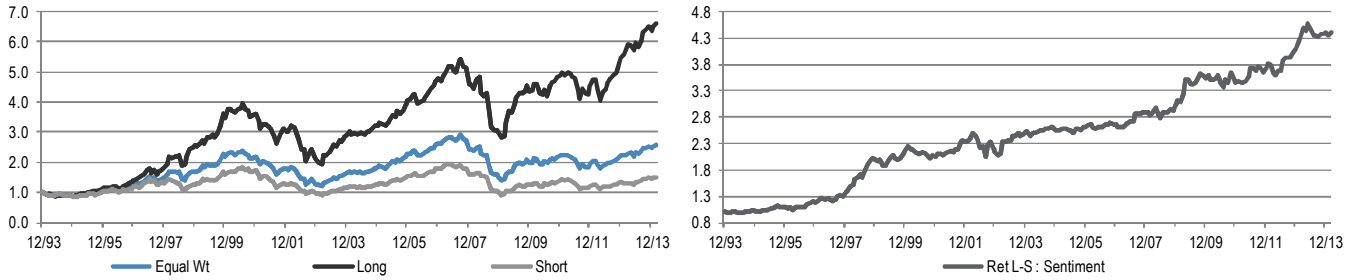
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Figure 59: Leading Economic Indicator



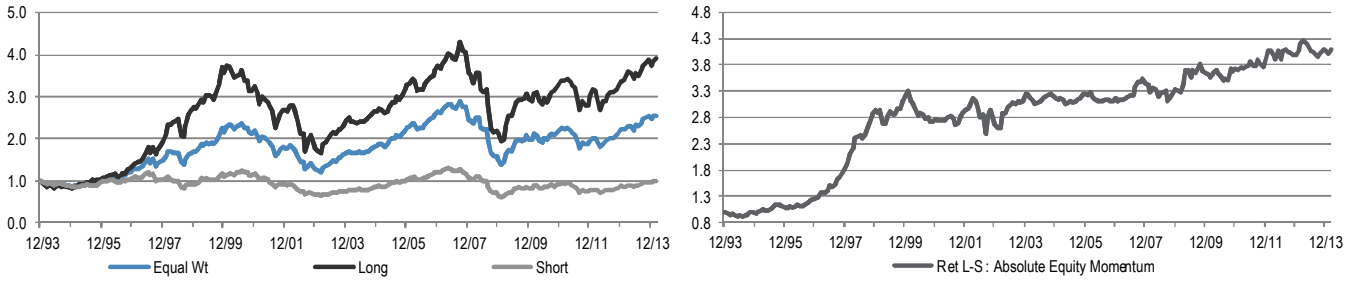
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Figure 60: Technical/Sentiment Strategies



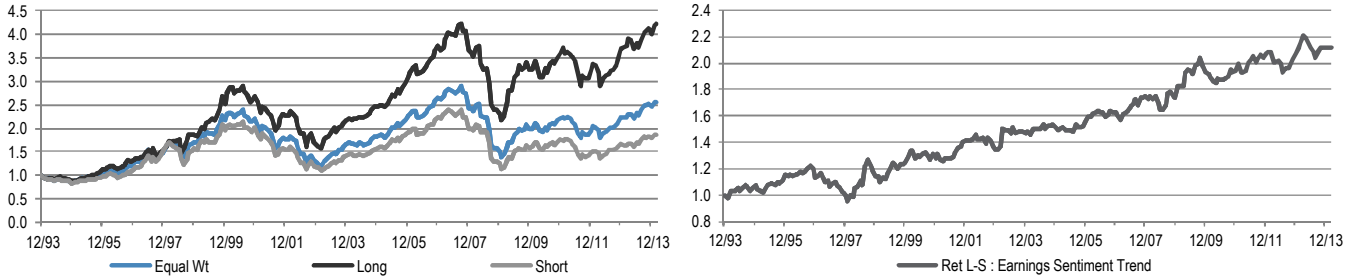
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Figure 61: Absolute Equity Momentum



