Framework for Style Investing

Style Rotation and the Business Cycle

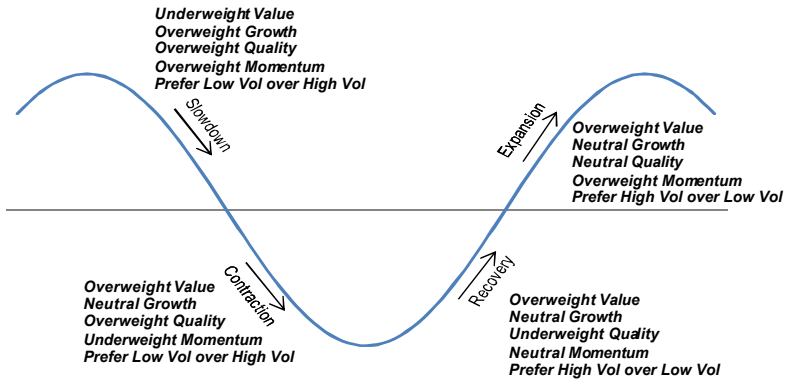
In this report a new systematic framework for style (risk premia) selection is initiated. A top-down approach is used to marry phases of the business cycle with optimal investment styles.

Similar risk factors were bundled into five different style groupings—Value, Momentum, Growth, Quality and Volatility—that intuitively capture commonly accepted equity attributes, have exhibited reasonably positive long term effectiveness and have similar correlation and regime properties.

The framework uses the *change* in the level of macroeconomic indicators and their *2nd derivative* to identify the phase of the business cycle. A robust Composite Macro Indicator (CMI) based on four different sources of information—growth, inflation, liquidity, and sentiment—was constructed and used to track the business cycle with a 3-6 month lead. The aim is to time the cycle by rotating amongst investment styles before major inflections occur. This allows for indirectly managing the evolving environment for risk vs. reward as we move through the cycle.

Currently the J.P. Morgan CMI is signaling that we are in the *contraction* state of the business cycle. This does not necessarily translate to an economic recession but rather significant weakening of macroeconomic conditions. Our analysis suggests that in a *contraction* phase, investors should increasingly move in favor of *Value* over *Growth*, reduce their exposure to *Momentum*, and continue to maintain exposure to high *Quality* and low *Volatility*.

J.P. Morgan Style Investing



Source: J.P. Morgan Quantitative and Derivatives Strategies

Global Quantitative Strategy

Dubravko Lakos-Bujas AC
(1-212) 622-3601
dubravko.lakos-bujas@jpmorgan.com
J.P. Morgan Securities LLC

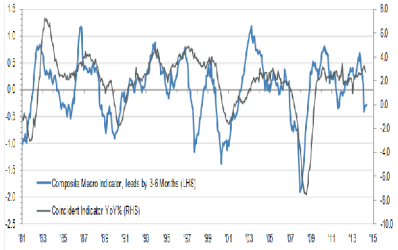
Narendra Singh AC
(1-212) 622-0087
narendra.2.singh@jpmorgan.com
J.P. Morgan Securities LLC

Sang H Han AC
(1-212) 622-6424
sang.h.han@jpmorgan.com
J.P. Morgan Securities LLC

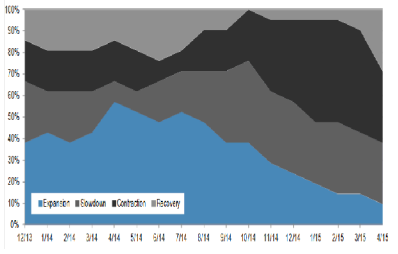
Khuram Chaudhry
(44-20) 7134-6297
khuram.chaudhry@jpmorgan.com
J.P. Morgan Securities plc

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com
J.P. Morgan Securities (Asia Pacific) Limited

JPM Composite Macro Indicator (CMI) Leads Business Cycle by 3-6 Months



Rising Proportion of CMI Components are Indicating Contraction



See page 27 for analyst certification and important disclosures, including non-US analyst disclosures.

Dubravko Lakos-Bujas
(1-212) 622-3601
dubravko.lakos-bujas@jpmorgan.com

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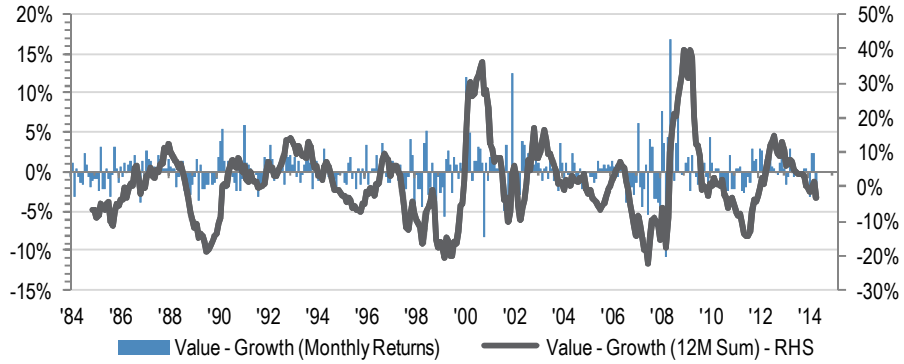
Dubravko Lakos-Bujas
(1-212) 622-3601
dubravko.lakos-bujas@jpmorgan.com

Motivation

Timing Style exposure can add value to portfolio performance.

Equity portfolios are usually constructed by focusing on some key characteristics of stocks — Country, Industry and Styles are the three most common organizing principles used by investors. A global investor with views on these drivers, for instance, could allocate more risk capital to Industrial Growth stocks in Germany compared to Bank Value stocks in France[1]. The portfolio manager can then concentrate on selecting the best (highest expected return over a time period) stocks within the more sharply defined portfolios. The key question is: how should one rotate the exposures within Country, Industry and Styles? While Country[2] and Industry[3] selection have been studied extensively, rotating between Styles has received less attention from investors[4]. An example of potential profitability of Style timing is the relative performance of Value versus Growth. As shown in Figure 1, on a 12 month basis Value can Out- or Under-perform Growth by 20% or more. Clearly, an investor can add value by varying the size of exposure to these two Styles using a model that anticipates their relative performance.

Figure 1: Profit Opportunity: Relative Performance of Value and Growth Styles



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

Style Construction

This report is about Style timing based on the business cycle

This report addresses Style timing based on the business cycle. Complementary methods like Style Momentum and Valuations (these are examples of what may be described as "factor on factor" approach) can also be used to augment Style cycle investing and we touch on them but the primary goal of this study is timing Styles based on business cycle.

In keeping with the methodology developed and analyzed in Equity Risk Premia Strategies we consider five Styles: **Value, Growth, Quality, Momentum,** and **Volatility**. To construct our Style Indices we have selected 16 Risk Factors – our choice is largely based on selecting Risk Factors that intuitively cover commonly

[1] A standard way to decompose a manager's performance is $R_p(t) = R_b(t) + R_s(t) + R_a(t)$ where $R_p(t)$ is portfolio return, $R_b(t)$ is the benchmark return, $R_s(t)$ is the style return and $R_a(t)$ is the manager's alpha.
[2] See Framework for Regional Equity Allocation
[3] See Sectors Unchained II: Industry Selection Model - Capturing Alpha
[4] A possible reason for this is that Country selection is typically seen as the province of strategists, economists and political scientists while Sector rotation is considered as a natural marriage of the bottom-up expertise of stock analysts and macro strategists. Style rotation, until very recently, has been considered a "quant" specialty – this is becoming less valid as concepts like "smart beta" and "fundamental indexing" go mainstream.

Dubravko Lakos-Bujas
(1-212) 622-3601
dubravko.lakos-bujas@jpmorgan.com

accepted concepts of the Style, have reasonably positive long term performance and have similar correlation, performance, and regime properties.

Table 1: Factor Composition of US JPM Styles

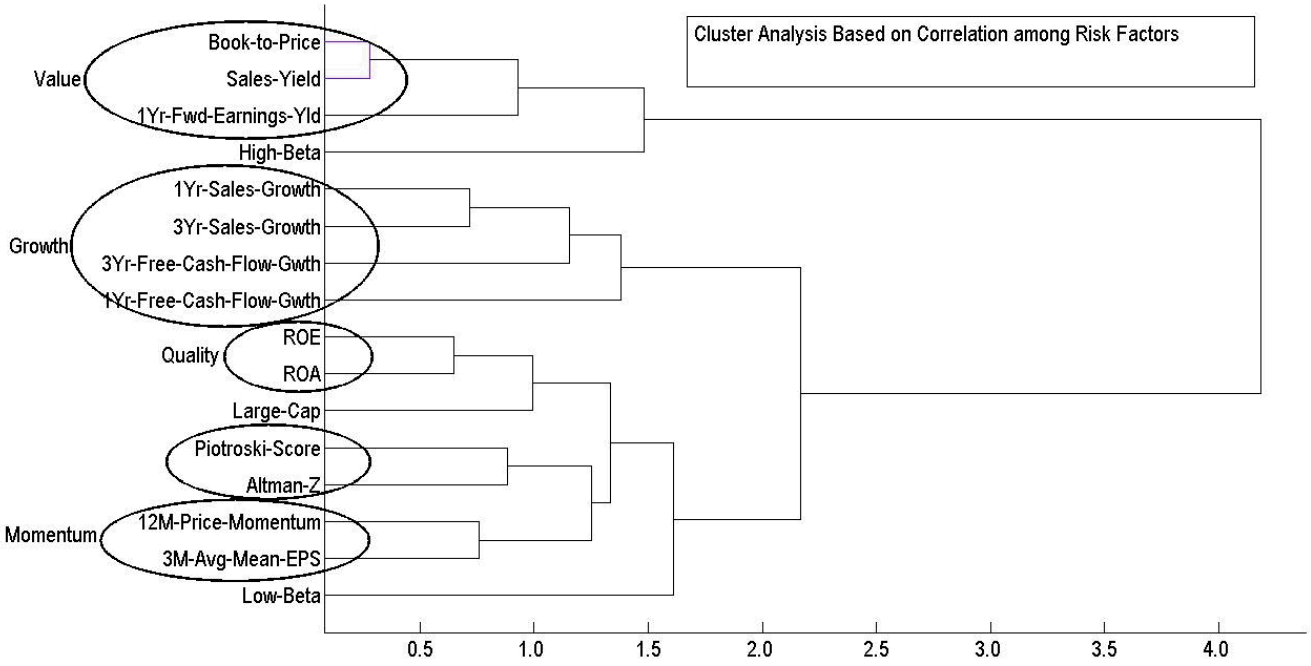
Momentum -12M Price Momentum -3M Fwd Earnings Momentum	**Value** -Book-to-Price -1Y r Fwd Earnings Yield -Sales Yield	**Low Volatility** -Large Capitalization -Low Beta -Financial Distress Risk (Altman)
Growth -Sales Growth (1Yr, 3Yr) -Free Cash Flow Growth (1Yr, 3Yr)	**Quality** -ROE -ROA -Earnings Quality (Piotroski)	**High Volatility** -High Beta

Source: J.P. Morgan Quantitative and Derivatives Strategies

A flexible approach to Style investing is taken by bundling similar risk factors into a Style family rather than the traditional approach which uses Style to bifurcate the benchmark into "opposing" styles like large/small and growth/value

The degree of similarity in performance of the risk factors is seen using a dendrogram (tree like structure) – the length of the branches is determined by all pair wise correlation amongst the risk factors. So, for example, Book-to-Price and Sales Yield are very close to each other in Figure 2 not just because their correlation with each other is high, but also because their correlation with other factors is very similar – they have almost equally large negative correlation with Growth, Quality and Momentum factors and positive correlation with High Beta factor (see Table 8 in Appendix D). The shorter the branches connecting two factors, the closer their relationship.

Figure 2: Clustering Equity Risk Factors into Styles



The cluster analysis is based on correlation in long-only excess return of sector normalized risk factors.
Source: J.P. Morgan Quantitative and Derivatives Strategies

It is also clear from Figure 2 that Growth and Momentum factors also huddle together. There is some overlap between Quality and Low Volatility risk factors.

