

# The Index Investor

*Invest Wisely...Get an Impartial Second Opinion.*

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## June 2010 Issue: Key Points

This month we begin a two part series on Understanding and Predicting Uncertainty Shocks. We start with an overview of how different asset classes respond when markets shift in to the high uncertainty regime. We then develop a better understanding of the nature and impact of uncertainty by reviewing the classic writings of Knight and Keynes, as well as newer research by Andrew Lo. Next month, we will explore the root causes of uncertainty shocks, the extent to which they can be predicted in advance, and steps investors can take to gain relative advantage by responding more quickly and effectively when they occur

This month's Economic Update reviews the findings of the biannual "Joint Operating Environment" report published by the Joint Forces Command of the U.S. Department of Defense. In our experience, the JOE is always a very insightful look at

key trends and uncertainties and the way they could affect the global environment over the next decade.

This month's product and strategy notes include a look at how investment managers' can improve their agility, the hidden nuggets in the U.S. financial reform legislation, and other interesting research findings.

## Global Asset Class Returns

<i>YTD31May10</i>	<u>In USD</u>	<u>In AUD</u>	<u>In CAD</u>	<u>In EUR</u>	<u>In JPY</u>	<u>In GBP</u>	<u>In CHF</u>	<u>In INR</u>
Asset Held								
<b>USD Bonds</b>	3.79%	10.54%	3.89%	18.27%	1.53%	13.82%	14.31%	3.42%
<b>USD Prop.</b>	11.44%	18.19%	11.53%	25.92%	9.18%	21.47%	21.96%	11.07%
<b>USD Equity</b>	-0.36%	6.39%	-0.27%	14.12%	-2.62%	9.67%	10.16%	-0.73%
<b>AUD Bonds</b>	-3.48%	3.27%	-3.38%	11.00%	-5.74%	6.55%	7.05%	-3.84%
<b>AUD Prop.</b>	-8.55%	-1.80%	-8.46%	5.93%	-10.81%	1.48%	1.97%	-8.92%
<b>AUD Equity</b>	-14.25%	-7.50%	-14.15%	0.23%	-16.51%	-4.22%	-3.72%	-14.62%
<b>CAD Bonds</b>	2.19%	8.94%	2.28%	16.67%	-0.07%	12.22%	12.71%	1.82%
<b>CAD Prop.</b>	3.44%	10.19%	3.53%	17.92%	1.18%	13.47%	13.96%	3.07%
<b>CAD Equity</b>	0.76%	7.51%	0.85%	15.23%	-1.51%	10.78%	11.28%	0.39%
<b>CHF Bonds</b>	-5.90%	0.85%	-5.81%	8.57%	-8.16%	4.12%	4.62%	-6.27%
<b>CHF Prop.</b>	-3.92%	2.82%	-3.83%	10.55%	-6.19%	6.10%	6.60%	-4.29%
<b>CHF Equity</b>	-12.04%	-5.29%	-11.95%	2.44%	-14.30%	-2.01%	-1.52%	-12.41%
<b>INR Bonds</b>	-0.07%	6.68%	0.02%	14.40%	-2.33%	9.95%	10.45%	-0.44%
<b>INR Equity</b>	-5.46%	1.29%	-5.37%	9.01%	-7.73%	4.56%	5.06%	-5.83%
<b>EUR Bonds</b>	-7.03%	-0.28%	-6.93%	7.45%	-9.29%	3.00%	3.49%	-7.40%
<b>EUR Prop.</b>	-17.01%	-10.26%	-16.91%	-2.53%	-19.27%	-6.98%	-6.48%	-17.38%
<b>EUR Equity</b>	-20.36%	-13.61%	-20.27%	-5.89%	-22.63%	-10.34%	-9.84%	-20.73%
<b>JPY Bonds</b>	2.46%	9.21%	2.55%	16.94%	0.20%	12.49%	12.98%	2.09%
<b>JPY Prop.</b>	7.53%	14.28%	7.63%	22.01%	5.27%	17.56%	18.06%	7.16%
<b>JPY Equity</b>	-2.36%	4.39%	-2.27%	12.11%	-4.62%	7.66%	8.16%	-2.73%
<b>GBP Bonds</b>	-6.15%	0.59%	-6.06%	8.32%	-8.42%	3.87%	4.37%	-6.52%
<b>GBP Prop.</b>	-18.29%	-11.54%	-18.19%	-3.81%	-20.55%	-8.26%	-7.76%	-18.65%
<b>GBP Equity</b>	-11.16%	-4.41%	-11.06%	3.32%	-13.42%	-1.13%	-0.63%	-11.52%
<b>1-3 Yr USGvt</b>	1.44%	8.19%	1.54%	15.92%	-0.82%	11.47%	11.97%	1.08%

<b>YTD31May10</b>	<b>In USD</b>	<b>In AUD</b>	<b>In CAD</b>	<b>In EUR</b>	<b>In JPY</b>	<b>In GBP</b>	<b>In CHF</b>	<b>In INR</b>
<b>World Bonds</b>	-2.66%	4.09%	-2.56%	11.82%	-4.92%	7.37%	7.87%	-3.02%
<b>World Prop.</b>	-0.84%	5.91%	-0.75%	13.64%	-3.10%	9.19%	9.68%	-1.21%
<b>World Equity</b>	-7.31%	-0.56%	-7.22%	7.17%	-9.57%	2.72%	3.21%	-7.68%
<b>Commod Long Futures</b>	-10.67%	-3.92%	-10.58%	3.80%	-12.93%	-0.65%	-0.15%	-11.04%
<b>Commod L/Shrt</b>	-12.32%	-5.58%	-12.23%	2.15%	-14.59%	-2.30%	-1.80%	-12.69%
<b>Gold</b>	10.78%	17.53%	10.88%	25.26%	8.52%	20.81%	21.31%	10.41%
<b>Timber</b>	-1.23%	5.52%	-1.14%	13.24%	-3.49%	8.79%	9.29%	-1.60%
<b>Uncorrel Alpha</b>	0.14%	6.89%	0.24%	14.62%	-2.12%	10.17%	10.67%	-0.23%
<b>Volatility VIX</b>	64.71%	71.46%	64.81%	79.19%	62.45%	74.74%	75.24%	64.35%
<b>Currency</b>								
<b>AUD</b>	-6.75%	0.00%	-6.65%	7.73%	-9.01%	3.28%	3.78%	-7.12%
<b>CAD</b>	-0.09%	6.65%	0.00%	14.38%	-2.36%	9.93%	10.43%	-0.46%
<b>EUR</b>	-14.48%	-7.73%	-14.38%	0.00%	-16.74%	-4.45%	-3.95%	-14.84%
<b>JPY</b>	2.26%	9.01%	2.36%	16.74%	0.00%	12.29%	12.79%	1.89%
<b>GBP</b>	-10.03%	-3.28%	-9.93%	4.45%	-12.29%	0.00%	0.50%	-10.39%
<b>USD</b>	0.00%	6.75%	0.09%	14.48%	-2.26%	10.03%	10.52%	-0.37%
<b>CHF</b>	-10.52%	-3.78%	-10.43%	3.95%	-12.79%	-0.50%	0.00%	-10.89%
<b>INR</b>	0.37%	7.12%	0.46%	14.84%	-1.89%	10.39%	10.89%	0.00%

## Uncorrelated Alpha Strategies Detail

As we have repeatedly noted over the years, actively managed strategies whose objective is to produce returns with low or no correlation with the returns on major asset classes (so-called “uncorrelated alpha strategies”) have an undeniable mathematical benefit for a portfolio. Moreover, the potential size of this benefit increases with the portfolio’s long-term real rate of return target. On the other hand, we have also repeatedly noted that, for a wide range of reasons, active management is an extremely difficult game to play consistently well, and that this challenge only increases with time. Hence, in our model portfolios, we have tried to strike an appropriate balance between these two perspectives. We start by limiting allocations to uncorrelated alpha to no more than ten percent of a portfolio. We then equally divide this allocation between four different strategies. Within each strategy, we track the performance of two liquid, retail funds which can be used to implement it, and which have far lower costs than the 2% of assets under management and 20% of profits typically charged by hedge fund managers using the same strategy (for more on the advantages of such funds, see “How Do Hedge Fund Clones Manage the Real

World?” by Wallerstein, Tuchshmid, and Zaker). The following table shows the year to date performance of these funds (which are listed by ticker symbol):

<b>YTD 31May10</b>	<b>In USD</b>	<b>In AUD</b>	<b>In CAD</b>	<b>In EUR</b>	<b>In JPY</b>	<b>In GBP</b>	<b>In CHF</b>	<b>In INR</b>
<b>Eq Mkt Neutral</b>								
HSKAX	-1.28%	5.47%	-1.19%	13.20%	-3.54%	8.75%	9.24%	-1.65%
OGNAX	-1.99%	4.76%	-1.90%	12.48%	-4.25%	8.03%	8.53%	-2.36%
<b>Arbitrage</b>								
ARBFX	-1.58%	5.17%	-1.48%	12.90%	-3.84%	8.45%	8.95%	-1.94%
ADANX	-0.09%	6.66%	0.00%	14.38%	-2.35%	9.93%	10.43%	-0.46%
<b>Currency</b>								
DBV	-4.04%	2.71%	-3.94%	10.44%	-6.30%	5.99%	6.49%	-4.40%
ICI	2.24%	8.99%	2.33%	16.71%	-0.02%	12.26%	12.76%	1.87%
<b>Equity L/S</b>								
HSGFX	3.44%	10.19%	3.54%	17.92%	1.18%	13.47%	13.97%	3.08%
PTFAX	5.17%	11.92%	5.26%	19.64%	2.91%	15.19%	15.69%	4.80%
<b>GTAA</b>								
MDLOX	-3.35%	3.40%	-3.26%	11.12%	-5.62%	6.67%	7.17%	-3.72%
PASAX	2.89%	9.64%	2.98%	17.37%	0.63%	12.92%	13.41%	2.52%

## Overview of Our Valuation Methodology

This short introduction is intended to provide an overview of our valuation methodology, and to put the analyses that follow into a larger, integrated context. Our core assumption is that forecasting asset prices is extremely challenging, because unlike physical systems, the behavior of political economies and financial markets isn't governed by constant natural laws. Instead, they are complex adaptive systems, in which positive feedback loops and non-linear effects are common, due to the interaction of competing investment strategies (e.g., value, momentum, arbitrage and passive approaches), and investor decisions that are made on the basis of incomplete information, by individuals with limited cognitive capacities, who are often pressed for time, affected by emotions, and subject to the influence of other people. We further believe that these interactions give rise to three different regimes in financial markets that are characterized by very different asset class return, risk, and correlation parameters. We term these three regimes “High Uncertainty”, “High Inflation” and “Normal Times.”

We emphasize that while forecasting the future behavior of a complex adaptive system (with a degree of accuracy beyond simple luck) is extremely challenging, it is not impossible. There are two reasons for this. First, complex adaptive systems are constantly evolving, and pass through phases when their behavior makes forecasting more and less challenging. In the investment context, we believe the best example of this is extreme overvaluations, which throughout history have confirmed that what can't continue doesn't continue. Second, it is also the case that, across a range of contexts, researchers have found that a small percentage of people and teams are able to develop superior mental models that provide them with a superior, if "coarse-grained" understanding of the dynamics of complex adaptive systems. More important there is also significant evidence that superior mental models translate into substantial performance advantages (see, for example, "Mental Models, Decision Rules, Strategy and Performance Heterogeneity" by Gary and Wood, "Team Mental Models and Team Performance" by Lim and Klein, and "Good Sensemaking is More Important than Information" by Eva Jensen).

We believe that investors are best served when their primary performance benchmark is the long-term real return their portfolio must earn in order to achieve their long term financial goals. We believe the best way to implement this approach is via a portfolio of broadly defined, low cost, low turnover, asset class index products that provide exposure to a diversified mix of underlying return generating processes. In this context, conservatively managing risk in order to avoid large losses is mathematically more important than taking aggressive risk position to reach for additional returns via actively managed strategies. This is not to say that in some cases investors would benefit from those additional active returns. Such cases typically involve aggressive goals, low starting capital, low savings, and/or a short time horizon. In these situations, it is mathematically clear that an allocation to certain actively managed investment strategies can benefit a portfolio, provided the results of those strategies have a low or no correlation with returns on the investor's existing allocations to broad asset class index products. The use of these "uncorrelated alpha" products has a further benefit, in that they avoid the situation (common in traditional

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actively managed funds) where an investor pays much higher fees to an active manager for performance that is, in fact, a mix of the index fund's results (often referred to as "beta") and the manager's skill (often referred to as "alpha").

We also believe that, in addition to careful asset allocation, a disciplined portfolio risk management process is critical to an investor achieving his or her long-term goals. In our view, there are four main elements to this process. The first is a systematic approach to rebalancing a portfolio back to its target weights, either on the basis of time (e.g., yearly) or when one or more asset classes is over or under its target weight by a certain "trigger" amount. The second risk management discipline is the monitoring of asset class prices, in relation to estimates of both fundamental valuation and short term investor behavior, matched with a willingness to reduce exposure (e.g., by hedging with options or moving into cash or undervalued asset classes) when overpricing becomes substantial and dangerous to the achievement of long-term goals. We stress that the objective of this process is not market timing in pursuit of higher returns; rather, we view this risk discipline as the willingness to depart from one's normal, long-term (i.e., "policy") asset allocation and rebalancing strategy under exceptional circumstances when crash risk is very high. Of course, this begs the question of when and how should one reinvest in an asset class after a bubble has inevitably burst. Again, we believe that fundamental valuation analysis should be an investor's guide to this third risk management discipline. From a long-term investment perspective, the best time to get back in is when an asset class is undervalued, even though this may be the most psychologically difficult time to do so. As a compromise approach, many investors choose to reinvest over time (i.e., "dollar cost average") to limit potential regret.

We also recognize that the valuation analyses which form the basis for these risk management decisions all contain an irreducible element of uncertainty. Hence, we believe that investors' fourth risk management discipline should be to combine our forecasts with those made by other analysts who use different methodologies. Research has demonstrated that forecast combination, using either simple averaging or more complex methods, improves forecast accuracy.

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In each month's issue of our journals, we provide investors with updated valuation estimates for a wide range of asset classes. The basic assumptions that underlie our valuation methodology are as follows: (1) In the medium term, asset prices are attracted to their fundamental values. (2) However, fundamental valuation can only be estimated with a degree of uncertainty. (3) In the short term, asset prices are most strongly influenced by what Keynes called the market's "animal spirits", which we interpret as collective investor behavior resulting from the complex interplay between underlying political and economic trends and events, information flows, individual mental models, emotions, and social network interactions. (4) Valuation methodologies are most useful to investors when they are applied on a consistent basis over time.

The analyses we provide each month can be grouped into three major categories. First, we compare prevailing asset class prices to our estimate of fundamental values. Second, we present a number of analyses that are intended to warn of the development of conditions that raise the probability of sudden and substantial short-term changes in collective investor behavior. These include (a) Trends in rolling three month asset class returns that assess the probability of a High Uncertainty or High Inflation regime developing (which are dangerous since both of these are extreme disequilibrium conditions); (b) Trends in sector returns within asset classes that indicate the next turning points in the normal business cycle; (c) An assessment of the direction and intensity of recent price momentum (with accelerating positive momentum in the face of fundamental overvaluation the most dangerous condition); and (d) A measure of the estimated strength of investor networks and herding risk. Finally, we summarize our views with an estimate of the percent of time that markets will spend in each regime over the next three years, and the resulting expected real returns on different asset classes over this time horizon.

### **Table: Market Implied Regime Expectations and Three Year Return Forecast**

We use the following table to provide insight into the weight of market views about which of three regimes – high uncertainty, high inflation, or normal growth – is developing. The table shows rolling three month returns for different asset classes. The asset classes we list under each regime should deliver relatively high returns when that regime develops. We assume that both the cross-sectional and time series comparisons we present provide insight into the market’s conventional wisdom – at a specific point in time -- about the regime that is most likely to develop within the next twelve months. To obtain the cross-sectional perspective, we horizontally compare the row labeled “This Month’s Average” for the three regimes. In our interpretation, the regime with the highest rolling three month average is the one which (on the specified date) the market’s conventional wisdom believed was the most likely to develop.

For the time series perspective, we vertically compare this month’s average rolling three month return for a given regime to the regime’s rolling three month average three months ago. We believe this time series perspective provides insight into how fast and in what direction the conventional wisdom has been changing over time.

<i>Rolling Three Month Returns in USD</i>			31May10
<i>High Uncertainty</i>	<i>High Inflation</i>	<i>Normal Growth</i>	
Short Maturity US Govt Bonds (SHY) <b>0.48%</b>	US Real Return Bonds (TIP) <b>2.69%</b>	US Equity (VTI) <b>-0.25%</b>	
1 - 3 Year International Treasury Bonds (ISHG) <b>-3.42%</b>	Long Commodities (DJP) <b>-6.70%</b>	EAFE Equity (EFA) <b>-8.17%</b>	
Equity Volatility (VIX) <b>64.46%</b>	Global Commercial Property (RWO) <b>1.46%</b>	Emerging Equity (EEM) <b>-2.21%</b>	
Gold (GLD) <b>8.64%</b>	Long Maturity Nominal Treasury Bonds (TLT)* <b>6.30%</b>	High Yield Bonds (HYG) <b>-0.71%</b>	



Rolling Three Month Returns in USD			31May10
<i>High Uncertainty</i>	<i>High Inflation</i>	<i>Normal Growth</i>	
<b>Average</b>	<b>Average (with TLT short)</b>	<b>Average</b>	
17.54%	-2.21%	-2.83%	
<b>Three Months Ago:</b>	<b>Three Months Ago:</b>	<b>Three Months Ago:</b>	
-7.91%	0.41%	-0.22%	

\* Falling returns on TLT indicate rising inflation expectations

As you can see, at the end of **May**, the conventional wisdom had radically changed from the end of the previous month, and favored the return to the high uncertainty regime that we have predicted.

At the request of many readers, we now publish forecasts for real returns on different asset classes in USD. They can be compared to asset class return forecasts regularly produced by GMO, to which many of our readers also subscribe. Given our belief that foresight accuracy is improved by combining the outputs from different forecasting methodologies, we have taken a different approach from GMO. As we understand it (and their methodology is available on their site), they start with their estimate of current over or undervaluation, and assume that these will return to equilibrium over a seven-year business cycle. They believe that the use of this time horizon will cause a number of ups and downs caused by cyclical and investor behavior factors to average out. It has always struck us as a very logical approach, though one that (like ours) is based on unavoidably imperfect assumptions. The forecasting approach we have taken is grounded in our research in to the performance of different asset classes in three regimes, which we have termed high uncertainty, high inflation and normal times. In the latter regime, asset class returns are strongly attracted to their equilibrium levels – i.e., to the situation in which the returns supplied and the returns demanded are close to balance.

Our approach to estimating returns under this regime is to appropriate risk premiums for different asset classes to our estimate of the equilibrium yield on risk return bonds when the system is operating under normal conditions. In contrast, the high uncertainty and high inflation regimes are very much disequilibrium conditions in which investor behavior determines the returns that are actually supplied. Under these

regimes, our approach to return forecasting starts with our estimate of what the real rate of return would be (lower than normal under high uncertainty because of a lower time discount rate, and lower still under high inflation because of much stronger investor demand for inflation hedging assets like real return bonds). We then add an estimate of the realized return spread over the real bond yield for each asset class in the high uncertainty and high inflation regimes. To determine these premia, we began with the results from our historical regime analysis, and subjectively adjusted the results to make them more consistent with each other while generally preserving the rank ordering of asset class returns from our historical regime analysis.