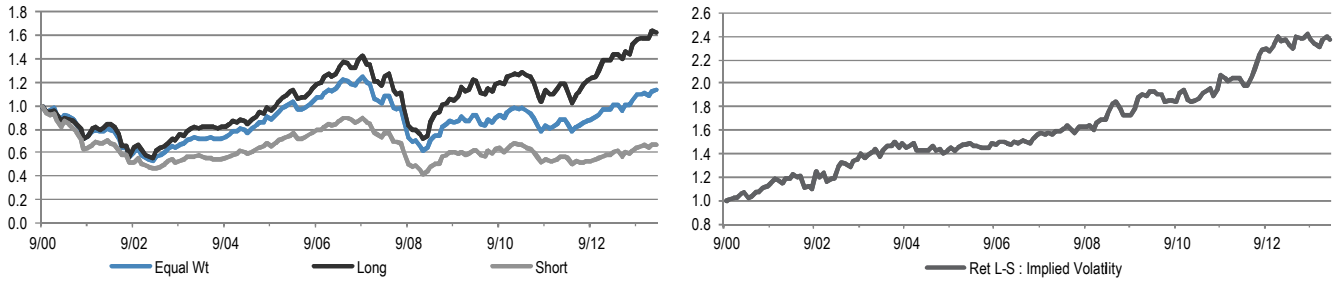
Source: J.P. Morgan Quantitative and Derivatives Strategy.

Figure 62: Earnings Sentiment Trend



Source: J.P. Morgan Quantitative and Derivatives Strategy.

Figure 63: Implied Volatility



Source: J.P. Morgan Quantitative and Derivatives Strategy.

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Heat Map: Tracking Long and Short Country Positions

Table 38: Holdings of the Full Model, Target 1% Risk (Cash Neutral), Monthly Rebalance (2008-2014)

