J.P.Morgan

J.P.Morgan

Global Equity Derivatives &
Quantitative Strategy
02 October 2015
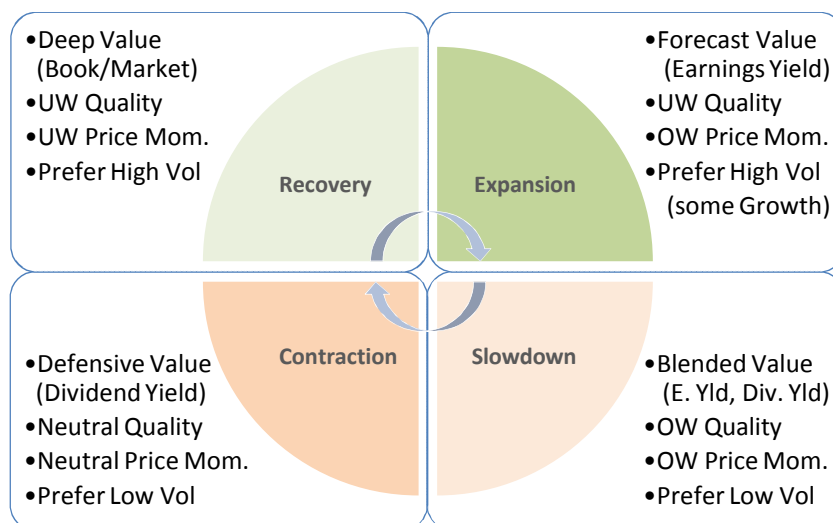
J.P.Morgan

Style Timing in GEM

Allocating Risk Premia through the Business Cycle

We follow up our previous developed market studies on style investing with our systematic framework for risk premia selection for *Emerging Markets*. We use a top-down approach to identify different stages of the business cycle and match them with their optimal styles. Similar risk factors were bundled into five different style groupings – Value, Quality, Momentum, Growth and Volatility – grouped to have similar correlation and regime response properties. These families have exhibited reasonably positive long term effectiveness but we do observe cyclicality in their behaviour which we are looking to exploit.

Our framework uses the *change* of market indicators along with the *change of the change (2nd derivative)* to identify the phase of the market cycle. Our EM Quantitative Market Indicator (EM QMI) is based on five different types of market series (trend, risk, reward, sentiment and macro) and used to track the cycle with a 1-3 month lead. We try and *leverage up styles* when we are more confident they will do well, but also to *protect against style risks* when we are concerned they might fail.

The main difference between this and our Developed Market frameworks is that in our EM QMI we use more of the 'risk based' market series and less policy driven macro-economic monitors. This is because it is difficult to capture government policy positions and economic indicators across the rather heterogeneous mix of 20+ EM countries. We also focus much more on Quality instead of Growth styles as it is far better suited to GEM.

Global Quantitative Strategy

Robert Smith, PhD [AC]
(852) 2800 8569
robert.z.smith@jpmorgan.com
Bloomberg JPMA RSMITH <GO>
J.P. Morgan Securities (Asia Pacific) Limited

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

Christopher Ma [AC]
(852) 2800-8530
christopher.x.ma@jpmorgan.com
Bloomberg JPMA MA <GO>
J.P. Morgan Securities (Asia Pacific) Limited

Khuram Chaudhry
(44-20) 7134-6297
khuram.chaudhry@jpmorgan.com
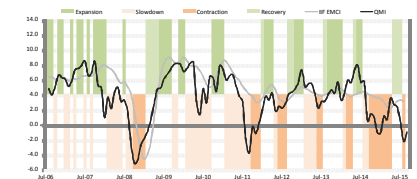**Bloomberg** JPMA CHAUDHRY <GO>
J.P. Morgan Securities plc

Global Head QDS

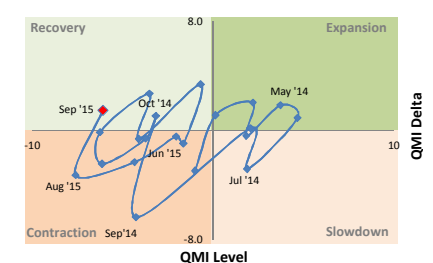**Marko Kolanovic, PhD**
(1-212) 272-1438
marko.kolanovic@jpmorgan.com
J.P. Morgan Securities LLC

J.P. Morgan Style Investing – the four states of the cycle and their style tilting

Recovery
- Deep Value (Book/Market)
- UW Quality
- UW Price Mom.
- Prefer High Vol

Expansion
- Forecast Value (Earnings Yield)
- UW Quality
- OW Price Mom.
- Prefer High Vol (some Growth)

Contraction
- Defensive Value (Dividend Yield)
- Neutral Quality
- Neutral Price Mom.
- Prefer Low Vol

Slowdown
- Blended Value (E. Yld, Div. Yld)
- OW Quality
- OW Price Mom.
- Prefer Low Vol

Source: J.P. Morgan Quantitative and Derivatives Strategies

The JPM EM QMI leads EM GDP by 1-3 Months…

Source: J.P. Morgan, IIF, MSCI Barra, Bloomberg

…and recently moved into a 'Recovery' state

Source: J.P. Morgan, MSCI Barra, Bloomberg

See page 30 for analyst certification and important disclosures, including nor-US analyst disclosures.

J.P. Morgan does and seeks to do business with companies covered in its research reports. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report. Investors should consider this report as only a single factor in making their investment decision.

www.jpmorganmarkets.com

This document is being provided for the exclusive use of Xu Zhang at MILLENNIUM PARTNERS - SINGAPORE.

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

Table of Contents

Appendices

Related JPM Reports

US: Framework for Style Investing: Style Rotation and the Business Cycle

EU: European Quant Strategy: Style Investing

Asia/EM: Beta Aware Alpha, Making the most of Macro

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

Motivation

Timing Style exposure can add value to portfolio performance.

But instead of 'chasing' rewards we more want to 'protect' against upcoming possible risks. This is a more cautious approach to style investing.

Building on the Developed Market frameworks already available from JPM[1,2] we use the same approach to identify market conditions in Emerging Markets and position our style portfolios more appropriately depending on the business cycle. Since equity portfolios are built by focusing on some key characteristics of stocks — Country, Industry and Styles are the three most common organizing principles used.

A global investor with views on these drivers could allocate more risk capital to say Industrial Momentum stocks in Asia over Bank Value stocks in LatAm. The portfolio manager could then concentrate on selecting the 'best' stocks within these more narrowly defined portfolios. But how should one rotate the exposures between Country, Industry and Styles?

While Country[3] and Industry[4] selection have been studied extensively, rotating between Styles has received less attention from investors. A possible reason for this is that Country selection is typically seen as the province of strategists and economists 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 but is becoming more popular as concepts like "smart beta" and "fundamental indexing" become more popular.

An example of potential profitability of Style timing is the relative performance of Value versus Quality in Emerging Markets. As shown below, Value can vastly outperform or underperform Quality styles over a rolling 12-month period often by 50% or more. This it is why it's tempting for investors to try to boost performance by varying their exposure between just these two styles using a model attempting to anticipate their future performance.

It is interesting to see how the choice between Value and Quality has been much more important in the last 10 years. Between 1998 and 2006 it was best to be simply overweight Value most of the time.

Figure 1: Profit Opportunity: Relative Performance of Value and Quality Styles in EM
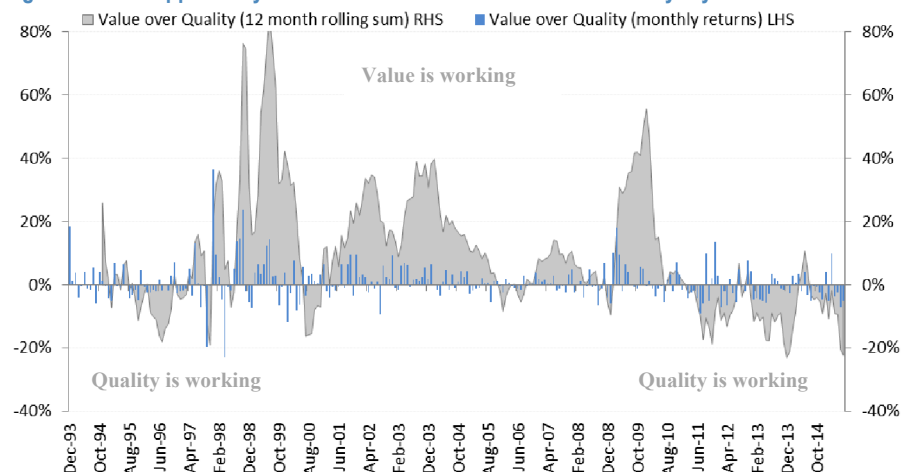
Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Bloomberg; MSCI Emerging Markets, Country Neutral, Long-Short, Deciles.

[1] See Framework for Style Investing: Style Rotation and the Business Cycle
[2] See European Quant Strategy: Style Investing
[3] See Framework for Regional Equity Allocation
[4] See Sectors Unchained II: Industry Selection Model - Capturing Alpha

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

The choice between Value and Quality seems even more important in the last decade.

While Value dominated EM during the period 1997- 2006, the last 10 years have been more Quality biased but then punctuated with periods of Value performance. It would seem that the recent decade more than ever before that a technique for timing between Value and Quality could be beneficial to performance. But how might we exploit what part of the cycle EM is currently in?

One thing in our favour is that Emerging Markets are generally seen to be of a higher volatility than developed ones. There is more information uncertainty and so they tend to be more sensitive to risk appetites switching between greed and fear. In some ways it makes the task of style timing a relatively simple question– are markets embracing risk or are they avoiding it? Is the business cycle rising or falling? If we can monitor some combination of signals to estimate just this, then we could simply focus on higher beta ones in rising cycle states and lower beta ones during falling cycle states – examples of two such factors, P/B and ROE, are shown below.

Figure 2: Plot of returns to a P/B and ROE factor mimicking portfolio against the market
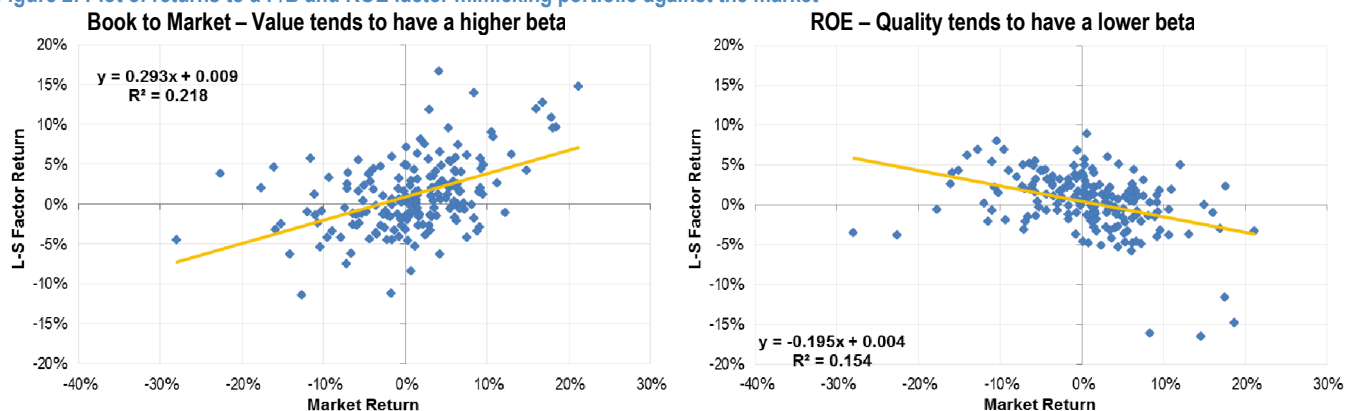
Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Bloomberg; MSCI Emerging Markets, Country Neutral, Long-Short, Deciles.

The choice between Value and Quality is most natural in EM as these two factors tend to be polar opposites when it comes to market risk. This is the main decision to be made in the cycle – not the allocation between Value and Growth which is more deliberated on in Developed Markets.

Of course these are just two rather extreme opposite examples, but in its simplest form style timing in EM might be just switching between P/B in expanding states and ROE during contracting states. We get great results by simply blending these two factors 50:50 (the diversified approach) but we still think there is something more to be had by being more concentrated in one or the other depending on the business cycle.

However there are also some useful styles for in between if we allow ourselves to make things just a little more granular. So we also want to make the distinction within these rising and falling states but also to estimate the relative *level* of each so that we might also take into account turning point risks. In other words we would like to say if we are closer to the end of a cycle than the beginning. In doing so we try to monitor four states; splitting rising states into *Recovery* and *Expansion*, and the falling states into *Slowdown* and *Contraction*.

In the next section we explore the risk premia we have to work with and how we can group them for this use in this four state framework.

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

Style choice and construction

This report is about Style timing based on the states of the business/market cycle.

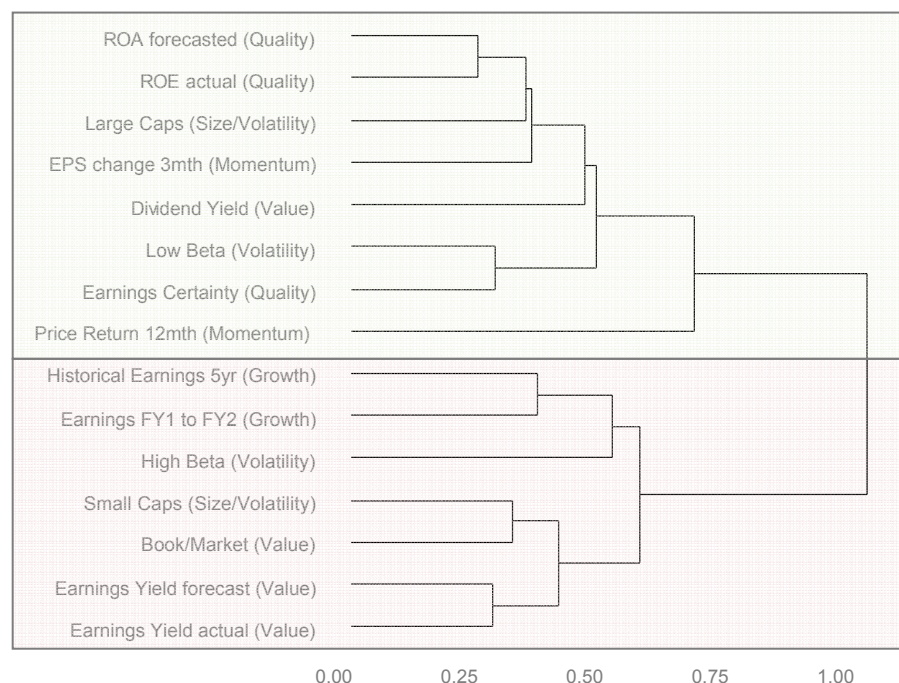**We use top-down macro inputs to estimate the 'state' of the business cycle.**

This report investigates style timing based on the business cycle. Other approaches like Style Momentum and Style Valuations (these are examples of what may be described as "factor on factor" approaches) might also be used to augment Style cycle investing, but the primary goal of this study is timing styles *based on business and market cycle state estimations using top-down macro inputs*.