The final step in our methodology is to subjectively estimate the percentage of time that the financial system will spend in each of the three different regimes over the next 36 months. These estimated probabilities may or may not change each month, in line with our assessment of evolving political and economic conditions. We are the first to admit that ours is, at best, a noisy estimate of the returns investors are likely to receive on different asset classes over our target time horizon. We have no doubt that GMO would say the same about the results produced by their methodology. Indeed, it is either naive or misleading to say anything else, given that one is attempting to forecast results produced by a constantly evolving complex adaptive system. On the other hand, we also believe that our readers appreciate our willingness to put a clear, quantitative stake in the ground, so to speak. As always, we stress that research has shown that foresight accuracy can be improved by combining (i.e., using simple averaging) forecasts produced using different methodologies. With that admonition, our results are as follows:

<b>Regime</b>	<b>Normal Regime</b>	<b>High Uncertainty Regime</b>	<b>High Inflation Regime</b>	<b><i>Forecast Annual USD Real Return Over Next Three Years (weighted real return plus premium)</i></b>
<i>Assumed Regime Probability Over Next 36 Months</i>	20%	45%	35%	
<i>Real Return Bond Yield</i>	3.5	2.5	1.5	2.4

<u>Asset Class Premia Over Real Rate (pct)</u>				
Domestic Bonds	1.0	1.0	-3.0	2.0
Foreign Bonds	0.5	2.0	0.5	3.5
Domestic Property	3.0	-10.0	1.0	(1.2)
Foreign Property	3.0	-10.0	-1.5	(2.1)
Commodities	2.0	-6.0	3.0	1.1
Timber	2.0	-8.0	1.0	(0.5)
Domestic Equity	3.5	-12.0	-5.0	(4.1)
Foreign Equity	3.5	-12.0	-7.0	(4.8)
Emerging Equity	4.5	-15.0	1.0	(3.2)
Gold	-2.0	2.0	2.5	3.7
Volatility	-25.0	50.0	25.0	28.6

### **Table: Fundamental Asset Class Valuation and Recent Return Momentum**

The table at the end of this section sums up our conclusions (based on the analysis summarized in this article) as to potential asset class under and overvaluations at **31 May 10**. We believe that asset prices reflect the interaction of three broad forces. The first is fundamental valuation, as reflected in the balance between the expected supply of and demand for returns. The Global Asset Class Valuation Analysis of each month's journal contains an extensive discussion of fundamental valuation issues. One of our core beliefs is that while asset prices are seldom equal to their respective fundamental values (because the system usually operates in disequilibrium), they are, in the medium and long-run strongly drawn towards that attractor.

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The second driver of asset prices, and undoubtedly the strongest in the short run, is investor behavior, which results from the interaction of a complex mix of cognitive, emotional and social inputs – the latter two comprising Keynes’ famous “animal spirits”. We try to capture the impact of investor behavior in each month’s Market Implied Expectations Analysis, as well as in two measures of momentum for different asset classes – one covering returns over the most recent three months (e.g., June, July and August), and one covering returns over the previous non-overlapping three month period (e.g., March, April, and May).

The third driver of asset prices is the ongoing evolution of political and economic conditions and relationships, and the degree uncertainty that prevails about their future direction. We capture these longer term forces in our economic scenarios.

In the table, we summarize our most recent conclusions the current pricing of different asset classes compared to their fundamental valuations.

The extent to which we believe over or underpricing to be the case is reflected in the confidence rating we assign to each conclusion. We believe it is extremely important for the recipient of any estimate or assessment to clearly understand the analyst’s confidence in the conclusions he or she presents. How best to accomplish this has been the subject of an increasing amount of research (see, for example, “Communicating Uncertainty in Intelligence Analysis” by Steven Rieber; “Verbal Probability Expressions in National Intelligence Estimates” by Rachel Kesselman, “Verbal Uncertainty Expressions: Literature Review” by Marek Druzdzel, and “What Do Words of Estimative Probability Mean?” by Kristan Wheaton). We use a three level verbal scale to express our confidence level in our valuation conclusions. “Possible” represents a relatively low level of confidence (e.g., 25% – 33%, or a 1 in 4 to 1 in 3 chance of being right), “likely” a moderate level of confidence (e.g., 50%, or a 1 in 2 chance of being right), and “probable” a high level of confidence (e.g., 67% to 75%, or a 2 in 3 to 3 in 4 chance of being right). We do not use a quantitative scale, because we believe that would give a false sense of accuracy to judgments that are inherently approximate due to the noisy data and subjective assumptions upon which they are based.

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An exception to this approach is our assessment of the future return to local investors for holding U.S. dollars. In this case, our conclusions are mechanically driven by interest rate differentials on ten year government bonds. To be sure, the theory of Uncovered Interest Rate Parity, which calls for exchange rates offsetting interest rate differentials is more likely to apply in the long-run than in the short run, as the apparent profitability of the carry trade has shown (i.e., borrowing in low interest rate currencies to invest in high interest rate currencies). However, other research have found that a substantial portion of these profits represents compensation for bearing so-called “crash” risk (see “Crash Risk in Currency Markets” by Farhi, Fraiberger, Gabaix, et al) – as many who were long Icelandic Krona in 2007 and 2008 learned the hard way. In sum, exchange rates that are moving at an accelerating rate away from the direction they should move under interest rate parity indicates a rising risk of sudden reversal (i.e., crash risk).

The table also shows return momentum for different asset classes over the preceding three months, as well as the three months before that, to make it easier to see the direction of momentum, and whether it is accelerating, decelerating, or has reversed. The most dangerous situation is where an asset class is probably overvalued on a fundamental basis, yet positive return momentum is accelerating. As so many authors have noted throughout history, trends that can't continue don't continue. In these situations, we strongly recommend either hedging (e.g. via put options) or reducing exposure. In contrast, a situation where an asset class is probably undervalued, but negative return momentum is still accelerating, may be an exceptionally attractive opportunity to increase one's exposure to an asset class. Finally, conclusions about changes in asset class valuations also have to be seen in the longer term context of the possible evolution of alternative political/economic scenarios, and their implications for asset class valuations and investor behavior (see, for example, our monthly Economic Updates). This is also an important input into investment decisions, as we do not believe that the full implications of these scenarios are typically reflected in current asset prices and investor behavior.

<b>Valuation at 31May10</b>	<b>Current Price versus Long-Term Fundamental Valuation Estimate</b>	<b>Rolling 3 Month Return in Local Currency</b>	<b>Rolling 3 Month Return 3 Months Ago</b>
AUD Real Bonds	Neutral	1.13%	0.80%
AUD Bonds	Neutral	0.95%	-2.07%
AUD Property	Neutral	-0.96%	1.10%
AUD Equity	Possibly Overvalued	-3.37%	-0.78%
CAD Real Bonds	Neutral	2.00%	1.33%
CAD Bonds	Neutral	0.65%	-0.02%
CAD Property	Possibly Undervalued	0.08%	11.76%
CAD Equity	Likely Overvalued	1.24%	1.79%
CHF Bonds	Likely Overvalued	3.40%	-0.59%
CHF Property	Likely Overvalued	0.89%	7.28%
CHF Equity	Possibly Overvalued	-3.42%	5.68%
EUR Real Bonds	Neutral	2.89%	-1.05%
EUR Bonds	Possibly Overvalued	4.37%	0.49%
EUR Prop.	Likely Undervalued	-3.97%	4.41%
EUR Equity	Likely Undervalued	-0.08%	-2.72%
GBP Real Bonds	Possibly Overvalued	2.85%	-2.52%
GBP Bonds	Neutral	3.57%	-2.28%
GBP Property	Likely Undervalued	-2.85%	-1.46%
GBP Equity	Probably Undervalued	-0.67%	7.47%
INR Bonds	Likely Overvalued	1.60%	-1.60%
INR Equity	Probably Overvalued	1.18%	-3.97%
JPY Real Bonds	Neutral	-0.75%	1.44%
JPY Bonds	Possibly Overvalued	0.40%	-0.49%
JPY Property	Likely Undervalued	1.81%	11.30%
JPY Equity	Probably Overvalued	-1.97%	8.19%
USD Real Bonds	Neutral	2.51%	-1.92%
USD Bonds	Possibly Overvalued	1.65%	-0.39%
USD Property	Neutral	11.52%	6.96%

<i>Valuation at 31May10</i>	<i>Current Price versus Long-Term Fundamental Valuation Estimate</i>	<i>Rolling 3 Month Return in Local Currency</i>	<i>Rolling 3 Month Return 3 Months Ago</i>
USD Equity	Probably Overvalued	-0.10%	2.59%
<i>Following in USD:</i>			
Investment Grade Credit (CIU)	Possibly Overvalued	1.20%	0.83%
High Yield Credit (HYG)	Probably Overvalued	-0.70%	3.37%
Emerging Mkt Equity (EEM)	Probably Overvalued	-11.48%	9.07%
Commodities Long	Likely Overvalued	-6.70%	-2.11%
Gold	Likely Undervalued	8.64%	-5.37%
Timber	Possibly Undervalued	2.25%	5.48%
Uncorrelated Alpha	N/A	-0.44%	1.04%
Volatility (VIX)	Probably Undervalued	64.46%	-19.98%
<i>Future Return in Local Currency from holding USD:</i>	<i>Based on Covered Interest Parity</i>		
Returns to AUD Investor	Positive	6.29%	3.77%
Returns to CAD Investor	Neutral	-0.71%	0.01%
Returns to EUR Investor	Negative	9.14%	10.35%
Returns to JPY Investor	Negative	2.62%	3.13%
Returns to GBP Investor	Neutral	4.06%	7.97%
Returns to CHF Investor	Negative	6.64%	6.97%
Returns to INR Investor	Positive	0.57%	-0.89%

## Investor Herding Risk Analysis

One of our core assumptions is that financial markets function as complex adaptive systems. One of the key features of such systems is their ability to pass through so-called “phase transitions” that materially change their character once certain variables exceed or fall below critical thresholds. In our September 2009 issue, we reviewed a paper on one of critical variables, “Leverage Causes Fat Tails and

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Clustered Volatility” by Thurner, Farmer and Geanakoplos. This paper more formally demonstrated the importance of a factor that has been associated with booms and busts throughout financial history: the expansion of the supply of credit at a pace well in excess of real economic growth. In the past we have also noted that rising uncertainty tends to increase the size, degree of connectedness and intensity of communications within social networks that influence investor decision making. In turn, this leads to greater coordination of investor behavior, causing not only a higher tendency toward momentum, but also higher fragility, and susceptibility to rapid changes in asset prices (see, for example, “Asset Pricing in Large Information Networks” by Ozsoylev and Walden, or “Dragon Kings, Black Swans, and the Prediction of Crises” by Didier Sornette).

As a practical matter, the challenge for investors has been to identify variables or statistics that can be used to track the strengthening of networks that is often associated with phase transitions. With this in mind, we call readers’ attention to an excellent paper by Lisa Borland, of the asset management firm Evnine and Associates in San Francisco (“Statistical Signatures in Times of Panic: Markets as a Self Organizing System”). Using the phase transition approach, Borland searched for statistical signatures of market panics, and proposes a new order parameter that is easy to calculate and appears to capture the changing dynamics of asset return correlations and the underlying social network and herding phenomena that give rise to them. The parameter equals the number of financial markets or assets that have positive returns over a given interval (in 2010 we are switching from YTD to just the past month, as we believe it provides a more accurate assessment), less the number that have negative returns, divided by the total number of financial markets or asset classes evaluated. If the value is zero, the markets are in a disordered state and far from the potential phase change point. However, as the parameter value approaches positive one or negative one, the markets are in an increasingly ordered state – that is, networks are larger and more active, causing increased alignment in collective investor behavior (more commonly known as “herding”). Under these conditions, a market may be close to a phase change point, and therefore subject to a sudden, and



potentially violent, shift in its previous trend. We have calculated this order parameter for the 38 financial markets (excluding foreign exchange) we evaluate each month. Here are the results for each of the most recent 12 months:

Jun	Jul	Aug	Sep	Oct	Nov	Dec09	Jan10	Feb10	Mar10	Apr10	May10
0.33	0.51	0.51	0.56	(0.30)	0.72	0.24	(0.03)	0.30	0.46	0.44	(0.28)

As you can see, in recent months global financial markets appear to have gone from a highly ordered and fragile state in November, to one that was highly disordered by the end of January (and therefore at lower risk of a sudden, substantial, and highly correlated change in prices across multiple asset classes) and back to a moderately ordered state by the end of April, and then to a less ordered, and therefore more resilient state at the end of last month.

### **This Month's Letters to the Editor**

*How can a UK investor access volatility as an asset class?*

The issue with accessing volatility as an asset class is similar to that posed by commodities: While investing in futures contracts is much easier than investing in the physicals, sometimes the performance of the two differs by a substantial amount. In theory, the price of a futures contract reflects investors' current forecast of what the future spot price of the commodity will be when the futures contract matures. Actually, this relationship isn't perfect, as the pricing of the futures contract should also contain some premium that reflects the uncertainty inherent in the forecast of the future spot price.

Most commodity index funds are based on a continuously rolled over portfolio of futures contracts that are owned by the fund (some commodity index funds are based on underlying swap contracts, but I won't go into those here). As we note each month in our journals, the return on a continuously rolled over portfolio of futures contracts broadly comes from three sources: (1) Because futures contracts can be purchased at a fraction of their face value, index funds invest the difference in short term

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government bonds that generate interest income. This is known as the collateral yield.

(2) When the price of a futures contract is lower than the spot price, the futures curve is said to be "backwardated." As a result, as the futures contract approaches maturity, its price approaches the spot price, enabling the index fund to generate a profit when the futures contract is sold, and a portion of the proceeds used to replace the maturing contract with a new one at a price that is lower than the spot price. The profit that results from rolling over a portfolio of futures contracts when the futures curve is backwardated is known as the "roll yield." However, futures prices can also be higher than the spot price, a situation known as a "contangoed" futures curve. In this situation, the roll yield is negative rather than positive. (3) Finally, to the extent that the spot price on the date when the futures contract matures differs from the spot price that was forecast when the futures contract was originally purchased (and that was reflected in the price of the futures contract), the index fund will earn a "spot return" that can be either positive or negative.

This is an important point -- too many investors in commodity index funds expect that they will earn returns that reflect changes in the spot price of a commodity. This is not the case. Rather, to the extent that investors earn a return from changes in spot prices, it will be due to changes in spot prices that were not anticipated at the time the futures contract was originally purchased. For example, if at the time of purchase the market consensus is for an increase in oil prices by \$2.00/bbl over the next 3 months, and the actual change turns out to be \$5.00/bbl, the futures contract investor will earn a spot return of \$3.00, not \$5.00.

This brief overview of the sources of return from commodity futures investing is an introduction to the issue of investing in equity market volatility (which is a good proxy for overall financial market volatility) as an asset class. In this case, the "spot" market is the current level of volatility implied by options prices on the S&P 500. This is measured by the well-known VIX index. Using the commodity analogy, the VIX can be thought of as the spot price of volatility.

There are also futures contracts traded on the VIX. Barclays has introduced two exchange traded notes (ETNs) whose returns are based on changes in the price

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of these futures contracts. In maturity terms, the closest ETN to the VIX is VXX, which tracks changes in the S&P 500 VIX Short-Term Futures Index, which is based on the price of first and second month futures contracts on the VIX (the other ETN tracks changes in longer dated VIX futures contracts). As is the case with other commodity funds based on continuously rolled futures, the return on VXX should reflect a roll return as well as a spot return (that reflects unanticipated changes in the level of the VIX over the time horizon covered by the one and two month VIX futures contracts). Because the ETN is an exchange traded note (with .89% annual expenses), there is no collateral return (the return on the note, which is a debt obligation of Barclays, reflects only the roll and spot returns).

More information about these ETNs can be found on [www.ipathetn.com](http://www.ipathetn.com). Data on that site show that, over the past five years, the correlation of returns on the VXX with returns on the VIX itself has been around .70. While this is not a perfect substitute for directly owning the VIX, it is reasonably close, as evidenced by the fact that VXX has attracted over \$1 billion in investment, measured in market capitalization terms.

*I see you use Crystal Ball to perform some of your Monte Carlo simulation and optimization calculations. Do you have a preference for CB over @Risk, which seems to be the closest competitor?*

There is a small group of people in the world for whom this is an ongoing and sometimes passionate argument. However, we take a neutral stance, as we have used both products for years and recognize they each have their strengths and weaknesses as tools that can help you to structure and make good decisions in the face of complexity and uncertainty. In our work at Index Investor, we chose to use CB because we thought it had a better integration between the simulation and optimization engines, and because they had changed the software in a way that very substantially reduced the time required for the type of calculations we do. However, both companies are constantly releasing new versions, and CB was recently sold to Oracle,

who have made a lot of changes to the product offering (not all of which are to our liking). So we are currently neutral on the question of which one we would recommend.

## **June 2010 Economic Update: The Joint Operating Environment**

One of the reports we most look forward to reading every two years is known as “the JOE.” This is the outlook for the future “Joint Operating Environment”, which is published by the United States Joint Forces Command. It is intended to “provide a perspective on future trends, shocks contexts and implications for joint force commanders and other leaders and professionals in the national security field.” Inevitably, it is a well-written and thought provoking document.

This year’s JOE begins with an appropriate caution: “The purpose of the [report] is not to predict, but to suggest ways leaders might think about the future...It is impossible to predict precisely how challenges will emerge and what form they might take. Nevertheless, it is absolutely vital to try to frame the strategic and operational contexts of the future, in order to glimpse the possible environments where political and military leaders will work...Only by wrestling with the possibilities, determining the leading indicators, and then reading the signposts of the times will the Joint Forces have some answers to the challenges of the future. The alternative, to focus exclusively on the here and now or to pass this mission on to the bureaucracy, will certainly result in getting caught flat-footed, reacting to near-term crises as they arise, at great cost in blood and treasure.”

“Thinking about the future requires an understanding of both what is timeless and what will likely change...[That said], the nature of the human condition will guarantee that uncertainty, ambiguity, and surprise will dominate the course of events. However carefully we think about the future; however thorough our preparations; however coherent and thoughtful our concepts, training and doctrine; we will be surprised. Even the wisest statesmen have found their assumptions about the future confounded by reality...Our goal is not to eliminate surprise – that is impossible. Our goal is, by a careful consideration of the future, to suggest the attributes of a joint force

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capable of adjusting with minimum difficulty when the surprise inevitably comes. The true test of military effectiveness in the past has been the ability of a force to diagnose the conditions it actually confronts, and then quickly adapt. In the end, it will be our imagination and agility to envision and prepare for the future, and then adapt to surprises that will determine how [we] will perform over the next twenty-five years...”

The JOE then offers some critical reminders that apply far beyond the national security realm: “There are other aspects of human conflict that will not change no matter what advances in technology or computing power may occur: fog and friction will distort, cloak, and twist the course of events. Fog will result from information overload, our own misperceptions and faulty assumptions, and the fact that the enemy will act in an unexpected fashion. Combined with the fog of war will be its frictions - that almost infinite number of seemingly insignificant incidents and actions that can go wrong. It will arise from fundamental aspects of the human condition and unavoidable unpredictabilities that lie at the very core of combat processes. The constant fog and friction of war turns the simple into the complex. In combat, people make mistakes. They forget the basics. They become disoriented, ignoring the vital to focus on the irrelevant. Occasionally, incompetence prevails. Mistaken assumptions distort situational awareness. Chance disrupts, distorts, and confuses the most careful of plans. Uncertainty and unpredictability dominate. Thoughtful military leaders have always recognized that reality and no amount of computing power will eradicate this basic messiness. Where friction prevails, tight tolerances, whether applied to plans, actions, or materiel are an invitation to failure – the more devastating for being unexpected. Operational or logistical concepts or plans that make no allowance for the inescapable uncertainties of war are suspect on their face – an open invitation to failure and at times defeat.”

Looking to the future, the JOE observes that while change often occurs at an exponential rate, people often view it as linear. As a result, “we often overestimate the impact of change in the short-term, and underestimate it in the long-term.” Moreover, because success tends to reinforce one’s view of the world, “leaders are often late to recognize changes, and even when they do, inertia tends to limit their ability to adapt

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quickly. Driven by an inherent desire to bring order to a disorderly, chaotic universe, human beings tend to frame their thoughts about the future in terms of continuities and extrapolations from the present and occasionally the past. But a brief look at the past quarter century, to say nothing of the past four thousand years, suggests the extent of changes that coming decades will bring.” For example, “the revolution in information and communications technologies, taken for granted today, was largely unimaginable in 1983.” So true. “In thinking about the world’s trajectory, we have reason to believe that the next twenty-five years will bring changes just as dramatic, drastic, and disruptive as those that have occurred in the past quarter century. Indeed, the pace of technological and scientific change is increasing.”

The JOE goes on to note the central challenge posed by what it calls “disruptions.” Trends may suggest possibilities and potential directions, but they are unreliable for understanding the future because they interact with and are influenced by other factors. The downturn of Wall Street after the crash of 1929 might well have remained a recession, but passage of the Smoot-Hawley tariffs destroyed American trade with other nations and turned the recession into a catastrophic global depression. In considering the future, one should not underestimate the ability of a few individuals, even a single person, to determine the course of events. One may well predict that human beings will act in similar patterns of behavior in the future, but when, where and how remains entirely unpredictable. The rise of a future Stalin, Hitler, or Lenin is entirely possible, but completely unpredictable, and the context in which they might reach the top is unforeseeable. The interplay of economic trends, vastly different cultures and historical experiences, and the idiosyncrasies of leaders, among a host of other factors, provides such complexity in their interactions as to make prediction impossible. Winston Churchill caught those complexities best in his masterful history of World War I: ‘One rises from the study of the causes of the Great War with a prevailing sense of the defective control of individuals upon world fortunes. It has been well said, ‘there is always more error than design in human affairs.’ The limited minds of the ablest men, their disputed authority, the climate of opinion in which they dwell, their transient and partial contributions to the mighty problem, that problem

itself so far beyond their compass, so vast in scale and detail, so changing in its aspects – all this must surely be considered’... Clearly, not all disruptions occur through the actions of individual leaders. Great events, involving the overthrow of regimes, the collapse of economic systems, natural disasters, and great conflicts within or among states have taken the flow of history and channeled it into new and unforeseen directions. Such disruptions are truly unpredictable, except for the fact that we can be sure that they will happen again. They will twist the future into new and unforeseen directions. Here, the only strategy that can mitigate the impact of surprise is knowledge of the past, an understanding of the present, and a balanced force that is willing and able to adapt in the future.”

