The Index Investor

Invest Wisely…Get an Impartial Second Opinion.

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This Month's Issue: Key Points

This month's first feature article takes a look at longevity risk, which we believe will be an increasingly popular topic in the years to come. We explain how the idiosyncratic longevity risk faced by individual investors (outliving their savings) is very different from the systematic longevity risk faced by institutions (uncertain future increases in average expected lifetimes). We summarize the hedging strategies available to individuals, and review why annuities (the best way to hedge longevity risk) are not more widely used. We then explore the concept of longevity risk based bonds and derivatives, which seem poised to become institutions' long hoped for hedging products of choice. We conclude with a review of whether these bonds belong in individual investors' portfolios, not as a hedge against their individual longevity risk (for which annuities are a much better choice) but rather as a new asset class. Our initial conclusion is that there is a case for the latter.

Our second feature article is a new update on trends in private equity investing. We summarize the key points from an extensive study of private equity recently issued by the U.K. Financial Services Authority. Our key takeaway is that the growing amount of money

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invested in private equity may be increasing systematic risk in the financial system, as high leverage interacts with the evolution of credit derivative markets. We then review the latest academic research into the returns on private equity. It is not encouraging; on average, returns lag those on broad public equity market indexes, and some types of institutions (e.g., endowments) seem to achieve much higher returns than others (e.g., pension funds). We conclude on an optimistic note with a new paper that proposes more effective due diligence criteria for private equity investors. However, our general position – that private equity is effectively a tilt within the broader domestic equity asset class that is generally not appropriate for individual investors to take – remains unchanged.

This month's product and strategy notes cover very interesting recent papers by Harry Kat (on how to evaluate alternative asset classes, why commodities make sense, and how to replicate hedge fund returns at a cost far lower than the familiar "2 and 20"), our evaluation of U.S. energy master limited partnerships as a potential asset class, why momentum trading profits are much lower in practice than in theory, whether concentrated portfolios are an indicator of active manager skill (they seem to be), why the U.S. rent/housing price ratio has fallen so much since 1975 (falling real interest rates and a declining housing risk premium), and new evidence on the "correct" ex-ante equity risk premium (3.5% plus or minus .5%).

This Month's Letters to the Editor

You have recently written about both Australian and Canadian real return bonds. Is there an easy way for someone not from those countries to invest in them?

In Canada, there is an ETF, XRB.TO, that tracks their main real return bond index. Australia presents a more difficult challenge, because there are fewer inflation protected bonds outstanding, and there is not yet an ETF that invests in them. Instead, you would have to see if you could invest in an Australian unit trust that invests in real return bonds, such as those offered by UBS and Macquarie. Finally, there is a closed end fund in the United States, IMF, that invests in a portfolio of real return bonds issued by different governments. The only catch here is that, to increase their returns, they also use leverage, which adds an additional

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element of risk to the investment. Once again, there appears to be an attractive new product opportunity for enterprising ETF developers.

Bill Bernstein, of www.efficientfrontier.com, seems to disagree with you on the subject of investing in commodities as an asset class. Any comments?

We have the highest respect for Bill and his writing. However, commodities is one of the few issues where we disagree with him. Bill's argument seems to be that the influx of financial investors into commodity futures has changed the dynamics of the market, and, by reducing the insurance return, made it unattractive as an asset class. Our response is that the only return we assume from commodities is the one from diversifying across energy, metal and agricultural futures, whose returns have very low correlations with each other. Moreover, even if the long term average return on commodities was zero (but with a standard deviation high enough that the return in any one year was unlikely to be zero), the very low correlation of commodity returns with those on other asset classes makes it an attractive asset class to add to a portfolio to reduce volatility and downside risk.