	01/31/08	02/29/08	03/31/08	04/30/08	05/31/08	06/30/08	07/31/08	08/31/08	09/30/08	10/31/08	11/30/08	12/31/08	01/31/09	02/28/09	03/31/09	04/30/09	05/31/09	06/30/09	07/31/09	08/31/09	09/30/09	10/31/09	11/30/09	12/31/09
AU	3.7%	3.7%	0.5%	-0.7%	0.5%	0.4%	0.1%	1.3%	-0.1%	1.3%	3.6%	0.2%	0.6%	0.0%	0.0%	1.4%	0.1%	-1.2%	-1.9%	-1.1%	-3.3%	-3.8%	-3.2%	-3.2%
CA	1.2%	0.5%	0.2%	3.7%	2.5%	2.9%	1.4%	0.6%	-2.4%	0.1%	0.1%	1.5%	0.8%	-0.4%	-0.3%	0.1%	1.5%	2.1%	0.1%	0.7%	0.6%	2.6%	2.2%	-0.6%
CH	-2.5%	-1.2%	-2.4%	-0.7%	-1.6%	-1.5%	0.2%	-4.0%	-6.3%	-5.3%	-2.7%	-2.5%	-2.8%	-1.7%	-2.3%	-1.9%	-1.4%	-2.6%	-1.3%	-2.7%	-1.9%	-1.3%	-0.6%	-0.6%
DE	1.8%	1.5%	-0.4%	1.4%	2.2%	1.3%	1.3%	2.5%	1.2%	0.3%	-0.6%	-1.6%	0.3%	-1.4%	-0.6%	-0.5%	0.3%	0.5%	0.8%	0.2%	0.4%	-1.5%	1.3%	1.3%
ES	0.5%	1.0%	0.1%	-3.6%	-1.3%	-2.0%	-1.3%	0.5%	-1.3%	3.0%	0.8%	0.5%	0.4%	1.1%	1.7%	0.0%	0.3%	-0.8%	-1.1%	0.4%	1.5%	0.4%	0.6%	0.4%
FR	-0.1%	1.0%	-0.7%	-0.3%	1.1%	-1.0%	-0.6%	-1.3%	0.6%	-0.3%	0.3%	0.3%	0.0%	1.0%	-0.2%	-0.7%	0.2%	1.6%	1.1%	0.3%	-0.4%	-1.0%	-1.8%	0.5%
GB	1.0%	0.4%	1.4%	1.0%	3.4%	1.3%	2.3%	3.5%	4.6%	1.3%	1.5%	2.9%	1.8%	0.7%	2.4%	2.1%	1.2%	1.6%	2.2%	1.4%	2.7%	2.1%	3.9%	2.3%
HK	-1.1%	0.1%	-3.1%	-1.7%	-2.8%	-3.8%	-2.6%	-3.5%	0.1%	-0.3%	-0.6%	-0.7%	-1.7%	-1.4%	-1.4%	-1.7%	-1.7%	0.6%	0.8%	0.7%	2.3%	2.2%	0.7%	-1.4%
IT	-2.0%	0.0%	1.4%	-1.3%	0.5%	-0.3%	-0.1%	0.0%	1.4%	-2.3%	-0.5%	1.7%	-0.2%	0.9%	1.1%	2.8%	2.2%	2.5%	3.3%	2.3%	0.8%	-0.1%	1.3%	1.3%
JP	-0.2%	0.3%	3.7%	1.6%	1.1%	-0.5%	-1.3%	-0.1%	1.0%	0.8%	-1.7%	-2.7%	-1.7%	-2.0%	-2.6%	-2.8%	-2.4%	-2.4%	-1.9%	-3.6%	-1.8%	-0.9%	-0.7%	-0.6%
NL	1.4%	-2.5%	0.4%	-1.0%	0.3%	-1.0%	0.3%	0.4%	3.4%	2.6%	1.6%	0.3%	-1.0%	0.9%	1.1%	-1.4%	-0.3%	-1.1%	-1.1%	0.5%	-2.2%	0.5%	-0.6%	1.8%
SE	0.8%	-0.2%	0.9%	0.8%	0.1%	1.5%	-0.5%	-1.8%	-2.0%	-1.6%	-0.2%	0.4%	3.1%	0.1%	-1.2%	-1.8%	-2.1%	-1.5%	-2.0%	-2.1%	-1.0%	-2.2%	-3.1%	1.2%
SG	-5.0%	-5.6%	-1.7%	-1.5%	-2.4%	0.0%	-1.6%	0.1%	-0.4%	0.9%	0.4%	0.3%	0.5%	-0.2%	1.0%	2.6%	0.7%	0.3%	-1.0%	1.1%	0.1%	0.1%	-1.4%	0.0%
US	0.6%	1.2%	-0.3%	2.5%	-3.5%	2.5%	2.3%	1.9%	0.1%	-0.3%	-1.9%	-0.4%	-0.1%	2.3%	1.1%	1.8%	1.3%	0.3%	2.0%	1.8%	2.1%	2.9%	1.4%	-2.4%