Having placed the report in its proper context, the authors of the JOE then turn to what they see as critical trends that will drive the future context in which the Joint Force will operate. In the following pages, we will highlight the key points from the JOE; however, we note that there is much more to read in the report itself (which can be downloaded at [www.jfcom.mil/newslink/storyarchive/2010/JOE\\_2010\\_o.pdf](http://www.jfcom.mil/newslink/storyarchive/2010/JOE_2010_o.pdf)).

### Demographics

“In total, the world will add approximately 60 million people each year and reach a total of 8 billion by the 2030s. Ninety-five percent of that increase will occur in developing countries. The more important point is that the world’s troubles will occur not only in the areas of abject poverty but also, to an even greater extent, in developing countries where the combination of demographics and economy permits populations to grow, but makes meeting rising expectations difficult. Here, the performance of the global economy will be key in either dampening down or inflaming ethnically or religiously based violent movements... The developed world faces the opposite problem. During the next 25 years population growth in the developed world will likely slow or in some cases decline. Russia in particular exemplifies this trend. Russia’s population is currently declining by 0.5% annually, and given Russian health and welfare profiles, there is every prospect that decline will continue, barring a drastic shift in social



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attitudes or public policy. As a recent Center for Strategic and International Studies (CSIS) report suggested, “Russia needs to cope with a rate of population decline that literally has no historical precedent in the absence of pandemic.” To Russia’s west, a similar, albeit less disastrous, situation exists. Over all, European nations stopped replacing their losses to deaths in 2007, and despite considerable efforts to reverse those trends, there is little likelihood their populations will significantly increase by the 2030s. This raises serious concerns about the sustainability of economic growth in that region. It also has serious implications for the willingness of European societies to bear the costs involved in lives and treasure that the use of military force inevitably carries with it.”

“Likewise, Japan’s population will fall from 128 million to approximately 117 million in the 2030s, but unlike the case of Russia this will result not from any inadequacy of Japanese medical services, which are among the world’s best, but from the collapse of Japan’s birth rate. The Japanese are taking serious steps to address their demographic decline, a fact which explains their major research and development efforts in the field of robotics as well as their shift to a capital intensive economy.”

“Over the next quarter century, China’s population will grow by 170 million, but its population will age significantly because of strict enforcement of the government’s edict of one child per family. An additional demographic factor, which may influence Chinese behavior, is the choice of many families to satisfy that limitation with a male child. How the resulting imbalance between young males and females will play out in China’s external and internal politics is impossible to predict because there are few historical analogues. Already we have seen exuberant displays of nationalistic feeling among the youth in response to criticisms of China’s behavior in Tibet. By the 2030s, the U.S. population will climb by more than 50 million to a total of approximately 355 million, in contrast to many of its peers. This growing population may be a significant advantage in international economic competition. This growth will result not only from births in current American families, but also from continued immigration, especially from Mexico and the Caribbean, which will lead to major increases in America’s Hispanic population. By 2030 at least 15% of the population of every state will be



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Hispanic in origin, in some states reaching upwards of 50%. How effective Americans prove in assimilating these new immigrants into the nation's politics and culture will play a major role in America's prospects. In this regard, the historical ability of the United States to assimilate immigrants into its society and culture gives it a distinct advantage over most other nations, which display little willingness to incorporate immigrant populations into the mainstreams of their societies."

"India will grow by 320 million during the next quarter of a century. The tensions that arise from a growing divide between rich and poor could seriously impact its potential for further economic growth. Exacerbating tensions will be the divide between the sub-continent's huge middle class and those in the villages mired in poverty, as well as the divide between Muslims and Hindus. Nevertheless, India's democratic system gives the country wide latitude for political changes to accommodate the society's poor. The continued population growth across the Middle East and in Sub-Saharan Africa has only recently begun abating, but not fast enough to forestall a demographic crisis in which economic growth fails to keep pace with population growth."

### Globalization

"For the most part, the developed world recognizes that it has a major stake in the continuing progress of globalization. The same can be said for those [countries] moving into the developed world. Nevertheless, one should not ignore the histories and passions of popular opinion in these states as they make their appearance. One should not confuse developed world trappings for underlying stability and maturity of civil societies. A more peaceful, cooperative world is possible only if the pace of globalization continues. In particular, this means engaging China and other nations politically and culturally as they enter into the developed world... Serious violence resulting from economic trends has almost invariably arisen where economic and political systems have failed to meet rising expectations. A failure of globalization would equate to a failure to meet those rising expectations. Thus, the real danger in a

globalized world, where even the poorest have access to pictures and media portrayals of the developed world, lies in a reversal or halt to global prosperity. Such a possibility would lead individuals and nations to scramble for a greater share of shrinking wealth and resources, as they did in the 1930s with the rise of Nazi Germany in Europe and Japan's "co-prosperity sphere" in Asia..."

"Remittances sent home by emigrant workers are often overlooked as a facet of globalization, but represent the biggest income source for developing nations. The total amount sent home by foreign workers exceeds the amount that the whole world spends on foreign aid and capital investments combined... However, as a prolonged economic downturn reduces work opportunities for emigrants, the reduction of this key source of income may also stunt the growth of the middle classes in developing countries, which are the driving force for the development and support of democratization and the rule of law, all of which are central to the evolution of stable and orderly states around the world."

### Economics

"The JOE 2008 reported that the emerging economic downturn and financial crises were likely to be significant events. From our vantage point in 2010 the scope and implications of the downturn are clarifying, though the perturbations both in mid and longer terms are yet unclear. Projected revenues from taxation in most plausible economic scenarios are far below that which is necessary to meet current and assumed commitments by the federal government. Furthermore, chronic trade and currency exchange imbalances in the global economic system have exacerbated both U.S. current account deficits and overall government indebtedness such that the amount of U.S. government debt held by foreigners has grown from 1.3 trillion to 3.5 trillion dollars representing some 40% of total U.S. debt. Large exporting nations accept U.S. dollars for their goods and use them both to build foreign exchange reserves and to purchase U.S. treasuries (which then finance ongoing U.S. federal operations). The dollar's "extraordinary privilege" as the primary unit of international

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trade allows the U.S. to borrow at relatively low rates of interest. However, the emerging scale of U.S. Government borrowing creates uncertainty about both our ability to repay the ever growing debt and the future value of the dollar. Moreover, “any sudden stop in lending...would drive the dollar down, push inflation and interest rates up, and perhaps bring on a hard landing for the United States.”

“The precise nature of a “hard landing” of this sort is difficult to predict should creditor nations such as China demand higher interest rates, increasing the perception that the U.S. no longer controls its own financial fate. This dynamic could encourage the establishment of new reserve currencies as global economic actors search for alternatives to the dollar. Changing conditions in the global economy could likewise have important implications for global security also, including a decreased ability of the United States to allocate resources for defense purposes, less purchasing power for available dollars, and shifting power relationships around the world in ways unfavorable to global stability. Domestically, the future of the U.S. financial picture in both the short and long term is one of chronic budget deficits and compounding debt. The federal deficit for the 2009 fiscal year was about \$1.42 trillion or one tenth of U.S. economic production in that year. For the first two months of the 2010 fiscal year, the cumulative deficit was already higher than any previous total yearly deficit run by the federal government and even the most optimistic economic projections suggest that the U.S. will add \$9 trillion to the debt over the next decade, outstripping even the most optimistic predictions for economic growth upon which the federal government relies for increased tax revenue...Although these fiscal imbalances have been severely aggravated by the recent financial crisis and attendant global economic downturn, the financial picture has long term components which indicate that even a return to relatively high levels of economic growth will not be enough to right the financial picture. The near collapse of financial markets and slow or negative economic activity has seen U.S. Government outlays grow in order to support troubled banks and financial institutions, and to cushion the wider population from the worst effects of the slowdown. These unfunded liabilities are a reflection of an aging U.S. Baby-Boom population increasing the number of those receiving social program benefits, primarily

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Social Security, Medicare, and Medicaid, versus the underlying working population that pays to support these programs.”

“Rising debt and deficit financing of government operations will require ever-larger portions of government outlays for interest payments to service the debt. Indeed, if current trends continue, the U.S. will be transferring approximately seven percent of its total economic output abroad simply to service its foreign debt. Interest payments are projected to grow dramatically, further exacerbated by recent efforts to stabilize and stimulate the economy, far outstripping the current tax base. Interest payments, when combined with the growth of Social Security and health care, will crowd out spending for everything else the government does, including National Defense. The foregoing issues of trade imbalance and government debt have historic precedents that bode ill for future force planners. Habsburg Spain defaulted on its debt some 14 times in 150 years and was staggered by high inflation until its overseas empire collapsed. Bourbon France became so beset by debt due to its many wars and extravagances that by 1788 the contributing social stresses resulted in its overthrow by revolution. Interest ate up 44% of the British Government budget during the interwar years 1919-1939, inhibiting its ability to rearm against a resurgent Germany. Unless current trends are reversed, the U.S. will face similar challenges, anticipating an ever-growing percentage of the U.S. government budget going to pay interest on the money borrowed to finance our deficit spending.”

## Energy

“To meet even the conservative growth rates posited in the economics section, global energy production would need to rise by 1.3% per year. By the 2030s, demand is estimated to be nearly 50% greater than today. To meet that demand, even assuming more effective conservation measures, the world would need to add roughly the equivalent of Saudi Arabia’s current energy production every seven years. Absent a major increase in the relative reliance on alternative energy sources (which would require vast insertions of capital, dramatic changes in technology, and altered political

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attitudes toward nuclear energy), oil and coal will continue to drive the energy train. By the 2030s, oil requirements could go from 86 to 118 million barrels a day (MBD)...Assuming the most optimistic scenario for improved petroleum production through enhanced recovery means, the development of non-conventional oils (such as oil shales or tar sands) and new discoveries, petroleum production will be hard pressed to meet the expected future demand of 118 million barrels per day..."

"That production bottleneck apart, the potential sources of future energy supplies nearly all present their own difficulties and vulnerabilities. None of these provide much reason for optimism. At present, the United States possesses approximately 250 million cars, while China with its immensely larger population possesses only 40 million. The Chinese are laying down approximately 1,000 kilometers of four-lane highway every year, a figure suggestive of how many more vehicles they expect to possess, with the concomitant rise in their demand for oil. The presence of Chinese "civilians" in the Sudan to guard oil pipelines underlines China's concern for protecting its oil supplies and could portend a future in which other states intervene in Africa to protect scarce resources. The implications for future conflict are ominous, if energy supplies cannot keep up with demand and should states see the need to militarily secure dwindling energy resources... "

"A severe energy crunch is inevitable without a massive expansion of production and refining capacity. While it is difficult to predict precisely what economic, political, and strategic effects such a shortfall might produce, it surely would reduce the prospects for growth in both the developing and developed worlds. Such an economic slowdown would exacerbate other unresolved tensions, push fragile and failing states further down the path toward collapse, and perhaps have serious economic impact on both China and India. At best, it would lead to periods of harsh economic adjustment. To what extent conservation measures, investments in alternative energy production, and efforts to expand petroleum production from tar sands and shale would mitigate such a period of adjustment is difficult to predict. One should not forget that the Great Depression spawned a number of totalitarian regimes that sought economic prosperity for their nations by ruthless conquest."

## Radical Ideologies

“In the 1940’s the Democratic West faced down and ultimately defeated an extreme ideology that espoused destruction of democratic freedoms: Nazism. Afterward, these same powers resisted and overcame another opposing ideology that demanded the diminution of individual liberties to the power of the state: Communism. We now face a similar, but even more radical ideology that directly threatens the foundation of western secular society. Al Qaeda terrorists, violent militants in the Levant, radical Salafist groups in the Horn of Africa, and the Taliban in the mountains of Afghanistan are all examples of local groups pursuing local interests, but tied together by a common, transnational, and violent ideology. These groups are driven by an uncompromising, nihilistic rage at the modern world, and accept no middle ground or compromise in pursuing their version of the truth. Their goal is to force this truth on the rest of the world’s population. These radical ideological groups have discovered how to form cellular, yet global networks that operate beyond state control and have the capacity – and, most importantly, the will – to challenge the authority of states. Because these organizations do not operate within the international diplomatic systems, they will locate bases of operations in the noise and complexity of cities and use international law and the safe havens along borders of weak states to shield their operations and dissuade the U.S. from engaging them militarily.”

“Combining extreme ideologies with modern technology, they use the Internet and other means of communications to share experiences, tactics, funding, and best practices...These radical groups are constructing globe-spanning “narratives” that effectively dehumanize their opponents, legitimizing in their eyes any tactic no matter how abhorrent to civilized norms of conduct. They believe that their target audience is the 1.1 billion Muslims who are 16 percent of the world’s total population. The use of terror tactics to shock and silence moderate voices in their operational areas includes suicide bombing and improvised explosive devices to kill and maim as many as possible. Most troubling is the possibility, indeed likelihood, that some of these groups

will achieve a weapons of mass destruction (WMD) capability through shared knowledge, through smuggling, or through the deliberate design of an unscrupulous state. The threat of attacks both abroad and in the homeland using nuclear devices, custom bio-weapons, and advanced chemical agents intended to demonstrate dramatically our security weaknesses are real possibilities we must take account of in our planning and deterrent strategies. No one should harbor the illusion that the developed world can win this conflict in the near future. As is true with most insurgencies, victory will not appear decisive or complete. It will certainly not rest on military successes. The treatment of political, social, and economic ills can help, but in the end will not be decisive. What will matter most will be the winning of a 'war of ideas,' much of which must come from within the Islamic world itself."

### Pandemics

"One of the fears haunting policy makers is the appearance of a pathogen, either man-made or natural, able to devastate mankind, as the "Black Death" did in the Middle East and Europe in the middle of the Fourteenth Century. Within barely a year, approximately a third of Europe's population died. The second and third-order effects of the pandemic on society, religion, and economics were devastating. In effect, the Black Death destroyed the sureties undergirding Medieval European civilization. It is not likely that a pandemic on this scale will devastate mankind over the next two decades. Even though populations today are much larger and more concentrated, increasing the opportunities for a new pathogen to spread, the fact that mankind lives in a richer world with greater knowledge of the world of microbes, the ability to enact quarantines, a rapid response capability, and medical treatment suggest that authorities could control even the most dangerous of pathogens. The crucial element in any response to a pandemic may be the political will to impose quarantine. The rapid identification and response to the 2009 H1N1 flu strain and the rapid termination of the 2003 Severe Acute Respiratory Syndrome (SARS) pandemic illustrate the seriousness with which medical authorities view these. In the case of SARS, after



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initial reports surfaced from East Asia in February of an atypical respiratory disease, medical authorities reported more than 8,000 cases in 30 different countries. The disease itself was highly contagious and life-threatening: almost 10% of reported cases died. However, once doctors identified the disease, the combined efforts of local, national, and international authorities contained it within five months. Newly reported cases increased rapidly in March and April 2003, peaked in early May, and rapidly declined thereafter.”

“The H1N1 and SARS examples do not mean, however, that the threat of social disorder or disruption originating from a viral source is nonexistent. A repetition of the 1918 influenza pandemic, which led to the deaths of millions world-wide, would have the most serious consequences for the United States and the world politically as well as socially. The dangers posed by the natural emergence of a disease capable of launching a global pandemic are serious enough, but the possibility exists also that a terrorist organization might acquire a dangerous pathogen. The deliberate release of a deadly pathogen, especially one genetically engineered to increase its lethality or virulence, would present greater challenges than a naturally occurring disease like SARS. While the latter is likely to have a single point of origin, terrorists could seek to release the pathogen at several different locations in order to increase the rate of transmission across a population. This would seriously complicate both the medical challenge of bringing the disease under control and the security task of fixing responsibility for its appearance.”

## China

“The Sino-American relationship represents one of the great strategic question marks of the next twenty five years...The course that China takes will determine much about the character and nature of the 21st Century - whether it will be another bloody century, or one of peaceful cooperation. The Chinese themselves are uncertain as to where their strategic path to the future will lead. Deng Xiaoping’s advice for China to ‘disguise its ambition and hide its claws’ may represent as forthright a statement as the



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Chinese can provide. What does appear relatively clear is that the Chinese are thinking in the long term regarding their strategic course. Rather than emphasize the future strictly in military terms, they seem willing to see how their economic and political relations with the United States develop, while calculating that eventually their growing strength will allow them to dominate Asia and the Western Pacific.”

“History provides some hints about the challenges the Chinese confront in adapting to a world where they are on a trajectory to become a great power. The continuities of Chinese civilization reach back to a time when the earliest civilizations in the Nile and the Mesopotamian valleys were emerging. But those continuities and the cultural power of China’s civilization have also provided a negative side: to a considerable extent they have isolated China from currents and developments in the external world. Much of its Twentieth Century experience had further exacerbated that isolation. The civil wars between the warlords and the central government and between the Nationalists and Communists, the devastating invasion and occupation of the 1930s and 1940s by the Japanese, and the prolonged period of China’s isolation during Mao’s rule further isolated China. Yet, one of the fascinating aspects of China’s emergence over the past three decades has been its efforts to learn from the external world. This has been neither a blatant copying of the West nor an effort to cherry pick ideas from history or Western theoretical writings on strategy and war, but rather a contentious debate to examine and draw lessons from the West’s experience. Two historical case studies have resonated with the Chinese: the Soviet Union’s collapse and the rise of Germany in the late Nineteenth and early Twentieth Centuries. These case studies, written in a series of books, were also made into documentary films that constitute one of the most popular shows on Chinese television. From the case of the Soviets the Chinese have drawn the lesson that they must not pursue military development at the expense of economic development. That is the path Deng laid out in the late 1970s and one which they have assiduously followed. Indeed, if one examines their emerging military capabilities in intelligence, submarines, cyber, and space, one sees an asymmetrical operational approach that is different from Western approaches, one consistent with the classical Chinese strategic thinkers... The

emphasis on nuclear submarines and an increasingly global Navy in particular, underlines worries that the U.S. Navy possesses the ability to shut down China's energy imports of oil, 80% of which goes through the straits of Malacca. As one Chinese naval strategist expressed it: 'the straits of Malacca are akin to breathing – to life itself.'"

"Chinese writers on military and strategic subjects seem to be in agreement that there is a window of opportunity that will last to the 2020s, during which China can focus on domestic economic growth and expanded trade with the world to make it a truly great power...What then are the potential courses that China might follow? The challenges that Chinese leadership confronts at present are enormous, and an unsuccessful China is perhaps more worrisome than a prosperous one. China is confronting major internal problems that could have an impact on its strategic course. The country will face increasing demographic pressures as its population ages. Due to its one child policy, China may grow old before it grows rich. Furthermore, a cultural preference for male heirs will create a surplus male population nearing 30 million by 2020. With a birth rate below replacement levels of 2.1 children per mother, China faces a "4-2-1 problem" with four grandparents having two children and one grandchild, a demographic profile that makes inter-generational pension programs impossible to finance. Urbanization, pollution on a monumental scale, water shortages, and the possible responsibility to protect a growing ethnic diaspora in places such as Siberia or Indonesia represent realities the Chinese leadership cannot easily dismiss."

"Over the course of its history, internal stability and the threat of foreign invasions have represented the twin political and strategic challenges that Chinese governments have confronted. Moreover, as recent events in Tibet and with the Uighurs suggest, tensions between the minorities and the central government in Beijing have been building. Yet with China's approach to strategy, there is considerable sophistication in the leadership's understanding of its internal problems. Taiwan is a wild card. Here the picture is unclear. A reunification might bring with it the spread of democratic ideals to the mainland and a weakening of the Party's grip on an increasingly educated and sophisticated population."

## Russia

“Russia’s future remains as uncertain as its past has been tragic. The world has watched its decline from one of the world’s most heavily populated nations in 1914. Blessed with overwhelming stocks of natural resources and rapid growth through industrialization, Russia instead tread a path to dissipation and collapse in the catastrophes of World War I (3-4 million military and civilian dead), civil war (5-8 million), man-made famines (6-7 million), purges (2-3 million), and World War II (27 million), accompanied by sixty years of ‘planned’ economic and agricultural disasters. The 1990 implosion of the Soviet Union marked a new low point, one that then-President Vladimir Putin decried as ‘the greatest geopolitical catastrophe of the century.’ With the collapse of the Soviet Union, Russia lost the lands and territories it had controlled for the better part of three centuries. Not only did the collapse destroy the economic structure that the Soviets created, but the weak democratic successor regime proved incapable of controlling the criminal gangs or creating a functioning economy. Moreover, the first attempt by the Russian military to crush the rebellion in Chechnya foundered in a sea of incompetence and faulty assumptions.”