A more flexible approach to style investing is taken by bundling similar risk factors into a style family rather than the traditional approach which typically uses a single style to bifurcate the benchmark into just two "opposing" ends of the spectrum such as large/small or growth/value. We group by style families that tend to show differing behaviour within each state ('orthogonality' is the term often used).

In keeping with the methodology developed and analyzed in Equity Risk Premia Strategies we consider five Style types: **Value, Growth, Quality, Momentum,** and **Volatility**. To construct our Style Indices we have selected 14 Risk Factors – our selection is largely based on factors that have reasonably positive long term performance; and intuitively cover commonly accepted concepts of the Style based on their similar regime correlations, performances, and behavior.

One way we can numerically explore these factors commonalities is through a cluster analysis and the resulting dendrogram – the length of the branches is determined by all pair wise correlation amongst the risk factors; the shorter the branches connecting two factors, the closer their relationship.

A broad observation of the style clusters is they fall into higher and lower beta style groups.

We can measure the beta of each style against the market as well and we typically not the Quality, Momentum, and Low Vol styles have lower betas, while Value, Growth and High Vol styles have higher betas.

We use this as a starting point to better position styles during contracting and expanding business states.

Figure 3: Clustering Equity Risk Factors into Style Families

The cluster analysis uses monthly long-short returns (quintile) of country normalized risk factors in MSCI Asia ex Japan (2001-2015).
Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Bloomberg

5

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

Defensive vs. Offensive Value

One thing about Emerging Markets is that Value is such as strong long-term performer we really are loathe to ever be underweight it. But there are subtle differences in the types of Value styles – from defensive Dividend Yield to the more aggressive deep value in the form of Book to Market.

If we look at just the Valuation factors clustered along with high and low beta styles, we can group together similar behaviors in this space. In the dendrogram below we can clearly see that Dividend Yield has less in common with High Beta than it does with Low Beta – confirming it is the most 'defensive' of the value factors.

Figure 4: Clustering the Value Risk Factors with High and Low Beta styles

Default Value – our typical value factor set used for 'all-weather' conditions. We will equal weight these.

Offensive Value – our more aggressive value factor for when we want more market beta exposure

Defensive Value – our lower beta factor for use during a contraction or more volatile market conditions
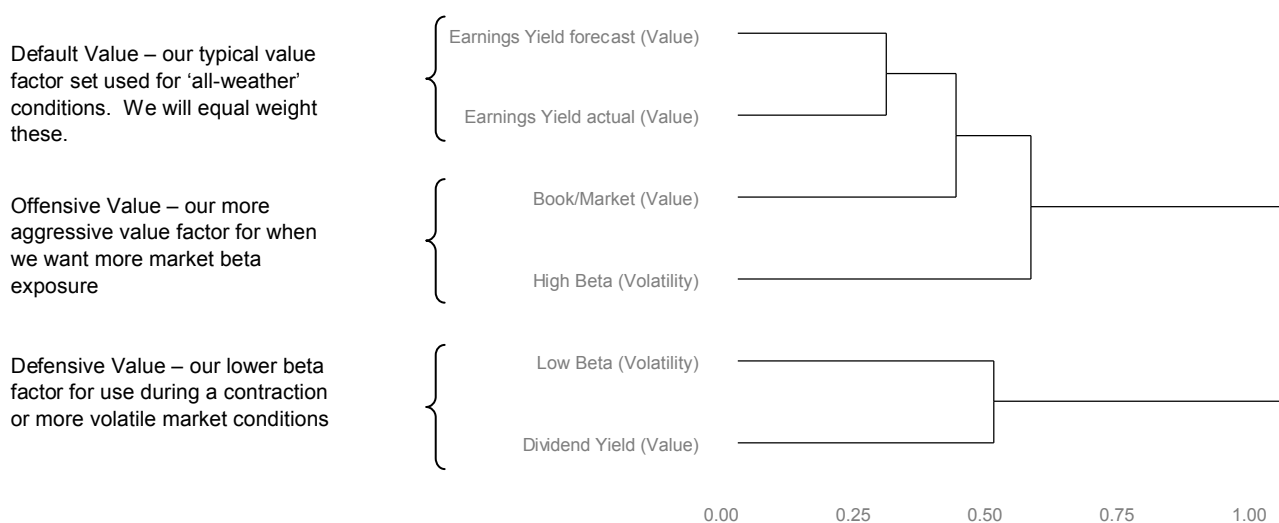

The cluster analysis uses monthly long-short returns (quintile) of country normalized risk factors in MSCI Asia ex Japan (2001-2015). Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Bloomberg

We are going to try and use Dividend Yield as our 'Defensive Value' style when the cycle environment is risk averse. Dividend yield has always been a proxy for defensive investing in Asia and EM.

Earnings yield actual vs. forecasted are showing up as being the most similar – which is not that surprising as the forecasted earnings will be based largely on the actual numbers. These are our 'Default' Value styles in EM. They are the go-to Value factor in our static composite models and we find that they are better performers in the long run if we were business cycle agnostic.

Book/Market shows up as having the most in common with High Beta performance - we will use this as our 'Offensive Value' style. Book/Market is usually the first factor to perform well after a market bottom when moving into a recovery phase. We will try and use this more during the early stages of bull markets.

So while we will keep Value on and relatively overweight most of the time, we do like to exploit the different kinds of Value and the defensive vs offensive behaviour they can exhibit.

6

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

Our choice of style groupings

From the style clusters in Figure 3 we can start to recognize the styles with similar characteristics that belong to the same risk premia 'families'. This has also been done in our report Equity Risk Premia Strategies.

For example ROE and ROA are very close to each as expected because their correlation with each other is high, and they have almost equally large negative correlation with Value factors and positive correlation with Low Beta factor. Naturally we will use these as the basis for our Quality style.

Earnings Certainty could be considered a Low Volatility style but we choose to include it with the Quality family as it is derived from a very different source – it is not based on the statements but rather analysts' forecasts. It is a measure of the clarity of the company business and representative financial statements which is highly sought after in EM where information uncertainty abounds.

It is also clear from Figure 3 that Value, Growth and High Volatility factors also clump together. These form the core of our Higher Beta styles for use when the cycle state is rising. Conversely we use Quality and Low Vol more when the cycle states are falling.

Table 1: Factor Groupings of Emerging Market JPM Styles

Default Value - Earnings yield 1Y forward Defensive Value - Dividend Yield Offensive Value - Book-to-Market	Momentum - 12M Price Momentum - 3M Earnings Momentum	Low Volatility - Large caps - Low Beta
Growth - Forecast Earnings Growth (1yr) - Historical Earnings Growth (5yr)	Quality - ROE actual - ROA forecasted - Earnings Certainty	High Volatility - Small caps - High Beta

Source: J.P. Morgan Quantitative and Derivatives Strategies

The biggest changes we have made from Developed Market counterpart models with the Altman Z-score in the Volatility family and the use of Sales Yield in Value. While these are certainly applicable to EM as well we find that Earnings Yield is a much better through cycle Value factor. The Altman Z-score does much better in DM so we prefer to stick to simpler ROE & ROA and Beta & Size for our quality and low risk proxies.

Robert Smith, PhD
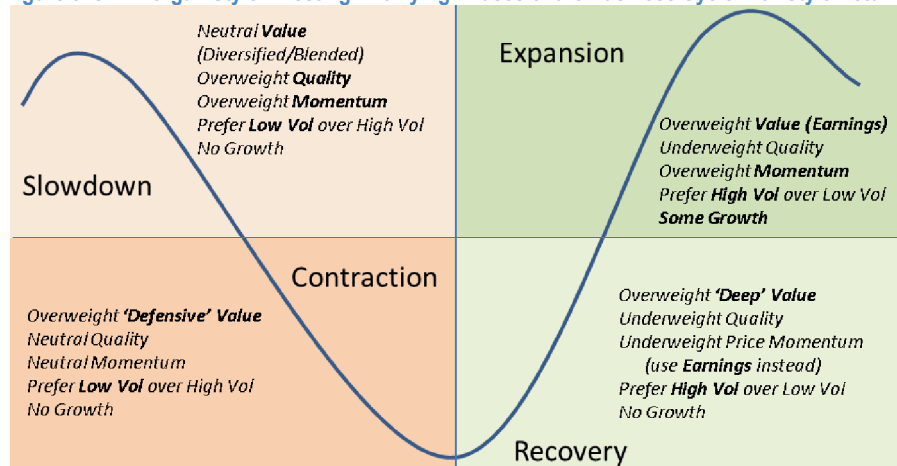(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

Framework for style Investing

Figure 5 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 delta in a macro series as well as delta in the delta (i.e. 2nd derivative) of macroeconomic data to classify where we are in the cycle.

The J.P. Morgan 'Cycle Investing' framework matches phases of the business cycle with investment style returns.

Also shown is our expectation of how styles should perform over the typical cycle.

Figure 5: J.P. Morgan Style Investing - Marrying Phases of the Business Cycle with Style Returns

Slowdown
Neutral *Value*
(Diversified/Blended)
Overweight *Quality*
Overweight *Momentum*
Prefer *Low Vol* over High Vol
No Growth

Expansion
Overweight *Value (Earnings)*
Underweight Quality
Overweight *Momentum*
Prefer *High Vol* over Low Vol
Some Growth

Contraction
Overweight *'Defensive' Value*
Neutral Quality
Neutral Momentum
Prefer *Low Vol* over High Vol
No Growth

Recovery
Overweight *'Deep' Value*
Underweight Quality
Underweight Price Momentum
(use *Earnings* instead)
Prefer *High Vol* over Low Vol
No Growth

Source: J.P. Morgan Quantitative and Derivatives Strategies

The aim is to position for the cycle by rotating *before* major draw-downs occur.

This way we are more cautiously managing the changing cycle attempting to better balance the style risk vs. style reward.

Cycle investing should be quite intuitive. For instance, we overweight **Quality** relative to **Value** in a *Slowdown*, since it is going to shelter the portfolio in case of risk adversity or a 'flight to Quality'. **Quality** is a great portfolio hedge and insurance in case of a bigger than expected correction.

If the Slowdown sinks into a *Contraction* then market volatility will increase and EM becomes very susceptible to risk-on/risk-off switching, so at this stage investors could use **Defensive Value** and **Lower Volatility** names (low beta, large caps) for protection. Dividend Yield for Defensive Value is a great protection strategy but still giving some exposure to 'cheap' stocks which makes it a nicely positioned factor for contractions in EM.

During the subsequent *Recovery*, we move overweight **deep Value** to get more exposure to higher beta names and we would at least cut the low vol exposure and even go so far as to rotate into **high Volatility**. This is the hardest transition to position for as it usually happens very quickly. This is why we have already cut the high Quality and high Momentum exposure to neutral during the Contraction stage. We know we can't time the bottom but we can protect against owning too much Momentum and Quality going into a Recovery (when it likely to expensive as well).

During and *Expansion* when the economy is humming and specific themes tend to dominate the market we want to use more **Momentum**. We want to still be in **Value** but looking now at Earnings Yield as our metric. Quality is less important during an expansion and we prefer Higher Volatility (high beta, small caps). **Growth** in EM only ever tends to work in this stage.

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

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.
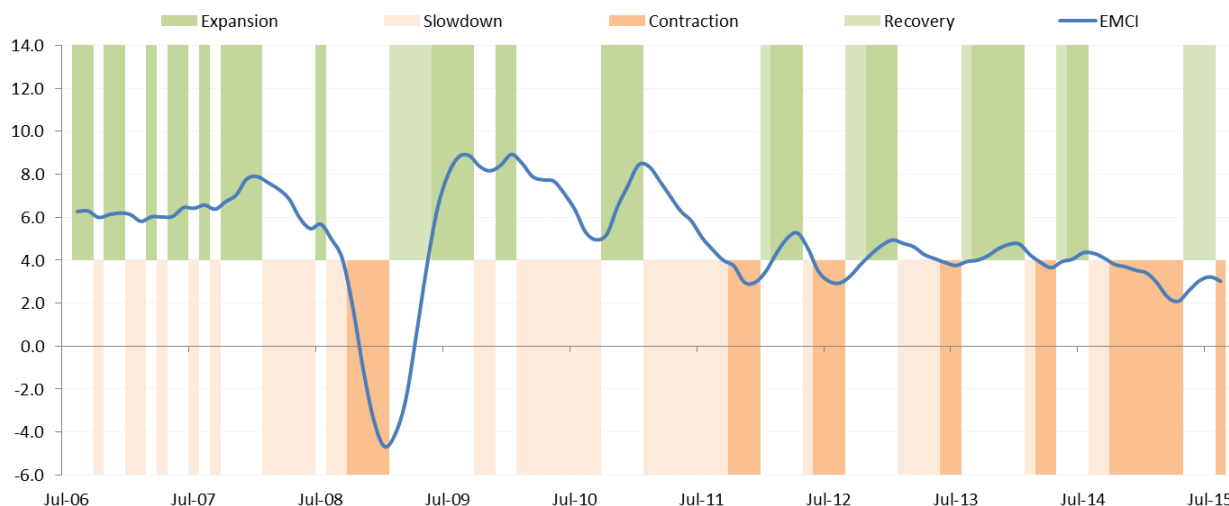
IIF Emerging Market Coincident Index

Having decided on how to position styles over a full business cycle based on appropriate risk premia and investor behavior, a suitable method to identify phases of the business cycle is needed. *In other words, we want a reference time series that defines the business cycle.*

Typically GDP is seen as a reflection of the economic cycle but it's invariably late and also restated often. We have been looking for a proxy that is more timely, so we use the IIF *Emerging Market **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. It is available a week after the month-end from the Institute of International Finance (IIF).

The EMCI is constructed by extracting the common trend of 41 macroeconomic indicators and is closely correlated with quarterly EM GDP (saar). Figure 6 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/deceleration).

Figure 6: State of the Business Cycle: IIF EM Coincident Indicator (3m/3m, saar) – we use 4.0% to distinguish between a 'Recovery' and 'Expansion state (also between 'Slowdown' and 'Contraction').

Source: J.P. Morgan Quantitative and Derivatives Strategies, IIF Emerging Market Coincident Indicator

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

It is interesting to note the lower depressed levels that the EMCI moved to over the last 5 years or so – average GDP growth has come down by a few percent more recently comparted to the longer term. The level of 4% (3m/3m, saar) we have used to set the threshold between Slowdown/Contraction and Recovery/Expansion is in line with the recent average. It is as a compromise between the longer term average of 5% and the average in the shorter term that was closer to 3%. Since we use this for benchmarking it affects the reference period results only.

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

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 7 shows a stylized business cycle with two mini business cycles before entering a full blown recession. We can observe a similar pattern in the IIF EMCI series during 2010 and 2011 when a full contraction period was never entered but there were moves between a slowdown and expansion and back again.

