Regime Change

Implications of macro shifts on asset class and portfolio performance

SUMMARY

In this paper, we present a framework for using regime-based asset allocation to improve portfolio efficiency and resiliency under a variety of economic scenarios. Our goal is to help long-term institutional investors take advantage of positive economic regimes, as well as withstand adverse economic regimes and reduce potential drawdowns.

Based on the analysis presented here, we believe that regime-based asset allocation has the potential to deliver significant benefits when compared to traditional investment policies, which are most commonly static and benchmark based. Contingent on good economic foresight, implementation of a regime-based approach can potentially add to cumulative performance over time, translating to an improved distribution of overall portfolio returns.

The Rationale for Regime-based Investing

It is a well-recognized empirical observation that different asset classes respond differently to different economic drivers. For example, fixed income assets tend to respond to anticipated movements in interest rates, among other factors: prices fall when interest rates rise. Commodities respond to, and sometimes drive, inflation expectations: commodity prices can rise fast when inflation expectations are rising, and they can fall quickly once inflation appears to have peaked.

J.P.Morgan
Asset Management

It is also well recognized that asset class behavior can vary significantly over shifting economic scenarios. For example, business cycles tend to impact cyclical vs. non-cyclical companies in markedly different ways, primarily due to sensitivities of consumers and producers to economic growth. Periods of capital markets liberalization (i.e., different regulatory environments) are often accompanied by favorable equity returns (as compared to bond returns)—as evidenced by many current and former emerging market economies.

Exhibit 1 shows the average performance of different asset classes in four economic regimes.[1]

These results indicate that no single asset class dominates under all economic conditions. From an investment perspective, even a purely historical analysis based on simple scenarios (built with only two variables: growth and inflation) supports our hypothesis that financial market performance does indeed vary significantly as economic conditions change.

Yet, while asset class performance certainly varies under different conditions, traditional asset allocation approaches make no effort to adapt to such shifts. Instead, traditional approaches seek to develop static "all-season" portfolios that optimize efficiency across a range of economic scenarios.

In this paper, we consider a compelling alternative. We define economic trends in their totality, as a single complex system that changes over time to produce what we call economic "regimes." And we investigate whether regime-based asset allocation can effectively respond to economic regimes at the portfolio level in an effort to provide better long-term results when compared to static benchmark-based approaches.

---

[1] These four regimes are "simplified" versions of the ones we develop in our full white paper as part of our asset allocation framework, using an expanded list of economic factors (please contact your J.P. Morgan client advisor for the full paper).

It is worth noting that regime-based investing is distinct from tactical asset allocation. While the latter is shorter term, higher frequency (i.e., daily or monthly), and driven primarily by valuation considerations, regime-based investing targets a longer time horizon (i.e., a year or more), and is driven by changing economic fundamentals. It straddles a middle ground between strategic and tactical. A regime-based approach is designed to give investors the flexibility to adapt to changing economic conditions *within* a benchmark-based investment policy.

Assessing the Potential Benefits of Regime-based Investing

Based on our analysis, we arrive at three key conclusions about regime-based investing:

1. **Economic regimes can be defined in terms of four key factors, which tend to dominate financial market performance.** These four factors are economic growth, inflation, monetary policy and labor market slack. Developing insight into near-term changes in these four factors—rather than their absolute levels—can provide an effective framework for executing a regime-based asset allocation policy.

2. **No single portfolio is resilient to all economic regimes—the concept of a static "all-season" portfolio is a myth.** Asset class performance varies significantly across different regimes, be they economic, regulatory, political or otherwise. For example, portfolios resilient to deflationary environments will likely underperform during periods of high inflation, and vice versa. Different economic regimes require different asset allocations.