“Since 2000, Russia has displayed a considerable recovery based on Vladimir Putin’s reconstitution of rule by the security services – a move most Russians have welcomed – and on the influx of foreign exchange from Russia’s production of petroleum and natural gas. How the Russian government spends this revenue over the long term will play a significant role in the kind of state that emerges. The nature of the current Russian regime itself is also of concern. To a considerable extent, its leaders have emerged from the old KGB, suggesting a strategic perspective that bears watching. At present, Russian leaders appear to have chosen to maximize petroleum revenues without making the investments in oil fields that would increase oil and gas production over the long term. With its riches in oil and gas, Russia is in a position to modernize and repair its ancient and dilapidated infrastructure and to improve the welfare of its long suffering people. Nevertheless, the current leadership has displayed

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little interest in such a course. Instead, it has placed its emphasis on Russia's great power status."

"For all its current riches, the brilliance of Moscow's resurgence, and the trappings of military power, Russia cannot hide the conditions of the remainder of the country. The life expectancy of Russia's male population, 59 years, is 148th in the world and places the country somewhere between East Timor and Haiti... Perhaps more than any other nation Russia has reason to fear the international environment, especially considering the invasions that have washed over its lands. There are serious problems: in the Caucasus with terrorists; in Central Asia where the stability of the new oil-rich nations is seriously in question; and in the east where the Chinese remain silent, but increasingly powerful, on the borders of eastern Siberia. In 2001, Russia and China agreed to demarcate the 4,300 mile border between them. However, demographic pressures across this border are increasingly tense as ethnic Russians leave (perhaps as many as a half million in the 2000-2010 time frame, or 6% of the total population) and ethnic Chinese immigrate to the region. Estimates of the number of ethnic Chinese in Siberia range from a low of about 480,000 (or less than 6% of the population) to more than 1 million (or nearly 12%). Russia must carefully manage this demographic transition to avoid ethnic tensions that could erupt into a cross border conflict with China..."

"Russia's failure to diversify its economy beyond oil and natural gas, together with its accelerating demographic collapse, will create a Russia of greatly decreased political, economic, and military power by the 2020s."

## India

"India has a special place in the future international environment. Few countries in the world may figure as prominently in future U.S. strategic calculations. As demographic trends indicate, India is on course to be the most populous nation on Earth in the next decade and a half. Furthermore, it shares with the U.S. a domestic political system based on the consent of the governed, and is highly diverse culturally

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and ethnically. India sits on the rim of an ocean pivotal to U.S. interests, and possesses a navy larger than any other in the region. It borders a troubled Pakistan, a growing China, is in a neighborhood at high risk of nuclear proliferation, is a common target for radical ideological groups using terrorist tactics, and sits astride key sea lanes linking East Asia to the oil fields of the Middle East...”

“India could more than quadruple its wealth over the course of the next two decades, but large swaths of its population will likely remain in poverty through the 2030s. Like China, this will create tensions between the rich and the poor. Such tension, added to the divides among its religions and nationalities, could continue to have implications for economic growth and national security. Nevertheless, its military will receive substantial upgrades in the coming years. That fact, combined with its proud martial traditions and strategic location in the Indian Ocean, will make India the dominant player in South Asia and the Middle East... In the 21st Century, the emergence of India as a strong, stable, democratic, and outwardly looking player with global interests has the potential to enhance the effectiveness of the international system and well-being of all, in a positive sum game.”

### The Middle East and Central Asia

“Based on current evidence, a principal nexus of conflict will continue to be the region from Morocco to Pakistan through to Central Asia. Across this part of the globe a number of historical, dormant conflicts between states and nations over borders, territories, and water rights exist, especially in Central Asia and the Caucasus. Radical extremists will present the first and most obvious challenge. The issue here is not terrorism per se, because terrorism is merely a tactic by which those who lack the technology, weapons systems, and scruples of the modern world can attack their enemies throughout the world. Radical extremists who advocate violence constitute a transnational, theologically-based insurgency that seeks to overthrow regimes in the Islamic world. They bitterly attack the trappings of modernity as well as the philosophical underpinnings of the West despite the fact their operations could not be

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conducted without the internet, air travel and globalized financial systems. At a minimum radical Islam seeks to eliminate U.S. and other foreign presence in the Middle East, a region vital to U.S. and global security, but only as a first step to the creation of a Caliphate stretching from Central Asia in the East to Spain in the West and extending deeper into Africa...”

“The problems in the Arab-Islamic world stem from the past five centuries, during which the rise of the West and the dissemination of Western political and social values paralleled a concomitant decline in the power and appeal of their societies. Today’s Islamic world confronts the choice of either adapting to or escaping from a globe of interdependence created by the West. Often led by despotic rulers, addicted to the exports of commodities which offered little incentive for more extensive industrialization or modernization, and burdened by cultural and ideological obstacles to education and therefore modernization, many Islamic states have fallen far behind the West, South Asia, and East Asia. The rage of radical Islamists feeds off the lies of their often corrupt leaders, the rhetoric of radical imams, the falsifications of their own media, and resentment of the far more prosperous developed world. If tensions between the Islamic world’s past and the present were not enough, the Middle East, the Arab heartland of Islam, remains divided by tribal, religious, and political divisions, making continued instability inevitable.”

### Iran

“Iran has an increasingly important role in this center of instability [in the Middle East and Central Asia]...Although the U.S. has removed Iran’s most powerful adversary (Saddam) and reduced the Taliban, the regime continues to foment instability in areas far from its own borders. Despite a population that remains relatively favorable to the United States, the cleric-dominated regime appears ready to continue dedicating its diplomatic and military capabilities to confrontation with the United States and Israel, and to cultivate an array of very capable proxy forces around the world. Hezbollah in Lebanon, Hamas in Gaza, various groups in Afghanistan,

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Yemen, Iraq, and the Caucasus, and other client states will serve to extend and solidify Iranian influence abroad. Internal dynamics will continue to play a large role in the Iranian leadership's decision-making calculus. The intervention by the Iranian Government in the outcome of the June 2009 Presidential elections has reinvigorated the Iranian public's widespread disillusionment with their ruling class, and the Iranian leadership will tread an increasingly fine line in maintaining political and social control while satisfying their public's growing desire for democratization and transparency. As one means of maintaining political support and suppressing dissension, Iran will continue to frame the nuclear power issue as a matter of nationalist pride and as the "right" of any sovereign country as a means to its own security. However, the Government of Iran will also have to match its nationalist rhetoric with tangible progress on the economic front. Extreme volatility in oil prices is eroding national revenues due to the failure of the regime to diversify the national economy, which stifles the future prosperity of the Iranian people. Iran must create conditions for its economic viability beyond the near term or face insolvency, internal dissension and ferment, and possible upheaval."

### Conclusions

The JOE 2010 provides a sobering look at what lies ahead, as seen through the eyes of the people whose lives will be at stake in future conflicts. As the authors note, "the United States has dominated the world economically since 1915 and militarily since 1943. Its dominance in both respects now faces challenges brought about by the rise of powerful states. Moreover, the rise of these great powers creates a strategic landscape and international system, which, despite continuing economic integration, will possess considerable instabilities. Lacking either a dominant power or an informal organizing framework, such a system will tend toward conflict. Where and how those instabilities will manifest themselves remains obscure and uncertain."

So what are the implications of the JOE 2010 for strategic asset allocation and risk management? Perhaps the most important is that, due to recurring bouts of



uncertainty and perhaps active conflict, the next decade is not likely to be one in which equities deliver strong returns. Conversely, these same factors may cause government bonds (both real and nominal return), volatility and gold to perform well. Commercial property may also benefit from higher instability, particularly in those countries where investors have traditionally turned to it in troubled times (e.g., Switzerland, the Eurozone, and the UK). Commodities seem to present more of a quandary. The JOE 2010 highlights the likely upward pressures we are likely to see in oil prices over the next decade. Yet those high prices, along with the heightened (and perhaps actually realized) potential for conflict along many fault lines, and particularly in China, suggests a heightened risk of lower global GDP growth which bodes ill for many commodity prices and returns. On the other hand, prolonged instability may benefit timber, to the extent more investors view it as an attractive means of preserving the real value of their capital in troubled times.

Last but not least, the JOE 2010 offers wise counsel for the way we as investors, and stewards of other people's savings, must approach the uncertain times that lie ahead: "The defining element in military effectiveness in war lies in the ability to recognize when prewar visions and understanding of war are wrong and must change. Unfortunately, in terms of what history suggests, most military and political leaders have attempted to impose their vision of future war on the realities of the conflict in which they find themselves engaged, rather than adapting to the actual conditions they confront. The fog and friction that characterize the battle space invariably make the task of seeing, much less understanding what has actually happened, extraordinarily difficult. Moreover, the lessons of today, no matter how accurately recorded and then learned, may no longer prove relevant tomorrow...The challenges of the future demand leaders who possess rigorous intellectual understanding. Providing such grounding for the [leaders] of the 2030s will ensure that the United States is as prepared as possible to meet the threats and seize the opportunities of the future."

## **Feature Article: Understanding and Predicting Uncertainty Shocks, Part 1**



It seems that wherever you look today, increased uncertainty is in the news. Investors are uncertain, and hence both anxiety and volatility are up. Business leaders are uncertain, so investment and employment are down. Households are uncertain, so consumption spending is down, and saving is up. And with the economic recovery stalling, policymakers and politicians are uncertain, leading to both action paralysis and increasingly rigid and stridently partisan rhetoric.

“High uncertainty” is also one of the three regimes we use in our market valuation analyses each month (the others being “high inflation” and “normal times”), in which short term domestic and foreign government bonds, volatility and gold are expected to deliver significantly better returns than other asset classes.

Clearly, sharp increases in uncertainty are a phenomenon we need to better understand, and, ideally, learn to predict in advance. And that is what we will attempt to do in this two part series. This month we will review the concept of uncertainty and how it affects our behavior. In our July 2010 issue, we will delve more deeply into what causes changes in the degree of uncertainty we perceive, and the extent to which these underlying causal factors may be predictable.

Much of our thinking about uncertainty has been influenced by the writing of Frank Knight, who was an economist of the old political-economy school, before the profession became dominated by deductive proofs and applied mathematics. In 1921, Knight published Risk, Uncertainty, and Profit. Chapter Three of that book, titled, “Imperfect Competition Through Risk and Uncertainty” is worth quoting at some length. Knight begins with an observation of the way the world works in practice, if not in theory: “The mental operations by which ordinary practical decisions are made are very obscure, and it is a matter for surprise that neither logicians nor psychologists have shown much interest in them. Perhaps (the writer is inclined to this view) it is because there is really very little to say about the subject. Prophecy seems to be a good deal like memory itself, on which it is based. When we wish to think of some man's name, or recall a quotation which has slipped our memory, we go to work to do it, and the desired idea comes to mind, often when we are thinking about something else—or else it does not come, but in either case there is very little that we can tell

about the operation, very little "technique." So when we try to decide what to expect in a certain situation, and how to behave ourselves accordingly, we are likely to do a lot of irrelevant mental rambling, and the first thing we know we find that we have made up our minds, that our course of action is settled. There seems to be very little meaning in what has gone on in our minds, and certainly little kinship with the formal processes of logic which the scientist uses in an investigation. We contrast the two processes by recognizing that the former is not reasoned knowledge, but "judgment," "common sense," or "intuition." There is doubtless some analysis of a crude type involved, but in the main it seems that we "infer" largely from our experience of the past as a whole, somewhat in the same way that we deal with intrinsically simple problems like estimating distances, weights, or other physical magnitudes, when measuring instruments are not at hand."

Knight then explores the different bases for forming these judgments. He initially begins with an exploration of probability estimates. "There are two fundamentally different ways of arriving at the probability judgment of the form that a given numerical proportion of *X*'s are also *Y*'s. The first method is by *a priori* calculation, and is applicable to and used in games of chance. This is also the type of case usually assumed in logical and mathematical treatments of probability. It must be strongly contrasted with the very different type of problem in which [*a priori*] calculation is impossible and the result is reached by the empirical method of applying statistics to actual instances [i.e., statistical induction] ... The import of this distinction for present purposes is that the first, mathematical or *a priori*, type of probability is practically never met with in business, while the second is extremely common."

Knight then goes on to identify a third basis for forming judgments, beyond deduction from theory (*a priori* reasoning) and inductive reasoning based on the use of statistics: "the probability in which the student of business risk is interested *is* an estimate, though in a sense different from any of the propositions so far considered. To discuss the question from this new point of view we must go back for a moment to the general principles of the logic of conduct. We have emphasized above that the exact science of inference has little place in forming the opinions upon which decisions

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of conduct are based, and that this is true whether the implicit logic of the case is prediction on the ground of exhaustive analysis or a probability judgment, *a priori* or statistical. We act upon estimates rather than inferences, upon "judgment" or "intuition," not reasoning, for the most part. Now an estimate or intuitive judgment is somewhat like a probability judgment, but very different from either of the types of probability judgment already described. The relations between the two sorts are in fact amazingly complex and as fraught with logical paradox as the probability judgment itself. If the term "probability" is to be applied to an estimate—and the usage is so well established that there is no hope of getting away from it—a third species under that genus must be recognized. Such a third type of probability fits very nicely in a scheme of classification with the two already discussed. We have insisted that there is a fundamental difference between "*a priori*" probability, on the one hand, and "statistical," on the other. In the former the "chances" can be computed on general principles, while in the latter they can only be determined empirically... Taking, then, the classification point of view, we shall find the following simple scheme for separating three different types of probability situation:

1. *A priori* probability. Absolutely homogeneous classification of instances completely identical except for really indeterminate factors. This judgment of probability is on the same logical plane as the propositions of mathematics (which also may be viewed, and are viewed by the writer, as "ultimately" inductions from experience).
2. Statistical probability. Empirical evaluation of the frequency of association between predicates, not analyzable into varying combinations of equally probable alternatives. It must be emphasized that any high degree of confidence that the proportions found in the past will hold in the future is still based on an *a priori* judgment of indeterminateness. Two complications are to be kept separate: first, the impossibility of eliminating all factors not really indeterminate; and, second, the impossibility of enumerating the equally probable alternatives involved and determining their mode of combination so as to evaluate the probability by a *a priori* calculation. The main distinguishing

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characteristic of this type is that it rests on an empirical classification of instances.

3. Estimates. The distinction here is that there is no valid basis of any kind for classifying instances. This form of probability is involved in the greatest logical difficulties of all, and no very satisfactory discussion of it can be given, but its distinction from the other types must be emphasized and some of its complicated relations indicated...It is this third type of probability, or uncertainty, which has been neglected in economic theory.”

Knight then emphasizes that, “the theoretical difference between the probability connected with an estimate and that involved in such phenomena as are dealt with by insurance is, however, of the greatest importance, and is clearly discernible in nearly any instance of the exercise of judgment. Take as an illustration any typical business decision. A manufacturer is considering the advisability of making a large commitment in increasing the capacity of his works. He "figures" more or less on the proposition, taking account as well as possible of the various factors more or less susceptible of measurement, but the final result is an "estimate" of the probable outcome of any proposed course of action. What is the "probability" of error (strictly, of any assigned degree of error) in the judgment? It is manifestly meaningless to speak of either calculating such a probability *a priori* or of determining it empirically by studying a large number of instances. The essential and outstanding fact is that the "instance" in question is so entirely unique that there are no others or not a sufficient number to make it possible to tabulate enough like it to form a basis for any inference of value about any real probability in the case we are interested in. The same obviously applies to the most of conduct and not to business decisions alone. Yet it is true, and the fact can hardly be overemphasized, that a judgment of probability is actually made in such cases. The business man himself not merely forms the best estimate he can of the outcome of his actions, but he is likely also to estimate the probability that his estimate is correct. The "degree" of certainty or of confidence felt in the conclusion after it is reached cannot be ignored, for it is of the greatest practical significance. The action which follows upon an opinion depends as much upon the amount of confidence in

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that opinion as it does upon the favorableness of the opinion itself. The ultimate logic, or psychology, of these deliberations is obscure, a part of the scientifically unfathomable mystery of life and mind. We must simply fall back upon a "capacity" in the intelligent animal to form more or less correct judgments about things, an intuitive sense of values. We are so built that what seems to us reasonable is likely to be confirmed by experience, or we could not live in the world at all... The opinions upon which we act in everyday affairs and those which govern the decisions of responsible business managers for the most part have little similarity with conclusions reached by exhaustive analysis and accurate measurement... Business decisions deal with situations which are far too unique, generally speaking, for any sort of statistical tabulation to have any value for guidance. The conception of an objectively measurable probability or chance is simply inapplicable...The mental processes are entirely different. In [the case of estimates] they are mostly subconscious."

Last but not least, Knight concluded that it was the existence of uncertainty that weakened the operation of competitive forces, and gave rise to the opportunity for earning profits above an investor's cost of capital.

Fifteen years after Frank Knight published Risk, Uncertainty, and Profit, John Maynard Keynes published his magnum opus, The General Theory of Employment, Interest and Money. Chapter 12 of Keynes' book ("The State of Long Term Expectation") further builds on Knight's original distinction between risk (a situation in which the likelihood of future outcomes could be derived from probability theory or statistical inference) and uncertainty (a situation in which a forecast of future outcomes, their likelihoods, and economic impact was based on subjective estimates). Again, it is worth quoting at some length, as Keynes' insights are critical and timeless.

"The considerations upon which expectations of prospective yields [long-term profits and cash flows, in modern terminology] are based are partly existing facts which we can assume to be known more or less for certain, and partly future events which can only be forecasted with more or less confidence...We can sum up the state of psychological expectation which covers the latter as being the state of long term expectation...The state of long-term expectation, upon which our decisions are based,

does not solely depend on the most probable forecast we can make. It also depends on the confidence with which we make this forecast – on how highly we rate the likelihood of our best forecast turning out quite wrong. If we expect large changes but are very uncertain as to what precise form these changes will take, then our confidence will be weak. ‘The state of confidence’, as they term it, is a matter to which practical men always pay the closest and most anxious attention. But economists have not analyzed it carefully and have been content, as a rule, to discuss it in general terms. In particular, it has not been made clear that its relevance to economic problems comes through its important influence on [investment]...There is, however, not much to be said about the state of confidence a priori. Our conclusions must mainly depend upon the actual observation of markets and business psychology...”

“The outstanding fact is the extreme precariousness of the basis of knowledge on which our estimates of prospective yield have to be made. Our knowledge of the factors which will govern the yield on an investment some years hence is usually very slight and often negligible...In fact, those who seriously attempt to make any such estimate are so much in the minority that their behavior does not govern the market. In former times, when enterprises were mainly owned by those who undertook them or by their friends and associates, investment depended on a sufficient supply of individuals of sanguine temperament and constructive impulses who embarked on business as a way of life, not really relying on a precise calculation of prospective profit. The affair was partly a lottery, though with the ultimate result largely governed by whether the abilities and character of the managers were above or below the average...Businessmen play a mixed game of skill and chance... Decisions to invest in private business of the old-fashioned type were, however, decisions largely irrevocable, not only for the community as a whole, but also for the individual. With the separation between ownership and management which prevails to-day and with the development of organised investment markets, a new factor of great importance has entered in, which sometimes facilitates investment but sometimes adds greatly to the instability of the system. In the absence of security markets, there is no object in frequently attempting to revalue an investment to which we are committed. But the

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Stock Exchange revalues many investments every day and the revaluations give a frequent opportunity to the individual (though not to the community as a whole) to revise his commitments. It is as though a farmer, having tapped his barometer after breakfast, could decide to remove his capital from the farming business between 10 and 11 in the morning and reconsider whether he should return to it later in the week. But the daily revaluations of the Stock Exchange, though they are primarily made to facilitate transfers of old investments between one individual and another, inevitably exert a decisive influence on the rate of current investment. For there is no sense in building up a new enterprise at a cost greater than that at which a similar existing enterprise can be purchased; whilst there is an inducement to spend on a new project what may seem an extravagant sum, if it can be floated off on the Stock Exchange at an immediate profit. Thus certain classes of investment are governed by the average expectation of those who deal on the Stock Exchange as revealed in the price of shares, rather than by the genuine expectations of the professional entrepreneur. How then are these highly significant daily, even hourly, revaluations of existing investments carried out in practice?"