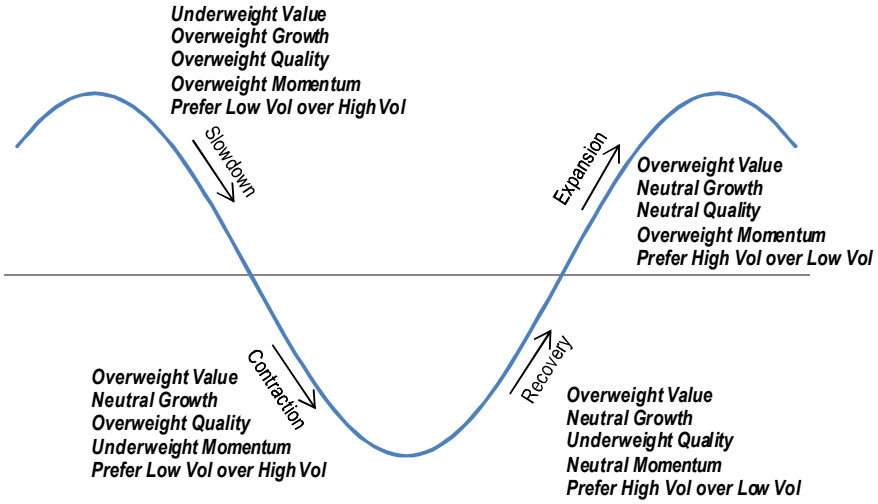
For instance, Large Cap factor is closer to Quality Factors like High ROE and ROA than to Low Beta. Altman-Z could be considered a Quality factor though we have chosen to assign it to Low Volatility Style since it captures Risk rather than Quality. In this sense we have chosen not to unquestionably follow historical correlation completely and have used some discretion in assigning the risk factors to styles. High Beta i.e. High Volatility factor, though an isolated factor, is close to Value.

Cycle Framework for Style Investing

Figure 3 shows a stylized business cycle along with the associated preferred reference positioning of the investment styles. The reference positioning of styles provides a coherent framework for managing style tilts as the views about the economy and linked investor behavior go through a cycle. Our framework uses the concept of understanding the changes as well as changes in the derivative (2nd derivative) of macroeconomic data to identify *where are we in the cycle*?

The J.P. Morgan 'Cycle Investing' framework marries phases of the business cycle with investment style returns – to the left is an "intuitive" expectation of how styles should perform over the typical cycle.

Figure 3: J.P. Morgan Style Investing - Marrying Phases of the Business Cycle with Style Returns



Source: J.P. Morgan Quantitative and Derivatives Strategies

The aim is to time the cycle by rotating before major draw-downs occur, and indirectly managing the changing environment for risk vs. reward as we move around the cycle.

Cycle investing is quite intuitive. For instance, we underweight **Value** relative to **Growth** in a *Slowdown*, since it is unlikely to shelter the portfolio in a severe slowdown or contraction. Also, Growth is *scarce* in this stage of the cycle and is preferred. If the Slowdown sinks into a *Contraction* investors would likely *rotate* from Growth to Value as volatility and dispersion of valuations rises. During the subsequent Recovery and Expansion, we stay neutral Growth (it is no longer scarce) but continue to overweight Value though be more selective in terms of sector and themes as the Cycle matures.

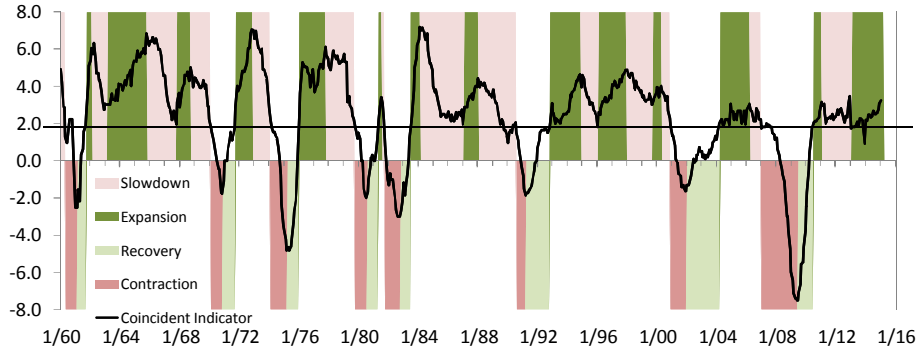
We overweight **Quality**, on the other hand, during Slowdown and Contraction when it is in short supply and provides insurance. Quality may be least desirable during Recovery when it is likely to expensive and less needed. **Momentum** is the most potent during Expansion when the economy is humming and specific themes dominate the market. Momentum becomes most hazardous during Contraction when the trends that have driven the market higher until then start to crumble and even reverse. Rules for handling **Volatility** are relatively straightforward though timing Volatility is challenging. During Slowdown and Contraction, aversion toward risk

generally intensifies and it makes sense to prefer the Lower Volatility and financially sound balance sheet. Conversely, once Recovery is in place, High Volatility stocks are preferable over Low Volatility ones.

In passing we also note that other aspects of investment styles, like relative valuation, momentum, fear/greed rotation and the crowdedness of a trade, may influence one's style preference during a specific stage of the business cycle.

Having decided on how to position Styles over a full business cycle based on likely risk premia and investor behavior, a suitable method to identify phases of the business cycle is essential. *In other words, we need a reference time series that defines the business cycle.* We take the Conference Board's ***Economic Coincident Index*** as a reference for the current state of the cycle since it is based on monthly series and is sufficiently reactive to mid-cycle ups and downs. The Coincident Index is composed of four indicators: Employees on nonagricultural payrolls; Personal income less transfer payments; Industrial production; and Manufacturing and trade sales. Figure 4 shows the year-on-year change in Coincident Index and the phases of business cycles based on the *level of change* and its *second derivative* (acceleration and deceleration in the change).

Figure 4: State of the Business Cycle: Conference Board's Coincident Index



Source: J.P. Morgan

In between recovery and contraction are mid-cycle scares and pauses—these have real impact on the financial markets.

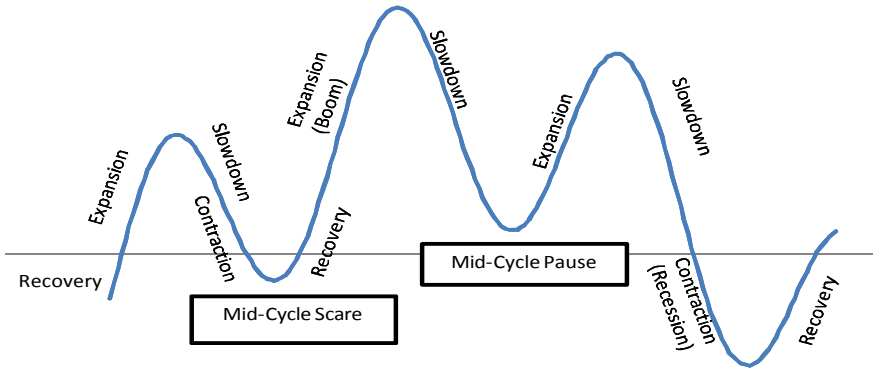
It is interesting that *prior* to 2000 whenever the Coincident Index was heading south and crossed the 2% threshold it was highly likely that the downward momentum would take the cycle into contraction territory. However, in the last two cycles (starting 2002 and 2009) the amplitude of the cycle has been suppressed and the Coincident Index has threatened to breach the 2% threshold on several occasions. In 2011, for example, the index headed south from a peak of 3.3% in Jan to 2.0% in May before bouncing up.

Business cycles do not follow a clean script – recovery, expansion, slowdown and contraction.

Historically, business cycles have one or more mini cycles of less extreme amplitude embedded between an upturn and a recession. Figure 5 shows a stylized business cycle with two mini business cycles before entering a full blown recession. For example, the 1982 upturn in the US was followed by dip in economic activity in 1985 preceding the 1990 recession; the long economic boom of 1990s had two mini-slowdowns in 1993 and 1995 before the recession in 2001.

Dubravko Lakos-Bujas
(1-212) 622-3601
dubravko.lakos-bujas@jpmorgan.com

Figure 5: Business Cycles Are Rarely Clean Up, Down and Up: There Is Usually Considerable Uncertainty about the Phase (i.e. Frequent False Positives)



Source: J.P. Morgan

One should not underestimate the impact of these mid-cycle scares and pauses on stock market performance.

Making decisions in an uncertain world requires action before all the facts are in, so it is not surprising that investors may react as strongly to a mid-cycle slowdown as they would to a slowdown that is truly a precursor to a recession. For instance, the stock market was flat in 1984 in anticipation of 1985 slowdown and similarly fell 2% in 1994 before the 1995 pause. In the current cycle, the year 2011 certainly felt like a precursor to a recession—the stock market ended the year flat but dropped -17% in the interim.

Table 2 presents the performance of various styles over the business cycle defined by the Coincident Indicator (COI). To remove sector biases in underlying style factors, we used *sector normalized* z-scores to construct the portfolios.

Table 2: Performance of Styles in Different Phases of the Business Cycle 11/1984-3/2015 (Monthly Returns, Equal Weighted Long Portfolios, Stock Selection Is Sector Normalized)

	Value	Growth	Quality	Momentum	Low Volatility	High Volatility	Equal Weighted Style	Market (Eq Wtd S&P 500)	Market (Cap Wtd S&P 500)
Absolute Return (Annualized)									
Expansion	21.0%	17.7%	16.4%	19.2%	14.2%	17.8%	22.0%	15.9%	14.0%
Slowdown	16.0%	19.1%	19.1%	19.0%	17.0%	15.2%	22.5%	16.3%	17.1%
Contraction	6.9%	-1.4%	1.9%	-3.9%	0.6%	-2.0%	6.5%	0.3%	-4.8%
Recovery	19.9%	14.1%	13.9%	15.0%	11.3%	16.6%	13.9%	14.1%	8.2%
Excess Return (relative to Equal Weighted S&P 500)									
Expansion	5.1%	1.9%	0.5%	3.3%	-1.6%	2.0%	6.1%	-	-1.8%
Slowdown	-0.3%	2.8%	2.8%	2.7%	0.7%	-1.1%	6.2%	-	0.8%
Contraction	6.6%	-1.7%	1.7%	-4.2%	0.4%	-2.3%	6.2%	-	-5.0%
Recovery	5.8%	0.0%	-0.2%	0.9%	-2.8%	2.5%	-0.2%	-	-5.9%
Standard Deviation (Annualized)									
Expansion	17.0%	14.8%	14.5%	15.5%	14.2%	17.9%	15.7%	14.5%	13.4%
Slowdown	18.5%	16.6%	15.5%	16.0%	13.6%	20.0%	16.4%	15.5%	14.3%
Contraction	33.8%	24.9%	22.8%	19.5%	17.9%	35.2%	22.7%	23.9%	19.6%
Recovery	22.8%	17.0%	15.2%	16.5%	12.4%	25.7%	16.2%	17.7%	15.5%
Information Ratio									
Expansion	1.24	1.20	1.13	1.24	1.00	1.00	1.40	1.09	1.05
Slowdown	0.87	1.15	1.23	1.19	1.25	0.76	1.37	1.05	1.19
Contraction	0.20	-0.06	0.08	-0.20	0.03	-0.06	0.29	0.01	-0.24
Recovery	0.87	0.83	0.92	0.91	0.92	0.65	0.86	0.80	0.53
Avg Sharpe	**0.87**	**0.83**	**0.92**	**0.91**	**0.92**	**0.65**	**0.86**	**0.80**	**0.53**

The Style Performance shown above is based on the equal weighted performance of sector normalized top 100 stocks by style portfolios within S&P 500 universe. Source: J.P. Morgan

The performance of the styles over the business cycle based on reference series Coincident Economic Indicator is close to the "intuitive" style rotation shown in Figure 3

The *only period* **Value** *underperforms* **Growth** in this analysis is during Slowdown (16.0% versus 19.1% annualized returns). Value's failing in Slowdown is compounded by higher volatility of the style resulting in a larger dispersion of Information Ratios (active return per unit of risk, Value's 0.87 versus Growth's 1.15) between Value and Growth over the whole cycle. Outside Slowdown, Value dominates Growth though on a risk adjusted basis the dominance is less overwhelming.

Quality takes the lead during Slowdown with a strong return (19.1%) and the lowest volatility among styles (15.5%) other than the Low Volatility portfolio whose risk unsurprisingly is the lowest in any phase of the cycle. Quality posts the least impressive *relative* return compared to other styles during Recovery (13.9%)—it makes intuitive sense to stay underweight Quality during Recovery.