	01/31/10	02/28/10	03/31/10	04/30/10	05/31/10	06/30/10	07/31/10	08/31/10	09/30/10	10/31/10	11/30/10	12/31/10	01/31/11	02/28/11	03/31/11	04/30/11	05/31/11	06/30/11	07/31/11	08/31/11	09/30/11	10/31/11	11/30/11	12/31/11
AU	-3.1%	-3.3%	-4.7%	-4.1%	-1.2%	-2.5%	-3.1%	-3.8%	-3.8%	-2.7%	-2.7%	-1.9%	-0.5%	-2.6%	-1.4%	-1.1%	-0.6%	-0.4%	-2.5%	-3.8%	-2.2%	-2.4%	-0.2%	-3.1%
CA	0.7%	-3.5%	-2.1%	-0.8%	-0.2%	-0.4%	-1.4%	0.1%	0.9%	-0.1%	-1.0%	0.3%	1.7%	3.4%	1.2%	0.1%	-0.6%	-1.0%	-2.3%	-0.3%	-2.4%	-1.8%	1.0%	-1.3%
CH	-2.5%	0.5%	0.1%	-0.2%	0.6%	2.1%	1.2%	1.6%	-0.4%	1.4%	0.0%	0.2%	2.3%	3.5%	1.0%	2.3%	-1.3%	1.3%	1.4%	-0.4%	-4.2%	-3.4%	-4.7%	0.3%
DE	-0.4%	-0.8%	-1.4%	1.5%	1.4%	2.6%	4.5%	2.0%	2.2%	4.2%	1.7%	0.0%	0.8%	1.6%	3.1%	1.4%	2.9%	-0.4%	0.4%	0.5%	2.0%	0.8%	-0.8%	1.1%
ES	-0.5%	2.4%	2.1%	1.2%	1.2%	0.2%	-0.7%	0.1%	2.0%	3.1%	4.2%	2.7%	-2.4%	0.6%	1.1%	1.9%	3.1%	0.3%	2.7%	3.8%	1.9%	2.9%	3.1%	1.7%
FR	1.8%	2.2%	2.1%	0.7%	-0.6%	1.6%	0.9%	0.9%	0.9%	1.8%	1.3%	1.8%	3.6%	5.1%	1.8%	2.8%	1.0%	-0.2%	-1.5%	-1.4%	3.0%	1.8%	1.5%	1.3%
GB	2.2%	1.1%	0.5%	0.1%	-0.3%	-1.0%	-1.1%	-4.2%	-3.6%	-4.7%	-2.5%	-3.2%	-2.2%	-8.9%	-2.6%	-3.1%	-2.5%	-2.1%	-3.2%	-3.5%	-1.6%	-4.0%	-4.8%	-5.4%
HK	-1.1%	-1.0%	-0.7%	-1.5%	-2.3%	-1.9%	-3.0%	0.5%	0.3%	-0.5%	-0.6%	0.8%	-0.5%	2.4%	3.3%	2.7%	-1.6%	1.0%	0.5%	0.8%	2.5%	1.8%	3.1%	0.4%
IT	1.7%	1.5%	2.2%	0.7%	-0.1%	-1.2%	0.0%	-1.8%	1.4%	-1.3%	-0.3%	2.2%	3.3%	1.2%	-0.6%	-1.4%	-1.4%	-1.7%	-2.0%	-4.8%	-1.0%	-1.7%	-2.4%	-1.7%
JP	0.7%	0.0%	0.9%	0.8%	-1.0%	1.4%	1.6%	2.8%	3.0%	1.9%	1.4%	-1.4%	-1.3%	1.2%	4.0%	4.5%	4.3%	5.5%	3.2%	1.3%	-0.4%	1.7%	0.5%	0.2%
NL	-0.4%	-0.4%	1.5%	0.9%	2.2%	1.1%	0.4%	1.4%	0.4%	-1.1%	-0.2%	-0.4%	-0.4%	-1.4%	-2.4%	-2.8%	-0.6%	-2.1%	2.2%	4.5%	3.2%	4.5%	4.0%	2.9%
SE	1.0%	-0.5%	0.6%	1.8%	0.8%	0.7%	0.8%	3.9%	1.1%	-0.1%	-1.1%	3.0%	2.0%	-2.5%	-3.8%	-2.7%	-3.0%	-1.8%	0.6%	0.7%	-0.2%	0.0%	-1.0%	2.5%
SG	-1.8%	-0.1%	-0.3%	-1.1%	-1.5%	-2.5%	-0.6%	-3.4%	-3.0%	-2.7%	-1.1%	-0.4%	-4.9%	-5.1%	-2.9%	-4.1%	-2.5%	-2.0%	-5.6%	-3.0%	-0.4%	-0.3%	-0.3%	3.8%
US	1.7%	1.8%	-0.8%	0.0%	1.0%	-0.1%	0.6%	-0.2%	-1.3%	0.8%	0.9%	-3.7%	-1.7%	1.6%	-1.7%	-0.6%	2.7%	3.4%	6.1%	5.5%	0.4%	-0.1%	0.9%	-2.8%