"In practice we have tacitly agreed, as a rule, to fall back on what is, in truth, a *convention*. The essence of this convention — though it does not, of course, work out quite so simply — lies in assuming that the existing state of affairs will continue indefinitely, except in so far as we have specific reasons to expect a change. This does not mean that we really believe that the existing state of affairs will continue indefinitely. We know from extensive experience that this is most unlikely. The actual results of an investment over a long term of years very seldom agree with the initial expectation...We are assuming, in effect, that the existing market valuation, however arrived at, is uniquely *correct* in relation to our existing knowledge of the facts which will influence the yield of the investment, and that it will only change in proportion to changes in this knowledge; though, philosophically speaking it cannot be uniquely correct, since our existing knowledge does not provide a sufficient basis for a calculated mathematical expectation. In point of fact, all sorts of considerations enter into the market valuation which are in no way relevant to the prospective yield.



Nevertheless the above conventional method of calculation will be compatible with a considerable measure of continuity and stability in our affairs, *so long as we can rely on the maintenance of the convention*. For if there exist organised investment markets and if we can rely on the maintenance of the convention, an investor can legitimately encourage himself with the idea that the only risk he runs is that of a genuine change in the news *over the near future*, as to the likelihood of which he can attempt to form his own judgment, and which is unlikely to be very large. For, assuming that the convention holds good, it is only these changes which can affect the value of his investment, and he need not lose his sleep merely because he has not any notion what his investment will be worth ten years hence. Thus investment becomes reasonably “safe” for the individual investor over short periods, and hence over a succession of short periods however many, if he can fairly rely on there being no breakdown in the convention and on his therefore having an opportunity to revise his judgment and change his investment, before there has been time for much to happen. Investments which are “fixed” for the community are thus made “liquid” for the individual.”

“It has been, I am sure, on the basis of some such procedure as this that our leading investment markets have been developed. But it is not surprising that a convention, in an absolute view of things so arbitrary, should have its weak points. It is its precariousness which creates no small part of our contemporary problem of securing sufficient investment. Some of the factors which accentuate this precariousness may be briefly mentioned:

(1) As a result of the gradual increase in the proportion of the equity in the community’s aggregate capital investment which is owned by persons who do not manage and have no special knowledge of the circumstances, either actual or prospective, of the business in question, the element of real knowledge in the valuation of investments by those who own them or contemplate purchasing them has seriously declined.

(2) Day-to-day fluctuations in the profits of existing investments, which are obviously of an ephemeral and non-significant character, tend to have an altogether

excessive, and even an absurd, influence on the market. It is said, for example, that the shares of American companies which manufacture ice tend to sell at a higher price in summer when their profits are seasonally high than in winter when no one wants ice. The recurrence of a bank-holiday may raise the market valuation of the British railway system by several million pounds.

(3) A conventional valuation which is established as the outcome of the mass psychology of a large number of ignorant individuals is liable to change violently as the result of a sudden fluctuation of opinion due to factors which do not really make much difference to the prospective yield; since there will be no strong roots of conviction to hold it steady. In abnormal times in particular, when the hypothesis of an indefinite continuance of the existing state of affairs is less plausible than usual even though there are no express grounds to anticipate a definite change, the market will be subject to waves of optimistic and pessimistic sentiment, which are unreasoning and yet in a sense legitimate where no solid basis exists for a reasonable calculation.

(4) But there is one feature in particular which deserves our attention. It might have been supposed that competition between expert professionals, possessing judgment and knowledge beyond that of the average private investor, would correct the vagaries of the ignorant individual left to himself. It happens, however, that the energies and skill of the professional investor and speculator are mainly occupied otherwise. For most of these persons are, in fact, largely concerned, not with making superior long-term forecasts of the probable yield of an investment over its whole life, but with foreseeing changes in the conventional basis of valuation a short time ahead of the general public. They are concerned, not with what an investment is really worth to a man who buys it "for keeps", but with what the market will value it at, under the influence of mass psychology, three months or a year hence. Moreover, this behaviour is not the outcome of a wrong-headed propensity. It is an inevitable result of an investment market organised along the lines described. For it is not sensible to pay 25 for an investment of which you believe the prospective yield to justify a value of 30, if you also believe that the market will value it at 20 three months hence...

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(5) So far we have had chiefly in mind the state of confidence of the speculator or speculative investor himself and may have seemed to be tacitly assuming that, if he himself is satisfied with the prospects, he has unlimited command over money at the market rate of interest. This is, of course, not the case. Thus we must also take account of the other facet of the state of confidence, namely, the confidence of the lending institutions towards those who seek to borrow from them, sometimes described as the state of credit. A collapse in the price of equities, which has had disastrous reactions on the marginal efficiency of capital, may have been due to the weakening either of speculative confidence or of the state of credit. But whereas the weakening of either is enough to cause a collapse, recovery requires the revival of *both*. For whilst the weakening of credit is sufficient to bring about a collapse, its strengthening, though a necessary condition of recovery, is not a sufficient condition..."

"Thus the professional investor is forced to concern himself with the anticipation of impending changes, in the news or in the atmosphere, of the kind by which experience shows that the mass psychology of the market is most influenced. This is the inevitable result of investment markets organised with a view to so-called "liquidity". Of the maxims of orthodox finance none, surely, is more anti-social than the fetish of liquidity, the doctrine that it is a positive virtue on the part of investment institutions to concentrate their resources upon the holding of "liquid" securities. It forgets that there is no such thing as liquidity of investment for the community as a whole. The social object of skilled investment should be to defeat the dark forces of time and ignorance which envelop our future. The actual, private object of the most skilled investment to-day is "to beat the gun", as the Americans so well express it, to outwit the crowd, and to pass the bad, or depreciating, half-crown to the other fellow... If the reader interjects that there must surely be large profits to be gained from the other players in the long run by a skilled individual who, unperturbed by the prevailing pastime, continues to purchase investments on the best genuine long-term expectations he can frame, he must be answered, first of all, that there are, indeed, such serious-minded individuals and that it makes a vast difference to an investment market whether or not they predominate in their influence over the game-players. But

we must also add that there are several factors which jeopardise the predominance of such individuals in modern investment markets. Investment based on genuine long-term expectation is so difficult to-day as to be scarcely practicable. He who attempts it must surely lead much more laborious days and run greater risks than he who tries to guess better than the crowd how the crowd will behave; and, given equal intelligence, he may make more disastrous mistakes. There is no clear evidence from experience that the investment policy which is socially advantageous coincides with that which is most profitable. It needs more intelligence to defeat the forces of time and our ignorance of the future than to beat the gun. Moreover, life is not long enough; — human nature desires quick results, there is a peculiar zest in making money quickly, and remoter gains are discounted by the average man at a very high rate... It is the long-term investor, he who most promotes the public interest, who will in practice come in for most criticism, wherever investment funds are managed by committees or boards or banks. For it is in the essence of his behaviour that he should be eccentric, unconventional and rash in the eyes of average opinion. If he is successful, that will only confirm the general belief in his rashness; and if in the short run he is unsuccessful, which is very likely, he will not receive much mercy. Worldly wisdom teaches that it is better for reputation to fail conventionally than to succeed unconventionally...”

“Even apart from the instability due to speculation, there is the instability due to the characteristic of human nature that a large proportion of our positive activities depend on spontaneous optimism rather than on a mathematical expectation, whether moral or hedonistic or economic. Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as a result of animal spirits — of a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities... Thus if the animal spirits are dimmed and the spontaneous optimism falters, leaving us to depend on nothing but a mathematical expectation, enterprise will fade and die; — though fears of loss may have a basis no more reasonable than hopes of profit had before... This means,

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unfortunately, not only that slumps and depressions are exaggerated in degree, but that economic prosperity is excessively dependent on a political and social atmosphere which is congenial to the average business man. If the fear of a Labour Government or a New Deal depresses enterprise, this need not be the result either of a reasonable calculation or of a plot with political intent; — it is the mere consequence of upsetting the delicate balance of spontaneous optimism. In estimating the prospects of investment, we must have regard, therefore, to the nerves and hysteria and even the digestions and reactions to the weather of those upon whose spontaneous activity it largely depends. We should not conclude from this that everything depends on waves of irrational psychology. On the contrary, the state of long-term expectation is often steady, and, even when it is not, the other factors exert their compensating effects. We are merely reminding ourselves that human decisions affecting the future, whether personal or political or economic, cannot depend on strict mathematical expectation, since the basis for making such calculations does not exist; and that it is our innate urge to activity which makes the wheels go round, our rational selves choosing between the alternatives as best we are able, calculating where we can, but often falling back for our motive on whim or sentiment or chance.”

Let us now jump forward to a much more recent reflection on uncertainty, Andrew Lo and Mark Mueller’ “Warning: Physics Envy May Be Hazardous to Your Wealth!” The authors note that the goal of their paper is “to provide a framework for investors, portfolio managers, regulators and policymakers in which the efficacy and limitations of economics and finance can be more readily understood...We hope to show through a series of examples drawn from both physics and finance that the failure of quantitative models in economics is almost always the result of a mismatch between the type of uncertainty in effect and the methods used to manage it. Moreover, the process of scientific discovery may be viewed as the means by which we transition from one level of uncertainty to the next.” Lo and Mueller stress that “the distinctions between various types of uncertainty are central to the differences between economics and physics.” Noting that “economists have been aware of some of these distinctions for decades, beginning with Frank Knight’s dissertation in 1921”,

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they “propose an even more refined taxonomy of uncertainty, that is capable of explaining the differences across the entire spectrum of intellectual pursuits from physics to biology to economics to philosophy and religion.” Here is how Lo and Mueller describe the spectrum of uncertainty:

“Level 1: Complete Certainty. This is the realm of classical physics, an idealized deterministic world governed by Newton’s laws of motion. All past and future states of the system are determined exactly if initial conditions are fixed and known—nothing is uncertain. Of course, even within physics, this perfectly predictable clockwork universe of Newton, Lagrange, LaPlace, and Hamilton was recognized to have limited validity as quantum mechanics emerged in the early twentieth century. Even within classical physics, the realization that small perturbations in initial conditions can lead to large changes in the subsequent evolution of a dynamical system underscores how idealized and limited this level of description can be in the elusive search for truth. However, it must be acknowledged that much of the observable physical universe does, in fact, lie in this realm of certainty...In this respect, physics has enjoyed a significant head start when compared to all the other sciences.”

“Level 2: Risk without Uncertainty. This level of randomness is Knight’s (1921) definition of risk: randomness governed by a known probability distribution for a completely known set of outcomes. At this level, probability theory is a useful analytical framework for risk analysis... No statistical inference is needed, because we know the relevant probability distributions exactly, and while we do not know the outcome of any given wager, we know all the rules and the odds, and no other information relevant to the outcome is hidden. This is life in a hypothetical honest casino, where the rules are transparent and always followed. This situation bears little resemblance to financial markets.”

“Level 3: Fully Reducible Uncertainty. This is risk with a degree of uncertainty, an uncertainty due to unknown probabilities for a fully enumerated set of outcomes that we presume are still completely known. At this level, classical (frequentist) statistical inference must be added to probability theory as an appropriate tool for analysis. By “fully reducible uncertainty”, we are referring to

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situations in which randomness can be rendered arbitrarily close to Level-2 uncertainty with sufficiently large amounts of data using the tools of statistical analysis. Fully reducible uncertainty is very much like an honest casino, but one in which the odds are not posted and must therefore be inferred from experience. In broader terms, fully reducible uncertainty describes a world in which a single model generates all outcomes, and this model is parameterized by a finite number of unknown parameters that do not change over time and which can be estimated with an arbitrary degree of precision given enough data. The resemblance to the “scientific method”—at least as it is taught in science classes today—is apparent at this level of uncertainty. One poses a question, develops a hypothesis, formulates a quantitative representation of the hypothesis (i.e., a model), gathers data, analyzes that data to estimate model parameters and errors, and draws a conclusion. Human interactions are often a good deal messier and more nonlinear, and we must entertain a different level of uncertainty before we encompass the domain of economics and finance.”

“Level 4: Partially Reducible Uncertainty. Continuing our descent into the depths of the unknown, we reach a level of uncertainty that now begins to separate the physical and social sciences, both in philosophy and model building objectives. By Level-4 or “partially reducible” uncertainty, we are referring to situations in which there is a limit to what we can learn about the underlying phenomena generating the data [either deductively using probability or inductively using statistics]. Examples include data-generating processes that exhibit: (1) stochastic or time-varying parameters that vary too frequently to be estimated accurately; (2) nonlinearities too complex to be captured by existing models, techniques, and datasets; (3) nonstationarities that render useless the Law of Large Numbers, Central Limit Theorem, and other methods of statistical inference and approximation; and (4) the dependence on relevant but unknown and unknowable conditioning information. Although the laws of probability still operate at this level, there is a non-trivial degree of uncertainty regarding the underlying structures generating the data that cannot be reduced to Level-2



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uncertainty, even with an infinite amount of data. Under partially reducible uncertainty, we are in a casino that may or may not be honest, and the rules tend to change from time to time without notice. In this situation, classical statistics may not be as useful as a Bayesian perspective, in which probabilities are no longer tied to relative frequencies of repeated trials, but now represent degrees of belief. Using Bayesian methods, we have a framework and lexicon with which partial knowledge, prior information, and learning can be represented more formally. Level-4 uncertainty involves “model uncertainty”, not only in the sense that multiple models may be consistent with observation, but also in the deeper sense that more than one model may very well be generating the data...At this level of uncertainty, modeling philosophies and objectives in economics and finance begin to deviate significantly from those of the physical sciences. Physicists believe in the existence of fundamental laws, either implicitly or explicitly, and this belief is often accompanied by a reductionist philosophy that seeks the fewest and simplest building blocks from which a single theory can be built. Even in physics, this is an over-simplification, as one era’s “fundamental laws” eventually reach the boundaries of their domains of validity, only to be supplanted and encompassed by the next era’s “fundamental laws”. The classic example is, of course, Newtonian mechanics becoming a special case of special relativity and quantum mechanics. It is difficult to argue that economists should have the same faith in a fundamental and reductionist program for a description of financial markets (although such faith does persist in some, a manifestation of physics envy). Markets are tools developed by humans for accomplishing certain tasks—not immutable laws of Nature—and are therefore subject to all the vicissitudes and frailties of human behavior. While behavioral regularities do exist, and can be captured to some degree by quantitative methods, they do not exhibit the same level of certainty and predictability as physical laws. Accordingly, model-building in the social sciences should be much less informed by mathematical aesthetics, and much more by pragmatism in the face of partially reducible uncertainty. We must

resign ourselves to models with stochastic parameters or multiple regimes that may not embody universal truth, but are merely useful, i.e., they summarize some coarse-grained features of highly complex datasets.”

“Level 5: Irreducible Uncertainty. Irreducible uncertainty is the polite term for a state of total ignorance; ignorance that cannot be remedied by collecting more data, using more sophisticated methods of statistical inference or more powerful computers, or thinking harder and smarter. Such uncertainty is beyond the reach of probabilistic reasoning, statistical inference, and any meaningful quantification. This type of uncertainty is the domain of philosophers and religious leaders, who focus on not only the unknown, but the unknowable. Stated in such stark terms, irreducible uncertainty seems more likely to be the exception rather than the rule. After all, what kinds of phenomena are completely impervious to quantitative analysis, other than the deepest theological conundrums? The usefulness of this concept is precisely in its extremity. By defining a category of uncertainty that cannot be reduced to any quantifiable risk—essentially an admission of intellectual defeat—we force ourselves to stretch our imaginations to their absolute limits before relegating any phenomenon to this level.”

Having looked at three different analyses of uncertainty (spanning 80 years), let us now turn to a brief review of its practical impact. In a few words, it is infrequent but very powerful. Most of the time, we operate with a relatively low level of perceived uncertainty. But when our sense of uncertainty changes, many things happen. As we have noted in the past, at the level of the individual actor, an increase in uncertainty is one of the three main triggers of the unconscious “fear response” in the part of our brain known as the amygdala. The other two triggers are various types of loss (e.g., actual loss of resources – say a big drop in portfolio value – or relative loss – say, a portfolio’s returns falling behind an important reference point, like an index, required rate of return, or the results of a group of friends or competitors), and social isolation. In practice, these three triggers are interrelated, for example, because it has also been

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shown that our need for the support of a group (and hence fear of social isolation) increases with our experience of loss or heightened uncertainty. All of these unconscious and automatic emotional responses clearly helped us to survive on the East African plain eons ago, and have been “hard-wired” into our human nature.

At the other end of the spectrum, changes in perceived uncertainty have also been shown to have a powerful impact on macroeconomic activity and financial market returns. For example, in “The Impact of Macroeconomic Uncertainty on Bank Lending Behavior”, Baum, Caglayan, and Ozkan find that “as macroeconomic uncertainty increases, banks behave more conservatively.” In “The Impact of Uncertainty Shocks”, Nicholas Bloom finds that macro-uncertainty shocks “produce a rapid drop in aggregate output and employment...which occur because higher uncertainty causes firms to temporarily pause in their investment and hiring.” Pablo Guerron-Quintana of the Federal Reserve Bank of Philadelphia finds that uncertainty shocks affect exchange rates (“Do Uncertainty and Technology Drive Exchange Rates?”). And in “Uncertainty and Economic Activity: Evidence from Business Survey Data”, Bachmann, Elstner and Sims find that uncertainty shocks (or their opposite, declines in business confidence) have long-lived (5 to 10 year) effects, “leading robustly to very prolonged declines in economic activity.” The impact of public policy uncertainty on the length and depth of the Great Depression was also the subject of Amity Shlaes excellent book, [The Forgotten Man: A New History of the Great Depression](#). In recent months, this theme has once again emerged in the popular press (see, for example, “Obama’s CEO Problem” by Fareed Zakaria in the 5July10 *Washington Post*, and General Electric CEO Jeff Immelt’s recent criticisms of the Obama administration’s policies towards business). Last but not least, sharp rises in uncertainty also have a strong impact on the prices, valuations and returns earned by investors in different asset classes. At this point, we have hopefully provided you with a better understanding of the nature and importance of uncertainty shocks to both real economic activity and financial market returns and volatility. The questions we will examine in Part 2 (next month’s issue) are, (1) What causes sharp changes in uncertainty? And (2), can these changes be predicted?

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## **Global Asset Class Valuation Analysis**

Our asset class valuation analyses are based on the belief that financial markets are complex adaptive systems, in which prices and returns emerge from the interaction of multiple rational, emotional and social processes. We further believe that while this system is attracted to equilibrium, it is generally not in this state. To put it differently, we believe it is possible for the supply of future returns a market is expected to provide to be higher or lower than the returns investors logically demand, resulting in over or underpricing relative to fundamental value. The attraction of the system to equilibrium means that, at some point, these prices are likely to reverse in the direction of fundamental value. However, the very nature of a complex adaptive system makes it hard to forecast when such reversals will occur. It is also the case that, in a constantly evolving complex adaptive system like a financial market, any estimate of fundamental value is necessarily uncertain. Yet this does not mean that valuation analyses are a fruitless exercise – far from it. For an investor trying to achieve a multiyear goal (e.g., accumulating a certain amount of capital in advance of retirement, and later trying to preserve the real value of that capital as one generates income from it), avoiding large downside losses is mathematically more important than reaching for the last few basis points of return. Investors who use valuation analyses to help them limit downside risk when an asset class appears to be substantially overvalued can substantially increase the probability that they will achieve their long term goals. This is the painful lesson learned by too many investors in the 2001 tech stock crash, and then learned again in the 2007-2008 crash of multiple asset classes.

We also believe that the use of a consistent quantitative approach to assessing fundamental asset class valuation helps to overcome normal human tendencies towards over-optimism, overconfidence, wishful thinking, and other biases that can cause investors to make decisions they later regret. Finally, we stress that our monthly market valuation update is only a snapshot in time, and says nothing about whether apparent over and undervaluations will in the future become more extreme before they inevitably reverse. That said, when momentum is strong and quickly

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moving prices far away from their fundamental values, it is usually a good indication a turning point is near.