Momentum works best during Expansion and Slowdown—we overweight it during these phases of the cycle. Usually the trends driving the cycle are intact in these two phases and our back-test confirms this hypothesis—Momentum returns and Information Ratio exceeds market in these two phases. As mentioned earlier, during Contraction trends can reverse and Momentum style can be perilous. Indeed the return of Momentum style is worse than the market and most other styles during Contraction.

On average, **Low Volatility** outperforms **High Volatility** during Slowdown and Contraction and High Volatility does better in Expansion and Recovery (albeit not necessarily on a risk-adjusted basis). This is consistent with our Cycle Investing recommendations. However, the striking fact about performance of Volatility styles is the divergence in the volatility of their performance during Contraction and Recovery. Highlighted figures in Table 2 above show that the volatility of High Volatility style is twice that of Low Volatility during this period. The result is that during Recovery despite the outperformance of High Volatility strategy, the Information Ratio of Low Volatility strategy is higher. Given the huge volatility spread, in our opinion, it is probably prudent not to take large tilts among Volatility styles.

Predicting Business Cycle Phase: J.P. Morgan Composite Macro Indicator (CMI)

Economic indicators rarely line up nicely to give an unambiguous view of the state of the business cycle.

In real time, data is noisy—some indicators declare the economy is improving, others may point to deterioration and while many indicators may be equivocal. For example, in April, many economic indicators like Change in Private Payrolls, Retail Sales, and ISM Manufacturing PMI have been softer than expected suggesting a slowing economy. At the same time, other indicators like ISM Non-Manufacturing PMI and Existing Home Sales have been better than expected. When confronted with conflicting information, investors typically gravitate towards maintaining status quo belief. This desire not to deviate from existing position can lead to misreading of the incoming information. Behavioral economists warn about the pitfall of overweighting new information that confirms existing biases while discounting data that challenges currently held views.

To overcome such biases and to reduce the uncertainty about the state of the cycle we examined over 50 indicators that cover a broad panorama of the business cycle. Out of these, a handful of uncorrelated indicators with leading information about the cycle were culled. The result is the proprietary J.P. Morgan Composite Macro Indicator (CMI) which has 3 to 6 months lead over the business cycle.

In selecting an indicator both its change and its change of change (second derivative) in predicting the state of the cycle was used.

To select the constituent indicators for the CMI various criteria were used. Looking at the change in an indicator we asked: How well does the potential indicator correlate with the reference series i.e. Coincident Economic Indicator at various leads and lags? Is there an economic rationale for the high correlation? What is the correlation of a potential candidate relative to other indicators? *We used both the change in an indicator and its second derivative to identify the state of the cycle.* Furthermore, we tracked how often does the state of the cycle specified by an indicator match that of the reference series? If an indicator makes a wrong state of the cycle call, what is the size of loss in performance?

The loss in performance from an indicator that imperfectly tracks the Coincident Economic Indicator can be calculated using the following Loss Table which shows the performance loss resulting from an incorrect call.

Table 3: Average Annualized Performance Loss When Making a Wrong Style Call

		Actual State based on Cycle Reference Series			
If Style Rotation Portfolio Is Positioned For:		Expansion	Slowdown	Contraction	Recovery
	Expansion	0.0%	-4.9%	-3.7%	0.6%
	Slowdown	-2.8%	0.0%	-1.7%	-4.8%
	Contraction	**-8.9%**	**-7.9%**	0.0%	-5.0%
	Recovery	-2.3%	**-7.2%**	-2.4%	0.0%

Source: J.P. Morgan.

As Table 3 demonstrates, the maximum annualized loss of -8.9% occurs when one positions for *Contraction too early* (i.e. Overweight Value and Quality, Neutral Growth, Underweight Momentum, Prefer Low over High Volatility) while the business cycle is *actually in Expansion*. We would not be too concerned about that since mistaking Expansion for Contraction seems unlikely since these phases of the cycle are quite different. However, mistaking Slowdown for Contraction or Recovery seems like a more plausible error. The Performance Loss from these errors is quite high at -7.9% and -7.2% respectively. Thus when considering a macro indicator for inclusion in the CMI, we considered the match of the cycle state defined by the indicator with that given by the reference series.

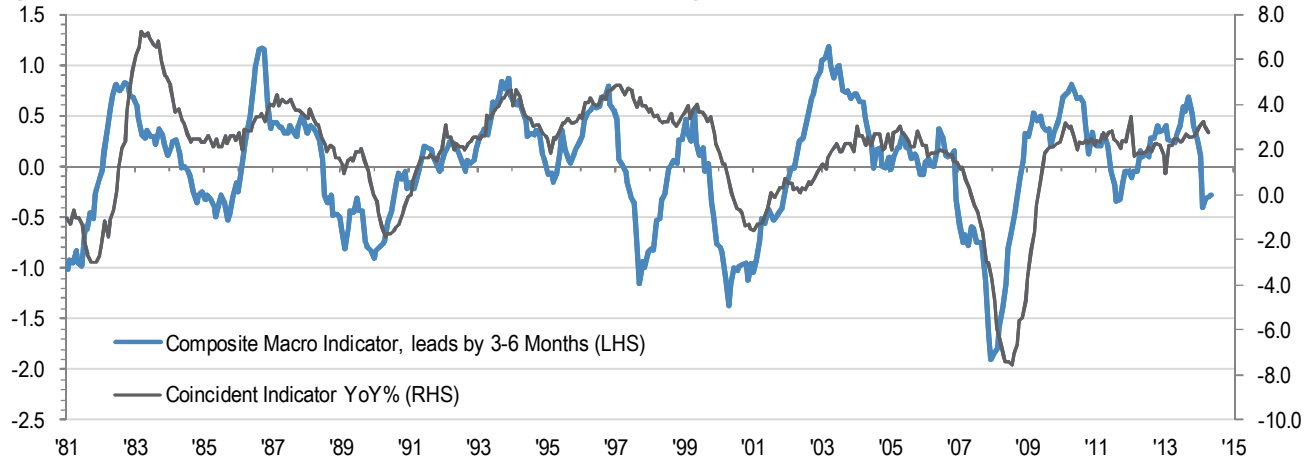
The components of the JPM Composite Macro Indicator (CMI) are sourced from four areas: *Growth*, *Liquidity*, *Inflation* and *Sentiment*

To get a robust Composite Macro Indicator it is necessary to include diverse and relatively uncorrelated information from different parts of the economy. Indicators that *directly* tell us about the phase of the business cycle are classified as **Growth indicators**. There are three other indicators that *indirectly* interact with the cycle: **Liquidity**, **Inflation** and **Sentiment**. As suggested these indicators carry information about the cycle: **Inflation indicators** typically fall when growth is weak, rise when growth picks up; improvement in **Liquidity indicators** due to faster money growth, lower interest rates or easier credit conditions tend to boost growth; and **Sentiment indicators** can be harbinger of consumption spending, corporate earnings and credit conditions. The JPM Composite Macro Indicator (CMI) is a combination of indicators from the four groups mentioned above.

The resulting indicator leads the Coincident Index by 3 to 6 months. Figure 6 plots CMI and Coincident Index over the same time period—the CMI turns up or down a few months before the Coincident Index. The peak correlation of 0.74 at 6 months lead is a confirmation that CMI can potentially be used to anticipate changes in the business cycle. In the Appendix B we have charted the complete set of indicators we track.

Currently the Composite Macro Indicator (CMI) is signaling that we are in the "contraction" state of the business cycle. This does not necessarily translate to an economic recession but rather significant weakening of economic conditions.

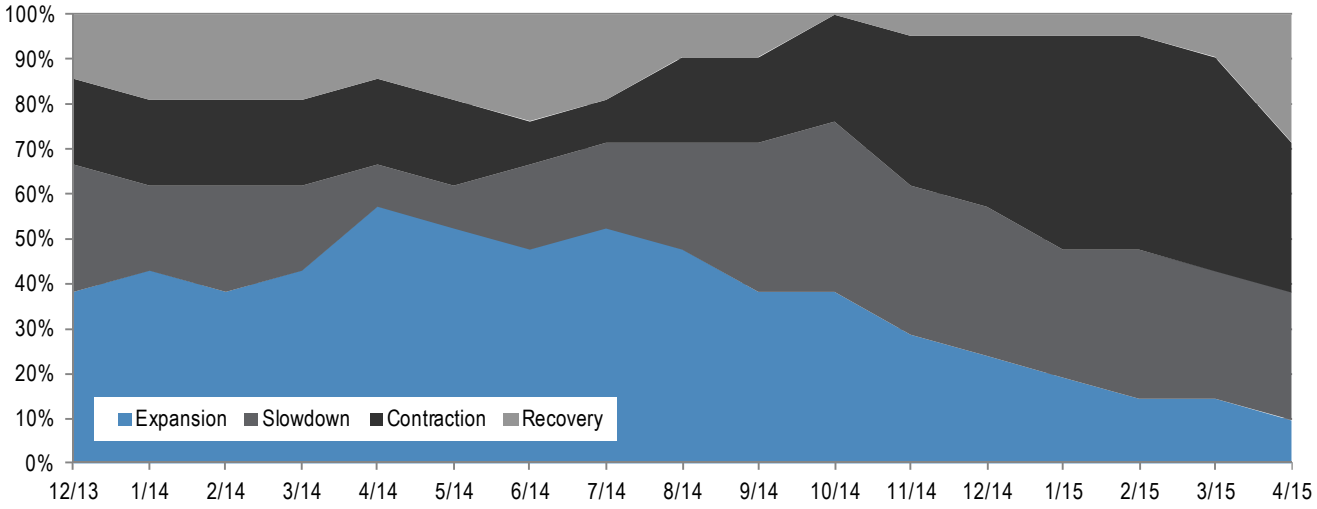
Figure 6: JPM Composite Macro Indicator Predicts State of the Business Cycle 3-6 Months Ahead



Source: J.P. Morgan

What do the underlying CMI components indicate and how have they evolved? The majority of the components were indicating "Expansion" throughout most of 2014. However, since late last year a growing number of components have started leaning towards "Slowdown" and more recently "Contraction" state.

Figure 7: Rising Proportion of CMI Components Are Indicating Contraction



Source: J.P. Morgan

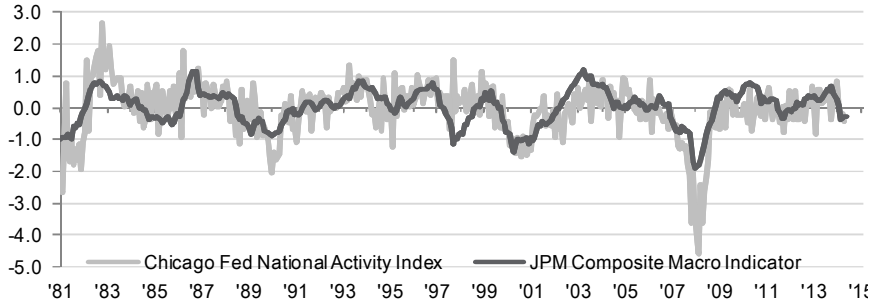
What does this mean in terms of Style positioning? Our analysis suggests that in a "contraction" phase of the business cycle, investors should increasingly move in favor of Value over Growth, reduce their exposure to Momentum, and continue to maintain exposure to high Quality and Low Volatility (i.e. as a form of insurance).

However, given the current non-conventional monetary policy environment this transition to "contraction" from "slowdown" may be more prolonged than usual, as

central bank policies may continue to provide artificial support to equity prices. This largely explains the clear disconnect we have seen between business cycle conditions and equity market, which has remained relatively resilient in recent months.

CMI and Chicago Fed National Activity Index: As a cross-check, CMI is compared with Chicago Fed's National Activity Index (CFNAI Index) which is a weighted average of 85 indicators and is designed to track growth and inflationary pressures in the national economy. Unsurprisingly, the two series are correlated – like JPM CMI, CFNAI is also suggesting that economic activity is currently below average (the last data point for CFNAI is for end-March while that of CMI is for end-April).