Figure 7: Business Cycles Are Rarely Clean Up, Down and Up: There Is Usually Considerable Uncertainty about the Phase (i.e. Frequent False Positives)
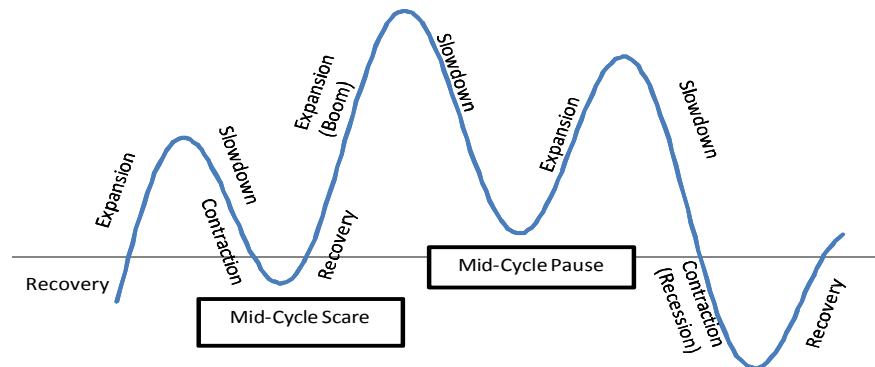
Source: J.P. Morgan Quantitative and Derivatives Strategies

We can also position for these mid-cycle scares and pauses to boost style performance.

Making decisions in an uncertain world means false starts abound, so it is not surprising that investors react as strongly to a mid-cycle slowdown as they would to a true slowdown before a recession. What this means for us in our implementation is that we allow the states to skip – for example we can move between Slowdown and Expansion and back again (without moving through Contraction and Recovery).

Table 2 over the page presents the performance of our various style groups over the business cycle defined by the EMCI. To remove biases in underlying style factors, we used *country normalized* z-scores to construct the portfolios.

In passing, also note that other aspects of investment styles, like relative valuation, style momentum, fear/greed rotation and possible 'factor crowding' may influence one's style preference during a specific stage of the business cycle. A fully integrated style allocation framework could make good use of all of these.

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

Table 2: Performance of Styles in Different Phases of the Business Cycle (based on the IIF EMCI)

	Value (EY)	Quality	Momentum	Growth	High Volatility	Low Volatility	Static Weighted Style	MSCI EM (Eq Wtd)	MSCI EM (Cap Wtd)
Long Only Returns (annualized)									
Expansion	28.3%	18.5%	24.0%	19.8%	19.4%	16.6%	22.3%	18.9%	15.2%
Slowdown	-4.3%	5.6%	10.0%	-11.6%	-12.5%	2.7%	1.2%	-0.4%	-7.2%
Contraction	-18.0%	-12.5%	-10.4%	-18.7%	-24.3%	-11.9%	-14.2%	-7.0%	-17.6%
Recovery	79.6%	49.4%	26.2%	58.9%	76.0%	34.6%	51.8%	46.9%	44.5%
Excess Return (relative to Equal Weighted MSCI EM)									
Expansion	9.5%	-0.3%	5.1%	0.9%	0.5%	-2.3%	3.4%	0.0%	-3.6%
Slowdown	-4.0%	5.9%	10.4%	-11.2%	-12.1%	3.1%	1.6%	0.0%	-6.9%
Contraction	-10.9%	-5.4%	-3.4%	-11.6%	-17.3%	-4.8%	-7.2%	0.0%	-10.5%
Recovery	32.7%	2.5%	-20.6%	12.0%	29.2%	-12.3%	5.0%	0.0%	-2.4%
Average Long-Short Return (annualized)									
Expansion	16.2%	-4.6%	7.7%	0.3%	2.8%	-2.8%	4.9%	18.9%	15.2%
Slowdown	1.2%	19.5%	30.8%	-0.6%	-15.2%	15.2%	13.4%	-0.4%	-7.2%
Contraction	-3.4%	6.6%	15.7%	-0.6%	-12.4%	12.4%	5.9%	-7.0%	-17.6%
Recovery	38.2%	-10.2%	-64.6%	-7.9%	41.4%	-41.4%	-12.6%	46.9%	44.5%
Return Standard Deviation (L-S Return)									
Expansion	8.4%	8.6%	13.8%	4.4%	7.3%	7.3%	5.3%	15.1%	17.7%
Slowdown	10.0%	6.4%	10.5%	5.1%	7.6%	7.6%	3.6%	17.3%	23.4%
Contraction	16.5%	9.5%	19.2%	4.8%	13.0%	13.0%	5.1%	22.1%	27.6%
Recovery	19.3%	14.8%	33.5%	5.7%	21.8%	21.8%	8.8%	25.6%	30.7%
Risk Adjusted Returns (L-S Return)									
Expansion	1.94	-0.54	0.56	0.06	0.38	-0.38	0.94	1.25	0.86
Slowdown	0.12	3.05	2.94	-0.13	-1.99	1.99	3.71	-0.02	-0.31
Contraction	-0.21	0.70	0.82	-0.13	-0.96	0.96	1.15	-0.32	-0.64
Recovery	1.98	-0.69	-1.93	-1.37	1.90	-1.90	-1.43	1.83	1.45
Avg Sharpe	0.74	0.59	0.51	-0.23	-0.20	0.20	1.11	0.52	0.16

Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset ;Based on the equal weighted performance of sector normalized top (and bottom) 10% of stocks by style portfolios within MSCI EM universe (Monthly Returns, Equal Weighted Long Portfolios, Country Normalized).

The performance of the styles over the business cycle based on reference series coincident indicator (EMCI) is very close to the hopefully 'intuitive' style rotation shown in Figure 5

Value (using Earnings Yield) does well most of the time but not during a *Contraction* when we need to move to defensive Value (Dividend Yield). Value really shines during the rising states – especially in Recovery (and we can lever it up even more by using Book/Market instead of Earnings Yield).

Quality styles absolutely dominate during a *Slowdown* (risk adjusted returns of 3.05). It struggles during the rising states when of course it can be expensive and investors really don't want to pay for its defensive properties.

Momentum works best during an Expansion and Slowdown—we overweight it during these phases of the cycle. Usually there are strong market themes driving these two parts of the cycle which is good for momentum, and there is less fear and macro volatility around driving the markets. During Contractions trends can reverse and Momentum style can be perilous if markets take off again so we go Neutral on Momentum in case of a recovery.

Growth only ever outperforms during an Expansion phase, when investors' (irrational?) exuberance tends to drive them to bid up Growth names sharply. Even then its performance is poor in the benchmarked test above. We understand the definition of Growth can be difficult and we would like to do more work on it. But in a naïve form Growth is not a factor we would use in EM or Asia.

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

On average, **Low Volatility** outperforms **High Volatility** during Slowdown and Contraction and High Volatility does better in Expansion and Recovery. This is consistent with our intuition. However, the striking fact about performance of Volatility styles is the divergence in the volatility of their performance during *Contraction* and *Recovery*. This again highlights the difficulty of this one particular transition.

In the figure below we summarize our comments on the risk premia positioning so far. Note the Value rotation from Deep Value (B/M) around through Forecast Value and then finally Defensive Value (Dividend Yield) during a contraction. Similarly we try to manage Momentum and Quality so that we are steadily increasing or decreasing exposure as we rotate through the cycle states.

The most difficult transition is from Contraction to Recovery. This transition normally happens very quickly so we are unlikely to be able to position well for it. To mitigate the risk we already move to Neutral Quality and Neutral Price Momentum during the Contraction stage.

Figure 8: J.P. Morgan Style Investing – the four states of the cycle and their style tilting
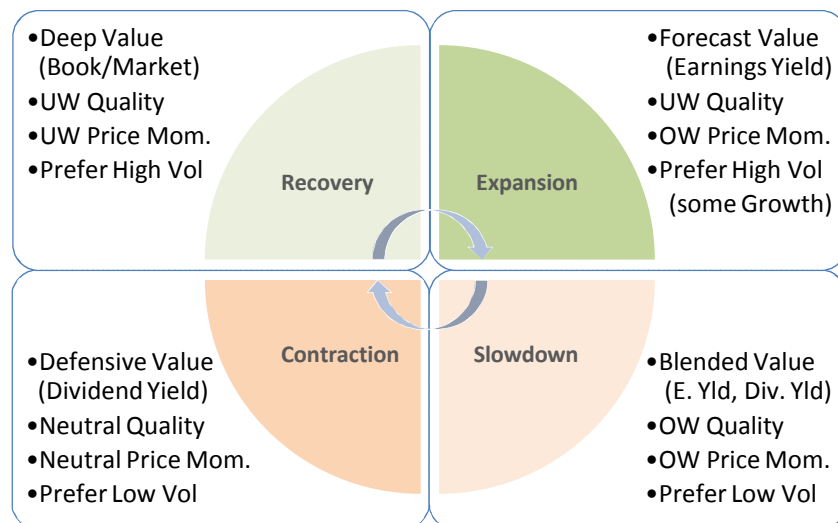
Source: J.P. Morgan Quantitative and Derivatives Strategies

The switch from the Expansion state (preferring higher Vol) to Slowdown (preferring lower Vol) is tricky but manageable as we can let our Momentum OW run; but the hardest to navigate is the low beta to high beta switch when transitioning from a Contraction to Recovery since this requires the largest shift in allocations. We try and minimize any drawdowns by staying with Value (in the form of Dividend Yield) as well as already having dropped to neutral on Quality and Momentum.

In the next section we look more at our indicator we use to predict each of these four parts of the cycle.

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

Predicting the Business Cycle

As much as we would like them to, economic indicators do not line up nicely to give a simple and straightforward 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. 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.

J.P. Morgan EM Quantitative Market Indicator (EM QMI)

To overcome such biases and to reduce the uncertainty about the state of the cycle we examined indicators that cover a broad panorama of the business cycle. Out of these a handful of indicators with leading information about the cycle were selected. The result is the proprietary J.P. Morgan Quantitative Market Indicator for Emerging Markets (EM QMI) which broadly leads the business cycle by 1-3 months.

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 EMQI various criteria were used. Looking at the change in an indicator we tested the correlation with the reference series (the IIF EM Coincident Indicator) at various leads and lags. Also important was an economic rationale for the high correlation.

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 Indicator can be seen in the following Loss Table which shows the performance loss resulting from an incorrect call. The highlighted combinations mark the most at risk calls (being too early or too late).

Table 3: Average monthly performance loss when making the wrong style call (LO)

		Actual State based on Cycle Reference Series			
		Expansion	**Slowdown**	**Contraction**	**Recovery**
If Style Rotation Portfolio Is Positioned For:	**Expansion**	0.0%	-0.4%	-0.2%	-1.2%
	Slowdown	-0.1%	0.0%	0.0%	-1.6%
	Contraction	-0.2%	-0.1%	0.0%	-1.7%
	Recovery	-0.1%	-0.7%	-0.5%	0.0%

Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset

The worst loss of -1.7% per month occurs when we position for *Contraction for too long* while the market is *actually in Recovery*. This is the toughest part of the cycle to get right as the switch from Contraction to Recovery in EM can be brutally quick. It is better to be positioned too early for the Recovery and still have the cycle be in Contraction, as the average monthly loss is in this scenario is only -0.5%. Still, this can be a tough trigger to pull when markets are falling. At the very least it would be worth being extra cautious and paying to hedge the possible recovery when markets have been extremely bearish.

13

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

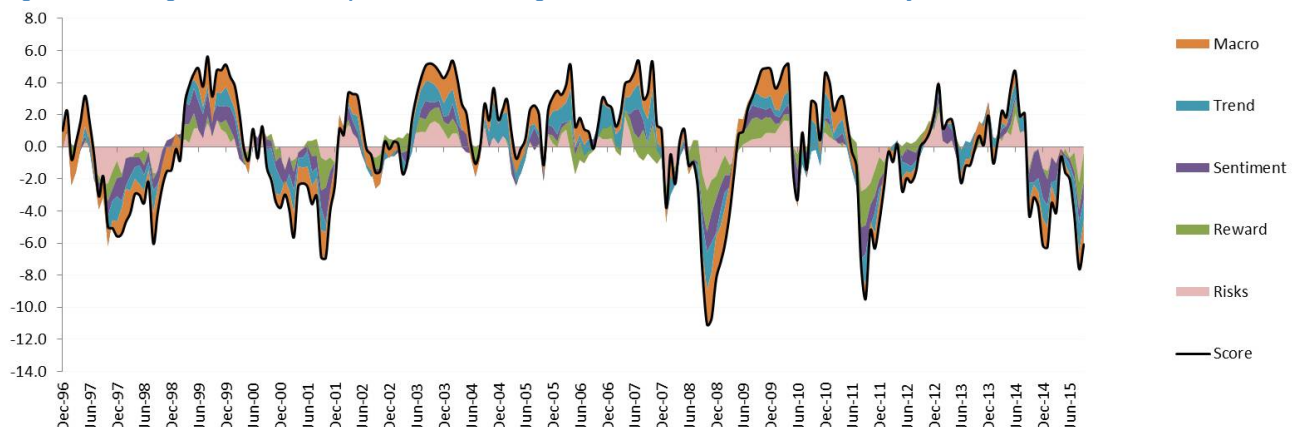## QMI Parts – Trend, Risk, Reward, Sentiment, Macro

To get a robust Macro Indicator it is necessary to include diverse from different parts of the economy. Indicators that *directly* tell us about the phase of the business cycle are more what we have in our macro category, but making the signal more robust are the market trends, the risk vs reward and the sentiment.

The components of the JPM EM Quantitative Market Indicator (QMI) are sourced from five areas: *Trend*, *Risk*, *Reward*, *Sentiment* and *Macro*

As suggested, these indicators carry information about the cycle: **Trend indicators** can be incredibly powerful (until they fail!) so we want to be aware of them as a start. The **Reward indicators** use market valuations to give us notice of when there are better opportunities to buy into the Value and higher beta names perhaps at the start of a rising cycle. **Risk indicators** are included to alert us to volatility and increased uncertainty – usually when these are high we would expect some correction and cycle downturn. **Sentiment indicators** reflect the market mood and risk appetites more directly. Lastly we do include some **Macro indicators** that broadly will influence all the EM countries as a group.

The JPM EM Quantitative Macro Indicator (EM QMI) is an *equal weighted* combination of indicators from these five groups. Each grouping has three inputs – see Appendix III for all the parts. The final signal through time is in the chart below.

Figure 9: The weight of our CMI Components is indicating a move from 'Contraction' to 'Recovery' state

Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset

The sum of the parts for Trend, Risk, Reward, Sentiment and Macro gives us the current level of the QMI. Each input is the rolling 12-month z-scores so we are in effect capturing the position of the QMI parts *relative to the last 12 months*. A subtle point to note then is that these inputs are already the first derivative of each underlying input series. It also allows us to sum the parts on a like for like basis. Then we take the change in the series to give us the view on the rising or falling

Clearly from the chart above the signals confirm each other when the market cycle is clearly rising or falling (so they tend to agree) with some noise through the transitioning points. We have just entered a recovery phase at the moment with all components at negative levels (relative to the last 12 months) but having just ticked up (relative to last month).

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

How far does the QMI lead the business cycle?