	01/31/12	02/29/12	03/31/12	04/30/12	05/31/12	06/30/12	07/31/12	08/31/12	09/30/12	10/31/12	11/30/12	12/31/12	01/31/13	02/28/13	03/31/13	04/30/13	05/31/13	06/30/13	07/31/13	08/31/13	09/30/13	10/31/13	11/30/13	12/31/13	01/31/14	02/28/14	03/31/14
AU	-2.9%	-1.4%	-2.0%	-2.4%	-0.7%	-1.4%	-0.6%	-0.4%	-2.0%	3.0%	2.2%	1.7%	-0.4%	-0.8%	-1.9%	-4.9%	-2.2%	-1.0%	-0.6%	-0.8%	0.9%	-0.7%	1.0%	1.8%	3.2%	1.9%	1.5%
CA	-1.9%	-1.5%	-1.2%	-1.4%	-1.1%	-0.3%	-0.9%	-0.7%	-1.9%	-0.5%	-4.1%	-6.1%	-1.0%	-0.2%	-1.8%	1.1%	-1.2%	-0.8%	-1.9%	-0.6%	0.9%	3.6%	2.2%	6.2%	2.0%	4.4%	4.3%
CH	1.6%	-3.6%	-2.0%	-1.5%	-1.2%	-2.0%	1.3%	2.0%	3.9%	5.9%	3.0%	4.8%	4.4%	4.5%	0.8%	-0.3%	0.4%	-0.5%	0.8%	0.6%	0.4%	0.6%	0.1%	3.0%	-1.5%	-0.5%	1.5%
DE	-0.6%	0.0%	-0.5%	0.9%	1.3%	2.1%	1.0%	2.3%	0.3%	-0.8%	0.3%	2.1%	-0.3%	-0.4%	2.3%	1.5%	1.8%	1.2%	-0.5%	0.4%	-4.2%	-3.7%	-2.8%	-1.1%	-1.1%	-1.9%	-1.2%
ES	1.0%	0.1%	1.5%	2.0%	0.9%	0.1%	0.7%	-0.5%	2.5%	0.6%	2.9%	-0.2%	1.7%	1.7%	1.7%	1.3%	1.1%	0.6%	1.6%	1.3%	1.5%	2.0%	1.4%	1.7%	0.8%	-1.1%	-0.9%
FR	1.4%	3.6%	2.0%	0.9%	1.7%	-0.2%	0.7%	-2.5%	-0.7%	-2.2%	-2.1%	-2.7%	-2.5%	1.3%	1.7%	1.0%	0.6%	0.8%	-1.7%	-1.2%	-1.8%	-2.9%	-1.3%	-1.2%	-1.9%	0.7%	-1.9%
GB	-3.0%	-4.0%	-1.0%	-1.3%	0.4%	-0.6%	-0.6%	-1.5%	-0.9%	-1.5%	-1.6%	-3.3%	0.2%	0.5%	-0.3%	0.0%	0.1%	-2.2%	-2.5%	-2.9%	-2.0%	1.9%	1.2%	-2.1%	-4.4%	-7.1%	-4.9%
HK	-1.2%	-1.4%	-0.8%	-0.9%	-1.3%	-0.9%	-0.9%	-2.1%	-0.7%	-2.0%	-0.8%	1.1%	-2.1%	-3.2%	-1.3%	-2.9%	-1.4%	1.5%	0.3%	-1.3%	1.0%	2.4%	2.4%	-1.6%	0.6%	0.2%	-5.2%
IT	0.8%	-0.6%	2.4%	2.2%	2.0%	2.7%	2.4%	2.9%	0.5%	-3.4%	-1.8%	-1.3%	-2.1%	1.2%	1.1%	-0.4%	0.9%	0.6%	3.7%	3.4%	3.1%	1.9%	1.5%	3.1%	4.7%	3.5%	5.2%
JP	1.4%	5.6%	0.8%	0.7%	0.4%	2.7%	-0.2%	2.5%	1.5%	2.9%	4.7%	5.8%	5.4%	4.0%	3.1%	5.1%	4.5%	4.7%	3.3%	3.3%	3.6%	3.6%	4.5%	3.6%	3.8%	4.8%	3.7%
NL	3.0%	1.3%	0.9%	1.7%	2.2%	4.0%	2.2%	1.5%	-0.5%	0.9%	0.5%	-0.3%	-2.7%	-1.2%	0.3%	2.3%	-0.9%	-3.0%	-4.7%	-4.3%	-3.9%	-4.4%	-2.6%	-7.3%	-0.5%	-2.5%	-3.3%
SE	1.8%	2.0%	0.6%	-0.8%	-1.7%	-1.5%	-1.3%	0.0%	1.6%	2.4%	2.4%	2.1%	-2.6%	-4.2%	-2.9%	-1.8%	-0.8%	0.2%	1.5%	2.3%	-1.2%	-2.5%	-3.5%	-1.7%	-0.6%	1.1%	4.5%
SG	-0.4%	-1.1%	-0.9%	0.7%	-1.3%	-0.9%	-1.8%	-3.9%	-2.5%	-4.1%	-5.8%	-4.0%	-0.2%	-1.5%	-1.4%	0.0%	-2.0%	-1.7%	1.1%	-1.8%	0.0%	-3.8%	-3.6%	-1.8%	-4.0%	-2.9%	-1.5%
US	-1.1%	1.0%	0.0%	-0.8%	-1.6%	-3.7%	-1.9%	0.4%	-1.1%	-1.3%	0.2%	0.2%	2.1%	-1.6%	-1.4%	-1.9%	-0.8%	-0.6%	-0.3%	1.7%	1.9%	2.2%	-0.5%	-2.5%	-1.2%	-0.7%	-2.0%