Figure 8: JPM Composite Macro Indicator and Chicago Fed National Activity Index (Correl = 0.65)

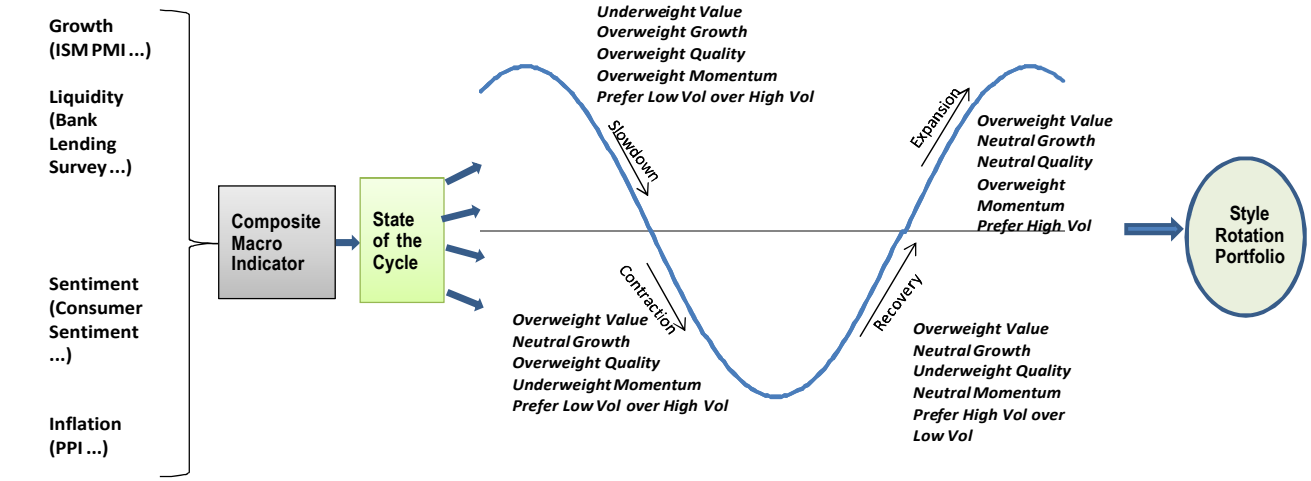


Source: J.P. Morgan

Putting It All Together: Back-test of Cycle Investing based Style Rotation

The Composite Macro Indicator (CMI) acts as a guide in determining the phase of the business cycle. Using a rule-based approach we map the CMI to one of the four states and position the style portfolio according to the cycle investing framework. Figure 9 depicts a schematic flow connecting macroeconomic cycle to style selection and finally to the construction of a style rotation portfolio.

Figure 9: From Business Cycle to Style Rotation Portfolio



Source: J.P. Morgan

Dubravko Lakos-Bujas
(1-212) 622-3601
dubravko.lakos-bujas@jpmorgan.com

In Table 4 we report the backtest results of two long-only Style Rotation portfolios. The first column of data shows the result of Style Rotation *assuming perfect foresight* i.e. we know in real time the state of the world (Expansion, Slowdown, Contraction and Recovery) of the *next month* using the Coincident Economic Indicator. Each of these four states has an associated portfolio — as described in Figure 9, each state is matched with desired under- and over-weight style tilts. The second column shows the performance of Style Rotation portfolio assuming we use Composite Macro Indicator (CMI) to *predict* next month's state of the world and then select the appropriate portfolio. For comparison we also report the performance statistics of the equal-weighted S&P 500 Index (a difficult benchmark to beat) and the traditional capitalization-weighted S&P 500 Index.

Table 4: Backtest Long Only Comparison: Style Rotation Portfolio and the Market
11/1984 - 3/2015

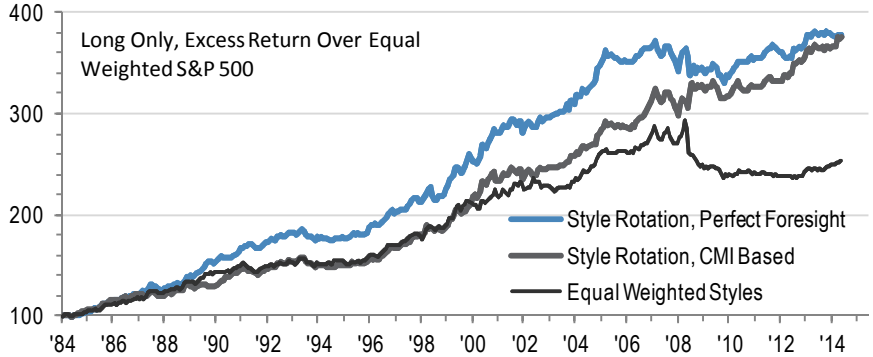
	Style Rotation, Using Coincident Indicator (Perfect Foresight)	Style Rotation, Using Composite Macro Indicator (CMI)	Market (S&P 500, Equal Weighted)	Market (S&P 500, Market Cap Weighted)
Average Annual Return	20.0%	20.0%	13.5%	11.6%
Annual Volatility	18.0%	18.4%	17.0%	15.2%
Information Ratio	1.11	1.09	0.80	0.76
Win Ratio	66.5%	66.2%	64.3%	64.6%
Max DrawDown	-51.6%	-51.9%	-54.9%	-50.9%

The Style Rotation Portfolio consists of the top 100 stocks in S&P 500 with investment in one of the following four portfolios each month: Expansion, Slowdown, Contraction and Recovery. Each of these four portfolios in turn is a blend of Value, Growth, Quality, Momentum, Low Volatility and High Volatility with weights assigned according to the overweight/underweight scheme described in Figure 9. Stock scores are sector normalized to minimize sector bias. Stocks are weighted equally in calculating the performance. No transaction cost is assumed. Past performance is not a guarantee of future performance.
Source: J.P. Morgan

The Style Rotation portfolio outperforms both the equal weighted and market capitalization weighted portfolio though with a higher volatility. However, the Information Ratio of Style Rotation portfolio is about 0.30 higher than the market portfolios suggesting that the return of the portfolio more than compensates for the higher volatility.

Importantly, we also compare the Style Rotation portfolio's performance with an equal weighted Value, Growth, Quality, Momentum and Volatility style portfolio (assuming no timing ability). Since the individual styles can be considered equity risk premia strategies, style rotation strategy should ideally pass an extra hurdle—be able to outperform a simple average of the individual risk strategies.

Figure 10: Style Rotation Portfolio Historically Outperforms Equal Weighted Style Portfolio, More So Recently



Source: J.P. Morgan

Figure 10 tracks the Style Rotation portfolio's long only excess performance versus that of equal-weighted Style portfolio and shows that Style Rotation historically has added value. The performance gap widened more during the past ten years suggesting the increased importance of style rotation recently. However, the performance of "perfect foresight" strategy in style selection is about the same as the CMI based style selection; this gives us comfort that the CMI is roughly capturing the changing phases of the business cycle.

Table 5 compares the performance statistics of Long-only excess return (from Figure 10) and Long-Short performance of Style Rotation strategy against Equal Weighted style strategy.

Table 5: Style Rotation based on Cycle Investing Outperforms Equal Weighting Strategy

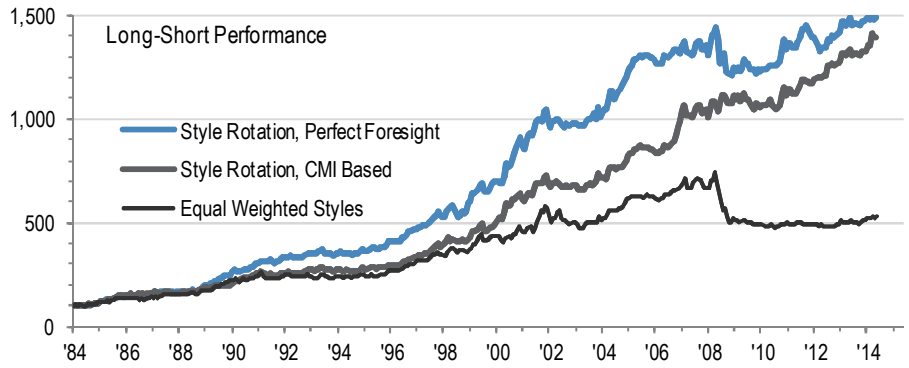
11/1984-3/2015

	Long (Excess Return over Equal Weighted S&P 500)		Long-Short	
	Style Rotation, Using CMI	Equal Weighted Styles	Style Rotation, Using CMI	Equal Weighted Styles
Average Ann. Return	4.5%	3.2%	9.0%	5.9%
Annual Volatility	4.1%	4.3%	7.4%	8.8%
Information Ratio	**1.08**	0.74	**1.22**	0.67
Win Ratio	62.6%	60.7%	65.4%	59.3%
Max DrawDown	-8.3%	-19.5%	-9.7%	-35.3%

Source: J.P. Morgan.

Lastly, Figure 11 graphs the Style Rotation strategy against Equal Weighted Style strategy.

Figure 11: Style Rotation Portfolio — Long-Short Performance



The Style Rotation Portfolio consists of the top 100 stocks in S&P 500 with investment in one of the following four portfolios each month: Expansion, Slowdown, Contraction and Recovery. Each of these four portfolios in turn is a blend of Value, Growth, Quality, Momentum, Low Volatility and High Volatility with weights assigned according to the overweight/underweight scheme described in Figure 9. Stock scores are sector normalized to minimize sector bias. Stocks are weighted equally in calculating the performance. No transaction cost is assumed. Past performance is not a guarantee of future performance.
Source: J.P. Morgan

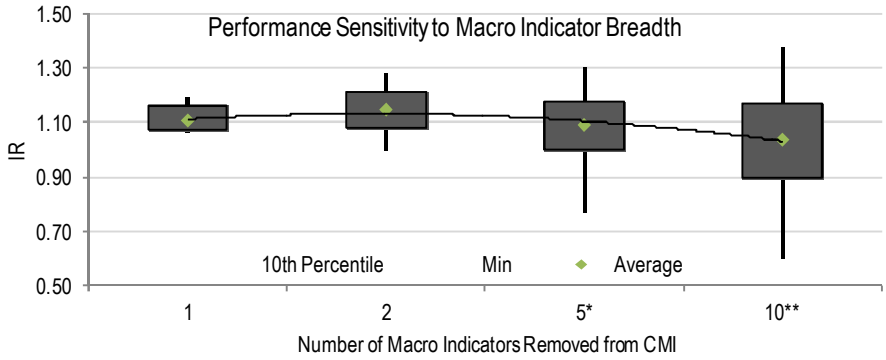
Sensitivity of Style Rotation Performance to the Construction of CMI

A well known drawback of back testing is the risk of over fitting the data. While we have been careful in selecting the inputs of the CMI (the key driver of style rotation), there is always a risk of over fitting the data – a possible consequence of that could be that the performance of the style rotation strategy is weaker out of sample. To test the robustness of CMI we removed one, two, five and ten indicators from the set of roughly two dozen indicators that have gone into constructing the CMI. Removing

Dubravko Lakos-Bujas
(1-212) 622-3601
dubravko.lakos-bujas@jpmorgan.com

one or two indicators does not present a computational issue since the number of combinations of the remaining indicators is small. However, when we remove 5 or 10 indicators from the CMI thousands of possible variations are possible. The average impact of random reconstruction of the CMI on the Information Ratio of the style rotation strategy is shown in Figure 12.

Figure 12: Sensitivity of Long-Short Information Ratio to Random Reconstruction of the CMI



* 10,000 random combinations were chosen for the exercise
** 30,000 random combinations were chosen for the exercise
Source: J.P. Morgan.

Removing one indicator from CMI appears to have minimal effect with the style rotation Information Ratio anchored around 1.10. However as the number of dropped indicators rises, the average performance of the strategy deteriorates and dispersion of possible Information Ratios widens from 1.05 to 1.20 and from 0.60 to 1.40. Our baseline CMI gives an Information Ratio of 1.22 which is on the upper range of possible random outcomes but not at an extreme.

Dubravko Lakos-Bujas
(1-212) 622-3601
dubravko.lakos-bujas@jpmorgan.com

Appendix A: Style Performance in Alternate Growth and Inflation Environments

We consider four possible Growth/Inflation environments:

Inflationary = High Growth, High Inflation
Reflationary = High Growth Low Inflation
Disinflationary = Low Growth, Low Inflation
Stagflationary = Low Growth, High Inflation

The definition of High Growth and Inflation is above the respective median value and Low Growth and Inflation is below the respective median. Both medians are calculated over the long term time period 1948-2015 (Median Growth = 2.9% year-on-year GDP; Median Inflation = 2.8% year-on-year CPI). The equal weighted performance results below are for sector normalized style portfolios (quintiles of S&P 500 universe).