Our resulting indicator leads the IIF EM Coincident Index by 1-3 months. Below we plot the QMI and IIF EMCI over the same time period—the QMI turns up or down a few months before the Coincident Index. The peak correlation of **78% at 2 months** lead should indicate the EMQI can be used to anticipate changes in the business cycle. The only difficulty we face using the IIF EMCI is the relatively short history and we can only compare back to July 2006.

Currently the IIF EMCI 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 and risk-off conditions.
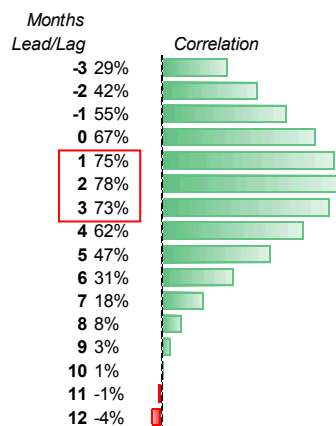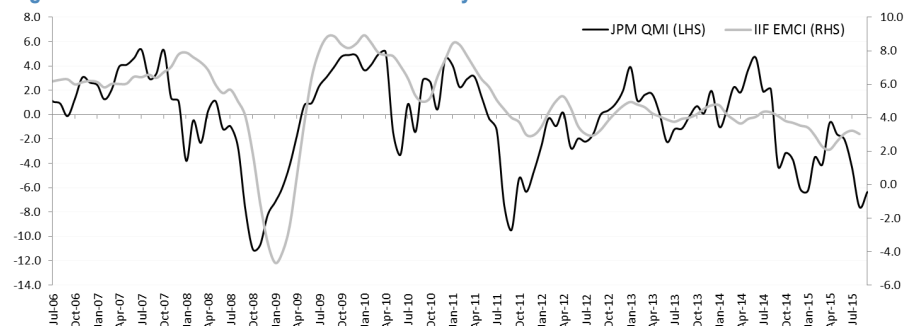
Months Lead/Lag	Correlation
-3	29%
-2	42%
-1	55%
0	67%
1	75%
2	78%
3	73%
4	62%
5	47%
6	31%
7	18%
8	8%
9	3%
10	1%
11	-1%
12	-4%

Figure 10: The JPM EM QMI leads the IIF EMCI by about 1-3 months

Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset

OECD Coincident Economic Indicator

As a further check, we compare the QMI against an aggregate of the EM countries OECD composite leading indicators. The components of the OECD CLI are series which exhibit leading relationship with the country GDP. We have crudely averaged (equal weight) the single country indicators to create an aggregate for EM for us to check against. The history for each of these country indicators is much longer and we can now go back to the 1996. This OECD EM series also correlates well with our QMI – and like the IIF EMCI, the OECD aggregate is also suggesting that economic activity is currently on a down trend (however the OECD numbers are only available after 2 months). The OECD series is less sensitive than the IIF EMCI so the lead/lag correlations are somewhat muted, but the QMI seems to lead by 3-4 months.

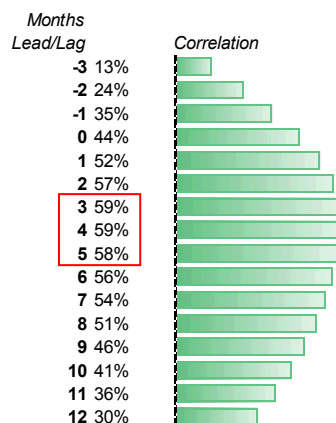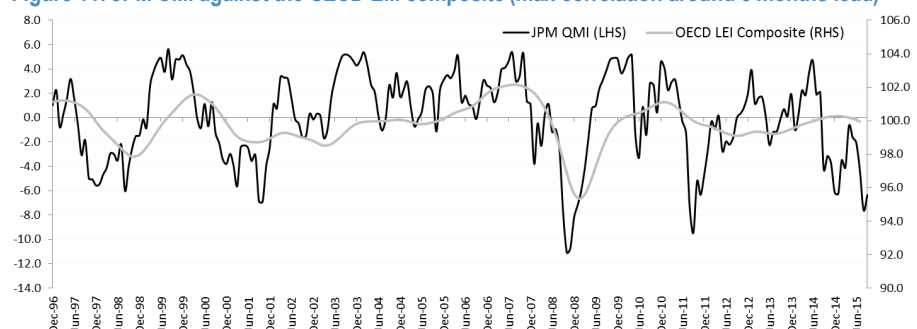| Months Lead/Lag	Correlation
-3	13%
-2	24%
-1	35%
0	44%
1	52%
2	57%
3	59%
4	59%
5	58%
6	56%
7	54%
8	51%
9	46%
10	41%
11	36%
12	30%

Figure 11: JPM CMI against the OECD EM composite (max correlation around 3 months lead)
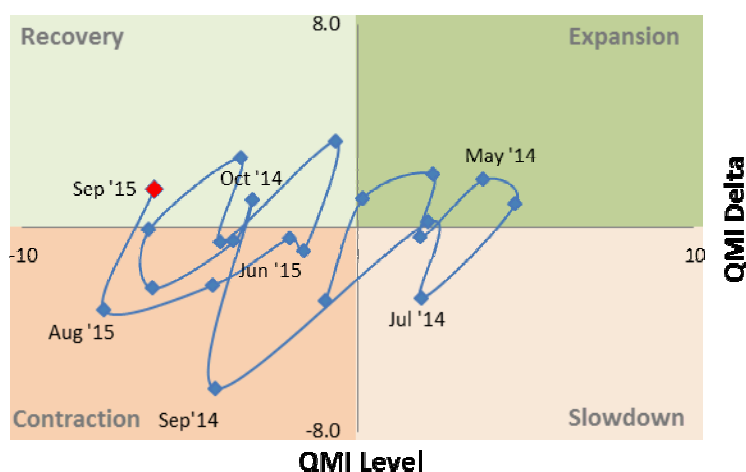

Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset;
OECD (2015), Composite leading indicator (CLI) (indicator). doi: 10.1787/4a174487-en (Accessed on 20 September 2015)

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

Current state of our indicator

The QMI is currently indicating a 'Recovery' state. It was indicating 'Contraction' for much of this year, but the negative momentum has eased so the indicator has just ticked upwards and started a rising trend as of 30 September 2015. We don't apply any smoothing at this level so there can be thrashing between these states. But a bigger risk is to still be positioned for a Contraction too long after markets have turned upwards. It could be prudent to start reducing Quality and Momentum exposure now.

Figure 12: Recent 12 month path of the QMI cycles

The EM QMI has been settling into the 'Contraction' quadrant the most in the last 12 months, and just moved into 'Recovery' again.

Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset

What does this mean for current style positioning?

Our analysis suggests that in a *Recovery* phase of the business cycle investors should increasingly favor **offensive Value** (P/B laggards) and reduce exposure to **Momentum** and to **Quality**. We also prefer higher **Volatility** names.

Table 13: Dynamic weights of the Risk Premia using the QMI states

	Value	Quality	Momentum	Growth	High Vol	Low Vol
Expansion	30%	0%	40%	10%	20%	0%
Slowdown	30%	30%	30%	0%	0%	10%
Contraction	30%	20%	20%	0%	0%	30%
Recovery	40%	15%	15%	0%	30%	0%

Source: J.P. Morgan Quantitative and Derivatives Strategies

Compare this with our static blend of risk premia for use as the benchmark in the table below where the weights are the same for every state. We overweight Value relative to Growth only because this is 'fairer' in EM for a static benchmark model.

Table 14: Static weights of the Risk Premia for our benchmark in all states

	Value	Quality	Momentum	Growth	High Vol	Low Vol
Benchmark	30%	20%	20%	10%	0%	20%

Source: J.P. Morgan Quantitative and Derivatives Strategies

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

Testing the Framework

When testing our framework in Emerging Markets we lean more heavily on risk based measures than country fundamentals since we cannot easily capture the macro-economic policy stance or country indicators across the emerging markets where there are more than 20+ rather heterogeneous countries in the benchmark index. Instead we rely on investor risk appetites as a precursor to the subsequent business cycle. When appetites are suppressed the business environment will usually be poor and vice versa.

Putting it all together

Our EM Quantitative Macro Indicator (EM QMI) acts as a guide in determining the phase of the business cycle. Using a rule-based approach we map the EMQI to one of the four states and position the style portfolio according to the cycle investing framework. Figure 15 depicts a schematic flow connecting macroeconomic cycle to style selection and finally to the construction of a style rotation portfolio.

Figure 15: From Business Cycle to Style Rotation Portfolio
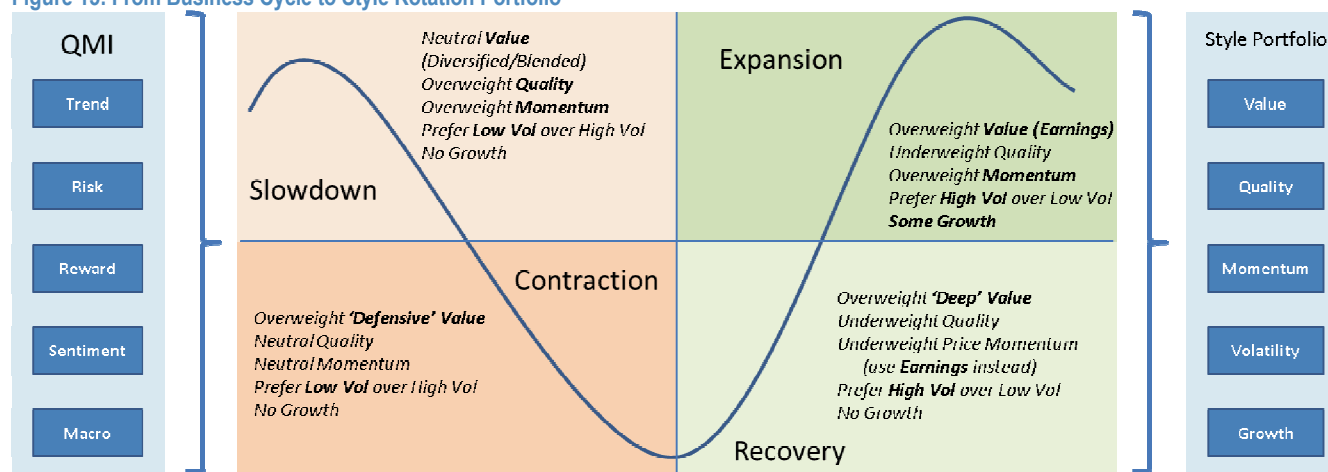
Source: J.P. Morgan Quantitative and Derivative Strategies

The Style Rotation Portfolio consists of the top 10% stocks in MSCI EM 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.

All of our risk premia are Country neutral, and we show the results from a Long-Only, Excess return (Long-Benchmark) and Long-Short approaches. We assume no transaction costs but we comment on turnover at the end of the report.

17

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

Back-test of cycle investing using style rotation

Importantly, we compare the Style Rotation performance with a static weighted Value, Growth, Quality, Momentum and Volatility style portfolio (assuming no timing ability).

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 *static weighting* (largely equal weight but with a Value overweight vs Growth to be fairer to typical models in EM). The second column shows the performance of Style Rotation portfolio assuming we use QMI to predict next state of the cycle and select the appropriate portfolio for it. Each of these four states has an associated portfolio (as described in Figure 15) with desired under- and over-weight style tilts.

Table 4: Backtests Long Only: Style Rotation Portfolio and the Market (12/1996-9/2015)

	Static Weighted Risk Premia	Style Rotation, Using Macro Indicator	Market (MSCI EM, Equal Weighted)	Market (MSCI EM, Market Cap Weighted)
Average Mth. Return	1.13%	1.53%	1.10%	0.50%
Monthly Volatility	2.12%	2.28%	1.70%	2.02%
Return per unit Risk	0.53	0.67	0.65	0.25
Win Ratio	59%	60%	62%	58%
Max Draw Down	-61.2%	-59.5%	-51.5%	-62.7%

Figure 16: Style Rotation Portfolio performs better than the static on a risk adjusted basis
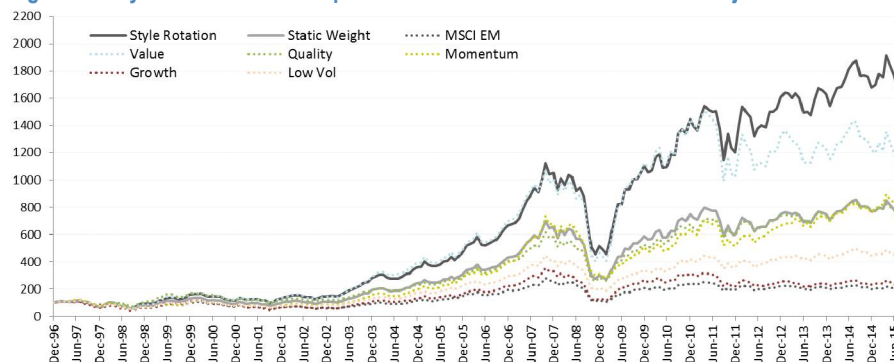
Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset.
Country neutral, Equal Weighted, No transaction costs.

The Dynamic Style Rotation portfolio outperforms both the equal weighted and market capitalization weighted portfolio though with a higher volatility. The only risk premia to come close is the Value premium but that has lost its strong track record in the last 5 years or so. Emerging Markets have been dominated by Value in the past, but low Vol and Quality investing is more popular of late.

As expected the static weighted portfolio performs roughly at the 'average' of its risk premia inputs. We did overweight Value slightly for the static benchmark to be fairer (instead of equal weighting across all the risk premia).

For comparison we show the performance of both the MSCI cap weighted (published) and the equal-weighted EM (a difficult benchmark to beat).

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

Long-Only returns with market hedging

Since the market risk is always so large we would like to remove that systemic beta from the performance – we hedge the LO return from the prior section using both the equal weighted and the cap weighted (published) MSCI EM index.

The Long-Only excess return (using monthly hedging) of Style Rotation strategy readily outperforms the statically weighted strategy.

Table 5: Style Rotation Excess Returns outperform the Static Weighting (12/1996-9/2015)

Excess Return over:	Equal Weighted MSCI EM		Market Cap weighted MSCI EM	
	Style Rotation	Static Weights	Style Rotation	Static Weights
Average Mth. Return	0.43%	0.03%	1.03%	0.63%
Monthly Volatility	0.78%	0.63%	0.78%	0.65%
Information Ratio	0.55	0.04	1.32	0.97
Win Ratio	54%	51%	69%	63%
Max Draw Down	-20.1%	-31.4%	-22.0%	-21.2%

Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset

The chart below shows the Style Rotation portfolio's long only excess performance versus that of equal-weighted Style portfolio. Style Rotation historically has added value. The performance gap widened more during the past ten years suggesting the increased importance of style rotation post GFC. Using the equal weighted index hedge has left performance flat for the last few years, but the more implementable market cap hedge has worked well.

Figure 17: Style Rotation Portfolios

Long-Only using a market hedge (*equal* weighted)

This test uses an EM *equal-weighted* index hedge.