EXHIBIT 1: AVERAGE ANNUAL RETURN (%) FROM DIFFERENT ASSET CLASSES OVER DIFFERENT HISTORICAL ECONOMIC REGIMES

Asset class	Regime 1 Rising growth + Rising inflation 32 periods	Regime 2 Rising growth + Falling inflation 34 periods	Regime 3 Falling growth + Rising inflation 36 periods	Regime 4 Falling growth + Falling inflation 47 periods
U.S. Dollar	-4.7 (Worst)	2.6	-2.8 (Worst)	1.7
Commodities	9.1 (Best)	1.5 (Worst)	11.7 (Best)	-6.3 (Worst)
Treasuries	3.9	8.7	5.5	11.5
Credit	6.8	12.6	2.1	12.1 (Best)
U.S. Equities	4.5	14.7 (Best)	1.0	5.5
Average return	3.9	8.0	3.5	4.9

Source: J.P. Morgan Asset Management. For illustration purposes only. Analysis based on quarterly data and rolling annual returns from Q4 1973 to Q4 2010.

3. Regime-based asset allocation may have a significant impact on portfolio efficiency.[2] Ignoring shifting economic regimes can exact a significant toll on portfolio performance, exposing it to draw-downs during interim periods of heightened turbulence and volatility. A good example of such a period is the Great Recession of 2008–2009. Based on our research, a typical benchmark-based portfolio would have lost approximately 17%, compared to a regime-oriented portfolio that would have lost only 7%.

On the other hand, addressing changes in economic regimes through regime-based asset allocation may provide significant performance benefits, including mitigating downside risk in extreme scenarios, i.e., so-called "tail" events. For the hypothetical portfolio used in this paper, a regime-based asset allocation approach improves real returns from -6.4% (for a static approach) to 5.7% in a severe recessionary scenario (coupled with deflation). In a high inflation scenario, a regime-oriented portfolio improves real returns from -2.7% (for a static portfolio) to 8.6%.

Exhibit 2 illustrates the impact of a regime-oriented asset allocation framework assuming perfect economic foresight on the probability distribution of portfolio returns.[3] A regime-oriented approach reduces the negative skew and kurtosis of the distribution. Both contribute towards making the overall distribution more attractive for the investor, thus clearly illustrating the power of an effective regime-based asset allocation approach.

Key Challenges to a Regime-based Investment Approach

While we can be certain that assets respond to economic regimes, and we can demonstrate that a regime-based framework may add value over time, there still remain two key significant hurdles between theory and practice.

First, we need to capture the complex nature of the interaction between economic drivers and assets. Our key finding in this regard is that these relationships are state dependent and non-linear in nature. Second, we need to establish the level of

---

[2] Portfolio efficiency in this context is defined as the return per unit of risk undertaken.

[3] We develop the distribution of portfolio returns based on the results of our back test. In other words, we apply a regimes-based asset allocation approach from Q1 1984. The analysis assumes perfect economic foresight. In our full white paper, we consider the impact of imperfect economic foresight on the value added from a regimes-based framework.

EXHIBIT 2: IMPACT OF REGIME-ORIENTED ASSET ALLOCATION ON DISTRIBUTION OF RETURNS WITH PERFECT ECONOMIC FORESIGHT
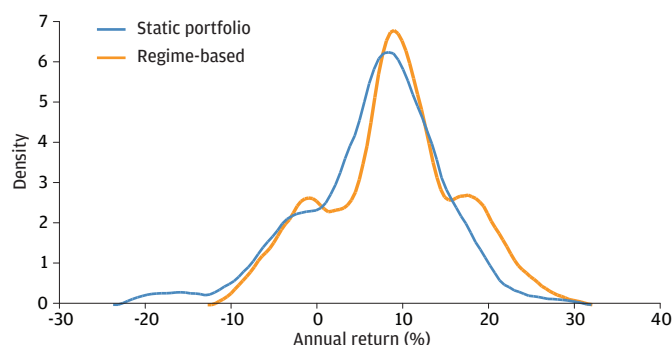
	Static portfolio	Regime-based (perfect foresight)
Mean (%)	6.7	8.9
Median (%)	7.7	9.4
Maximum (%)	26.8	27.6
Minimum (%)	-18.1	-7.7
Std. Dev. (%)	8.0	7.7
Skewness	-0.61	-0.06
Kurtosis	3.80	2.66
Jarque-Bera	9.19	0.57
Probability	0.01	0.75

Source: J.P. Morgan Asset Management. For illustration purposes only.

economic foresight necessary to be successful; our analysis indicates that successful implementation of a regime-based framework requires only imperfect economic foresight. However, we find that even this level of skill is not necessarily easy to achieve in practice.