Table 6: Long Short Performance (1984-2015)

	% of months	Value	Growth	Quality	Mom
		Average Monthly Return			
Inflationary	28%	0.8%	0.4%	0.2%	0.7%
Reflationary	20%	-0.4%	0.6%	0.5%	0.7%
Disinflationary	32%	0.5%	0.0%	-0.3%	-0.3%
Stagflationary	20%	0.1%	0.1%	0.6%	0.4%
		Monthly Volatility			
Inflationary		2.3%	1.7%	2.2%	2.3%
Reflationary		3.5%	1.9%	2.3%	3.3%
Disinflationary		3.9%	2.2%	3.0%	5.0%
Stagflationary		4.1%	2.4%	2.6%	4.1%
	Avg IR	Information Ratio			
Inflationary	**0.55**	**1.20**	0.72	0.40	**1.03**
Reflationary	**0.40**	**-0.43**	**1.09**	0.69	0.71
Disinflationary	-0.03	0.48	-0.04	-0.31	-0.23
Stagflationary	0.24	0.11	0.12	0.77	0.31

Source: J.P. Morgan.

Key Takeaways

- **Styles work best** in Inflationary (High Growth and High Inflation) and Reflationary (High Growth and Low Inflation) environments.
- **Style Investing is most challenged** in Disinflationary (Low Growth and Low Inflation) environment though there are individual styles that may work in this environment. Stagflationary (Low Growth and High Inflation) have mediocre style returns.
- **Value** thrives in Inflationary periods and performs better than any other style in Disinflationary periods. The worst environment for Value is Reflationary (Low Inflation, High Growth).
- **Growth style** does well in High Growth environments (Inflationary and Reflationary).
- **Quality style** does best in Stagflationary (Low Growth, High Inflation) – indeed, better than any other style in this environment. Quality is also effective in Reflationary (High Growth, Low Inflation) when Growth and Inflation are again moving in opposite directions.
- **Momentum** style is a bit like Growth – best in Inflationary environment, good in Reflationary periods.

Table 7: Long Only Excess Returns (1984-2015)

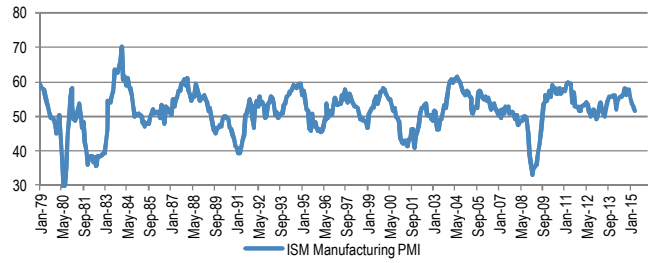
	% of months	Value	Growth	Quality	Mom
		Average Monthly Return			
Inflationary	28%	0.4%	0.3%	0.1%	0.4%
Reflationary	20%	-0.1%	0.3%	0.3%	0.5%
Disinflationary	32%	0.4%	-0.1%	-0.1%	-0.1%
Stagflationary	20%	0.0%	0.0%	0.2%	0.1%
		Monthly Volatility			
Inflationary		1.3%	0.9%	1.0%	1.4%
Reflationary		1.9%	1.0%	1.0%	1.7%
Disinflationary		2.6%	1.0%	1.2%	2.1%
Stagflationary		2.4%	1.2%	1.3%	1.7%
	Avg IR	Information Ratio			
Inflationary	**0.46**	**1.05**	**1.04**	0.31	**0.89**
Reflationary	**0.45**	-0.14	**1.04**	**0.97**	**0.94**
Disinflationary	-0.04	0.53	-0.25	-0.30	-0.10
Stagflationary	0.10	-0.07	-0.09	0.56	0.21

Source: J.P. Morgan.

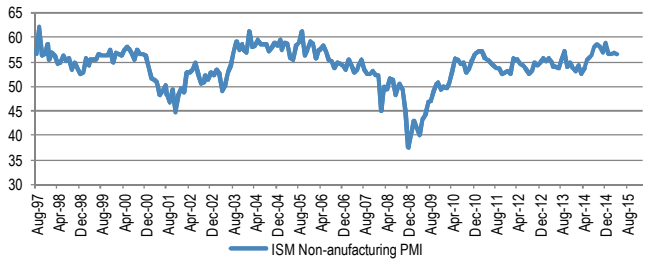
Dubravko Lakos-Bujas
(1-212) 622-3601
dubravko.lakos-bujas@jpmorgan.com

Appendix B: Macro Indicators for Style Cycle Investing

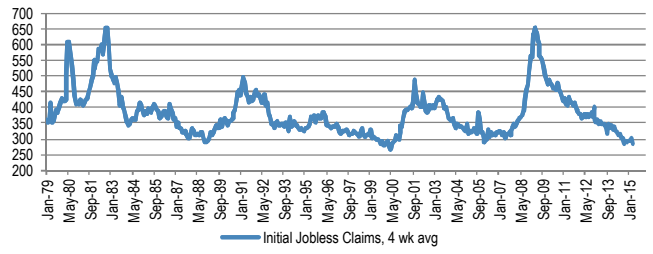
Key: (+ +) Expansion signal; (+) Recovery signal; (-) Slowdown signal; (- -) Contraction signal.



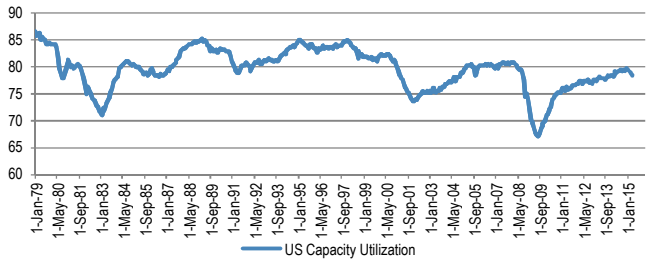
- (- -) Although manufacturing PMI indicates an expansionary economic state, there has been a sharp decline since December.



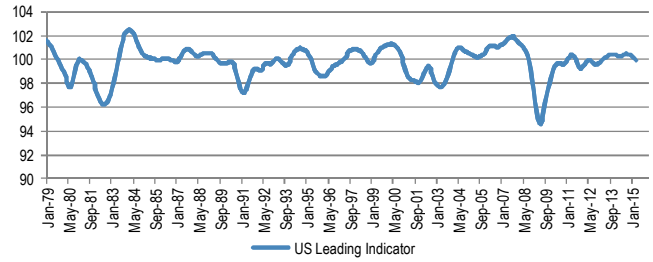
- (+ +) Unlike manufacturing PMI, non-manufacturing PMI shows a consistent expansionary state



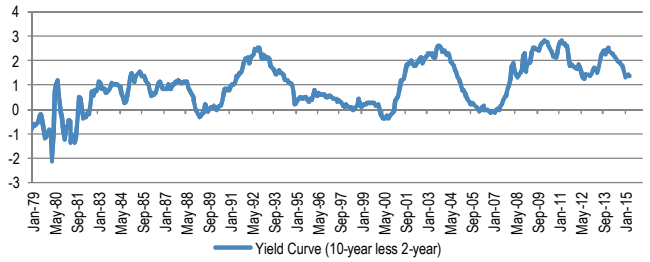
- (-) There continies to be a steady decline in the initial jobless claims – at the lowest level since the economic upturn.



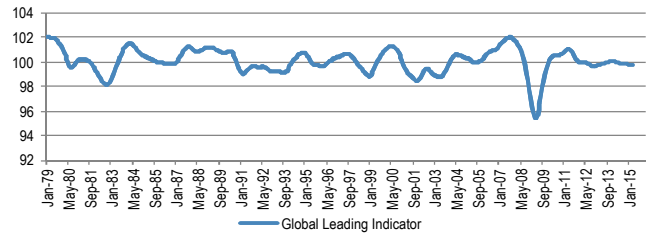
- (-) As good as it gets? Capacity utilization level is close to the pre-crisis peak level, but not as high as the 1990s level.



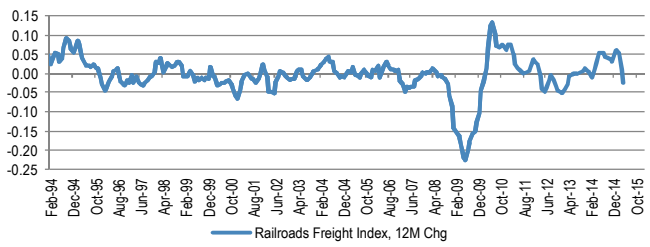
- (- -) US LEI shows a pullback in recent months but is not decisively heading south.



- (+) The yield cuve has been flattening since late last year, propelled by declining long-term yield – may be steepening now.



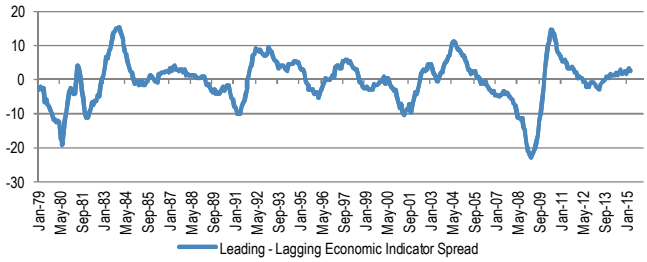
- (- -) Global LEI slowing down, more so compared to that of the US.



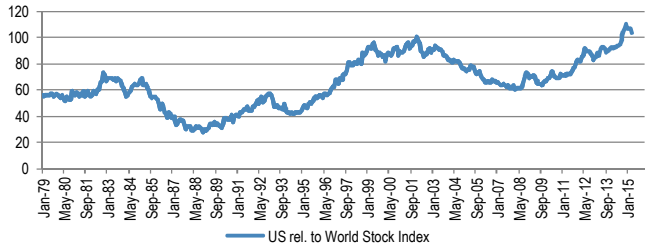
- (-) After strong pick-up in Jan/Feb, there has been a sharp slowdown.

Dubravko Lakos-Bujas
(1-212) 622-3601
dubravko.lakos-bujas@jpmorgan.com

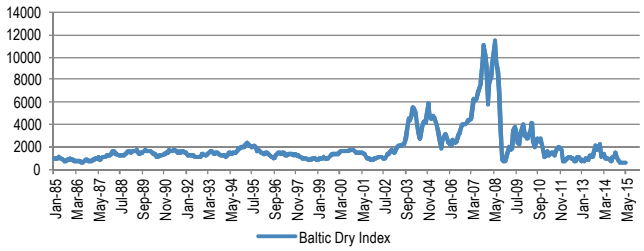
Key: (+ +) Expansion signal; (+) Recovery signal; (-) Slowdown signal; (- -) Contraction signal.



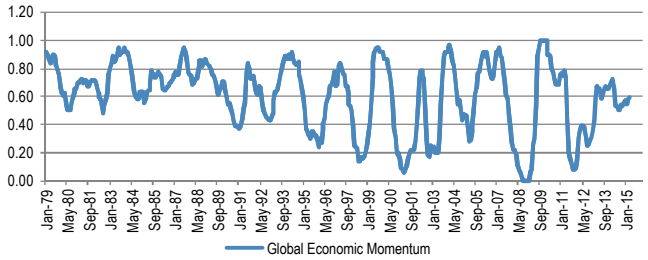
- (+ +) Leading LEI has steadily outpaced lagging indicator for the past year and half – still rising



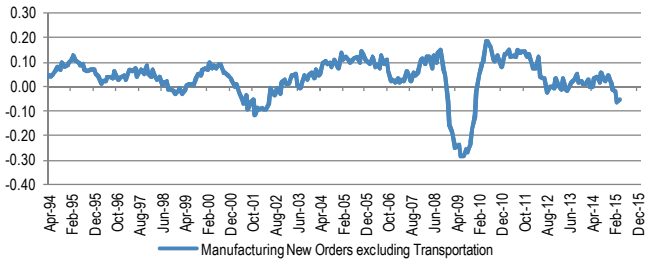
- (-) US equity market outperformance to that of the world appears to be peaking.