This is perhaps the theoretical true excess returns as now we have constructed the index same way as the risk premia themselves (i.e. equal weighted). But it is not very practical as this short hedge does not exist and would be expensive to build.

Long-Only using a market hedge (*market cap* weighted)

This test uses the cap-weighted (MSCI published) index hedge.

This option is actually the most implementable as the short side can be accessed much more cheaply and easily using structured products such as ETFs or Swaps.

Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset.
Country neutral, Equal Weighted Factor portfolios, No transaction costs.

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

Long-Short returns

Lastly we test the same framework again but use the Long-Short risk premia returns. This time we have the added power of the short side, however the implementation of such is going to be expensive (or even inaccessible) in the Emerging Markets so we acknowledge a lot of this will be theoretical only. We include it for reference to see the benefit that market neutrality at the individual risk premia can have.

Table 6: Long-Short Style Rotation (12/1996-9/2015)

	Style Rotation using EMQI	Equal Weighted Styles
Average Mth. Return	1.34%	0.52%
Monthly Volatility	0.60%	0.64%
Sharpe Ratio	2.23	0.81
Win Ratio	81%	69%
Max Draw Down	-13.4%	-34.5%

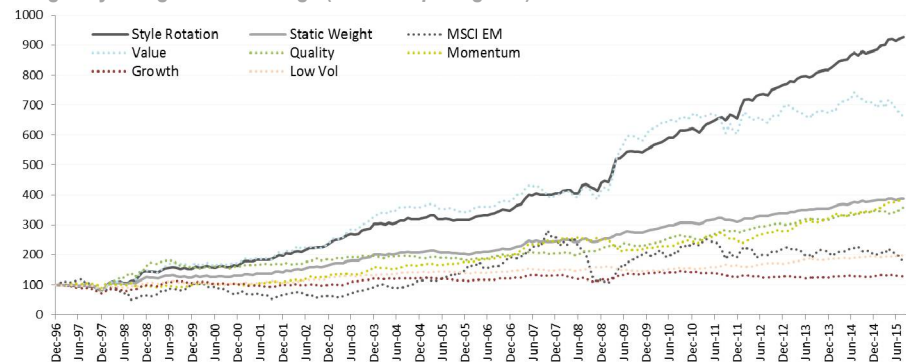Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset.
Country neutral; Equal Weighted Stock weights; No transaction costs

Below we show the Long-Short performance of the Style Rotation strategy against the notional L-S Equal Weighted Style strategy as well as the individual L-S risk premia. Note the Value risk premia in EM has been outstanding until recently, when Quality and Momentum have been dominating.

The Long-Short performance in EM is outstanding. But the short side can be very difficult and expensive to implement in EM countries.

Figure 18: Style Rotation Portfolio — Long-Short Performance
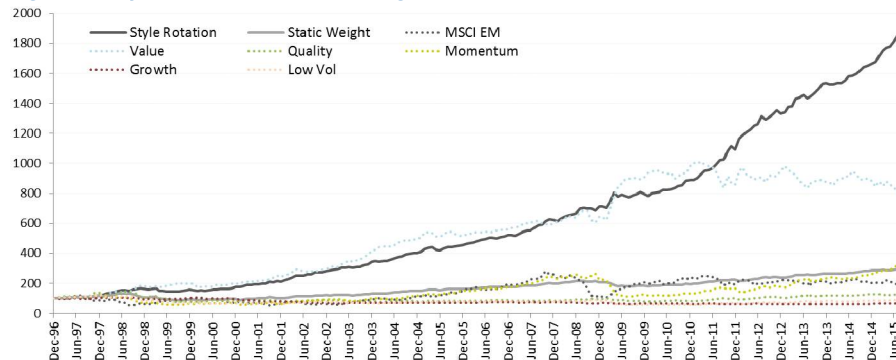
Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset.
Country neutral, Equal Weighted Factor portfolios, No transaction costs.

Clearly the returns to the rotation strategy are astounding (with no transaction costs of course), but we would like to point out the benchmark (static weighted) portfolio is also incredibly stable in emerging markets. Apart from the 2009 drawdown due to Price Momentum it has had very consistent outperformance. In terms of risk adjusted performance, Emerging markets are the best in the world for multi-factor L/S investing.

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

Turnover concerns

We see that our QMI states persist for ~2 months on average and we can estimate the increased turnover will be about +12% per month more than that of the static strategy if we assume an average style weight shift of 20-25% across all the styles for each state transition. A milder rotation strategy with such a constraint is below.

Table 19: Dynamic Risk Premia using mild style tilting (no more than ±10% from benchmark)

	Value	Quality	Momentum	Growth	High Vol	Low Vol
Expansion	30%	20%	25%	15%	10%	0%
Slowdown	30%	30%	20%	10%	0%	10%
Contraction	30%	20%	15%	5%	10%	20%
Recovery	40%	15%	10%	10%	20%	5%
Benchmark	30%	20%	20%	10%	0%	20%

Source: J.P. Morgan Quantitative and Derivatives Strategies

Table 7: Style Rotation showing the increased turnover over the benchmark (mild vs. aggressive)

Long (Excess Return over Cap Weighted MSCI EM)			
	Aggressive Style Rotation	**Mild Style Rotation**	**Static Weights**
Average Mth. Return	1.03%	0.81%	0.63%
Monthly Volatility	0.78%	0.74%	0.65%
Information Ratio	1.32	1.10	0.97
Win Ratio	69%	62%	63%
Max Draw Down	-22.0%	-22.7%	-21.2%
Excess Turnover	+21%	+12%	-

Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset
Turnover is calculated as the average of the total weight allocation change b/w all states / the average holding period.

The mild rotation strategy still does very well and the excess turnover over the static benchmark is +12% per month.

We still get ample return performance increase over and above the static benchmark using the 'milder' weight transitions when style tilting – see below for the comparison charts L-Cap Weighted Bench. The more aggressive strategy is shown previously in Figure 17 (the lower panel).

Figure 20: Mild Style Rotation (L-Bench) vs. static weight benchmark
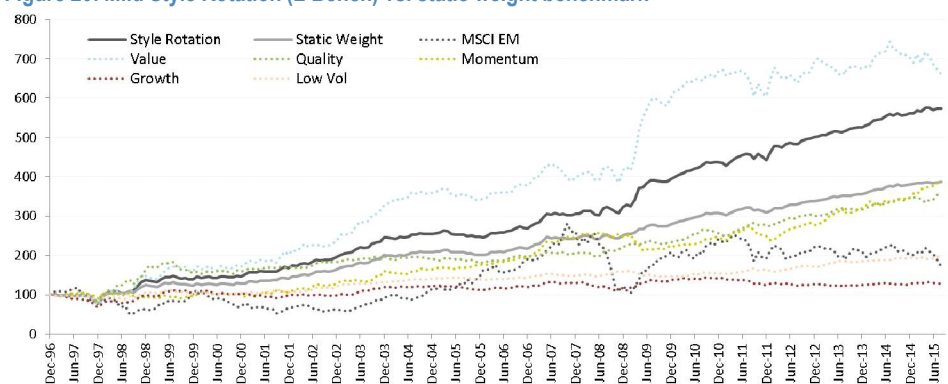
This milder rotation strategy when tracked as Long-Bench (hedged MSCI EM index) still outperforms the static benchmark.

Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

Switching Value – Offensive vs. Defensive

We demonstrate how the different types of Value factors can be used to leverage up the returns even further. Here we use Earnings Yield (forecast) for our default 'through-cycle' value factor, but shift to Book/Market when we want more offensive value and Dividend Yield when we want more a more defensive style.

Table 21: Dynamic weights of the Risk Premia when using Value switching

	Value			Quality	Mom	Growth	High Vol	Low Vol
	EY	B/M	DY					
Expansion	30%			0%	40%	10%	20%	0%
Slowdown	15%		15%	30%	30%	0%	0%	10%
Contraction			30%	20%	20%	0%	0%	30%
Recovery	10%	30%		10%	10%	0%	40%	0%

Source: J.P. Morgan Quantitative and Derivatives Strategies

Table 8: Style Rotation based on Cycle Investing Outperforms Equal Weighting Strategy

	Long (Excess Return over Cap Weighted MSCI EM)		Long-Short	
	Style Rotation, Using CMI	Rotation, with Value Switching	Style Rotation, Using CMI	Rotation, with Value Switching
Average Mth. Return	1.03%	1.14%	1.34%	1.61%
Monthly Volatility	0.78%	0.77%	0.60%	0.65%
Information Ratio	1.32	1.47	2.23	2.47
Win Ratio	69%	72%	81%	83%
Max Draw Down	-22.0%	-20.2%	-13.4%	-12.5%

Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset

The approach amplifies the already good results from the rotation strategy. The downside will be increased turnover which we estimate will be at most +10% p.m. over the turnover of the simpler style rotation strategy (Long-Only) – if implemented using single stocks there will also be overlapping names between the value factors reducing the turnover some more. The gain should be more than the added t-costs.

The Value Switching versions levers up the outperformance even more - the cost will be increased turnover.

Using a cap-weighted (MSCI published) index hedge we see good performance improvement.

Long-Short returns are also much improved.

Figure 22: Style Rotation Portfolio – Long-Only using a market hedge and also the L-S returns

Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset

22

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

Summary

It's clear that styles or Risk Premia can behave differently during different parts of the economic cycle and in EM there are big differences in behaviour between risk-on styles and risk-off styles. The concept of 'flight to Quality' is especially strong in this market, and the term 'trash Rally' is often used to imply the lack of said quality in the high beta stocks that perform well during market recoveries.

Using a coincident indicator (from the IIF) we can explore the sorts of styles that work in states to form a kind of style 'play book' for the cycle. So while the different performance characteristics of styles is not in dispute, the real challenge is trying to preempt what part of the cycle in an effort to exploit them.

By using a composite of market indicators we can get a very broad view of the level and direction of the cycle – and use this to roughly break the states into four parts: *Recovery*, *Expansion*, *Slowdown* and *Contraction*. Our goal with this was to make it preempt the real market cycle (using the coincident indicator as a proxy) by at least a month so that we can allocate beforehand.

Our EM Quantitative Market indicator is an *equal weighted* blend of the market series shown in Appendix III. We use the change over 12 months, and then the change of this change each month to position into one of the four states. We find that the QMI is relatively insensitive to the choice of market series inputs as long as there is some forward correlation in the market indicators to begin with.

Drawdown risk is a big concern. By being dynamic we increase the risk of being completely wrong with our allocation, and wrong by more than we would be if we were simply static (or diversified) across all the styles. We show that the worst scenario is still being positioned for a *Contraction* when a *Recovery* is underway. We mitigate this somewhat by being less defensive and more neutral than we might ordinarily want to be in a Contraction – just in case the Recovery happens very quickly.

Increased turnover is also concern but the benefits seem to outweigh the extra costs associated with the dynamic style rotation. We estimate good improvements in risk adjusted returns are possible even after transaction costs.

In summary it certainly seems that the cycle investing approach has merit in allocating between styles. At most it can be used to leverage up styles that work better in some states, and at the very least it can be used to avoid the styles that do not suit the current indicated state. In any case we think it is useful to have a systematic strategic view on the market cycle for managing portfolio risk.

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

Global Equity Derivatives & Quantitative Strategy
02 October 2015

J.P.Morgan

Appendix I: Performance Sensitivity

A well known draw back of back testing is the risk of over fitting the data. While we have been careful in selecting the inputs of the EM QMI 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 our indicator we test the performance using just one of the five sub components (Trend, Risk, Reward, Sentiment or Macro). In each case we are still able to see a significant improvement over the static benchmark (but not as good as using all five together). In fact if we test any single market series out of the 15 used we see some slight improvement.

Figure 23: Sensitivity of Long-Short risk adjusted returns of the QMI – *using* one input only

	Full QMI	Trend	Reward	Risk	Sentiment	Macro	Static Weighted
Average Ann. L/S Return	1.34%	0.96%	1.05%	0.83%	0.73%	1.07%	0.52%
Annual Volatility	0.60%	0.62%	0.62%	0.69%	0.65%	0.65%	0.64%
Sharpe Ratio	2.23	1.55	1.68	1.21	1.12	1.65	0.81
Win Ratio	81%	73%	74%	71%	70%	74%	69%
Max Draw Down	-13.4%	-23.3%	-23.1%	-19.9%	-27.2%	-16.4%	-34.5%

Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset

Another quick test is just removing *one* indicator from EM QMI and we would expect style rotation risk performance to still hold up well.

Figure 24: Sensitivity of Long-Short risk adjusted returns of the QMI – *removing* just one input

	Full QMI	Trend	Reward	Risk	Sentiment	Macro	Static Weighted
Average Ann. L/S Return	1.34%	1.06%	1.24%	1.25%	1.35%	1.28%	0.52%
Annual Volatility	0.60%	0.66%	0.65%	0.59%	0.61%	0.61%	0.64%
Sharpe Ratio	2.23	1.60	1.93	2.13	2.22	2.10	0.81
Win Ratio	81%	75%	78%	77%	80%	79%	69%
Max Draw Down	-13.4%	-15.9%	-13.4%	-15.1%	-13.7%	-18.2%	-34.5%

Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset

In both sets of sensitivity tests above we see that the results are somewhere between the Full EM QMI test and the benchmark. We could conclude that all the parts are useful, with perhaps the Sentiment series being the least powerful, and the Trend/Macro giving more. See Appendix III for the component inputs.

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

Appendix II: MSCI Asia ex Japan results

As a sanity check we also ran the same framework through MSCI Asia ex Japan – a predominantly higher beta market than those of DM (comprised of mostly EM countries).

Table 9: Style Rotation vs. Static Weighting in MSCI Asia ex Japan (12/1996-9/2015)

Both the Long-Only and Excess returns (using monthly hedging) tests of the Style Rotation strategy readily outperformed the statically weighted strategy.

	Long-Only			Excess return over MSCI AxJ	
	Style Rotation	Static Weights	MSCI AxJ	Style Rotation	Static Weights
Average Mthly Return	1.61%	1.07%	0.36%	1.23%	0.69%
Annual Volatility	2.55%	2.28%	2.05%	0.96%	0.73%
Risk adjusted returns	0.63	0.47	0.17	1.28	0.95
Win Ratio	59%	60%	52%	71%	66%
Max Draw Down	-61.7%	-63.2%	-65.4%	-21.7%	-20.3%

Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset

Again we see the significant increase in performance when dynamically allocating risk premia. We are using the *exact* same framework for Asia as we did for EM (arguably we could make some of the QMI inputs more Asia specific but this was a useful cross-check in any case).

Figure 25: Style Rotation Portfolios vs. Static Benchmark and individual ERPs

Long-Only
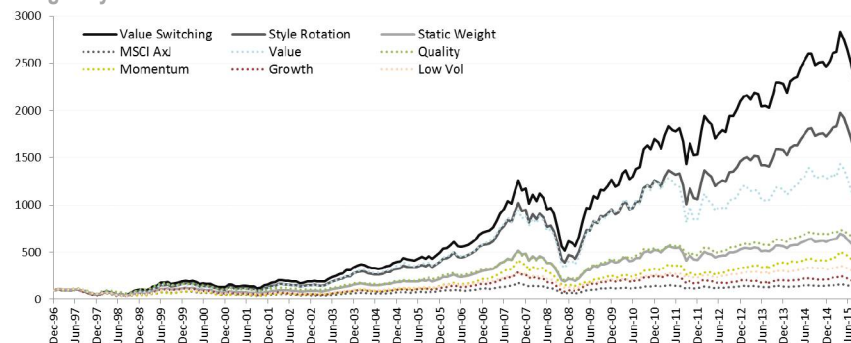
This test uses the MSCI AxJ cap-weighted (published) index hedge.