### Equity Markets

In the case of an equity market, we define the future supply of returns to be equal to the current dividend yield plus the rate at which dividends are expected to grow in the future. We define the return investors demand as the current yield on real return government bonds plus an equity market risk premium. While this approach emphasizes fundamental valuation, it does have an implied linkage to the investor behavior factors that also affect valuations. On the supply side of our framework, investors under the influence of fear or euphoria (or social pressure) can deflate or inflate the long-term real growth rate we use in our analysis. Similarly, fearful investors will add an uncertainty premium to our long-term risk premium, while euphoric investors will subtract an “overconfidence discount.” As you can see, euphoric investors will overestimate long-term growth, underestimate long-term risk, and consequently drive prices higher than warranted. In our framework, this depresses the dividend yield, and will cause stocks to appear overvalued. The opposite happens under conditions of intense fear. To put it differently, in our framework, it is investor behavior and overreaction that drive valuations away from the levels warranted by the fundamentals. As described in our November 2008 article “Are Emerging Market Equities Undervalued?”, people can and do disagree about the “right” values for the variables we use in our fundamental analysis. Recognizing this, we present four valuation scenarios for an equity market, based on different values for three key variables. First, we use both the current dividend yield and the dividend yield adjusted upward by .50% to reflect share repurchases. Second, we define future dividend growth to be equal to the long-term rate of total (multifactor) productivity growth. For this variable, we use two different values, 1% or 2%. Third, we also use two different values for the equity risk premium required by investors: 2.5% and 4.0%. Different combinations of all these variables yield high and low scenarios for both the future

returns the market is expected to supply (dividend yield plus growth rate), and the future returns investors will demand (real bond yield plus equity risk premium). We then use the dividend discount model to combine these scenarios, to produce four different views of whether an equity market is over, under, or fairly valued today. The specific formula is  $(\text{Current Dividend Yield} \times 100) \times (1 + \text{Forecast Productivity Growth})$  divided by  $(\text{Current Yield on Real Return Bonds} + \text{Equity Risk Premium} - \text{Forecast Productivity Growth})$ . Our valuation estimates are shown in the following tables, where a value greater than 100% implies overvaluation, and less than 100% implies undervaluation. In our view, the greater the number of scenarios that point to overvaluation or undervaluation, the greater the probability that is likely to be the case.

*Equity Market Valuation Analysis at 31May10*

<i>Australia</i>	<b>Low Demanded Return</b>	<b>High Demanded Return</b>
<b>High Supplied Return</b>	68%	100%
<b>Low Supplied Return</b>	101%	137%

<i>Canada</i>	<b>Low Demanded Return</b>	<b>High Demanded Return</b>
<b>High Supplied Return</b>	67%	119%
<b>Low Supplied Return</b>	125%	189%

<i>Eurozone</i>	<b>Low Demanded Return</b>	<b>High Demanded Return</b>
<b>High Supplied Return</b>	42%	76%
<b>Low Supplied Return</b>	74%	113%

<i>Japan</i>	<b>Low Demanded Return</b>	<b>High Demanded Return</b>
<b>High Supplied Return</b>	90%	148%
<b>Low Supplied Return</b>	163%	237%

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<i>United Kingdom</i>	<b>Low Demanded Return</b>	<b>High Demanded Return</b>
<b>High Supplied Return</b>	28%	64%
<b>Low Supplied Return</b>	60%	101%

<i>United States</i>	<b>Low Demanded Return</b>	<b>High Demanded Return</b>
<b>High Supplied Return</b>	76%	137%
<b>Low Supplied Return</b>	149%	227%

<i>Switzerland</i>	<b>Low Demanded Return</b>	<b>High Demanded Return</b>
<b>High Supplied Return</b>	61%	105%
<b>Low Supplied Return</b>	107%	236%

<i>India</i>	<b>Low Demanded Return</b>	<b>High Demanded Return</b>
<b>High Supplied Return</b>	67%	164%
<b>Low Supplied Return</b>	200%	347%

<i>Emerging Markets</i>	<b>Low Demanded Return</b>	<b>High Demanded Return</b>
<b>High Supplied Return</b>	86%	177%
<b>Low Supplied Return</b>	127%	219%

In our view, the key point to keep in mind with respect to equity market valuations is the level of the current dividend yield (or, more broadly, the yield of dividends and buybacks), which history has shown to be the key driver of long-term real equity returns in most markets. The rise in uncertainty that accompanied the 2007-2008 crisis undoubtedly increased many investors' required risk and uncertainty premium above the long-term average, while simultaneously decreasing their long-term real growth forecasts. The net result was a fall in equity prices that caused dividend yields to increase. From the perspective of an investor with long-term risk and growth



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assumptions in the range we use in our model, in some regions this increase in dividend yields more than offset the simultaneous rise in real bond yields, and caused the equity market to become undervalued (using our long-term valuation assumptions). On the other hand, in a still weak economy, many companies have been cutting dividends at a pace not seen since the 1930s. Hence the numerator of our dividend/yield calculation may well further decline in the months ahead, which, all else being equal, should further depress prices.

Despite this, the months since March 2009 have seen a very strong rally develop in many equity markets, which, in some cases, has caused our valuation estimates to rise into the “overvalued” region. Given the absence of progress in reducing the three main obstacles that block a return to sustainable economic growth (see our recent Economic Updates), we believe that these rallies reflect investor herding, rather than any improvement in the underlying fundamentals. In turn, we strongly suspect that the root causes of this herding phenomenon, which appears to have strengthened in recent years, lie in a combination of the rising percentage of assets (and even higher percentage of trading) accounted for by delegated asset managers (rather than the investors who own the assets being traded), the incentive structure faced by these delegated managers (e.g., 2 and 20 on this years returns), and the rise of algorithmic trading.

### *Real Return Bonds*

Let us now move on to a closer look at the current level of real interest rates. In keeping with our basic approach, we will start by looking at the theoretical basis for determining the rate of return an investor should demand in exchange for making a one-year risk free investment. The so-called Ramsey equation tells us that this should be a function of a number of variables. The first is our “time preference”, or the rate at which we trade-off a unit of consumption in the future for one today, assuming no growth in the amount of goods and services produced by the economy. The correct value for this parameter is the subject of much debate. For example, this lies at the

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heart of the debate over how much we should be willing to spend today to limit the worst effects of climate change in the future. In our analysis, we assume the long-term average time preference rate is two percent per year.

However, it is not the case that the economy does not grow; hence, the risk free rate we require also should reflect the fact that there will be more goods and services available in the future than there are today. Assuming investors try to smooth their consumption over time, the risk free rate should also contain a term that takes the growth rate of the economy into account. Broadly speaking, this growth rate is a function of the increase in the labor supply and the increase in labor productivity. However, the latter comes from both growth in the amount of capital per worker and from growth in “total factor productivity”, which is due to a range of factors, including better organization, technology and education. Since capital/worker cannot be increased without limit, over the long-run it is growth in total factor productivity that ultimately drives the increase in productivity. Hence, in our analysis, we assume that future economic growth reflects the growth in the labor force and TFP.

Unfortunately, future economic growth is not guaranteed; there is an element of uncertainty involved. Therefore we also need to take investors’ aversion to risk and uncertainty into account when estimating the risk free rate of return they should require in exchange for letting others use their capital for one year. There are many ways to measure this, and unsurprisingly, many people disagree on the right approach to use. In our analysis, we have used Constant Relative Risk Aversion with an average value of three (see “How Risk Averse are Fund Managers?” by Thomas Flavin). The following table brings all these factors together to determine our estimate of the risk free rate investors in different currency zones should logically demand in equilibrium (for an excellent discussion of the issues noted above, and their practical importance, see “The Stern Review of the Economics of Climate Change” by Martin Weitzman):

Region	Labor Force Growth %	TFP Growth %	Steady State Econ Growth %	Std Dev of Econ Growth Rate %	Time Preference %	Risk Aversion Factor	Risk Free Rate Demanded*
Australia	1.0	1.20	2.2	1.1	1.0	3.0	2.2
Canada	0.8	1.00	1.8	0.9	1.0	3.0	2.8
Eurozone	0.4	1.20	1.6	0.8	1.0	3.0	2.9
Japan	-0.3	1.20	0.9	0.5	1.0	3.0	2.8
United Kingdom	0.5	1.20	1.7	0.9	1.0	3.0	2.8
United States	0.8	1.20	2.0	1.0	1.0	3.0	2.5

- The risk free rate equals time preference plus (risk aversion times growth) less (.5 times risk aversion squared times the standard deviation of growth squared).

The next table compares this long-term equilibrium real risk free rate with the real risk free return that is currently supplied in the market. Negative spreads indicate that real return bonds are currently overvalued, as their prices must fall in order for their yields (i.e., the returns they supply) to rise. The valuation is based on a comparison of the present values of ten year zero coupon bonds offering the rate demanded and the rate supplied, as of **31 May 10**:

Region	Risk Free Rate Demanded	Actual Risk Free Rate Supplied	Difference	Overvaluation (>100) or Undervaluation (<100)
Australia	2.2	2.7	0.5	95
Canada	2.8	1.4	-1.4	114
Eurozone	2.9	1.3	-1.6	117
Japan	2.8	1.8	-1.0	110
United Kingdom	2.8	0.7	-2.2	124
United States	2.5	1.4	-1.1	112

Note that in this analysis we have conservatively used 1%, rather than our normal 2%, as the rate of time preference. This is consistent with recent research findings that as investors' sense of uncertainty increases, they typically reduce their time preference

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discount rate – that is, they become less impatient to consume, and more willing to save (see, for example, “Uncertainty Breeds Decreasing Impatience” by Epper, Fehr-Duda, and Bruhin). Given our conservative time preference assumption, it is interesting to speculate what accounts for the current situation in which yields on real return bonds are significantly lower than what our model would suggest. Logically, answer must lie in some combination of reduced expectations for future economic growth, higher variability of future economic growth rates, and/or higher average levels of risk aversion.

Finally, we also recognize that certain structural factors can also affect the pricing (and therefore yields) of real return bonds. For example, some have argued that in the U.K., the large number of pension plans with liabilities tied to inflation has created a permanent imbalance in the market for index-linked gilts, causing their returns to be well below those that models (such as ours) suggest should prevail. A similar set of conditions may be developing in the United States, particularly as demand for inflation hedging assets increases. Finally, valuation of real return bonds is further complicated by deflation, which affects different instruments in different ways. For example, US TIPS and French OATi adjust for inflation by changing the principal (capital) value of the bond. However, they also contain a provision that the redemption value of the bond will not fall below its face value; hence, a prolonged period of deflation could produce significant real capital gains (this is known as the “deflation put”). In light of these considerations, we have a neutral view on the valuation of real return bonds in all currency zones.

### Government Bond Markets

Our government bond market valuation update is based on the same supply and demand methodology we use for our equity market valuation update. In this case, the supply of future fixed income returns is equal to the current nominal yield on ten-year government bonds. The demand for future returns is equal to the current real bond yield plus historical average inflation between 1989 and 2003. We use the latter

as a proxy for the average rate of inflation likely to prevail over a long period of time. To estimate of the degree of over or undervaluation for a bond market, we use the rate of return supplied and the rate of return demanded to calculate the present values of a ten year zero coupon government bond, and then compare them. If the rate supplied is higher than the rate demanded, the market will appear to be undervalued. This information is contained in the following table:

*Bond Market Analysis as of 31 May 10*

	<b>Current Real Rate*</b>	<b>Average Inflation Premium (89-03)</b>	<b>Required Nominal Return</b>	<b>Nominal Return Supplied (10 year Govt)</b>	<b>Yield Gap</b>	<b>Asset Class Over or (Under) Valuation based on 10 year zero</b>	<b>Implied Annual Inflation Rate over 10 year time horizon = <math>(1+Nom)/(1+Real)-1</math></b>
Australia	2.67%	2.96%	5.63%	5.39%	-0.24%	<b>2.30%</b>	2.65%
Canada	1.40%	2.40%	3.80%	3.32%	-0.48%	<b>4.76%</b>	1.89%
Eurozone	1.33%	2.37%	3.70%	2.66%	-1.04%	<b>10.61%</b>	1.31%
Japan	1.78%	0.77%	2.55%	1.27%	-1.28%	<b>13.42%</b>	-0.50%
UK	0.68%	3.17%	3.85%	3.57%	-0.28%	<b>2.72%</b>	2.87%
USA	1.37%	2.93%	4.30%	3.30%	-1.00%	<b>10.06%</b>	1.91%
Switz.	1.54%	2.03%	3.57%	1.57%	-2.00%	<b>21.51%</b>	0.03%
India	1.54%	7.57%	9.11%	7.80%	-1.31%	<b>12.84%</b>	6.16%

\*For Switzerland and India, we use the average of real rates in other regions with real return bond markets

It is important to note some important limitations of this analysis. Our bond market analysis uses historical inflation as an estimate of expected future inflation over the long-term. This may not produce an accurate valuation estimate, if the historical average level of inflation is not a good predictor of future average inflation levels. This risk is especially acute today, when the world economy is operating in uncharted waters, and faces both deflationary pressures (from falling demand relative to productive capacity, and significant debt servicing problems in the private sector) and

inflationary pressures (from unprecedented peacetime government deficits, that are largely being financed by central banks under the “quantitative easing” programs). Under these circumstances, one could argue that many nominal return government bonds might in fact be underpriced today, over a shorter time horizon (more likely to experience deflation), while overpriced over a longer time horizon (that is more likely to see higher levels of inflation). As we like to point out, in the absence of public policy interventions, overindebtedness on the part of private borrowers typically results in widespread bankruptcies and deflation caused by the accelerating liquidation of collateral. In contrast, overindebtedness on the part of governments more often results in some combination of inflation and exchange rate depreciation (e.g., look at the history of Argentina, which we know all too well).

The following two pieces of information may help your to put the current situation in perspective. The last column of the table above shows the average annual inflation rate implied by the current spread between ten-year nominal rates and average real rates (note that research has shown that the real yield curve tends to be quite flat, which is consistent with economic theory). As you can see, apart from Japan and India, government bond markets do not appear to be incorporating either deflation or levels of inflation substantially above historical norms. This is not consistent with our view of how the future is likely to unfold. On the one hand, this may be due to wishful thinking by some investors. On the other hand, it may reflect efforts by central banks to maintain interest rates at a constant level, to maximize the impact of fiscal stimulus programs on aggregate demand.

The second piece of information that can help to put our government bond valuation analysis into a larger context is presented in the following table. It shows historical average inflation rates (and their standard deviations) for the U.K. and U.S. over very long periods of time:

	<i>U.K.</i>	<i>U.S.</i>
<i>Avg. Inflation, 1775-2007</i>	<i>2.19%</i>	<i>1.62%</i>
Standard Deviation	6.60%	6.51%
<i>Avg. Inflation, 1908-2007</i>	<i>4.61%</i>	<i>3.29%</i>

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	<i>U.K.</i>	<i>U.S.</i>
Standard Deviation	6.24%	5.03%
<i>Avg. Inflation, 1958-2007</i>	<i>5.98%</i>	<i>4.11%</i>
Standard Deviation	5.01%	2.84%

Assuming inflation levels revert to their long-term averages over a long time horizon, many government bond markets appear overpriced today (i.e., prevailing nominal yields appear to be too low). However, over a short-term time horizon, it may well be the case that many countries will first experience declining prices (deflation) before they experience a substantial rise in inflation. From this perspective, government bonds may be underpriced over the expected time horizon for deflation, but overpriced in the context of the substantial reflations that governments will eventually attempt (given that the economic consequences of deflation seem to be much worse than those associated with higher than normal inflation). In sum, when it comes to questions about bond market valuation, one's time horizon assumption is critical.

### *Credit Spreads*

Let us now turn to the subject of the valuation of non-government bonds. Some have suggested that it is useful to decompose the bond yield spread into two parts. The first is the difference between the yield on AAA rated bonds and the yield on the ten year Treasury bond. Because default risk on AAA rated companies is very low, this spread primarily reflects prevailing liquidity and jump (regime shift) risk conditions (e.g., between a low volatility, relatively high return regime, and a high volatility, lower return regime). The second is the difference between BAA and AAA rated bonds, which tells us more about the level of compensation required by investors for bearing relatively high quality credit risk. Research has also shown that credit spreads on longer maturity intermediate risk bonds has predictive power for future economic demand growth, with a rise in spreads signaling a future fall in demand (see "Credit Market Shocks and Economic Fluctuations" by Gilchrist, Yankov, and Zakrajsek).



The following table shows the statistics of the distribution of these spreads between January, 1986 and December, 2008 (based on daily Federal Reserve data – 11,642 data points). Particularly in the case of the BAA spread, it is clear we are not dealing with a normal distribution!

	AAA – 10 Year Treasury	BAA-AAA
Average	1.20%	.94%
Standard Deviation	.44%	.34%
Skewness	.92	3.11
Kurtosis	.53	17.80

At **31 May 10**, the AAA minus 10 year Treasury spread was 1.71%. The AAA minus BAA spread was 1.19%. Both represent a significant increase over levels that have prevailed in recent months. Since the distributions of AAA and BAA credit spreads are not normal (i.e., they do not have a “bell curve” shape), we need to look at history rather than Gaussian (normal curve) statistics to put them into perspective. Over the past twenty-three years, there have been only 775 days with a higher AAA spread (6.7% of all days) and 1,083 days with a higher BAA spread (9.3% of all days in our sample). These are significant changes from the previous months – credit spreads have substantially widened, signaling growing investor concern about what lies ahead for the economy and for many overleveraged households, businesses, banks and governments. Moreover, the fact that both the AAA and BAA spreads have widened indicates that investors are concerned about a worsening of both liquidity and credit conditions.

Over a longer-term time horizon, when liquidity and credit risk premiums would be expected to return to their historical averages, one can argue that credit is underpriced today, given high prevailing yields. However, the validity of that conclusion also critically depends on one’s assumptions about future default rates and loss rates conditional upon default. A decision to buy 50,000 in bonds at what appears to be a very attractive yield from a long-term perspective can still generate negative

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total returns if the future default rate (and losses conditional upon default) more than wipes out the apparently attractive extra yield. And since the differences between current AAA and BBB spreads and their long-term averages (1.20% and .94%, respectively) are well under 100 basis points today, it doesn't take much mis-estimation of future default rates (and losses conditional on default) to turn today's apparently good decision into tomorrow's painful outcome. And the "historically attractive yields" argument gets (non-linearly) less convincing the further down the credit ratings ladder you go. On balance, we think that even on a long-term view, credit likely overpriced today, given the increasingly uncertain economic outlook and difficulty in accurately estimating future default and loss given default rates.

### Currencies

Let us now turn to currency prices and valuations. For an investor contemplating the purchase of foreign bonds or equities, the expected future annual percentage change in the exchange rate is also important. Study after study has shown that there is no reliable way to forecast this, particularly in the short term. At best, you can make an estimate that is justified in theory, knowing that in practice it will not turn out to be accurate, especially over short periods of time (for a logical approach to forecasting equilibrium exchange rates over longer horizons, see "2009 Estimates of Fundamental Equilibrium Exchange Rates" by Cline and Williamson).

In our case, we have taken the difference between the yields on ten-year government bonds as our estimate of the likely future annual change in exchange rates between two regions. According to theory, the currency with the relatively higher interest rates should depreciate versus the currency with the lower interest rates. Of course, in the short term this often doesn't happen, which is the premise of the popular hedge fund "carry trade" strategy of borrowing in low interest rate currencies, investing in high interest rate currencies, and, essentially, betting that the change in exchange rates over the holding period for the trade won't eliminate the potential profit. Because (as noted in our June 2007 issue) there are some important players in the foreign

exchange markets who are not profit maximizers, carry trades are often profitable, at least over short time horizons (for an excellent analysis of the sources of carry trade profits – of which 25% may represent a so-called “disaster risk premium”, see “Crash Risk in Currency Markets” by Farhi, Frailberger, Gabaix, Ranciere and Verdelhan). Our expected medium to long-term changes in exchange rates are summarized in the following table:

*Annual Exchange Rate Changes Implied by Bond Market Yields on 31 May 10*

	To AUD	To CAD	To EUR	To JPY	To GBP	To USD	To CHF	To INR
From								
<b>AUD</b>	0.00%	-2.07%	-2.73%	-4.12%	-1.82%	-2.09%	-3.82%	2.41%
<b>CAD</b>	2.07%	0.00%	-0.66%	-2.05%	0.25%	-0.02%	-1.75%	4.48%
<b>EUR</b>	2.73%	0.66%	0.00%	-1.39%	0.91%	0.64%	-1.09%	5.14%
<b>JPY</b>	4.12%	2.05%	1.39%	0.00%	2.30%	2.03%	0.30%	6.53%
<b>GBP</b>	1.82%	-0.25%	-0.91%	-2.30%	0.00%	-0.27%	-2.00%	4.23%
<b>USD</b>	2.09%	0.02%	-0.64%	-2.03%	0.27%	0.00%	-1.73%	4.50%
<b>CHF</b>	3.82%	1.75%	1.09%	-0.30%	2.00%	1.73%	0.00%	6.23%
<b>INR</b>	-2.41%	-4.48%	-5.14%	-6.53%	-4.23%	-4.50%	-6.23%	0.00%

Commercial Property

Our approach to valuing commercial property securities as an asset class is also based on the expected supply of and demand for returns, utilizing the same mix of fundamental and investor behavior factors we use in our approach to equity valuation. Similar to equities, the supply of returns equals the current dividend yield on an index covering publicly traded commercial property securities, plus the expected real growth rate of net operating income (NOI). A number of studies have found that real NOI growth has been basically flat over long periods of time (with apartments showing the strongest rates of real growth). This is in line with what economic theory predicts, with increases in real rent lead to an increase in property supply, which eventually causes real rents to fall. However, it is entirely possible – as we have seen

in recent months – that rents can fall sharply over the short term during an economic downturn.