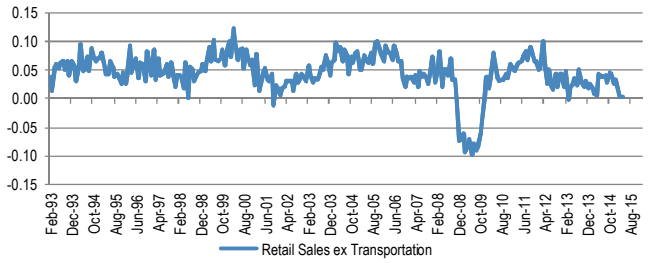
- (+) Contraction in Baltic Dry Index has slowed down in the last a few months; early signs of turning around.



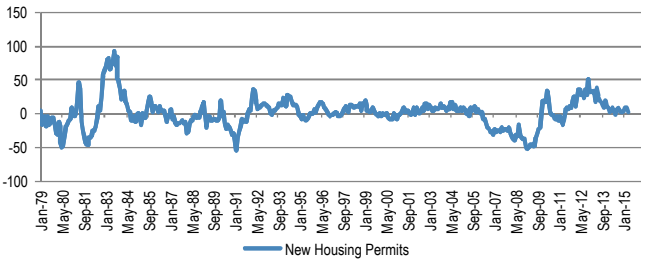
- (+ +) The Global Economic Momentum has turned positive recently.



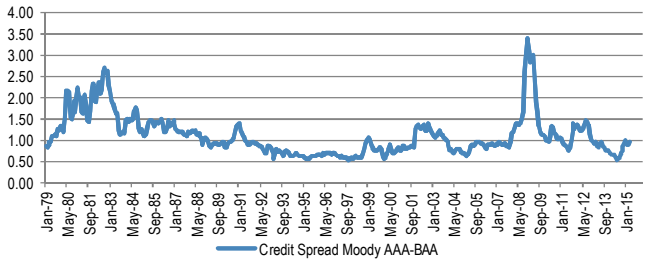
- (- -) The new orders have considerably slowed down entering 2015.



- (- -) Coupled with new orders, retail sales have not seen much growth since the beginning of the year.

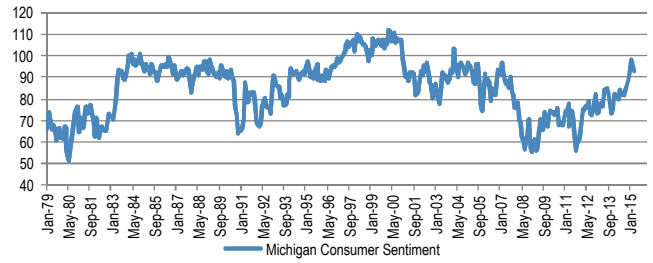


- (+) Decline in new housing permits acitivity has leveled off and may be turning up.

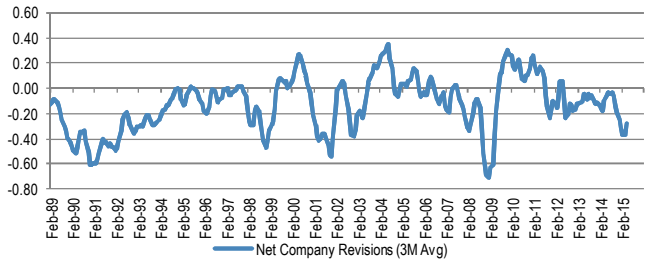


- (- -) Credit spread picked up sharply in the past a few months.

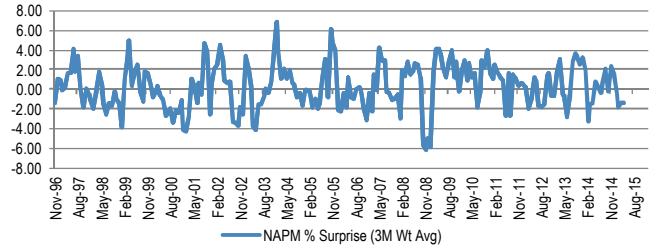
Key: (+ +) Expansion signal; (+) Recovery signal; (-) Slowdown signal; (- -) Contraction signal.



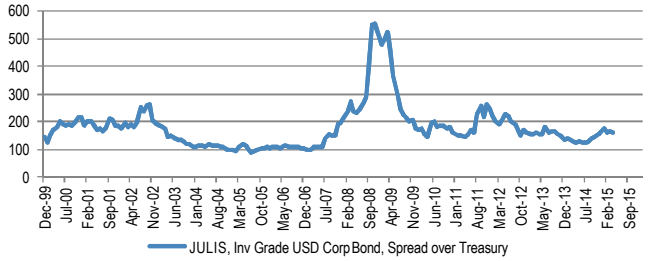
- (-) Michigan consumer index has reached the pre-crisis level but appears to be slowing now.



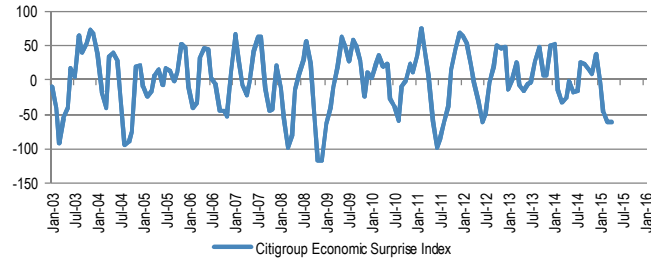
- (+) There has been a sharp decline in the net earnings revisions in the past several quarters. Recent data suggests an uptick in net Revisions.



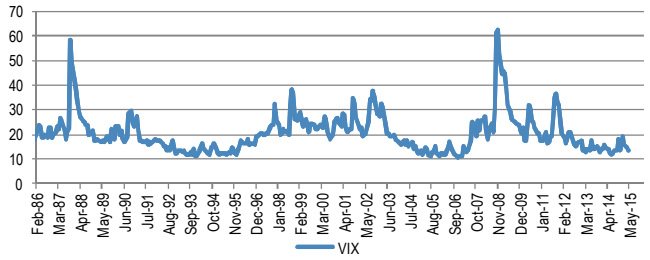
- (+) NAPM has delivered negative surprises since January this year. The latest reading appears a bit positive.



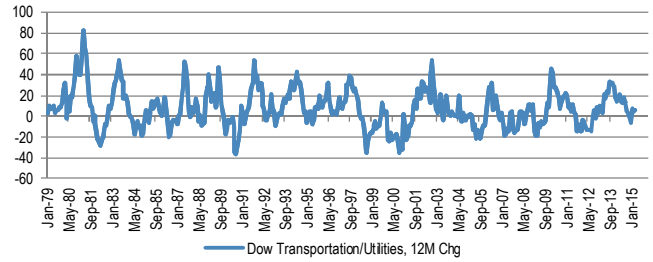
- (- -) The recent rise in yield spread (credit market risk) remains elevated and has not shown noticable sign of improvement.



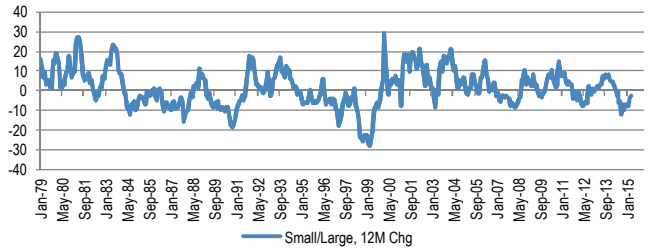
- (- -) Negative economic surprise has been predominant recently.



- (+) The VIX level is still at very low point – there is a risk of mean reversion but the jump is unlikely to be a sustained

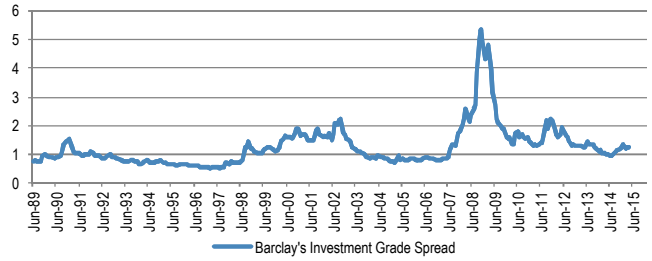


- (- -) The downward trend persists – recent data suggests continued cyclical weakness.

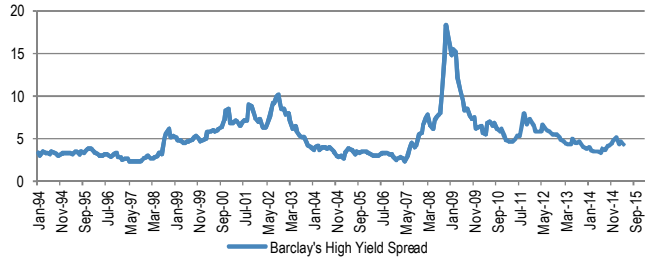


- (+) The small cap outpeformance seen recently after significant large cap leadership last year.

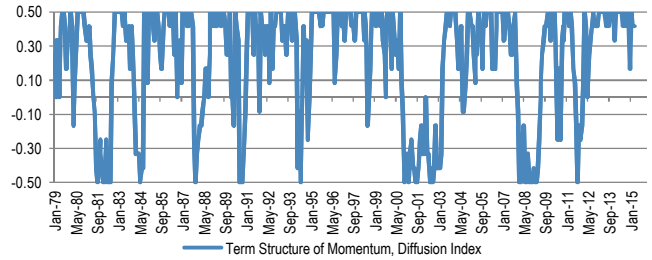
Key: (+ +) Expansion signal; (+) Recovery signal; (-) Slowdown signal; (- -) Contraction signal.



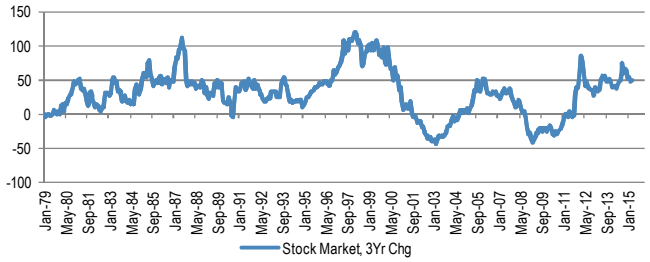
- (-) The recent elevation in yield spread (credit market risk) has not improved noticeably.



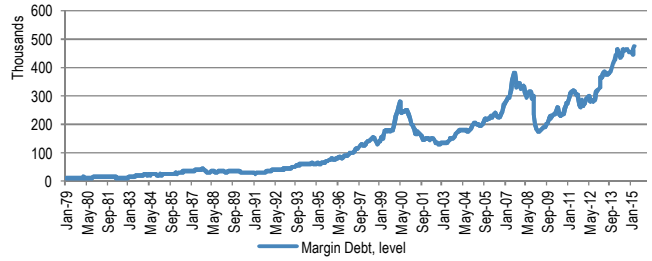
- (- -) The recent elevation in high yield spread is higher than the more "normal" periods.



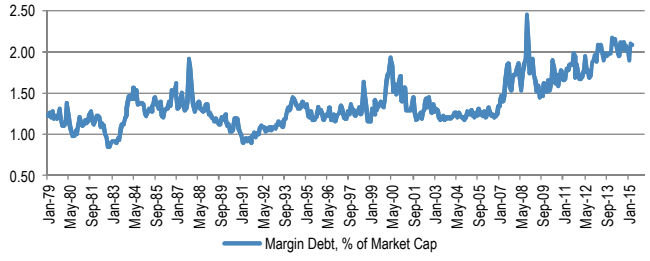
- (- -) The equity market momentum has been less resillient recently.



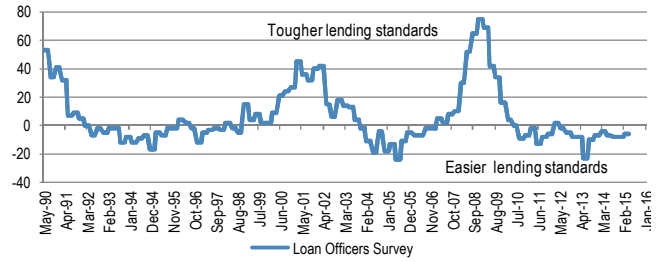
- (-) The equity market exhibits positive price trend over a longer time horizon but the direction has been down recently.