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Specification of Country-Industry-Style Regression

The Importance of Country Membership For Stock Returns Using Multifactor Approach

Getting country exposure tilts right is one of the most important determinant of portfolio performance for global managers. If the portfolio over-weights the worst performing market, it might be impossible to overcome the negative country effect even if a manager selects the best stocks within the country. Just how much a stock's performance depends on its country membership has been studied extensively since seminal work of Heston and Rouwenhorst (1995)[11]. In such a model, the *excess return* of firm k that is domiciled in country C and belongs to industry I is assumed to be driven by five unobservable returns.

$$r(k, C, I, t) = r(G,t) + r(C,t) + r(I,t) + r(S,k,t) + e(k,t) \qquad t=1,2,\ldots,T$$

r(G,t) is a *global* return that is common to all stocks at time t; r(C,t) is the stock's *"pure" country* return, r(I,t) is the stock's *"pure" industry* return, r(S,t) is the stock's *"pure" style* return and e(k,t) is the *stock specific* return.

The excess return for a stock is simply the difference between the stock return and the developed market return.

The logic of the multifactor decomposition of stock returns can be challenged in a world where companies have global revenue and profit exposures, and the business segments have straddled several industries. Multifactor analyses are thus, of necessity, an approximation that hopefully give an insight into what is driving stock returns but do not necessarily fully reflect reality.