Below, we provide further detail on each of these key challenges.

1. Regime-based investing requires understanding the state-dependent relationship between financial markets and the broader economy, and devising a method of modeling the non-linear nature of such relationships.

Successful regime investing is predicated on modeling the relationships between assets and economic performance drivers. This process starts with the recognition that the direction and strength of financial market movements depends on a range of broad economic factors. For example, equities tend to do well in environments featuring rising growth rates, as well as falling inflation. We can say that equities are "state dependent" in that they respond to the state of the economy

as defined by such factors. At the same time, we also recognize that financial markets do not always react to changes in the economy in an orderly or well-defined fashion. For example, in times of extreme market stress, historical correlations among asset classes tend to break down. The term we use to describe relationships that change character beyond certain thresholds is "non-linear."

In non-linear relationships, two variables may be positively correlated under one set of conditions, but show a lower or even negative correlation under different conditions. Traditional analysis can often overlook such relationships (due to zero overall correlation) and mistakenly assumes there is no definable relationship at all. Advanced statistical methods, however, can capture and model non-linearity, which is an important pre-requisite to developing a regime-based framework that adds value over time.

Regime investing, therefore, requires us to develop a capability to model relationships that are both state-dependent and non-linear.

Modeling such relationships, however, is quite complex, for both conceptual and practical purposes. For example, when one looks at a simple scatter plot of the relationship between S&P 500 returns and GDP growth, at first there may not seem to be much of a relationship at all, at least not a clearly linear one. Applying a non-linear model, however, helps us make progress in defining this relationship: as prospects for economic growth improve, equity prices tend to rally, but beyond a certain threshold, this relationship, too, starts to break down.

This relationship is illustrated in **Exhibit 3**, which plots S&P 500 returns and *levels* of real GDP growth.

The chart shows that the impact of incrementally higher real GDP on equity prices begins to decline beyond a certain threshold. This could be explained, for example, as a reaction of markets to price potentially tighter monetary policy or a simple cyclical squeeze in profit margins, both of which can lead to reduced corporate profits. In practice, equity markets are impacted by more than just growth rates, but even the simple example above is useful in illustrating the need to model both the state-dependency and non-linearity of financial market responses to shifting economic regimes.

EXHIBIT 3: ANNUAL S&P RETURNS VS. REAL GDP GROWTH
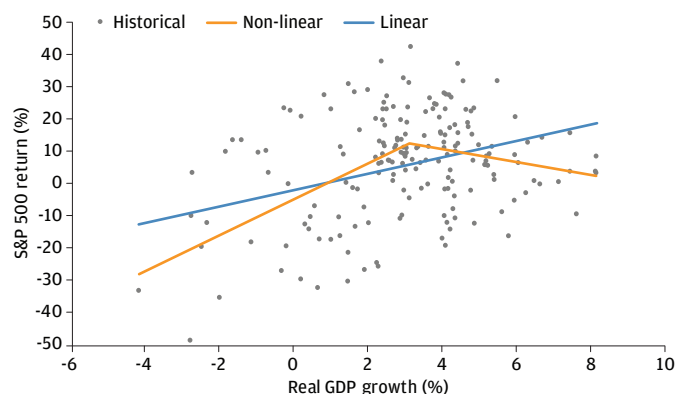
Source: J.P. Morgan Asset Management. For illustration purposes only. Linear R^2 = 12.0%, Non-linear R^2 = 22.5%. Data from December 1964 to December 2010.

Of course, asset class performance can be driven by more than just economic fundamentals (as indicated by low R-squared values of some of our equations). In particular, changes to valuation, e.g., Price-Earnings ratios for Equities, are often a significant driver of performance. It is possible for financial markets to reflect extreme optimism or pessimism (from a valuation perspective) for long periods of time, rather than pure economic fundamentals. In such cases, regime-based frameworks may prove inadequate for the purposes of developing robust and resilient portfolios.

2. Successfully developing and executing a regime-based asset allocation strategy does not require perfect economic forecasting skills. However, even imperfect economic foresight is not necessarily easy to achieve.