This option is actually the most implementable as the short side can be accessed much more cheaply and easily using structured products such as ETFs or Swaps.

Long-Only using a market hedge (*market cap* weighted)
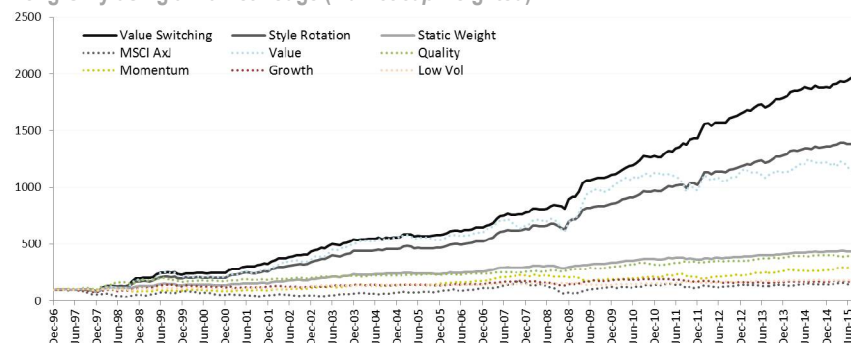
Source: J.P. Morgan Quantitative and Derivatives Strategies, MSCI Barra, Thomson Reuters, Factset.
Country neutral, Equal Weighted stock portfolios, No transaction costs.

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

Appendix III: EM Quantitative Market Indicator inputs

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

(- -) TREND: MSCI EM Index: Markets have been struggling and the index has fallen sharply over the last 6 months

Lead/ Lag	EMCI	Lead/ Lag	OECD
-3	29.8%	-3	13.8%
-2	39.5%	-2	24.1%
-1	48.8%	-1	34.4%
0	57.7%	0	44.2%
1	65.9%	1	52.4%
2	70.8%	2	58.3%
3	70.5%	3	62.1%
4	64.9%	4	63.9%
5	56.0%	5	64.0%
6	44.3%	6	62.4%
Max		*Max*	
2	70.8%	5	64.0%

Legend: Z Score (1); dZ (0); Signal; EMCI (ZS); MSCI EM

(- +) TREND: ADXY Index: Sharp fall in regional currencies relative to the USD but small uptick

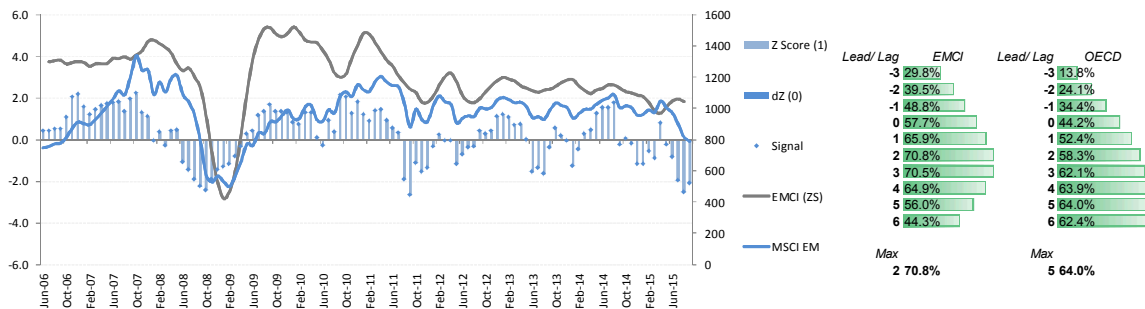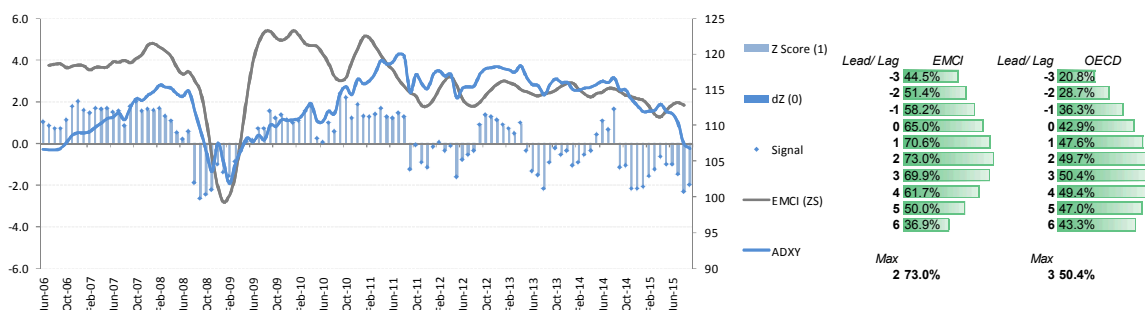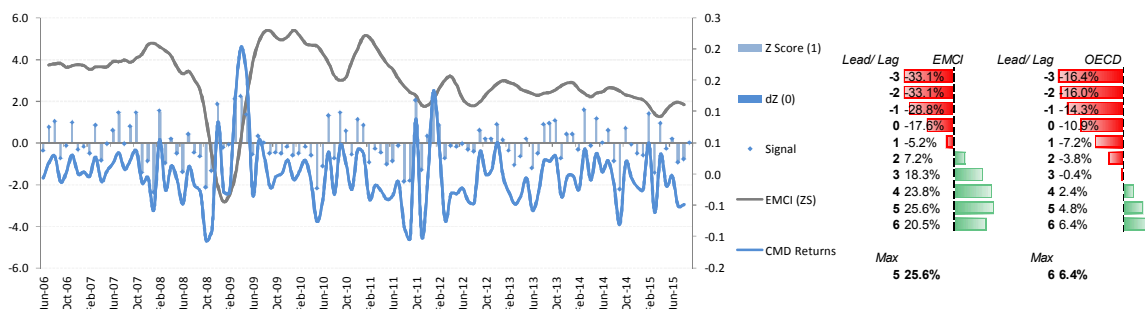| Lead/ Lag	EMCI	Lead/ Lag	OECD
-3	44.5%	-3	20.8%
-2	51.4%	-2	28.7%
-1	58.2%	-1	36.3%
0	65.0%	0	42.9%
1	70.6%	1	47.6%
2	73.0%	2	49.7%
3	69.9%	3	50.4%
4	61.7%	4	49.4%
5	50.0%	5	47.0%
6	36.9%	6	43.3%
Max		*Max*	
2	73.0%	3	50.4%

Legend: Z Score (1); dZ (0); Signal; EMCI (ZS); ADXY

(- -) TREND: Cyclical minus Defensive returns have been favouring Defensives more lately

Lead/ Lag	EMCI	Lead/ Lag	OECD
-3	-33.1%	-3	-16.4%
-2	-33.1%	-2	-16.0%
-1	-28.8%	-1	-14.3%
0	-17.6%	0	-10.9%
1	-5.2%	1	-7.2%
2	7.2%	2	-3.8%
3	18.3%	3	-0.4%
4	23.8%	4	2.4%
5	25.6%	5	4.8%
6	20.5%	6	6.4%
Max		*Max*	
5	25.6%	6	6.4%

Legend: Z Score (1); dZ (0); Signal; EMCI (ZS); CMD Returns

(- +) REWARD: Cyclical minus Defensive Spread is showing more upside but flattened recently

Lead/ Lag	EMCI	Lead/ Lag	OECD
-3	13.9%	-3	27.2%
-2	21.2%	-2	32.5%
-1	26.8%	-1	37.0%
0	30.7%	0	39.7%
1	32.5%	1	41.6%
2	33.8%	2	41.6%
3	33.1%	3	40.4%
4	29.5%	4	36.6%
5	22.8%	5	31.5%
6	14.3%	6	27.0%
Max		*Max*	
2	33.8%	1	41.6%

Legend: Z Score (1); dZ (0); Signal; EMCI (ZS); CMD Spread

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

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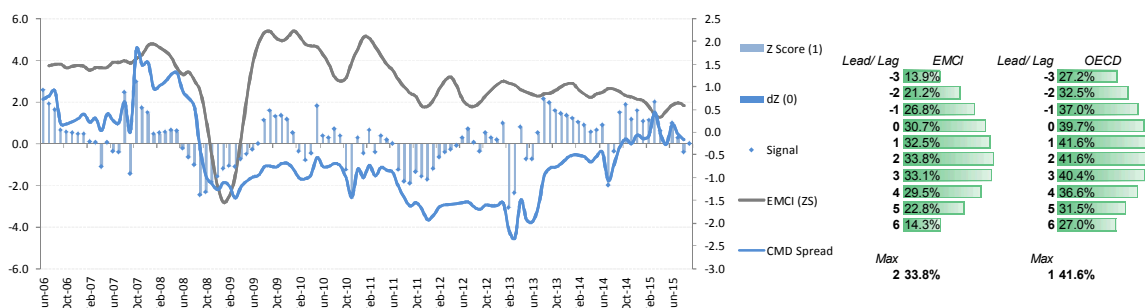
Key: (- +) Expansion signal; (- +) Recovery signal; (+ -) Slowdown signal; (- -) Contraction signal.

(- +) REWARD: Spreads on P/B have increased putting more upside on Value.

Lead/Lag	EMCI	Lead/Lag	OECD
-3	2.2%	-3	-9.6%
-2	15.1%	-2	-0.5%
-1	27.7%	-1	9.9%
0	40.9%	0	18.8%
1	51.7%	1	27.5%
2	58.6%	2	34.8%
3	60.5%	3	40.4%
4	58.6%	4	44.8%
5	55.6%	5	47.6%
6	49.6%	6	49.1%
Max		Max	
3	60.5%	6	49.1%

Legend: Z Score (-1), dZ (0), Signal, EMCI (ZS), PB Spread
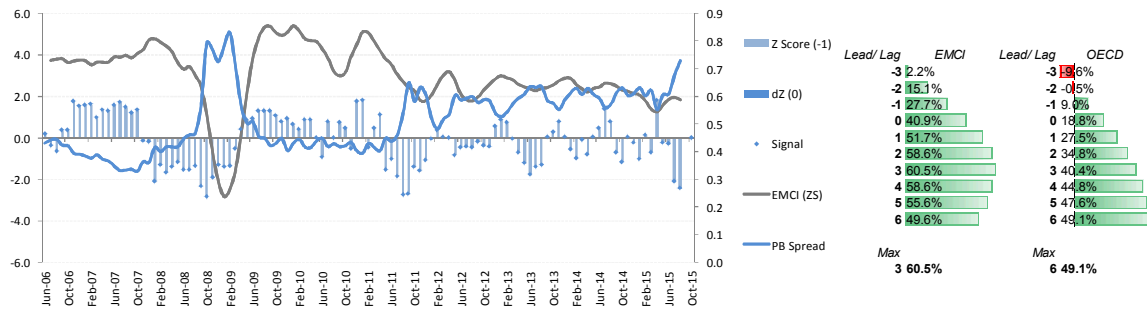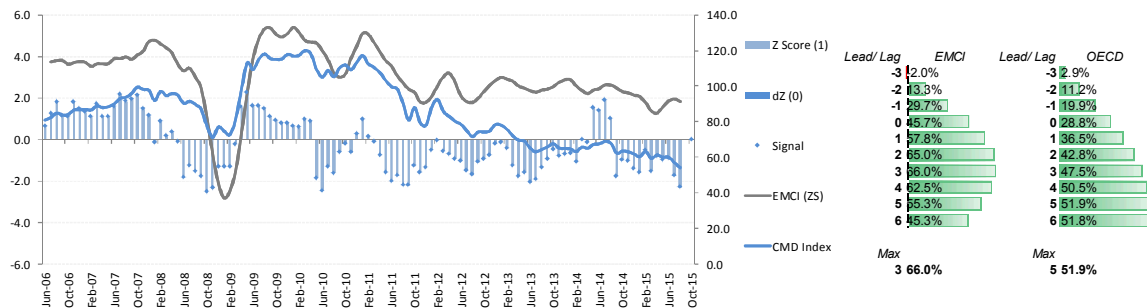
(- +) REWARD: Cyclicals minus Defensive Index show more upside but still neutral.

Lead/Lag	EMCI	Lead/Lag	OECD
-3	2.0%	-3	2.9%
-2	13.3%	-2	11.2%
-1	29.7%	-1	19.9%
0	45.7%	0	28.8%
1	57.8%	1	36.5%
2	65.0%	2	42.8%
3	66.0%	3	47.5%
4	62.5%	4	50.5%
5	55.3%	5	51.9%
6	45.3%	6	51.8%
Max		Max	
3	66.0%	5	51.9%

Legend: Z Score (1), dZ (0), Signal, EMCI (ZS), CMD Index

(- -) RISK: Beta Volatility is increasing.

Lead/Lag	EMCI	Lead/Lag	OECD
-3	25.2%	-3	10.2%
-2	25.8%	-2	15.6%
-1	27.2%	-1	20.3%
0	28.1%	0	24.5%
1	27.8%	1	27.4%
2	25.4%	2	29.7%
3	22.0%	3	31.4%
4	18.3%	4	32.2%
5	15.0%	5	32.8%
6	12.8%	6	33.2%
Max		Max	
0	28.1%	6	33.2%

Legend: Z Score (-1), dZ (-1), Signal, EMCI (ZS), CMD Vol
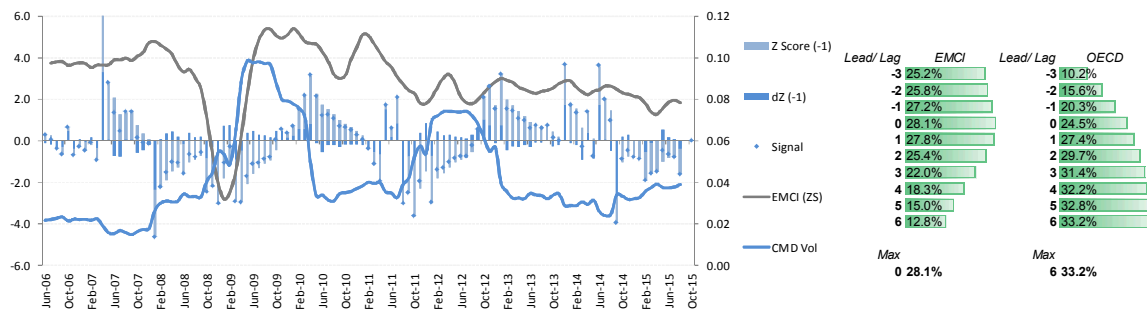
(- -) RISK: The VIX has spiked upwards and then come off again..