Notice that two terms, stock specific return e(k,t) and style return r(S,k,t) depend on the stock, the other three returns are not stock dependent. All stocks in country C get identical country return contribution of r(C,t) and all stocks in industry I get equal contribution of r(I,t). In the following analysis, the style component r(S,k,t) is sum of three sub-returns of styles: Value, Momentum and Size. As an astute reader may rightly argue that the analysis of stock returns are as good as the validity of the underlying concept. For instance, one could argue that we need more than these three styles to explain the cross-section of stock returns. The global return r(G,t) would then probably capture the average effect of the missing factors. More profoundly the concept of country and industry could be challenged in a world where a company's revenues and profits come from several countries and/or several industries. For instance, by our estimation nearly 1/3rd of the revenue of S&P 500 companies currently comes from outside North America. It is beyond the scope of this research to delve into these issues. For now, taking a leap of faith, we assume that the above decomposition approximates fairly well how investors price cross-section of stocks in a given month.

We have used the standard procedure of assigning 0, 1 dummies for countries and industries. Our universe is MSCI 23 Developed Countries. For industries we have analyzed the decomposition using Industry Groups (24, GICS level 2) although the results are not qualitatively different for Sectors (10, GICS level 1). In the complete model, we use the cross-section of returns to estimate 51 coefficients (1+23+24+3). If we had a universe of just 51 stocks and their cross-sectional returns was not "too similar", the estimating the unobservable returns (factors) would be like solving for 51 variables with 51 equations. In actuality, we have about 1600 stocks in the MSCI developed market and a constrained regression is used to estimate the factors.

In the aggregate, the capitalization weighted net effect of country, industry group and style factors should be zero. If that were not the case, then the excess return of all stocks would not zero, contradicting the definition of excess return. Consequently in the regression we impose the following conditions:

[11] Heston, Steven L., and K. Geert Rouwenhorst, 1995, Industry and Country Effects in International Stock Returns, Journal of Portfolio Management, 53-58.

$\sum_{c=1}^{23} w(c,t) * \mathrm{r(c,t)} = 0$

where w(c,t) is the weight of country c in the universe (MSCI Developed Markets).

$\sum_{i=1}^{23} w(i,t) * \mathrm{r(i,t)} = 0$

where w(i,t) is the weight of industry i in the universe.

$\sum_{k=1}^{N} w(k,t) * \mathrm{r(k,s,t)} = 0$

where w(k,t) is the weight of stock k in the universe and N is the number of stocks in the universe.

By definition, the sum of the weights of countries, industry groups and stocks, in total should be one.

$\sum_{c=1}^{23} w(c,t) = 1$, $\sum_{c=1}^{24} w(i,t) = 1$, $\sum_{k=1}^{N} w(k,t) = 1$

Thus the original regression

$$\mathrm{r(k, C, I, t)} = \mathrm{r(G,t)} + \mathrm{r(C,t)} + \mathrm{r(I,t)} + \mathrm{r(S,k,t)} + \mathrm{e(k,t)} \qquad t=1,2,\ldots,T$$

is estimated subject to the six constraints shown above.

In practice, the "pure" style return is the sum of three sub-returns.

$\mathrm{r(S,k,t)} = \mathrm{r(value,k,t)} + \mathrm{r(momentum,k,t)} + \mathrm{r(size,k,t)}$

The cap weighted sum of the pure value, momentum and size returns is constrained to be zero.

For value, we used JPM Quant composite value score which is based on three valuation metrics: price to earnings, price to sales and price to cash flow. Momentum is simply the 12-month price momentum. Size is the market weight of the stock. All three style sub-factors were transformed so that the cap-weighted sum of their scores is zero. They were scaled to have a maximum value of 1 in order to make the estimated “pure” style returns comparable to country and industry returns.

The regression analysis ensures that returns are estimate in a manner that results in the sum of idiosyncratic or stock-specific return to be zero.

$\sum_{k=1}^{N} e(k,t) = 0$

Some authors prefer to impose (not done here) the condition

$\sum_{k=1}^{N} w(k,t-1) * e(k,t) = 0$

giving higher weight to large cap’s stocks.

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JPMS Equity Research Coverage	46%	47%	7%
IB clients*	75%	66%	54%

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