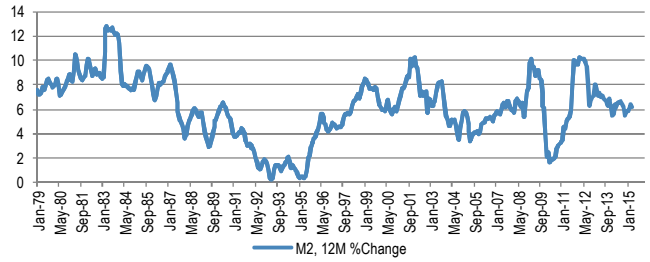
- (+ +) The margin debt is rising again after having stalled for a while.



- (-) Margin debt as % of market capitalization is moving sideways.

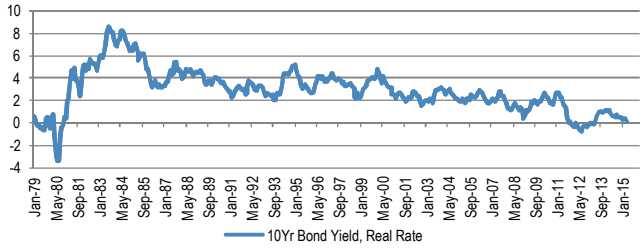


- (- -) Lending standards, while easy compared to before, have tightened a bit recently.

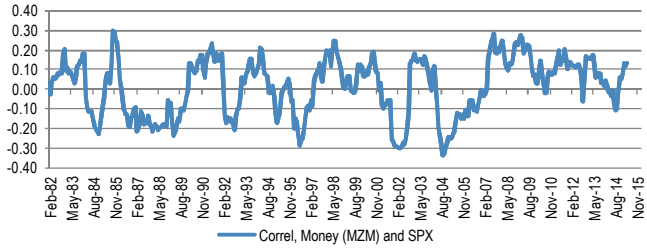


- (+) The growth rate of money supply has been relatively steady since the end of monetary quantitative easing.

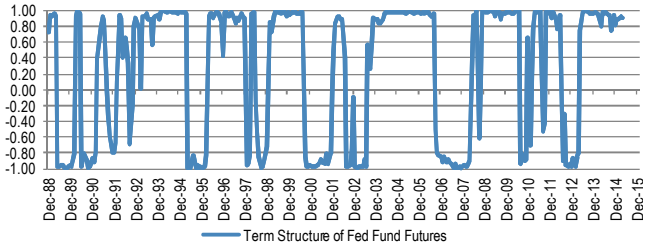
Key: (+ +) Expansion signal; (+) Recovery signal; (-) Slowdown signal; (- -) Contraction signal.



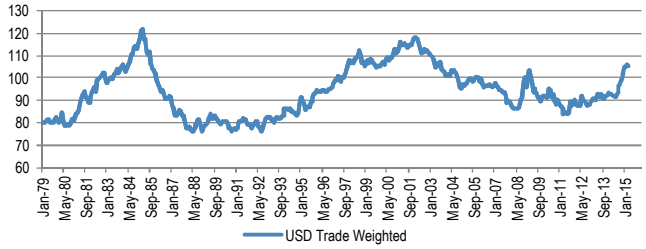
- (- -) The 10 year real yield has shown a declining trend historically, reaching close to zero yield recently under the zero interest rate policy despite low inflation.



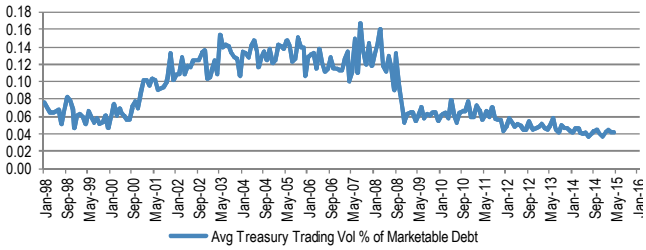
- (+ +) The monetary policy and equity market has been in sync since the crisis and there has been a sharp pick up in recent months.



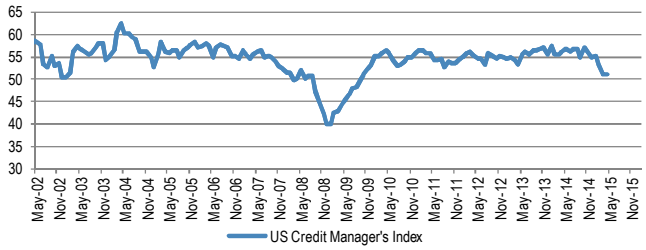
- (-) The fed fund future remains in contango, though the curve has flattened a bit recently.



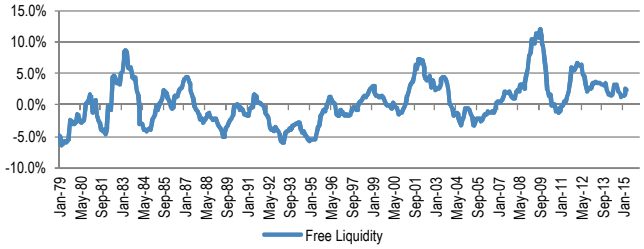
- (+) There has been a sharp increase in dollar on a traded weighted basis. Recent data suggests dollar may be softening a tad.



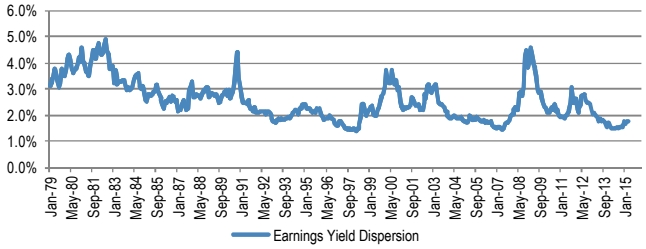
- (- -) The debt market has become less liquid.



- (- -) There has been a pronounced tightening of credit availability.

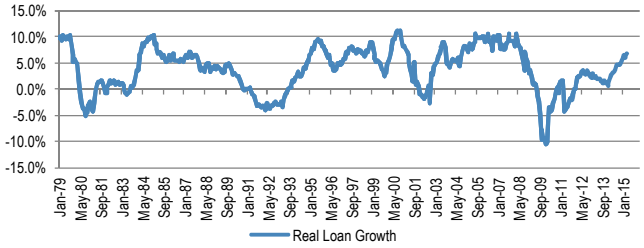


- (+) The monetary liqudity is still attractive altough there has been a decline in recent period.

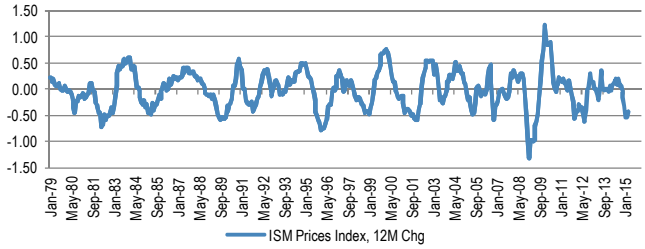


- (+) The cross-sectional earnings dispersion has narrowed down due to falling volatility but has widened recently.

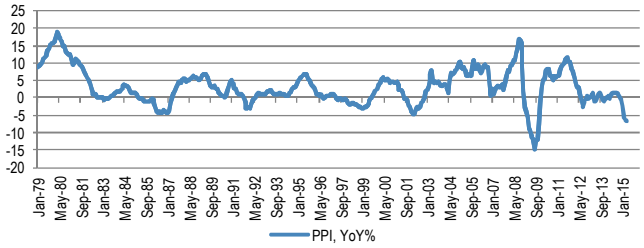
Key: (+ +) Expansion signal; (+) Recovery signal; (-) Slowdown signal; (- -) Contraction signal.



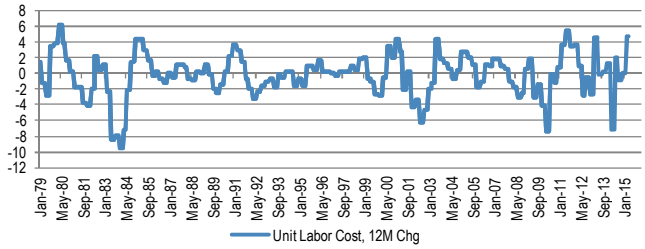
- (+ +) The size and direction of loan growth has improved since late 2014.



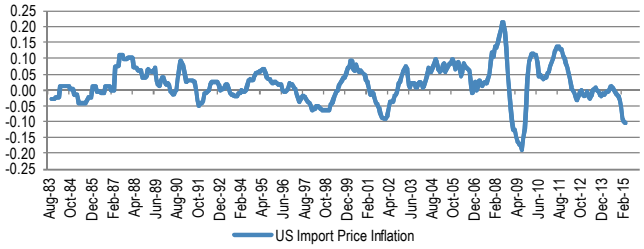
- (+) The sharp decline in ISM price index removes potential pick-up in unexpected inflation. Recent data shows stabilizing of the price index.



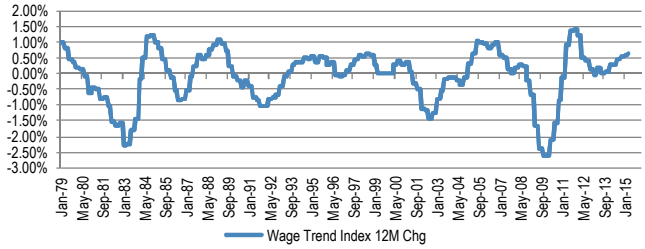
- (+) The drop in .PPI is explanable by the dollar and oil price. Recent stability in these factors is a positive.



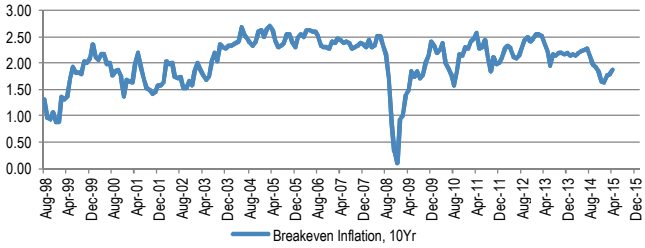
- (+ +) While rising unit labor cost puts pressure on businesses' high profit margin, increase in labor's share of output may be a positive.



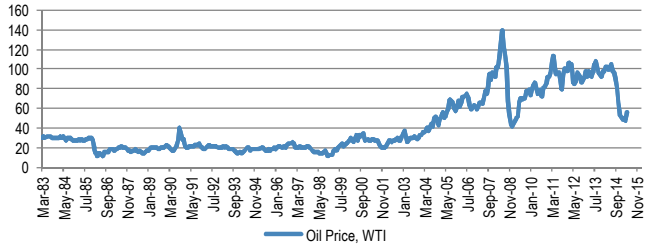
- (+) The rate of decline in import price inflation is slowing – a good thing.



- (+ +) Positive wage trend also suggests that the reflationary monetary policy is gaining ground.

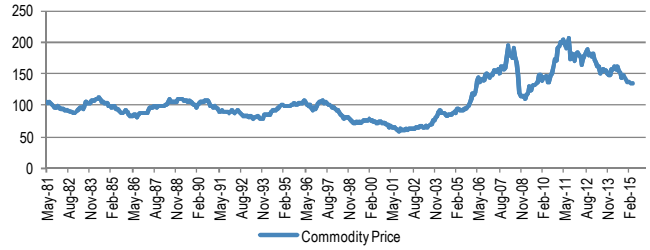


- (+) TIPS market reveals modest increase in expected inflation.

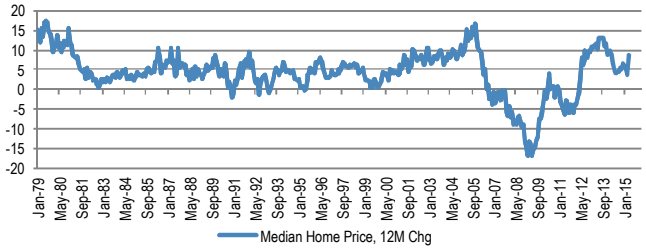


- (+) The oil price, while still weak, is stabilizing.

Key: (+ +) Expansion signal; (+) Recovery signal; (-) Slowdown signal; (- -) Contraction signal.



- (- -) The general commodity price has seen a decline sinec 2011.



- (- -) The recovery in home prices had stalled for a while – if recent pickup persists, it would be another positive.