Lead/Lag	EMCI	Lead/Lag	OECD
-3	5.1%	-3	-18.0%
-2	5.2%	-2	-12.1%
-1	13.6%	-1	-6.0%
0	20.4%	0	0.1%
1	27.2%	1	5.1%
2	32.2%	2	8.8%
3	31.7%	3	11.4%
4	25.4%	4	13.0%
5	14.5%	5	14.2%
6	2.1%	6	14.9%
Max		Max	
2	32.2%	6	14.9%

Legend: Z Score (-1), dZ (0), Signal, EMCI (ZS), VIX

Source: MSCI Barra, Thomson Reuters, Bloomberg

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

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

(- -) RISK: EM Index Volatility 90 day has increased
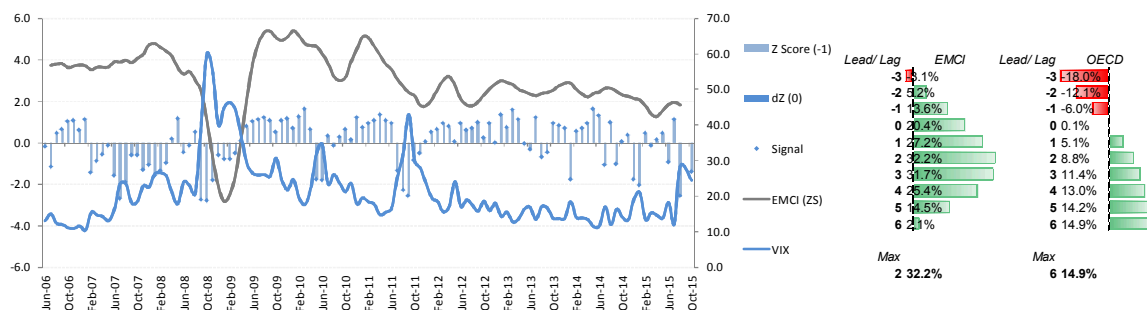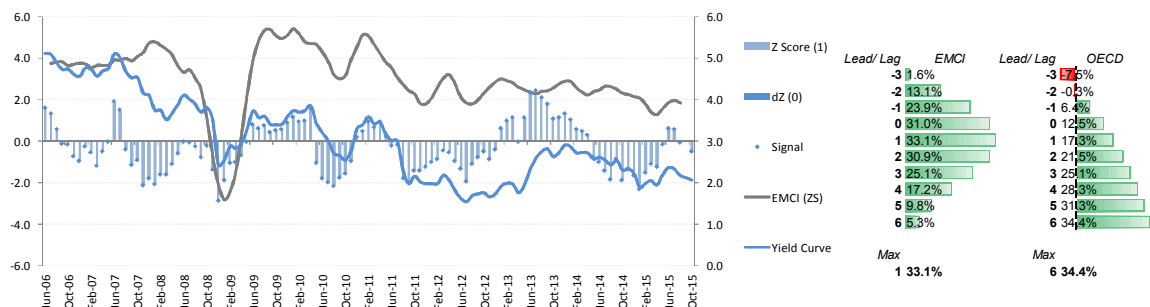
Legend: Z Score (-1); dZ (0); Signal; EMCI (ZS); EM 90DVol

Lead/Lag	EMCI	Lead/Lag	OECD
-3	5.6%	-3	-21.4%
-2	13.9%	-2	-16.4%
-1	23.4%	-1	-11.3%
0	31.6%	0	-6.4%
1	36.5%	1	-2.7%
2	35.6%	2	0.1%
3	28.9%	3	1.8%
4	16.7%	4	2.9%
5	2.9%	5	4.0%
6	-9.1%	6	5.4%

Max 1 36.5% | Max 6 5.4%
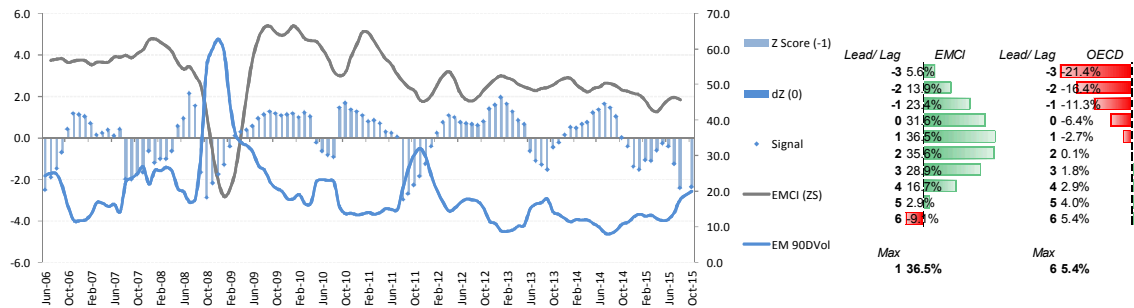
(- -) SENTIMENT: Aggregate Revisions Ratio to FY2 has started trending down again

Legend: Z Score (1); dZ (0); Signal; EMCI (ZS); Revision Ratio

Lead/Lag	EMCI	Lead/Lag	OECD
-3	-27.6%	-3	-27.4%
-2	-13.8%	-2	-18.8%
-1	2.3%	-1	-9.6%
0	18.7%	0	-0.2%
1	32.2%	1	8.3%
2	40.7%	2	16.0%
3	42.6%	3	22.1%
4	40.8%	4	26.8%
5	37.1%	5	30.2%
6	31.7%	6	32.9%

Max 3 42.6% | Max 6 32.9%
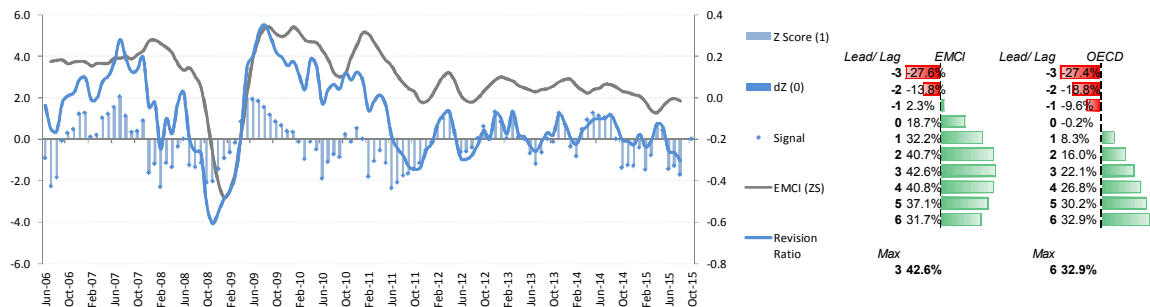
(- -) SENTIMENT: Oil to Gold ratio signal is flat but ticked down

Legend: Z Score (1); dZ (0); Signal; EMCI (ZS); Oil on Gold

Lead/Lag	EMCI	Lead/Lag	OECD
-3	19.0%	-3	20.0%
-2	26.2%	-2	21.4%
-1	31.6%	-1	21.5%
0	34.9%	0	20.1%
1	35.1%	1	17.2%
2	31.1%	2	13.3%
3	23.0%	3	8.8%
4	10.9%	4	4.0%
5	-4.6%	5	-0.7%
6	-20.6%	6	-4.9%

Max 1 35.1% | Max -1 21.5%
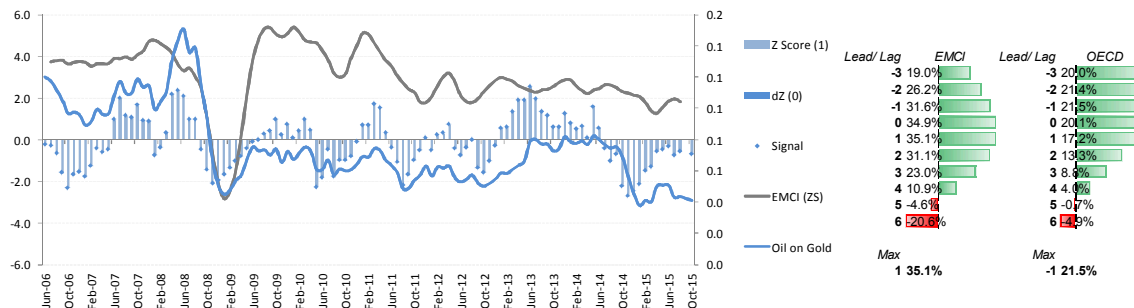
(- -) SENTIMENT: The US Treasury Yield Curve stable but ticking down in the last couple of months

Legend: Z Score (1); dZ (0); Signal; EMCI (ZS); Yield Curve

Lead/Lag	EMCI	Lead/Lag	OECD
-3	1.6%	-3	-7.6%
-2	13.1%	-2	-0.3%
-1	23.9%	-1	6.4%
0	31.0%	0	12.5%
1	33.1%	1	17.3%
2	30.9%	2	21.5%
3	25.1%	3	25.1%
4	17.2%	4	28.3%
5	9.8%	5	31.3%
6	5.3%	6	34.4%

Max 1 33.1% | Max 6 34.4%

Source: MSCI Barra, Thomson Reuters, Bloomberg

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

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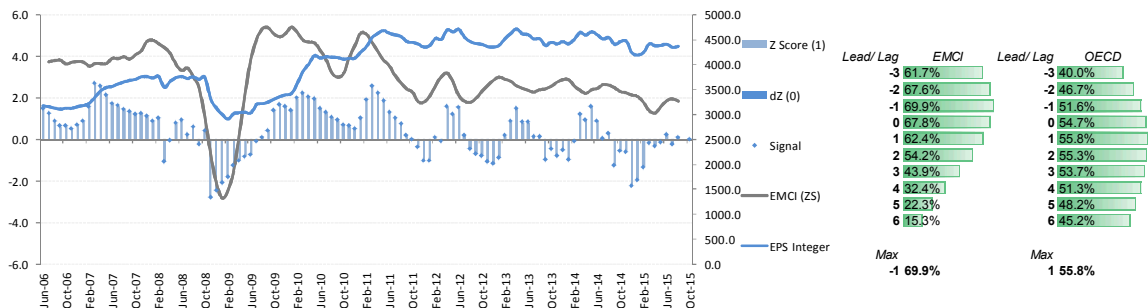

(- -) MACRO: Bloomberg Commodities Index (CRY) is negative
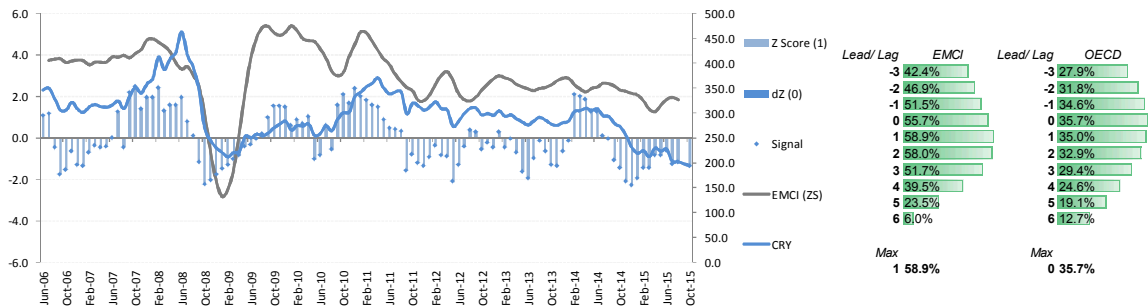
(- -) MACRO: Bloomberg Financial Conditions index (FCON) is negative
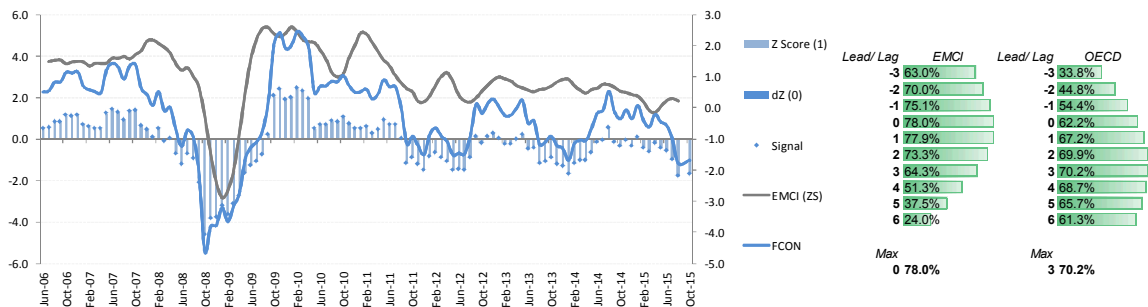
(- -) MACRO: Aggregate EPS forecasts (notional integer) is turning downwards

---

Source: MSCI Barra, Thomson Reuters, Bloomberg

29

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

Global Equity Derivatives & Quantitative Strategy
02 October 2015

J.P.Morgan

Disclosures

Analyst Certification: The research analyst(s) denoted by an "AC" on the cover of this report certifies (or, where multiple research analysts are primarily responsible for this report, the research analyst denoted by an "AC" on the cover or within the document individually certifies, with respect to each security or issuer that the research analyst covers in this research) that: (1) all of the views expressed in this report accurately reflect his or her personal views about any and all of the subject securities or issuers; and (2) no part of any of the research analyst's compensation was, is, or will be directly or indirectly related to the specific recommendations or views expressed by the research analyst(s) in this report. For all Korea-based research analysts listed on the front cover, they also certify, as per KOFIA requirements, that their analysis was made in good faith and that the views reflect their own opinion, without undue influence or intervention.

Important Disclosures

● MSCI: The MSCI sourced information is the exclusive property of MSCI. Without prior written permission of MSCI, this information and any other MSCI intellectual property may not be reproduced, redisseminated or used to create any financial products, including any indices. This information is provided on an 'as is' basis. The user assumes the entire risk of any use made of this information. MSCI, its affiliates and any third party involved in, or related to, computing or compiling the information hereby expressly disclaim all warranties of originality, accuracy, completeness, merchantability or fitness for a particular purpose with respect to any of this information. Without limiting any of the foregoing, in no event shall MSCI, any of its affiliates or any third party involved in, or related to, computing or compiling the information have any liability for any damages of any kind. MSCI and the MSCI indexes are services marks of MSCI and its affiliates.

Company-Specific Disclosures: Important disclosures, including price charts and credit opinion history tables, are available for compendium reports and all J.P. Morgan–covered companies by visiting https://jpmm.com/research/disclosures, calling 1-800-477-0406, or e-mailing research.disclosure.inquiries@jpmorgan.com with your request. J.P. Morgan's Strategy, Technical, and Quantitative Research teams may screen companies not covered by J.P. Morgan. For important disclosures for these companies, please call 1-800-477-0406 or e-mail research.disclosure.inquiries@jpmorgan.com.