Our framework suggests that CIOs with good economic insight can successfully implement and add value using a coherent regime-based asset allocation framework. We define good insight as forecasting *the direction* of economic changes, rather than their exact magnitude. The former is much more important in determining the success of dynamic regime response.
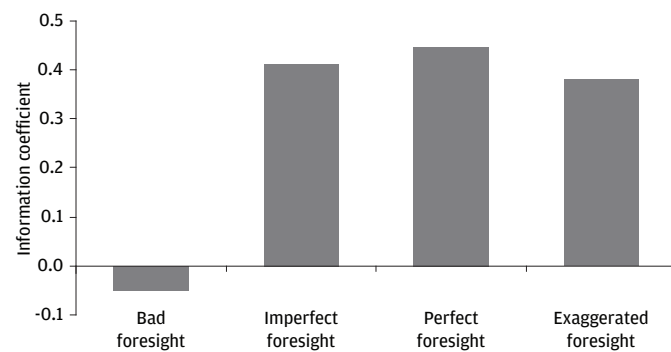
Average information coefficient	
Bad foresight	-0.0494
Imperfect foresight	0.4128
Perfect foresight	0.4467
Exaggerated foresight	0.3786

Bad foresight = -2 × Actual economic conditions
Imperfect foresight = 0.5 × Actual economic conditions
Perfect foresight = Actual economic conditions
Exaggerated foresight = 2 × actual economic conditions

Source: J.P. Morgan Asset Management. For illustration purposes only.

Exhibit 4 shows that the worse the accuracy of the economic foresight, the lower the value added by the framework, as measured by the average information coefficient.[4]

However, developing imperfect economic foresight is not necessarily straightforward given the confluence of factors impacting the economy. These influences include, but are not limited to, changing patterns in consumption, savings, investments, taxation and fiscal policy on the broader economy. In fact, we can glean some insight into the necessary skill required to add value using a regime-based approach by considering the average information coefficient associated with imperfect foresight. At 0.41, this figure is high. Typically upper quartile (macro) currency managers have an information coefficient of 0.2, while upper quartile equity managers have an information coefficient of 0.1, suggesting that successful regime-based investing does require considerable economic forecasting skills.

---

[4] The information coefficient calculates the correlation between actual and forecasted returns, using our regime-based asset allocation framework. It is often considered to be a measure of "skill" associated with the manager or investment strategy. In our case, the correlation is calculated cross-asset classes for each period and averaged over time to produce the average information coefficient.

Finally, even with perfect economic foresight (i.e., correctly forecasting the direction and magnitude of economic changes) asset class response can be extremely difficult to capture. This is particularly true when the economy and financial markets experience new paradigms relative to history. In such circumstances, the relationship between economic factors and financial markets can change quickly, leading to under performance of a regime-based investing approach developed on historical data.

So, it is important not to underestimate the complexity of the challenges of foresight, or overstate its power to capture returns.

Illustrating the Results of a Regime-based Investment Approach

Even given the complexity of the challenge, our work indicates that regime-based investing may add value to portfolios over time. And as a preface to our full white paper, we offer the following preview of how regime analysis may be implemented in an effort to improve portfolio results. (For a copy of the full paper, please contact your J.P. Morgan client advisor.)

Step 1: Develop the relationship between economic factors and financial markets

As a first step, our regime-based model develops the relationship between asset class performance relative to economic "regimes," which by definition include multiple factors that may all be changing simultaneously. In calculating asset return dynamics, we note that asset classes show unique sensitivities to economic factors; every asset class does not respond to every factor. For example, in modeling commodities, the primary influence in our framework comes from real GDP growth and inflation.
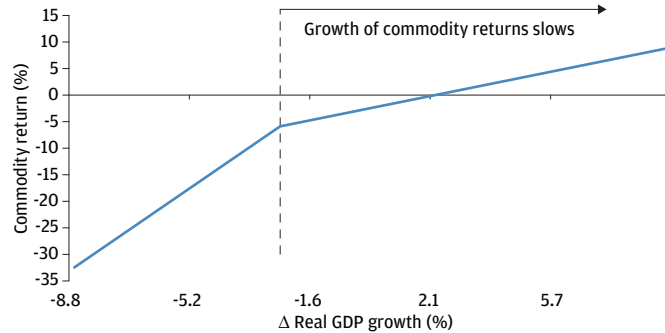
The full equation for arriving at the expected commodity returns within the framework as at December 31, 2010 is as follows:

Commodities return = 0.13 + 8.03 x max(0,ΔInflation - 1.87%) - 7.46 x max(0, 1.87% - ΔInflation) + 1.24 x max(0,ΔReal GDP Growth + 2.65%) - 4.32 x max(0,- 2.64- ΔReal GDP Growth) + 4.50 x max(0,-0.30% - ΔInflation)

R-Squared = 51.2%

EXHIBIT 5: COMMODITIES VS. ΔREAL GDP GROWTH

Source: J.P. Morgan Asset Management. For illustration purposes only.

Our equations support a positive relationship between commodities and changes in real GDP growth, but the relationship is significantly less positive beyond a threshold of -2.65%. This is illustrated in **Exhibit 5**.

This threshold effect can be explained in a number of ways, one of which is the growing influence of emerging markets on commodity markets. For example, many economists argue that emerging markets have experienced a decoupling effect from developed markets (particularly the U.S.). In other words, barring a severe global recession, emerging markets are likely to continue on the path of robust economic growth. In such instances, their influence on commodity markets, amongst others, is likely to grow, not dwindle.

Our analysis supports this theory. In fact, our equation suggests that the influence of U.S. real GDP growth on commodities is significantly negative below a threshold of -2.65%. In other words, U.S. real GDP growth would have to fall by more than 2.65% year over year, i.e., a severe (possibly global) recession, to significantly detract from commodity returns. When this does not happen, i.e., during normal times or mild recessions, the impact of U.S. growth on commodities is less

significant. This implies somewhat of a decoupling effect, where demand from emerging markets supports commodity prices, as long as the global economy avoids a deep recession.

The complete paper includes equations and explications of the relationships between each of our five key asset classes (U.S. Dollar, Treasuries, U.S. Equities, Commodities, and Credit) and our four economic factors. Based on this work, we develop similar conclusions about the state-dependent and non-linear relationships between these other asset classes and economic factors in our framework.

Step 2: Model the behavior of different asset classes in different economic regimes

Once we have developed relationships between our economic factors and asset classes, we can model the regime-dependent returns of various asset classes. **Exhibit 6** outlines six possible economic regimes defined in terms of U.S. real GDP growth, headline inflation, Federal Funds rate and unemployment and ranks five dollar-denominated asset classes for their relative performance potential, from best to worst, within those regimes.

It is clear from this analysis that shifts in asset class leadership are so broad and varied that no static portfolio weighting could be optimal across all regimes. Just on an intuitive basis, regime-based asset allocation appears to be the most logical response to shifting economic regimes.

Step 3: Assess the impact of different economic regimes at the total portfolio level and optimize portfolio allocations depending on economic insight and risk constraints

The next step is to assess the impact of different economic regimes at the total portfolio level and optimize portfolio allocations depending on economic insight and the investor's risk

EXHIBIT 6: IMPLIED ASSET CLASS RELATIVE PERFORMANCE UNDER DIFFERENT ECONOMIC REGIMES TO YEAR ENDING DECEMBER 2011

Scenario	FROM Year ended December 2010	TO Severe recession	Recession	Stagnant economy	Moderate recovery	Strong recovery	Strong recovery with inflation
1. Best performer	Commodities	U.S. Dollar	Treasuries	Treasuries	U.S. Equities	U.S. Equities	Commodities
2. Above median performer	U.S. Equities	Treasuries	U.S. Dollar	Credit	Credit	Commodities	U.S. Dollar
3. Median	Credit	Credit	Credit	U.S. Dollar	Treasuries	Credit	Treasuries
4. Below median performer	Treasuries	U.S. Equities	U.S. Equities	U.S. Equities	Commodities	Treasuries	U.S. Equities
5. Worst performer	U.S. Dollar	Commodities	Commodities	Commodities	U.S. Dollar	U.S. Dollar	Credit

Source: J.P. Morgan Asset Management. For illustration purposes only.