Our analysis also assumes that over the long-term, investors require a 3.0% risk premium above the yield on real return bonds as compensation for bearing the risk of securitized commercial property as an asset class. Last but not least, there is significant research evidence that commercial property markets are frequently out of equilibrium, due to slow adjustment processes as well as the interaction between fundamental factors and investors' emotions (see, for example, "Investor Rationality: An Analysis of NCREIF Commercial Property Data" by Hendershott and MacGregor; "Real Estate Market Fundamentals and Asset Pricing" by Sivitanides, Torto, and Wheaton; "Expected Returns and Expected Growth in Rents of Commercial Real Estate" by Plazzi, Torous, and Valkanov; and "Commercial Real Estate Valuation: Fundamentals versus Investor Sentiment" by Clayton, Ling, and Naranjo). Hence, it is extremely hard to forecast how long it will take for any over or undervaluations we identify to be reversed. The following table shows the results of our valuation analysis as of **31 May 10**: We use the dividend discount model approach to produce our estimate of whether a property market is over, under, or fairly priced today, assuming a long-term perspective on property market valuation drivers. The specific formula is  $(\text{Current Dividend Yield} \times 100) \times (1 + \text{Forecast NOI Growth})$  divided by  $(\text{Current Yield on Real Return Bonds} + \text{Property Risk Premium} - \text{Forecast NOI Growth})$ . Our estimates are shown in the following tables, where a value greater than 100% implies overpricing, and less than 100% implies underpricing.

Country	Dividend Yield	Plus LT Real Growth Rate	Equals Supply of Returns	Real Bond Yield	Plus LT Comm Prop Risk Premium	Equals Returns Demanded	Over or Undervaluation (100% = Fair Value)
Australia	5.9%	0.2%	6.1%	2.7%	3.0%	5.7%	92%
Canada	4.9%	0.2%	5.1%	1.4%	3.0%	4.4%	85%
Eurozone	5.9%	0.2%	6.1%	1.3%	3.0%	4.3%	70%
Japan	9.3%	0.2%	9.5%	1.8%	3.0%	4.8%	49%
Switzerland*	3.3%	0.2%	3.5%	1.5%	3.0%	4.5%	132%
U.K.	5.2%	0.2%	5.4%	0.7%	3.0%	3.7%	67%
U.S.A.	4.4%	0.2%	4.6%	1.4%	3.0%	4.4%	95%

*\*Using the current dividend yield, the valuation of the Swiss property market appears to be significantly out of line with the others. Hence, our analysis is based on the estimated income yield on directly owned commercial property in Switzerland instead of the dividend yield on publicly traded property securities.*

As you can see, on a long-term view, a number of commercial property markets still look underpriced today, despite the sharp recent increase in property share prices in many countries. Over the next twelve months, however, we believe the balance of risks points in the other direction. Consumer spending remains weak in many markets, occupancy rates are declining, rents are stagnant at best, and landlords continue to struggle with debt refinancings (indeed, the press is full of stories about the declining quality of commercial mortgage backed securities). It is hard to see how government fiscal stimulus, strong though it is, will improve this situation very much, as long as the underlying problems – high consumer leverage, a weak financial system, and continuing international imbalances – remain unresolved. Moreover, the development of real return bond and commodity markets has weakened, to some extent, property's traditional attraction as an inflation hedge. While these factors tend to weaken support for property prices, we also recognize that, at least in some markets, they can be offset by property's historical attraction as a means of preserving wealth in very difficult times. In sum, we believe that the sharp run up in property security prices in recent months is due to some combination of investor over-optimism about the speed and size of economic recovery, and/or the tendency of institutional investors to herd rather than risk losing assets (or their jobs) due to their underperforming an asset class benchmark. Switzerland and the Eurozone may be exceptions to this view, in that rising uncertainty may have triggered rising demand for property in these markets.

### Commodities

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Let us now turn to the Dow Jones AIG Commodity Index (now known as the DJ UBS Commodity Index), our preferred benchmark for this asset class because of the roughly equal weights it gives to energy, metals and agricultural products. One of our core assumptions is that financial markets function as a complex adaptive system which, while attracted to equilibrium (which generates mean reversion) are seldom in it. To put it differently, we believe that investors' expectations for the returns an asset class is expected to supply in the future are rarely equal to the returns a rational long-term investor should logically demand. Hence, rather than being exceptions, varying degrees of over and under pricing are simply a financial fact of life. We express the demand for returns from an asset class as the current yield on real return government bonds (ideally of intermediate duration) plus an appropriate risk premium. While the former can be observed, the latter is usually the subject of disagreement. In determining the risk premium to use, we try to balance a variety of inputs, including historical realized premiums (which may differ considerably from those that were expected, due to unforeseen events), survey data and academic theory (e.g., assets that payoff in inflationary and deflationary states should command a lower risk premium than those whose payoffs are highest in "normal" periods of steady growth and modest changes in the price level). In the case of commodities, Gorton and Rouwenhorst (in their papers "Facts and Fantasies About Commodity Futures" and "A Note on Erb and Harvey") have shown that (1) commodity index futures provide a good hedge against unexpected inflation; (2) they also tend to hedge business cycle risk, as the peaks and troughs of their returns tend to lag behind those on equities (i.e., equity returns are leading indicators, while commodity returns are coincident indicators of the state of the real business cycle); and (3) the realized premium over real bond yields has historically been on the order of four percent. We are inclined to use a lower ex-ante risk premium in our analysis (though reasonable people can still differ about what it should be), because of the hedging benefits commodities provide relative to equities. This is consistent with the history of equities, where realized ex-post premiums have been shown to be larger than the ex-ante premiums investors should logically have expected.

The general form of the supply of returns an asset class is expected to generate in the future is its current yield (e.g., the dividend yield on equities), plus the rate at which this stream of income is expected to grow in the future. The key challenge with applying this framework to commodities is that the supply of commodity returns doesn't obviously fit into this framework. Broadly speaking, the supply of returns from an investment in commodity index futures comes from four sources. First, since commodity futures contracts can be purchased for less than their face value (though the full value has to be delivered if the contract is held to maturity), a commodity fund manager doesn't have to spend the full \$100 raised from investors to purchase \$100 of futures contracts. The difference is invested – usually in government bonds – to produce a return.

The second source of the return on a long-only commodity index fund is the so-called “roll yield.” Operationally, a commodity index fund buys futures contracts in the most liquid part of the market, which is usually limited to the near term. As these contracts near their expiration date, they are sold and replaced with new futures contracts. For example, a fund might buy contracts maturing in two or three months, and sell them when they approached maturity. The “roll yield” refers to the gains and losses realized by the fund on these sales. If spot prices (i.e., the price to buy the physical commodity today, towards which futures prices will move as they draw closer to expiration) are higher than two or three-month futures, the fund will be selling high and buying low, and thus earning a positive roll yield. When a futures market is in this condition, it is said to be in “backwardation.” On the other hand, if the spot price is lower than the two or three month's futures price, the market is said to be in “contango” and the roll yield will be negative (i.e., the fund will sell low and buy high). The interesting issue is what causes a commodity to be either backwardated or contangoed. A number of theories have been offered to explain this phenomenon. The one that seems to have accumulated the most supporting evidence to date is the so-called “Theory of Storage”: begins with the observation that, all else being equal, contango should be the normal state of affairs, since a person buying a commodity at spot today and wishing to lock in a profit by selling a futures contract will have to incur



storage and financing costs. In addition to his or her profit margin, storage and financing costs should cause the futures price to be higher than the spot price, and normal roll yields to be negative.

However, in the real world, all things are not equal. For example, some commodities are very difficult or expensive to store; others have very high costs if you run out of them (e.g., because of rapidly rising demand relative to supply, or a potential disruption of supply). For these commodities, there may be a significant option value to holding the physical product (the Theory of Storage refers to this option value as the “convenience yield”). If this option value is sufficiently high, spot prices may be bid up above futures prices, causing “backwardation” and positive roll-yields for commodity index funds. Hence, a key question is the extent to which different commodities within a given commodity index tend to be in backwardation or contango over time. Historically, most commodities have spent time in both states. However, contango has generally been more common, but not equally so for all commodities. For example, oil has spent relatively more time in backwardation, as have copper, sugar, soybean meal and lean hogs. Moreover, because of changing supply and demand conditions in many physical commodity markets (e.g., global demand has been growing, while marginal supplies are more expensive to develop and generally have long lead times), it is not clear that historical tendencies toward backwardation or contango are a good guide to future conditions.

To the extent that any generalizations can be made, higher real option values, and hence backwardation and positive roll returns are more likely to be found when demand is strong and supplies are tight, and/or when there is a rising probability of a supply disruption in a commodity where storage is difficult. For example, ten commodities make up roughly 75% of the value of the Dow Jones AIG Commodities Index. The current term structures of their futures curves are as follows on **31 May 10**:

<b>Commodity</b>	<b>DJAIG Weight</b>	<b>Current Status</b>
Crude Oil	13.8%	Contango
Natural Gas	11.9%	Contango
Gold	7.9%	Contango
Soybeans	7.6%	Backwardated

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<b>Commodity</b>	<b>DJAIG Weight</b>	<b>Current Status</b>
Copper	7.3%	Contango
Aluminum	7.0%	Contango
Corn	5.7%	Contango
Wheat	4.8%	Contango
Live Cattle	4.3%	Backwardated
Unleaded Gasoline	3.7%	Contango
	<i>74.0%</i>	

However (and this is a critical however), this Theory of Storage analysis assumes that there is no change in the relative supply of investors willing to purchase futures contracts sold by commodity producers. This assumption has been violated in recent years, which have seen a dramatic increase in the amount of investment committed to long-only commodity futures based index funds. Some observers have argued that this increase in demand for commodity futures has overwhelmed any changes that have taken place on the supply side that are driven by the Theory of Storage. They conclude that this has resulted in a permanent change in the structure of many commodity futures markets that has made contangoed conditions, and hence negative roll returns, much more likely. We are persuaded of the logic of this argument, which is why in our model portfolios we now use products (e.g., the ETF LSC), that can take both long and short positions in commodity futures, based on market supply and demand conditions as evaluated by an algorithm (technically, this produces an index that the fund tracks; however, for all intents and purposes, these are active quantitative strategies).

Given the continued presence of so many contangoed futures curves, expected near term roll returns on the DJAIG as a whole are still negative, absent major supply side shocks. On a weighted basis (using the DJAIG weights), the forward premium (relative to the spot price) at the end of **May** was 0.74%, compared to 1.14% one month previously, .63% two months ago, and .94% three months ago. Remember, a forward premium means the roll return will be negative (because the futures investor will be selling the maturing contract at a lower price than he or she must pay to replace it with a longer-dated contract). Roll returns are positive only when there is a forward

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discount (when the average price of a futures contract with a long maturity is lower than the price of a contract with a very short maturity).

This brings us to the third source of return for long-only commodity futures funds: unexpected changes in the price of the commodity during the term of the futures contract. It is important to stress that the market's prevailing consensus about the expected change in the spot price is already included in the futures price that is paid when the contract is purchased. The source of return we are referring to here is the portion of the final realized price change that was unexpected when the futures contract was purchased. Given the large increase in funds committed to long-only, commodity futures based index investments, unexpected price changes have become a much more important source of return than they have been in the past. The good news is that this return driver probably offers skilled active investors the best chance of making profitable forecasts, since most human beings find it extremely difficult to accurately understand situations where cause and effect are significantly separated in time (e.g., failure to recognize how fast rising house prices would – albeit with a time delay – trigger an enormous increase in new supply). In this regard, large price surprises seem to be more frequent when supply and demand for a commodity are finely balanced – the same conditions which can also give rise to changes in real option values and positive roll returns, under the Theory of Storage. However, given our economic outlook, at this point in time we view negative surprises on the demand side that depress commodity prices as more likely than demand or supply surprises that have the opposite effect. Put differently, on balance we expect price surprises to have a negative impact on commodity returns over the next year.

The fourth source of returns for a diversified commodity index fund is generated by rebalancing a funds portfolio of futures contracts back to their target commodity weightings as prices change over time. This is analogous to an equity index having a more attractive risk/return profile than many individual stocks. This rebalancing return will be higher to the extent that price volatilities are high, and the correlations of price changes across commodities are low. Historically, this rebalancing return has been estimated to be around 2% per year, for an equally weighted portfolio of different

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commodities. However, as correlations have risen in recent years, the size of this return driver has probably declined – say to 1% per year.

So, to sum up, the expected supply of returns from a commodity index fund over a given period of time equals (1) the current yield on real return bonds, reduced by the percentage of funds used to purchase the futures contracts; (2) expected roll yields, adjusted for commodities' respective weights in the index; (3) unexpected spot price changes; and (4) the expected rebalancing return. Of these, the yield on real return bonds can be observed, and we can conservatively assume a long-term rebalancing return of, for example, 1.0%. These two sources of return are clearly less than the demand for returns that are equal to the real rate plus a risk premium of, say, 3.0%. The difference must be made up by a combination of roll returns (which, given the current shape of futures curves, are likely to be negative in the near term) and unexpected price changes, due to unanticipated changes in demand (where downside surprises currently seem more likely than upside surprises) and/or unanticipated changes in supply conditions (e.g., incomplete investor recognition of slowing oil production from large reservoirs, a major disruption due to war/terrorism or a significant accident, discovery of significant new deposits, or a major breakthrough that makes biofuels much more cost competitive). On balance, we believe that returns on many commodity futures are more likely to be negative over the next year than positive; hence, using this analytical framework we conclude that commodities are likely overpriced today, using a one-year time horizon.

Another approach to assessing the valuation of commodities as an asset class is to compare the current value of the DJAIG Index to its long-term average. Between 1991 and 2008, the inflation adjusted (i.e., real) DJAIG had an average value of 91.61, with a standard deviation of 16.0 (skewness of .52, and kurtosis of -.13 – i.e., it was close to normal). The inflation adjusted **31 May 10** closing value of 78.61 was an estimated .78 standard deviations below the long term average. Assuming the value of the index is normally distributed around its historical average (which in this case is approximately correct), a value within one standard deviation of the average should occur about 67% of the time, and a value within two standard deviations 95% of the

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time. Whether the current level of the inflation adjusted DJAIG signifies that commodities are undervalued depends upon the time horizon being used.

There are three arguments that, on a medium term (three to five year) view, commodities are underpriced today. The first is the large amount of monetary easing underway in the world, which, at some point, could lead to higher inflation. The second is the equally large amount of fiscal stimulus being applied to the global economy, with its focus on infrastructure projects, should eventually boost demand for commodities (and indirectly boost economic growth in commodity exporting countries like Australia and Canada). The third is that the possibility that we will see a substantial fall in the value of the US Dollar versus other currencies, causing investors to increase their holdings of commodities as confidence in fiat currencies wanes. The argument that commodities are overpriced today on a medium term view is based on the belief that (a) investment in clean fuels and other changes in environmental regulation will cause a permanent reduction in global demand for oil relative to supply; (b) the inability to quickly resolve the economic challenges facing the world economy will result in a prolonged period of weak or no growth (including a major slowdown in Chinese growth), which will reduce the demand for commodities; and (c) that in scenario of prolonged global stagnation, investors will prefer to increase their holdings of short term government bonds, and perhaps gold, rather than increasing their holdings of a broader range of commodities. Taking all of these arguments into consideration, the medium term valuation question comes down to the probabilities one attaches to a decline in global demand from today's relatively weak levels (which would cause commodities prices to fall) and the development of a crisis of confidence in the U.S. dollar (which would cause commodities prices to rise). On balance, we believe that the former is more likely than the latter, as the High Uncertainty Regime typically sees a flight into U.S. dollars rather than a flow out of them. On that basis, we conclude that, over a three to five year time horizon, commodities are likely overpriced today.

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## Gold

Gold is extremely difficult to value, because it produces no explicit current income stream (i.e., yield). Its price seems to be driven by a combination of worries about future inflation, and, more powerfully, from uncertainty about the ability of U.S. government securities to provide a stable, liquid store of value in highly uncertain periods. Since investor concerns in both of these areas seem to be increasing, gold prices have been increasing.

Structural changes in financial markets may also be contributing to the rise in gold prices. Moreover, the transmission of increasing investor worries into rising gold prices has been made much easier by the expanding range of gold ETF products that make easier to invest in this commodity. Unfortunately, this has also made it much easier to apply momentum strategies in this asset class, and to facilitate herding and bubbles.

A third, and more quantitative, approach to assessing gold prices was described at length in our January 2010 article on gold as a separate asset class. When the yield on U.S. real return bonds is lower than approximately 2.35%, there tends to be upward pressure on the price of gold; when the yield on U.S. real return bonds is above this level, gold seems to experience downward price pressure. At the end of **May**, the yield on a 10-year USD real return bond was about 1.40%, which implies further upward pressure on gold prices.

Taking all these factors into consideration, we conclude that low yields on real return bonds, rising worries about the safety of U.S. government securities, and changes in the structure of gold markets will, over the next year, probably continue to put upward pressure on gold prices. However, what we cannot say is when gold will become overpriced – and that makes it a very dangerous asset class to include in a portfolio. For that reason, our historical view has been that physical gold coins have an important diversifying role to play in an investor's liquid reserves, but not necessarily in a strategic asset allocation policy.

To some extent, conditions in the gold futures market may provide some indication of what lies ahead. Currently, gold futures are only very slightly contangoed, with a forward premium (based on the price difference between the two nearest month contracts) of only 0.08%. In terms of price surprises, it is worth considering that negative surprises elsewhere in the world (e.g., the Eurozone) are the equivalent of a positive price surprise for U.S. government securities as a (relatively) stable and liquid store of value in highly uncertain times. It is also worth considering that there are strong voices in the United States calling for, if not immediate reductions in the size of the federal government's deficit, than much clearer plans for eventually reducing it, as well as the United States' government debt/GDP ratio. Under these conditions, negative gold price surprises seem more likely than positive gold price surprises, at least in the short-term. Offsetting this, however, is our medium-term uncertainty about the potential impact of herding on gold prices, as well as our uncertainty about fiscal and monetary developments in the United States over the next three years.

### Timber

The underlying diversification logic for investing in timber is quite simple: the key return driver is biological growth, which has essentially no correlation with factors driving returns on other asset classes. That said, the correlation of timber returns with other asset classes should be different from zero, as it also depends on the price of timber products (which depends, in part, on GDP growth) as well as changes in real interest rates and investor behavior – factors affect returns on other asset classes as well as timber.

However, in valuing timber as a global asset class, we face a number of significant challenges. First, the underlying assets are not uniform – they are divided between softwoods and hardwoods, at different stages of maturity, located in different countries, face different supply conditions (e.g., development, harvesting, and environmental regulations and pest risks), and different demand conditions in end-user markets. Second, the majority of investment vehicles containing these assets are



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illiquid limited partnerships, and the few publicly traded timber investment vehicles (e.g., timber REITs) provide insufficient liquidity to serve as the basis for indexed investment products. Finally, the two indexes that attempt to measure returns from timberland investing (the NCREIF Index in North America, and IPD Index in Europe) are regional in coverage and utilize an appraisal based valuation methodology based on timber limited partnerships, which tends to understate the volatility of returns and their correlation with other asset classes. Given these challenges, the result of any valuation estimate for timber as a global asset class must be regarded as, at best, a rough approximation.

Our valuation approach is based on two timber REITs that are traded in the United States: Plum Creek (PCL) and Rayonier (RYN). We chose this approach because both of these REITs are liquid, publicly traded vehicles, and both derive most of their revenues from their timberland operations. This avoids many of the problems created by appraisal-based approaches such as the NCREIF and IPD indexes. That said, for the reasons noted above, this approach is still far from a perfect solution to the asset class valuation problem presented by timber.

As in the case of equities, we compare the returns that a weighted mix of PCL and RYN are expected to supply (defined as their current dividend yield plus the expected growth rate of those dividends) to the equilibrium return investors should rationally demand for holding timber assets (defined as the current yield on real return bonds plus an appropriate risk premium for this asset class). We note that, since PCL and RYN are listed securities, investors should not demand a liquidity premium for holding them, as they would in the case of an investment in a TIMO Limited Partnership (Timber Management Organization). Two of the variables we use in our valuation analysis are readily available: the dividend yields on the timber REITS and the yield on real return bonds. The other two variables, the expected rate of growth and the appropriate risk premium, have to be estimated. The former presents a particularly difficult challenge.

In broad terms, the rate of dividend growth results from the interaction of physical, economic, and regulatory processes. Physically, trees grow, adding a

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certain amount of mass each year. The exact rate depends on the mix of trees (e.g., southern pine grows much faster than northern hardwoods), on silviculture techniques employed (e.g., fertilization, thinning, etc.), and weather and other natural factors (e.g., fires, drought, and beetle invasions). Another aspect of the physical process is that a certain number of trees are harvested each year, and sold to provide revenue to the timber REIT. A third aspect of the physical process is that trees are exposed to certain risks, such as fire, drought, or disease (e.g., the mountain pine beetle in the northwest United States and Canada). And fourth physical process is that, through photosynthesis, trees sequester a portion of the carbon dioxide that would otherwise be added to the earth's atmosphere.