Explanation of Equity Research Ratings, Designations and Analyst(s) Coverage Universe:
J.P. Morgan uses the following rating system: Overweight [Over the next six to twelve months, we expect this stock will outperform the average total return of the stocks in the analyst's (or the analyst's team's) coverage universe.] Neutral [Over the next six to twelve months, we expect this stock will perform in line with the average total return of the stocks in the analyst's (or the analyst's team's) coverage universe.] Underweight [Over the next six to twelve months, we expect this stock will underperform the average total return of the stocks in the analyst's (or the analyst's team's) coverage universe.] Not Rated (NR): J.P. Morgan has removed the rating and, if applicable, the price target, for this stock because of either a lack of a sufficient fundamental basis or for legal, regulatory or policy reasons. The previous rating and, if applicable, the price target, no longer should be relied upon. An NR designation is not a recommendation or a rating. In our Asia (ex-Australia) and U.K. small- and mid-cap equity research, each stock's expected total return is compared to the expected total return of a benchmark country market index, not to those analysts' coverage universe. If it does not appear in the Important Disclosures section of this report, the certifying analyst's coverage universe can be found on J.P. Morgan's research website, www.jpmorganmarkets.com.

J.P. Morgan Equity Research Ratings Distribution, as of September 30, 2015

	Overweight (buy)	Neutral (hold)	Underweight (sell)
J.P. Morgan Global Equity Research Coverage	45%	43%	12%
IB clients*	52%	49%	35%
JPMS Equity Research Coverage	45%	47%	8%
IB clients*	69%	66%	54%

*Percentage of investment banking clients in each rating category.
For purposes only of FINRA/NYSE ratings distribution rules, our Overweight rating falls into a buy rating category; our Neutral rating falls into a hold rating category; and our Underweight rating falls into a sell rating category. Please note that stocks with an NR designation are not included in the table above.

Equity Valuation and Risks: For valuation methodology and risks associated with covered companies or price targets for covered companies, please see the most recent company-specific research report at http://www.jpmorganmarkets.com, contact the primary analyst or your J.P. Morgan representative, or email research.disclosure.inquiries@jpmorgan.com.

Equity Analysts' Compensation: The equity research analysts responsible for the preparation of this report receive compensation based upon various factors, including the quality and accuracy of research, client feedback, competitive factors, and overall firm revenues.

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

Global Equity Derivatives & Quantitative Strategy
02 October 2015

J.P.Morgan

Registration of non-US Analysts: Unless otherwise noted, the non-US analysts listed on the front of this report are employees of non-US affiliates of JPMS, are not registered/qualified as research analysts under NASD/NYSE rules, may not be associated persons of JPMS, and may not be subject to FINRA Rule 2711 and NYSE Rule 472 restrictions on communications with covered companies, public appearances, and trading securities held by a research analyst account.

Other Disclosures

J.P. Morgan ("JPM") is the global brand name for J.P. Morgan Securities LLC ("JPMS") and its affiliates worldwide. J.P. Morgan Cazenove is a marketing name for the U.K. investment banking businesses and EMEA cash equities and equity research businesses of JPMorgan Chase & Co. and its subsidiaries.

All research reports made available to clients are simultaneously available on our client website, J.P. Morgan Markets. Not all research content is redistributed, e-mailed or made available to third-party aggregators. For all research reports available on a particular stock, please contact your sales representative.

Options related research: If the information contained herein regards options related research, such information is available only to persons who have received the proper option risk disclosure documents. For a copy of the Option Clearing Corporation's Characteristics and Risks of Standardized Options, please contact your J.P. Morgan Representative or visit the OCC's website at http://www.optionsclearing.com/publications/risks/riskstoc.pdf

Legal Entities Disclosures
U.S.: JPMS is a member of NYSE, FINRA, SIPC and the NFA. JPMorgan Chase Bank, N.A. is a member of FDIC. **U.K.**: JPMorgan Chase N.A., London Branch, is authorised by the Prudential Regulation Authority and is subject to regulation by the Financial Conduct Authority and to limited regulation by the Prudential Regulation Authority. Details about the extent of our regulation by the Prudential Regulation Authority are available from J.P. Morgan on request. J.P. Morgan Securities plc (JPMS plc) is a member of the London Stock Exchange and is authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority. Registered in England & Wales No. 2711006. Registered Office 25 Bank Street, London, E14 5JP. **South Africa**: J.P. Morgan Equities South Africa Proprietary Limited is a member of the Johannesburg Securities Exchange and is regulated by the Financial Services Board. **Hong Kong**: J.P. Morgan Securities (Asia Pacific) Limited (CE number AAJ321) is regulated by the Hong Kong Monetary Authority and the Securities and Futures Commission in Hong Kong and/or J.P. Morgan Broking (Hong Kong) Limited (CE number AAB027) is regulated by the Securities and Futures Commission in Hong Kong. **Korea**: This material is issued and distributed in Korea by or through J.P. Morgan Securities (Far East) Limited, Seoul Branch, which is a member of the Korea Exchange(KRX) and is regulated by the Financial Services Commission (FSC) and the Financial Supervisory Service (FSS). **Australia**: J.P. Morgan Australia Limited (JPMAL) (ABN 52 002 888 011/AFS Licence No: 238188) is regulated by ASIC and J.P. Morgan Securities Australia Limited (JPMSAL) (ABN 61 003 245 234/AFS Licence No: 238066) is regulated by ASIC and is a Market, Clearing and Settlement Participant of ASX Limited and CHI-X. **Taiwan**: J.P.Morgan Securities (Taiwan) Limited is a participant of the Taiwan Stock Exchange (company-type) and regulated by the Taiwan Securities and Futures Bureau. **India:** J.P. Morgan India Private Limited (Corporate Identity Number - U67120MH1992FTC068724), having its registered office at J.P. Morgan Tower, Off. C.S.T. Road, Kalina, Santacruz - East, Mumbai – 400098, is a member of the National Stock Exchange of India Limited (SEBI Registration Number - INB 230675231/INF 230675231/INE 230675231) and Bombay Stock Exchange Limited (SEBI Registration Number - INB 010675237/INF 010675237) and is regulated by Securities and Exchange Board of India. Telephone: 91-22-6157 3000, Facsimile: 91-22-6157 3990 and Website: www.jpmipl.com. For non local research reports, this material is not distributed in India by J.P. Morgan India Private Limited. **Thailand**: This material is issued and distributed in Thailand by JPMorgan Securities (Thailand) Ltd., which is a member of the Stock Exchange of Thailand and is regulated by the Ministry of Finance and the Securities and Exchange Commission and its registered address is 3rd Floor, 20 North Sathorn Road, Silom, Bangrak, Bangkok 10500. **Indonesia**: PT J.P. Morgan Securities Indonesia is a member of the Indonesia Stock Exchange and is regulated by the OJK a.k.a. BAPEPAM LK. **Philippines**: J.P. Morgan Securities Philippines Inc. is a Trading Participant of the Philippine Stock Exchange and a member of the Securities Clearing Corporation of the Philippines and the Securities Investor Protection Fund. It is regulated by the Securities and Exchange Commission. **Brazil**: Banco J.P. Morgan S.A. is regulated by the Comissao de Valores Mobiliarios (CVM) and by the Central Bank of Brazil. **Mexico**: J.P. Morgan Casa de Bolsa, S.A. de C.V., J.P. Morgan Grupo Financiero is a member of the Mexican Stock Exchange and authorized to act as a broker dealer by the National Banking and Securities Exchange Commission. **Singapore**: This material is issued and distributed in Singapore by or through J.P. Morgan Securities Singapore Private Limited (JPMSS) [MCI (P) 100/03/2015 and Co. Reg. No.: 199405335R] which is a member of the Singapore Exchange Securities Trading Limited and is regulated by the Monetary Authority of Singapore (MAS) and/or JPMorgan Chase Bank, N.A., Singapore branch (JPMCB Singapore) which is regulated by the MAS. This material is provided in Singapore only to accredited investors, expert investors and institutional investors, as defined in Section 4A of the Securities and Futures Act, Cap. 289. Recipients of this document are to contact JPMSS or JPMCB Singapore in respect of any matters arising from, or in connection with, the document. **Japan**: JPMorgan Securities Japan Co., Ltd. is regulated by the Financial Services Agency in Japan. **Malaysia**: This material is issued and distributed in Malaysia by JPMorgan Securities (Malaysia) Sdn Bhd (18146-X) which is a Participating Organization of Bursa Malaysia Berhad and a holder of Capital Markets Services License issued by the Securities Commission in Malaysia. **Pakistan**: J. P. Morgan Pakistan Broking (Pvt.) Ltd is a member of the Karachi Stock Exchange and regulated by the Securities and Exchange Commission of Pakistan. **Saudi Arabia**: J.P. Morgan Saudi Arabia Ltd. is authorized by the Capital Market Authority of the Kingdom of Saudi Arabia (CMA) to carry out dealing as an agent, arranging, advising and custody, with respect to securities business under licence number 35-07079 and its registered address is at 8th Floor, Al-Faisaliyah Tower, King Fahad Road, P.O. Box 51907, Riyadh 11553, Kingdom of Saudi Arabia. **Dubai**: JPMorgan Chase Bank, N.A., Dubai Branch is regulated by the Dubai Financial Services Authority (DFSA) and its registered address is Dubai International Financial Centre - Building 3, Level 7, PO Box 506551, Dubai, UAE.

Country and Region Specific Disclosures
U.K. and European Economic Area (EEA): Unless specified to the contrary, issued and approved for distribution in the U.K. and the EEA by JPMS plc. Investment research issued by JPMS plc has been prepared in accordance with JPMS plc's policies for managing conflicts of interest arising as a result of publication and distribution of investment research. Many European regulators require a firm to establish, implement and maintain such a policy. This report has been issued in the U.K. only to persons of a kind described in Article 19 (5), 38, 47 and 49 of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005 (all such persons being referred to as "relevant persons"). This document must not be acted on or relied on by persons who are not relevant persons. Any investment or investment activity to which this document relates is only available to relevant persons and will be engaged in only with relevant persons. In other EEA countries, the report has been issued to persons regarded as professional investors (or equivalent) in their home jurisdiction. **Australia:** This material is issued and distributed by JPMSAL in Australia to "wholesale clients" only. This material does not take

Robert Smith, PhD
(852) 2800 8569
robert.z.smith@jpmorgan.com

J.P.Morgan

into account the specific investment objectives, financial situation or particular needs of the recipient. The recipient of this material must not distribute it to any third party or outside Australia without the prior written consent of JPMSAL. For the purposes of this paragraph the term "wholesale client" has the meaning given in section 761G of the Corporations Act 2001. **Germany:** This material is distributed in Germany by J.P. Morgan Securities plc, Frankfurt Branch and J.P.Morgan Chase Bank, N.A., Frankfurt Branch which are regulated by the Bundesanstalt für Finanzdienstleistungsaufsicht. **Hong Kong:** The 1% ownership disclosure as of the previous month end satisfies the requirements under Paragraph 16.5(a) of the Hong Kong Code of Conduct for Persons Licensed by or Registered with the Securities and Futures Commission. (For research published within the first ten days of the month, the disclosure may be based on the month end data from two months prior.) J.P. Morgan Broking (Hong Kong) Limited is the liquidity provider/market maker for derivative warrants, callable bull bear contracts and stock options listed on the Stock Exchange of Hong Kong Limited. An updated list can be found on HKEx website: http://www.hkex.com.hk. **Japan:** There is a risk that a loss may occur due to a change in the price of the shares in the case of share trading, and that a loss may occur due to the exchange rate in the case of foreign share trading. In the case of share trading, JPMorgan Securities Japan Co., Ltd., will be receiving a brokerage fee and consumption tax (shouhizei) calculated by multiplying the executed price by the commission rate which was individually agreed between JPMorgan Securities Japan Co., Ltd., and the customer in advance. Financial Instruments Firms: JPMorgan Securities Japan Co., Ltd., Kanto Local Finance Bureau (kinsho) No. 82 Participating Association / Japan Securities Dealers Association, The Financial Futures Association of Japan, Type II Financial Instruments Firms Association and Japan Investment Advisers Association. **Korea:** This report may have been edited or contributed to from time to time by affiliates of J.P. Morgan Securities (Far East) Limited, Seoul Branch. **Singapore:** JPMSS and/or its affiliates may have a holding in any of the securities discussed in this report; for securities where the holding is 1% or greater, the specific holding is disclosed in the Important Disclosures section above. **Taiwan**: This material is issued and distributed in Taiwan by J.P. Morgan Securities (Taiwan) Limited. **India:** For private circulation only, not for sale. **Pakistan:** For private circulation only, not for sale. **New Zealand:** This material is issued and distributed by JPMSAL in New Zealand only to persons whose principal business is the investment of money or who, in the course of and for the purposes of their business, habitually invest money. JPMSAL does not issue or distribute this material to members of "the public" as determined in accordance with section 3 of the Securities Act 1978. The recipient of this material must not distribute it to any third party or outside New Zealand without the prior written consent of JPMSAL. **Canada:** The information contained herein is not, and under no circumstances is to be construed as, a prospectus, an advertisement, a public offering, an offer to sell securities described herein, or solicitation of an offer to buy securities described herein, in Canada or any province or territory thereof. Any offer or sale of the securities described herein in Canada will be made only under an exemption from the requirements to file a prospectus with the relevant Canadian securities regulators and only by a dealer properly registered under applicable securities laws or, alternatively, pursuant to an exemption from the dealer registration requirement in the relevant province or territory of Canada in which such offer or sale is made. The information contained herein is under no circumstances to be construed as investment advice in any province or territory of Canada and is not tailored to the needs of the recipient. To the extent that the information contained herein references securities of an issuer incorporated, formed or created under the laws of Canada or a province or territory of Canada, any trades in such securities must be conducted through a dealer registered in Canada. No securities commission or similar regulatory authority in Canada has reviewed or in any way passed judgment upon these materials, the information contained herein or the merits of the securities described herein, and any representation to the contrary is an offence. **Dubai:** This report has been issued to persons regarded as professional clients as defined under the DFSA rules. **Brazil**: Ombudsman J.P. Morgan: 0800-7700847 / ouvidoria.jp.morgan@jpmorgan.com.

General: Additional information is available upon request. Information has been obtained from sources believed to be reliable but JPMorgan Chase & Co. or its affiliates and/or subsidiaries (collectively J.P. Morgan) do not warrant its completeness or accuracy except with respect to any disclosures relative to JPMS and/or its affiliates and the analyst's involvement with the issuer that is the subject of the research. All pricing is as of the close of market for the securities discussed, unless otherwise stated. Opinions and estimates constitute our judgment as of the date of this material and are subject to change without notice. Past performance is not indicative of future results. This material is not intended as an offer or solicitation for the purchase or sale of any financial instrument. The opinions and recommendations herein do not take into account individual client circumstances, objectives, or needs and are not intended as recommendations of particular securities, financial instruments or strategies to particular clients. The recipient of this report must make its own independent decisions regarding any securities or financial instruments mentioned herein. JPMS distributes in the U.S. research published by non-U.S. affiliates and accepts responsibility for its contents. Periodic updates may be provided on companies/industries based on company specific developments or announcements, market conditions or any other publicly available information. Clients should contact analysts and execute transactions through a J.P. Morgan subsidiary or affiliate in their home jurisdiction unless governing law permits otherwise.

"Other Disclosures" last revised July 14, 2015.