EXHIBIT 7: IMPLIED PORTFOLIO PERFORMANCE UNDER DIFFERENT ECONOMIC REGIMES
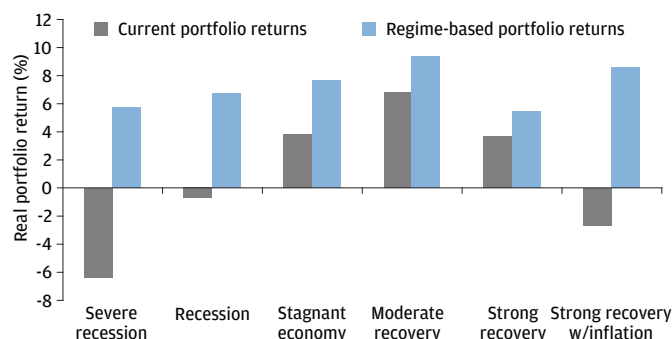
Source: J.P. Morgan Asset Management. For illustration purposes only.

constraints. And our finding is that, for a hypothetical diversified portfolio, regime-based asset allocation has the potential to significantly increase portfolio efficiency. **Exhibit 7** compares the results of a static benchmark-based policy to those of a regime-based policy under the regimes outlined above.

The hypothetical portfolio is most vulnerable to "tail" scenarios of a severe recession or an overheated recovery with inflationary pressures. In both these instances, the real return from the portfolio is negative. The current portfolio is best structured for a period of mild to normal growth.

In each case, our model adjusts asset allocation to target optimal efficiency under each regime. The optimized portfolios (**Exhibit 8**) for each regime overweight those asset classes most likely to perform well in the given economic environment and underweight those most likely to perform poorly, allowing for the risk constraints specified by the investor.

Purely measured by portfolio returns, the regime-based portfolio produces superior results, especially at the "tails"–i.e., extreme economic scenarios where traditional,

static approaches show the least resilience. In recessionary or stagnant growth scenarios, the regime-based portfolios are very conservative in nature, while in moderate to strong recovery scenarios, the portfolios are aggressive. In an inflationary scenario, the regime-based portfolio is slightly more conservative than the current portfolio.

Caveats and Conclusions

It is important to note here we do not advocate abandoning benchmark-based investing. Institutional investors set their portfolios' strategic benchmarks based on a desire to meet liabilities and other important strategic goals. Within these broad objectives, however, we argue that investors may be handicapping their portfolios by being regime agnostic, which is what a strategic benchmark is.

Instead, we believe that investors would benefit from being "regime aware" and allowing themselves the freedom to adjust allocations around the strategic benchmark in response to shifts in economic regimes. We believe, based on our analysis, that regime-based investing can offer a compelling alternative to the static "all-season" approach.

Limitations of reliance

It should be noted that a quantitative framework is only one input into the asset allocation process and cannot replace the professional skill and judgment necessary to arrive at an appropriate strategy. The importance of allowing for subjective– and often qualitative–factors in decision making remains. Further, there is always an explicit need to account for the investor's specific circumstances, including liabilities, when arriving at an appropriate portfolio allocation.

EXHIBIT 8: ALLOCATIONS TO STRATEGIC PORTFOLIO AND EACH OF THE REGIME PORTFOLIOS

| (%)	Strategic allocation	Severe recession	Recession	Stagnant economy	Moderate recovery	Strong recovery	Strong recovery with inflation
Commodities	15.0	0.0	0.0	0.0	0.0	18.0	30.0
Treasuries	15.0	30.0	30.0	30.0	15.0	15.0	15.0
Credit	15.0	15.0	15.0	30.0	22.0	15.0	0.0
U.S. Equities	40.0	25.0	25.0	25.0	47.0	43.0	25.0
U.S. Dollar	15.0	30.0	30.0	15.0	8.0	8.9	30.0

Source: J.P. Morgan Asset Management. For illustration purposes only.

AUTHORS

Abdullah Z. Sheikh, FIA, FSA
Director of Research
Strategic Investment Advisory
Group (SIAG)
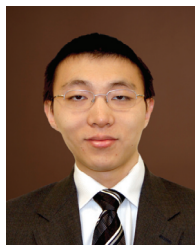
Jianxiong Sun
Analyst
Strategic Investment Advisory
Group (SIAG)

J.P.Morgan
Asset Management