In the economic area, three processes are important. First, as trees grow, they can be harvested to make increasingly valuable products, starting with pulpwood when they are young, and sawtimber when they reach full maturity. This value-increasing process is known as "in-growth." The speed and extent to which in-growth occurs depends on the type of tree; in general, this process produces greater value growth for hardwoods (whose physical growth is slower) than it does for pines and other fast-growing softwoods. At the level of individual timber investments, the rate of in-growth is a key driver of returns; however, at the asset class level, we have decided to assume a constant mix of grades over time. The second economic process (or, more accurately, processes) is the interaction of supply and demand that determines changes in real prices for different types and grades of timber. As is true in the case of commodities, there is likely to be an asymmetry at work with respect to the impact of these processes, with prices reacting more quickly to more visible changes in demand, while changes in supply side factors (which only happen with a significant time delay) are more likely to generate surprises. In North America., a good example of this may be the eventual supply side and price impact of the mountain pine beetle epidemic that has been spreading through the northwestern forests of the United States and Canada. The IMF produces a global timber price index that captures the net impact of demand and supply fluctuations. The average annual change in real prices (derived by adjusting the IMF series for changes in U.S. inflation) between 1981 and 2007 was

0.1% (i.e., average prices over the period remained essentially constant in real terms), but with a significant standard deviation of 9.2% -- i.e., it is normal for real timber prices to be quite volatile from year to year.

The third set of economic processes that affects the growth rate of dividends includes changes in a timber REIT's cost structure, and in its non-timber related revenue streams (e.g., proceeds from selling timber land for real estate development or conservation easements). For example, if wood prices decline, and non-timber sources of revenue dry up (as is happening during the current recession), a timber REIT (or timber LP) will have to either cut operating costs and/or distributions to investors, or increase the physical volume of trees that are harvested.

Regulatory processes also affect the future growth rate for timber REIT dividends. In the past, the most important of these included restrictions on harvesting or land development. In the future, the most important regulatory factor is likely to be the imposition of carbon taxes or a cap and trade systems to limit carbon emissions. These new environmental regulations could provide an additional source of revenue for timber REITs in the future (for an early attempt at establishing the CO2 sequestration value of timberland, see "Economic Valuation of Forest Ecosystem Services" by Chiabai, Traversi, Ding, Markandya and Nunes. For a review of similar studies, see "Estimates of Carbon Mitigation Potential from Agricultural and Forestry Activities" by the U.S. Congressional Research Service).

The following table summarizes the assumptions we make about these physical and economic variables in our valuation model:

<b>Growth Driver</b>	<b>Assumption</b>
Biological growth of trees	We assume 6% as the long term average for a diversified timberland portfolio. We stress that biological growth rates can vary widely for different types of timber investment (with softwoods and timber located in tropical countries delivering the highest growth, and hardwoods and timber in more temperate climates delivering the

Growth Driver	Assumption
	slowest growth rates). We have also changed our valuation model to assume a constant mix of product grades, to present a better approximation for timber as a global asset class.
Harvesting rate	As a long term average, we assume that 5% of tree volume is harvested each year. As a practical matter, this should vary with timber prices and the REITs prevailing dividend level. So 5% is a “noisy” long-term estimate for timber as a global asset class.
Change in prices of timber products	In line with IMF data, we assume that over the long term, average timber prices will just keep pace with inflation. Again, this is a “noisy” estimate, because the IMF data also shows that real prices are highly volatile. Moreover, there are indications that climate change is causing increasing tree deaths in some areas, which should lead to future real price increases (see “Western U.S. Forests Suffer Death by Degrees” by E. Pennisi, <i>Science</i> , 23Jan09). Hence we believe our long-term price change assumption is conservative.
Carbon credits	Until more comprehensive regulations are enacted, we assume no additional return to timberland owners from the CO2 sequestration service they provide (or for timber’s use in various biomass energy applications). Again, given the high level of global concern with limiting the increase in atmospheric CO2 levels, we believe this is a conservative assumption.

This leaves the question of the appropriate return premium that investors should demand to compensate them for bearing the risk of investing in timber as an asset class. Historically, the difference between returns on the NCRIF timberland index and those on real return bonds has averaged around six percent. However, since the timber REITS are much more liquid than the properties included in the

NCRIEF index, and since timber has displayed a very low correlation with returns on other asset classes (particularly during the worst of the 2008 crisis, even in the case of liquid timber vehicles), we use three percent as the required return premium for investing in liquid timberland assets. Arguably, because a portion of timber's return generating process (physical growth) has zero correlation with the return generating processes for other asset classes, we should use an even lower risk premium. Again, we believe our approach is conservative in this regard. Given these assumptions, our assessment of the valuation of the timber asset class at **31 May 10** is shown in the following table. We use the dividend discount model approach to produce our estimate of whether timber is over, under, or fairly valued today. The specific formula is  $(\text{Current Dividend Yield} \times 100) \times (1 + \text{Forecast Dividend Growth})$  divided by  $(\text{Current Yield on Real Return Bonds} + \text{Timber Risk Premium} - \text{Forecast Dividend Growth})$ . A value greater than 100% implies overvaluation, and less than 100% implies undervaluation.

Average Dividend Yield (70% PCL + 30% RYN)	4.65%
Plus Long Term Annual Biological Growth	6.00%
Less Percent of Physical Timber Stock Harvested Each Year	(5.00%)
Plus Long Term Real Annual Price Change	0.00%
Plus Other Sources of Annual Value Increase (e.g., Carbon Credits)	0.00%
Equals Average Annual Real Return Supplied	<b><u>5.65%</u></b>
Real Bond Yield	1.37%
Plus Risk Premium for Timber	3.00%
Equals Average Annual Real Return Demanded	<b><u>4.37%</u></b>
Ratio of Returns Demanded/Returns Supplied Equals Valuation Ratio (less than 100% implies undervaluation)	<b><u>72%</u></b>

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We stress that this is a long-term valuation estimate that contains a higher degree of uncertainty than valuation estimates for larger and more liquid asset classes. Over a one-year time horizon, you could easily reach a different valuation conclusion. For example, if you believe that real timber prices will decline over the next year, and/or that physical harvesting rates will increase to cover costs and dividends, then you could argue that, in so far as PCL and RYN are roughly accurate proxies for the asset class as a whole, timber, as proxied by PCL and RYN, is likely overpriced today. On the other hand, whether looking over a short or long-term time horizon, if you believe that future revenues from timber's CO<sub>2</sub> sequestration service are likely to be significant, and/or that four percent is too high a risk premium to use, then you could argue that timber is likely underpriced today.

In sum, timber valuation is an issue upon which reasonable people can and do disagree, in no small measure because of their different time horizons and the different underlying assumptions and methodologies they use to reach their conclusions. On balance, taking a long-term view, we continue to believe that timberland is likely underpriced today, for three reasons: (1) future revenue growth related to CO<sub>2</sub> sequestration is likely to be significant; (2) the negative impact on timber prices caused by the recession and long-term slowdown in North American housing construction will be moderated or offset by the impact of supply side changes, such as the mountain pine beetle problem, and by rising demand for wood products that will accompany rising incomes in China. On a one-year view, however, we are neutral, with downward timber price risk (due to continuing economic weakness) balanced against the upside potential inherent in pending environmental legislation.

### Volatility

Our approach to assessing the current value of equity market volatility (as measured by the VIX index, which tracks the level of S&P 500 Index volatility implied by the current pricing of put and call options on this index) is similar to our approach to commodities. Between January 2, 1990 and December 30, 2008, the average daily

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value of the VIX Index was 19.70, with a standard deviation of 7.88 (skewness 2.28, kurtosis 9.71 – i.e., a very “non-normal” distribution). On **31 May 10**, the VIX closed at 32.07. To put this in perspective, only 5.2% of the days in our sample had higher closing values of the VIX. In sum, at the end of last month, volatility had returned to a level that we believe is more consistent with the high uncertainty regime that we expect to prevail in global financial markets over the next year. For these reasons as of **31 May 10** we are neutral on the issue of whether volatility is underpriced over overpriced over a one year time horizon. Over a longer-term time horizon, we are also neutral at the current level of volatility. The logic behind this view is that structural changes – such as electronic trading, faster dispersal of information to investors, and the substantial amount of money committed to various quantitative trading strategies -- may well have made equity prices permanently more volatile than they have been in the past.

### **Sector and Style Rotation Watch**

The following table shows a number of classic style and sector rotation strategies that attempt to generate above index returns by correctly forecasting turning points in the economy. This table assumes that active investors are trying to earn high returns by investing today in the styles and sectors that will perform best in the next stage of the economic cycle. The logic behind this is as follows: Theoretically, the fair price of an asset (also known as its fundamental value) is equal to the present value of the future cash flows it is expected to produce, discounted at a rate that reflects their relative riskiness.

Current economic conditions affect the current cash flow an asset produces. Future economic conditions affect future cash flows and discount rates. Because they are more numerous, expected future cash flows have a much bigger impact on the fundamental value of an asset than do current cash flows. Hence, if an investor is attempting to earn a positive return by purchasing today an asset whose value (and price) will increase in the future, he or she needs to accurately forecast the future



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value of that asset. To do this, he or she needs to forecast future economic conditions, and their impact on future cash flows and the future discount rate. Moreover, an investor also needs to do this before the majority of other investors reach the same conclusion about the asset's fair value, and through their buying and selling cause its price to adjust to that level (and eliminate the potential excess return).

We publish this table to make an important point: there is nothing unique about the various rotation strategies we describe, which are widely known by many investors. Rather, whatever active management returns (also known as "alpha") they are able to generate is directly related to how accurately (and consistently) one can forecast the turning points in the economic cycle. Regularly getting this right is beyond the skills of most investors. In other words, most of us are better off just getting our asset allocations right, rather than trying to earn extra returns by accurately forecasting the ups and downs of different sub-segments of the U.S. equity and debt markets (for three good papers on rotation strategies, see "Sector Rotation Over Business Cycles" by Stangl, Jacobsen and Visaltanachoti; "Can Exchange Traded Funds Be Used to Exploit Industry Momentum?" by Swinkels and Tjong-A-Tjoe; and "Mutual Fund Industry Selection and Persistence" by Busse and Tong).

That being said, the highest rolling three month returns in the table do provide us with a rough indication of how investors expect the economy and interest rates to perform in the near future. *The highest returns in a given row indicate that a plurality of investors (as measured by the value of the assets they manage) are anticipating the economic and interest rate conditions noted at the top of the next column* (e.g., if long maturity bonds have the highest year to date returns, a plurality of bond investor opinion expects rates to fall in the near future). Comparing returns across strategies provides a rough indication of the extent of agreement (or disagreement) investors about the most likely upcoming changes in the state of the economy. When the rolling returns on different strategies indicate different conclusions about the most likely direction in which the economy is headed, we place the greatest weight on bond market indicators. Why? We start from a basic difference in the psychology of equity and bond investors. The different risk/return profiles for these two investments

produce a different balance of optimism and pessimism. For equities, the downside is limited (in the case of bankruptcy) to the original value of the investment, while the upside is unlimited. This tends to produce an optimistic view of the world. For bonds, the upside is limited to the contracted rate of interest and getting your original investment back (assuming the bonds are held to maturity). In contrast, the downside is significantly greater – complete loss of principal. This tends to produce a more pessimistic (some might say realistic) view of the world (although some might argue that the growth of the credit derivatives market has undermined this discipline). As we have written many times, investors seeking to achieve a funding goal over a multi-year time horizon, avoiding big downside losses is mathematically more important than reaching for the last few basis points of return. Bond market investors' perspective tends to be more consistent with this view than equity investors' natural optimism. Hence, when our rolling rotation returns table provides conflicting information, we tend to put the most weight on bond investors' implied expectations for what lies ahead. Finally, we note that this table shows a dramatic (negative) change in investor sentiment compared to last month, particularly in the bond market.

### ***Three Month Rolling Nominal Returns on Classic Rotation Strategies in the U.S. Markets***

*Rolling 3 Month  
Returns Through*

**31 May 10**

<b><i>Economy</i></b>	Bottoming	Strengthening	Peaking	Weakening
<b><i>Interest Rates</i></b>	Falling	Bottom	Rising	Peak
<b><i>Style and Size Rotation</i></b>	Small Growth (DSG) <b>4.84%</b>	Small Value (DSV) <b>5.41%</b>	Large Value (ELV) <b>-0.50%</b>	Large Growth (ELG) <b>-1.64%</b>
<b><i>Sector Rotation</i></b>	Cyclicals (RXI) <b>1.82%</b>	Industrials (EXI) <b>-1.27%</b>	Staples (KXI) <b>-4.62%</b>	Utilities (JXI) <b>-6.83%</b>
<b><i>Bond Market Rotation</i></b>	Higher Risk (HYG) <b>-0.71%</b>	Short Maturity (SHY) <b>0.48%</b>	Low Risk (TIP) <b>2.69%</b>	Long Maturity (TLT) <b>6.30%</b>

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## **Product and Strategy Notes**

### Developing an Agile Mindset

When someone asks us what our publications are about, our short answer is always the same: How to achieve long-term financial goals in the face of rapid change and uncertainty. When asked to get more specific, we say that the answer to this challenge can be thought of as a three legged stool. Part of the answer lies in improved forecasting (e.g., simple averaging of forecasts based on different methodologies), and part lies with improved portfolio construction and risk management techniques (e.g., focus on target real rates of return, rather than beating external benchmarks; models that integrate a wider range of decisions; use of simulation optimization and multi-regime methodologies, etc.). However, the most frequently overlooked leg of the stool is agility and adaptability. Clearly taking market valuation levels into account when making decisions is part of this. But so too is thinking clearly (e.g., avoiding over-optimism, overconfidence and the confirmation bias), recognizing the powerful impact our emotions can have, and developing what we like to call an “agile mindset.” We have always found the latter hard to succinctly describe, though easy to identify when you encounter it, whether in the investment, corporate or military world. The good news is that we recently read an article that does an excellent job of describing this concept and defining its key components.

In “The Innovator’s DNA”, Dyer, Gregersen and Christensen report on the results of study of 3,500 recognized business innovators. They conclude that five “discovery skills” are critical to innovation success. The first is “Associating”, or “the ability to successfully connect seemingly unrelated questions, problems or ideas from different fields.” The authors note how this complements diversity: “the more diverse our experience and knowledge, the more connections the brain can make...The more frequently the people in our study attempted to understand, categorize, and store new knowledge, the more easily their brains could naturally and consistently make, store and recombine associations.” The second discovery skill, and the one the authors

deem the most important to practice, is “Questioning – innovators like to play devil’s advocate and constantly ask questions that challenge common wisdom...To question effectively, innovators ask ‘why?’, ‘why not?’ and ‘what if?’” The third discovery skill is “Observing – innovators carefully, intentionally, and consistently look out for small behavioral details...particularly in the behavior of potential customers.” The fourth discovery skill is “Experimenting – trying out new ideas by creating prototypes and launching pilots.” Interestingly, the authors found that “one of the most powerful experiments innovators can engage in is living and working overseas...The more countries a person has lived in, the more likely he or she is to leverage that experience to deliver innovations.” The fifth discover skill is “Networking – unlike most executives, who network to access resources, to sell themselves or their companies, or to boost their careers, innovators go out of their way to meet people with different kinds of ideas and perspectives to extend their own knowledge domains.”

The authors conclude, “though innovative thinking may be innate in some, it can also be developed and strengthened through practice. We cannot emphasize enough the importance of rehearsing over and over the five behaviors described above, to the point that they become automatic.”

### Good News in the U.S. Financial Regulation Bill

Hidden among the pages of the recently passed U.S. financial services reform legislation (the Dodd-Frank Wall Street Reform and Consumer Protection Act) were two gems. The first calls for a study (by the Government Accounting Office) of mutual fund advertising that uses past-performance data, and recommendations for how regulations in this area should be changed to improve investor protection. Specifically, the bill includes this language: *“The Comptroller General of the United States shall conduct a study on mutual fund advertising to identify--(1) existing and proposed regulatory requirements for open-end investment company advertisements; (2) current marketing practices for the sale of open-end investment company shares, including the use of past performance data, funds that have merged, and incubator funds; (3)*

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*the impact of such advertising on consumers; and (4) recommendations to improve investor protections in mutual fund advertising and additional information necessary to ensure that investors can make informed financial decisions when purchasing shares.”*

The second gem gives the SEC authority to impose the same standards of fiduciary responsibility on brokers as now apply to Registered Investment Advisers. We have long advocated this change, and strongly believe that the current “suitability” standard for broker’s recommendations is too loose. While we have no doubt that both of these gems will be fought by interest groups with the most to lose, we have high hopes that the studies called for in Dodd-Frank will result in long-overdue reforms.

### The Impact of High Frequency Trading

We have noted our belief that the increased use of algorithmic trading programs, and the move to high frequency trading had to be affecting the nature of market prices. A recent research paper confirms this view. In “Is High Frequency Trading Inducing Changes in Market Microstructure and Dynamics?”, Reginald Smith concludes that, in the case of fourteen heavily traded stocks that he studied, there has been “a shift toward more self-similar dynamics in recent years” that coincided with “declining average size of trades with smaller trades showing markedly higher degrees of self-similarity.” Call it more micro-momentum, if you will. For better or worse, the daily “battle of the trading bots” is changing the nature of the price and returns series we observe each day.

### Common Sense and Value Investing

We have long had a relatively simple view of the logic behind active investing: You buy an asset because you expect its price to increase, based on your analysis of the underlying business and/or your analysis of other investors. Over the years, lots of academic studies have blurred this basic concept, with endless arguments over the

underlying source of the “momentum factor” and the “value premium.” Occasionally, however, you come across a research study that thankfully brings the discussion back to basics. We recently enjoyed one of those all-too-rare experiences when we read “The Other Side of Value: Good Growth and the Gross Profitability Premium” by Robert Novy-Marx. The author starts with an examination of different measures of profitability and finds that gross profits “is the cleanest accounting measure of true economic profitability. The further down the income statement one goes, the more polluted profitability measures become, and the less related they are to true economic profitability.” Despite this, “popular media is preoccupied with earnings, the variable on which Wall Street analysts’ forecasts focus.” Novy-Marx uses gross profits to construct a measure of firm productivity by dividing it by total assets. He finds that this measure has “roughly the same power to predict the cross-section of expected returns as the book to market ratio.” Moreover, “more profitable firms earn significantly higher average returns than unprofitable firms, despite having, on average, lower book-to-market ratios, and higher market capitalizations. That is, profitable firms are high return ‘good growth’ stocks, while unprofitable firms are low return ‘bad value’ stocks.” These results contrast with Fama and French’s view that “profitability, as measured by earnings, adds little or nothing in economic terms to the prediction of returns provided by size and book-to-market.”

### Two Excellent Papers on Risk Management

We highly recommend both of them: (1) “Tail Risk Hedging: A Roadmap for Asset Owners” by the Deutsche Bank Pension Strategies and Solutions Group, and (2) “Tomorrow’s Risk Management” by BNY Mellon’s Alternative Investment Services Group.

## **Model Portfolios Update**

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Our model portfolios are constructed using a simulation optimization methodology. They assume that an investor understands the long-term compound real rate of return he or she needs to earn on his or her portfolio to achieve his or her long-term financial goals. We use SO to develop multi-period asset allocation solutions that are “robust”. They are intended to maximize the probability of achieving an investor’s compound annual return target under a wide range of possible future asset class return scenarios. More information about the SO methodology is available on our website. Using this approach, we produce model portfolios for six different compound annual real return targets: 7%, 6%, 5%, 4%, 3%, and 2%. We produce two sets of these portfolios: one assumes only investments in broad asset class index funds. These are our “all beta” portfolios. The second set of model portfolios includes uncorrelated alpha strategy funds as a possible investment. These assume that an investor is primarily investing in index funds, but is willing to allocate up to ten percent of his or her portfolio to equity market neutral investments.

We use two benchmarks to measure the performance of our model portfolios. The first is cash, which we define as the yield on a one year government security purchased on the last trading day of the previous year. For 2010, our USD cash benchmark is 0.44% (in nominal terms). The second benchmark we use is a portfolio equally allocated between the ten asset classes we use (it does not include uncorrelated alpha). This portfolio assumes that an investor believes it is not possible to forecast the risk or return of any asset class. While we disagree with that assumption, it is an intellectually honest benchmark for our model portfolios’ results.

The year-to-date nominal returns for all these model portfolios can be found at: <http://www.indexinvestor.com/Members/YTDReturns/USA.php>