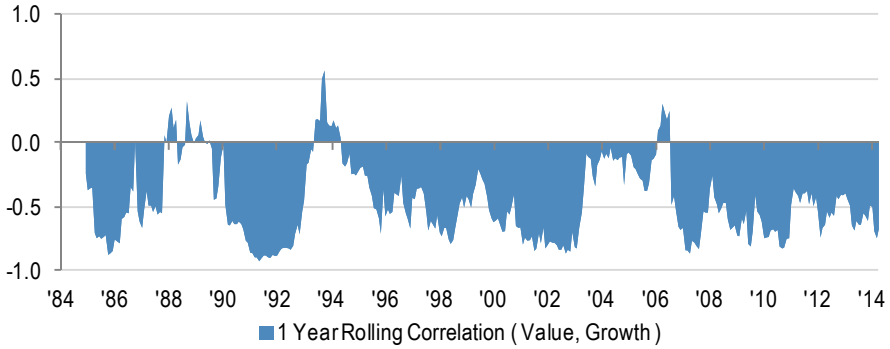
Appendix C: A Term Structure Momentum based Style Rotation Strategy

We show an alternate approach to Style Rotation based on Momentum

While Cycle Investing discussed above is an effective and robust approach to style rotation, there are other approaches that can complement it. For instance, Momentum factor which seems to work in many other contexts can be deployed for style rotation. However, a simple 12-month rotation strategy — buy the winning style, sell the losing style for the past one year — in itself is not that effective at adapting to market cycles. An improved approach that uses momentum term structure (evaluating 1-month, 3-month and 12-month momentum, thus effectively using exponentially weighted momentum) turns out to be a much better style rotation strategy[5].

For simplicity, here we consider style rotation between Value and Growth using Term-Structure Momentum. Even without an active rotation strategy, Value and Growth styles make a nice couple – they are negatively correlated with an average -56% correlation over the past thirty years. Figure 13 shows one year rolling correlation of sector-neutral L/S performance of the two styles.

Figure 13: Value and Growth Styles are almost always negatively correlated



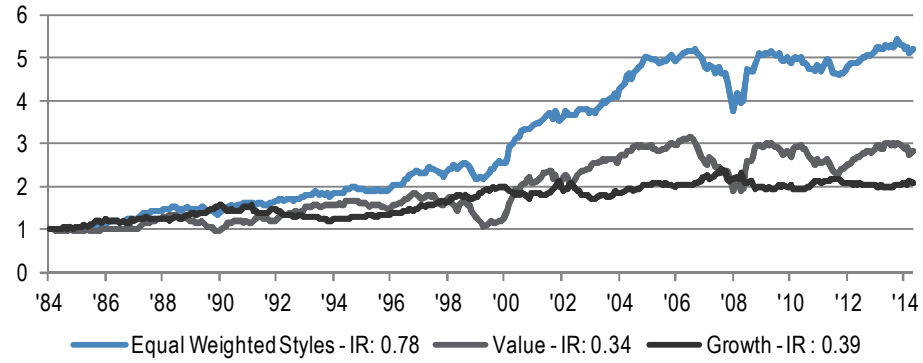
Source: J.P. Morgan.

[5] A similar approach is used in Mitigating Equity Index Risk Using Term Structure of Price Momentum.

Opposites Attract – Value and Growth Smooth out Volatility resulting in Higher IR

As a result, combining these two styles in equal measure provides a nice diversification, resulting in an attractive Composite Long-Short IR of 0.78 compared to IR = 0.34 for Value and IR = 0.39 for Growth over the past three decades (see Figure 14).

Figure 14: Value and Growth are Good Diversifiers



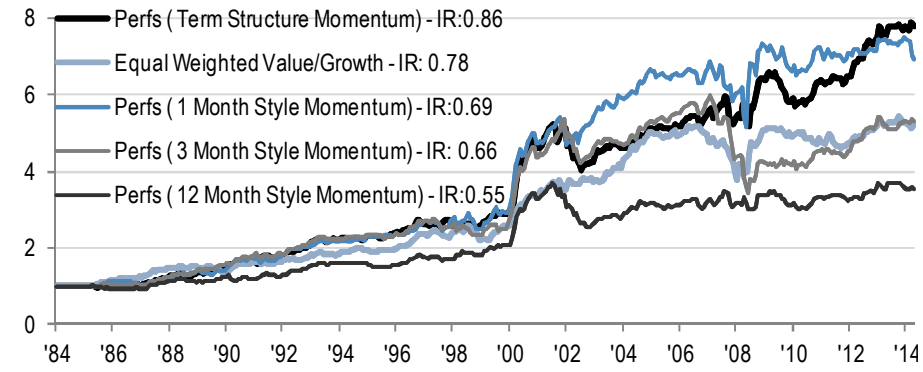
Source: J.P. Morgan.

Can we do better than a static 50-50 allocation shown above? Needless to say, the crucial point is getting the timing of rotation right. **We suggest the following strategy:** whichever style has the highest average momentum over 1-, 3- and 12-month time horizons (i.e. higher Term Structure of Momentum based on sector-neutralized quintile long-short portfolios) is overweight in the subsequent month.

We consider two variation of Value-Growth rotation: **Full rotation** and **Partial rotation**.

In **Full rotation**, if Value has higher Momentum, 100% weight is allocated to Value, otherwise Growth is allocated 100% weight. Figure 15 shows the performance of Full rotation approach — comparing the Long-Short performance of three single horizon Momentum strategies (1-month, 3-month, and 12-month) and Term Structure Momentum strategy. None of the single momentum horizon does better than Equal Weighted Value+Growth portfolio though the Term Structure Momentum based strategy is able to outperform the Equal Weighted portfolio (see Figure 15).

Figure 15: Full Rotation: Term Structure Momentum IR = 0.86 Exceeds Equal Weight IR = 0.78

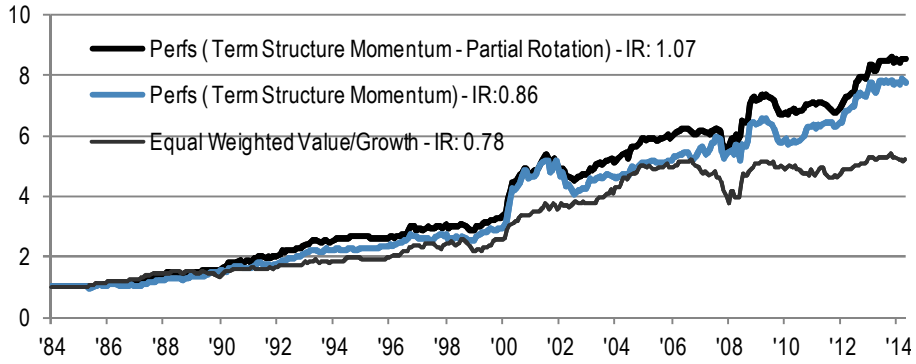


Source: J.P. Morgan.

Dubravko Lakos-Bujas
(1-212) 622-3601
dubravko.lakos-bujas@jpmorgan.com

Lastly, a **Partial rotation** is considered. If Value is favored over Growth, Value receives 75% weight while Growth gets 25% weight and vice-versa. This partial rotation strategy generated a superior result compared to full rotation with Long-Short IR of 1.07.

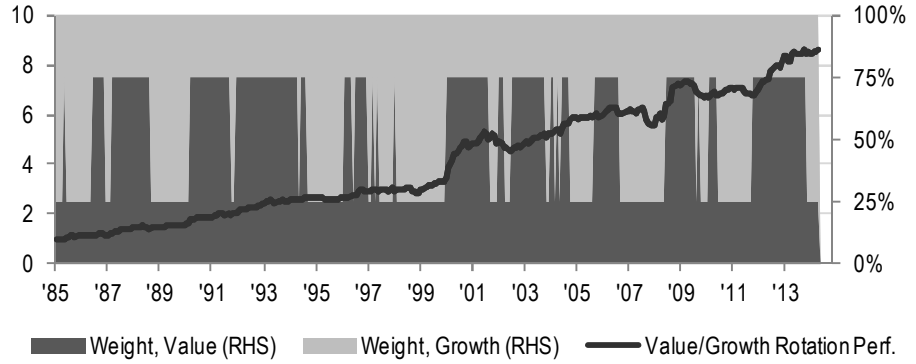
Figure 16: Partial Rotation between Value and Growth Using Term Structure Momentum Gives the Best Performance



Source: J.P. Morgan.

The history of style weights of the partial rotation strategy is shown below.

Figure 17: Backtest Performance: Value/Growth Rotation Based on Term Structure Momentum Factor



Source: J.P. Morgan.

Dubravko Lakos-Bujas
(1-212) 622-3601
dubravko.lakos-bujas@jpmorgan.com

Appendix D: Correlation among Risk Factors

Table 8: Pair Wise Correlation among Performance of the Top Quintile Sector Normalized Factors – based on Excess Total Return Relative to Equal Weighted S&P 500

	Value			Growth				Quality			Momentum		Low Volatility			Hi Vol
11/1984-3/2015	Book-to-Price	1Yr-Fwd-Earnings-Yld	Sales-Yield	1Yr-Sales-Growth	3Yr-Sales-Growth	1Yr-Free-Cash-Flow-Gwth	3Yr-Free-Cash-Flow-Gwth	ROE	ROA	Piotroski-Score	12M-Price-Momentum	3M-Avg-Mean-EPS	Large-Cap	Low-Beta	Altman-Z	High-Beta
Book-to-Price	1.00	0.65	0.86	-0.31	-0.17	-0.08	-0.24	-0.53	-0.69	-0.34	-0.66	-0.49	-0.63	-0.45	-0.42	0.49
1Yr-Fwd-Earnings-Yld	0.65	1.00	0.68	-0.16	-0.09	-0.06	-0.23	-0.13	-0.37	-0.13	-0.53	-0.37	-0.48	-0.24	-0.13	0.22
Sales-Yield	0.86	0.68	1.00	-0.33	-0.19	-0.15	-0.24	-0.49	-0.67	-0.24	-0.61	-0.43	-0.61	-0.42	-0.33	0.44
1Yr-Sales-Growth	-0.31	-0.16	-0.33	1.00	0.61	0.23	0.33	0.33	0.44	0.28	0.35	0.42	0.17	-0.05	0.27	0.16
3Yr-Sales-Growth	-0.17	-0.09	-0.19	0.61	1.00	0.16	0.28	0.29	0.34	0.07	0.16	0.25	0.09	-0.17	0.17	0.27
1Yr-Free-Cash-Flo-Gwth	-0.08	-0.06	-0.15	0.23	0.16	1.00	0.19	0.07	0.07	0.24	0.16	0.19	0.00	0.11	0.11	-0.02
3Yr-Free-Cash-Flo-Gwth	-0.24	-0.23	-0.24	0.33	0.28	0.19	1.00	0.12	0.23	0.27	0.31	0.21	0.07	0.06	0.22	0.05
ROE	-0.53	-0.13	-0.49	0.33	0.29	0.07	0.12	1.00	0.70	0.25	0.37	0.17	0.44	0.17	0.40	-0.21
ROA	-0.69	-0.37	-0.67	0.44	0.34	0.07	0.23	0.70	1.00	0.34	0.49	0.36	0.51	0.28	0.51	-0.31
Piotroski-Score	-0.34	-0.13	-0.24	0.28	0.07	0.24	0.27	0.25	0.34	1.00	0.40	0.32	0.26	0.27	0.42	-0.26
12M-Price-Momentum	-0.66	-0.53	-0.61	0.35	0.16	0.16	0.31	0.37	0.49	0.40	1.00	0.66	0.45	0.34	0.37	-0.31
3M-Avg-Mean-EPS	-0.49	-0.37	-0.43	0.42	0.25	0.19	0.21	0.17	0.36	0.32	0.66	1.00	0.25	0.14	0.22	-0.06
Large-Cap	-0.63	-0.48	-0.61	0.17	0.09	0.00	0.07	0.44	0.51	0.26	0.45	0.25	1.00	0.31	0.21	-0.37
Low-Beta	-0.45	-0.24	-0.42	-0.05	-0.17	0.11	0.06	0.17	0.28	0.27	0.34	0.14	0.31	1.00	0.29	-0.81
Altman-Z	-0.42	-0.13	-0.33	0.27	0.17	0.11	0.22	0.40	0.51	0.42	0.37	0.22	0.21	0.29	1.00	-0.28
High-Beta	0.49	0.22	0.44	0.16	0.27	-0.02	0.05	-0.21	-0.31	-0.26	-0.31	-0.06	-0.37	-0.81	-0.28	1.00

Source: J.P. Morgan

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