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Global Asset Class Returns

YTD 30Nov06	In USD	In AUD	In CAD	In EURO	In JPY	In GBP	In CHF	In INR
Asset Held								
US Bonds	4.75%	-2.91%	2.93%	-7.21%	2.78%	-9.58%	-4.78%	4.05%
US Prop.	37.56%	29.90%	35.74%	25.60%	35.59%	23.23%	28.03%	36.86%
US Equity	14.22%	6.56%	12.40%	2.26%	12.25%	-0.11%	4.69%	13.52%
AUS Bonds	4.30%	-3.36%	2.48%	-7.66%	2.33%	-10.03%	-5.24%	3.60%
AUS Prop.	30.90%	23.24%	29.08%	18.94%	28.93%	16.57%	21.36%	30.20%
AUS Equity	27.70%	20.04%	25.88%	15.74%	25.72%	13.37%	18.16%	27.00%
CAN Bonds	6.92%	-0.74%	5.10%	-5.04%	4.95%	-7.41%	-2.61%	6.22%
CAN Prop.	24.57%	16.91%	22.75%	12.61%	22.60%	10.24%	15.04%	23.87%
CAN Equity	17.67%	10.01%	15.85%	5.71%	15.70%	3.34%	8.14%	16.97%
Euro Bonds	13.54%	5.88%	11.72%	1.58%	11.57%	-0.79%	4.01%	12.84%
Euro Prop.	47.90%	40.24%	46.08%	35.94%	45.93%	33.58%	38.37%	47.20%
Euro Equity	31.23%	23.57%	29.41%	19.27%	29.26%	16.90%	21.70%	30.53%
Japan Bonds	2.28%	-5.38%	0.46%	-9.68%	0.31%	-12.05%	-7.25%	1.58%
Japan Prop.	16.61%	8.95%	14.79%	4.65%	14.64%	2.28%	7.08%	15.91%
Japan Equity	2.14%	-5.51%	0.32%	-9.81%	0.17%	-12.18%	-7.39%	1.45%
UK Bonds	16.77%	9.11%	14.95%	4.81%	14.80%	2.44%	7.24%	16.07%
UK Prop.	56.70%	49.04%	54.88%	44.74%	54.73%	42.37%	47.17%	56.00%
UK Equity	26.75%	19.09%	24.93%	14.79%	24.77%	12.42%	17.21%	26.05%
World Bonds	6.98%	-0.68%	5.16%	-4.98%	5.01%	-7.35%	-2.55%	6.28%
World Prop.	36.62%	28.96%	34.80%	24.66%	34.65%	22.29%	27.09%	35.92%
World Equity	18.54%	10.88%	16.71%	6.58%	16.56%	4.21%	9.00%	17.84%
Commodities	4.43%	-3.23%	2.61%	-7.53%	2.46%	-9.90%	-5.10%	3.73%
Timber	7.91%	0.25%	6.09%	-4.05%	5.94%	-6.42%	-1.62%	7.21%
EqMktNeutral	3.88%	-3.77%	2.06%	-8.08%	1.91%	-10.44%	-5.65%	3.18%
Volatility	-9.61%	-17.27%	-11.43%	-21.57%	-11.58%	-23.94%	-19.15%	-10.31%
Currency								
AUD	7.66%	0.00%	5.84%	-4.30%	5.68%	-6.67%	-1.88%	6.96%
CAD	1.82%	-5.84%	0.00%	-10.14%	-0.15%	-12.51%	-7.71%	1.12%
EUR	11.96%	4.30%	10.14%	0.00%	9.99%	-2.37%	2.42%	11.26%
JPY	1.97%	-5.68%	0.15%	-9.99%	0.00%	-12.35%	-7.56%	1.27%
GBP	14.33%	6.67%	12.51%	2.37%	12.35%	0.00%	4.79%	13.63%
USD	0.00%	-7.66%	-1.82%	-11.96%	-1.97%	-14.33%	-9.53%	-0.70%
CHF	9.53%	1.88%	7.71%	-2.42%	7.56%	-4.79%	0.00%	8.83%
INR	0.70%	-6.96%	-1.12%	-11.26%	-1.27%	-13.63%	-8.83%	0.00%

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Asset Class Valuation Update

Our market valuation analyses are based on the assumption that markets are not perfectly efficient and always in equilibrium. This means that 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. 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. As described in our May, 2005 issue, people can and do disagree about the "right" values for these variables. 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, which is equal to either 1% or 2%. Third, we use two different values for the equity risk premium required by investors: 2.5% and 4.0%. Different combinations of these variables yield high and low scenarios for both the future returns the market is expected to supply, and the future returns investors will demand. 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 (Current Dividend Yield x 100) x (1+ Forecast Productivity Growth) divided by (Current Yield on Real Return Bonds + Equity Risk Premium - 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:

Australia	**Low Demanded Return**	**High Demanded Return**
High Supplied Return	70%	105%
Low Supplied Return	107%	147%

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Canada	**Low Demanded Return**	**High Demanded Return**
High Supplied Return	71%	122%
Low Supplied Return	128%	190%

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Eurozone	Low Demanded Return	High Demanded Return
High Supplied Return	66%	112%
Low Supplied Return	116%	171%

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Japan	Low Demanded Return	High Demanded Return
High Supplied Return	98%	190%
Low Supplied Return	234%	369%

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United Kingdom	Low Demanded Return	High Demanded Return
High Supplied Return	46%	89%
Low Supplied Return	88%	137%

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United States	Low Demanded Return	High Demanded Return
High Supplied Return	119%	185%
Low Supplied Return	213%	301%

Switzerland	Low Demanded Return	High Demanded Return
High Supplied Return	79%	149%
Low Supplied Return	167%	245%

India	Low Demanded Return	High Demanded Return
High Supplied Return	131%	217%
Low Supplied Return	270%	392%

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

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bonds. The demand for future returns is equal to the current real bond yield plus the historical average inflation premium (the difference between nominal and real bond yields) between 1989 and 2003. 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:

	Current Real Rate	Average Inflation Premium (89-03)	Required Nominal Return	Nominal Return Supplied (10 year Govt)	Return Gap	Asset Class Over or (Under) Valuation, based on 10 year zero
Australia	2.51%	2.96%	5.47%	5.57%	0.10%	-0.94%
Canada	1.61%	2.40%	4.01%	3.90%	-0.11%	1.06%
Eurozone	1.66%	2.37%	4.03%	3.69%	-0.34%	3.33%
Japan	1.10%	0.77%	1.87%	1.66%	-0.21%	2.09%
UK	1.16%	3.17%	4.33%	4.52%	0.19%	-1.80%
USA	2.16%	2.93%	5.09%	4.47%	-0.62%	6.10%
Switz.	1.20%	2.03%	3.23%	2.30%	-0.93%	9.47%
India	2.80%	7.57%	10.37%	7.80%	-2.57%	26.57%

*Derived from ten year yield and forecast inflation

It is important to note some important limitations of this analysis. First, it uses the current yield on real return government bonds (or, in the cases of Switzerland and India, the implied real yield if those bonds existed). Over the past forty years or so, this has averaged around 3.00%. Were we to use this rate, the required rate of return would generally increase. Theoretically, the "natural" or equilibrium real rate of interest is a function of three variables: (1) the expected rate of multifactor productivity growth (as it increases, so to should the demand for investment, which will tend to raise the real rate); (2) risk aversion (as investors become more risk averse they save more, which should reduce the real rate of interest, all else being equal); and (3) the time discount rate, or the rate at which investors are willing to trade

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off consumption today against consumption in the future. A higher discount rate reflects a greater desire to consume today rather than waiting (as consumption today becomes relatively more important, savings decline, which should cause the real rate to increase). These variables are not unrelated; a negative correlation (of about .3) has been found between risk aversion and the time discount rate. This means that as people become more risk averse, they also tend to be more concerned about the future (i.e., as risk aversion rises, the time discount rate falls).

All three of these variables can only be estimated with uncertainty. For example, a time discount rate of 2.0% and risk aversion factor of 4 are considered to be average, but studies show that there is wide variation within the population and across the studies themselves. The analysis in the following table starts with current real return bond yields and the OECD's estimates of multifactor productivity growth between 1995 and 2002 (with France and Germany proxying for the Eurozone). We then try to back out estimates for risk aversion and the time discount rate that would bring theoretical rates into line with those that have been observed in the market. The real rate formula is [Time Discount Rate + ((1/Risk Aversion Factor) x MFP Growth)].

Real Rate Analysis	AUD	CAD	EUR	JPY	GBP	USD
Risk Aversion Factor	4.0	5.0	5.0	6.0	6.0	4.0
Time Discount Rate	2.00%	1.50%	1.50%	1.00%	1.00%	2.00%
MFP Growth	1.60%	1.20%	1.40%	0.60%	1.40%	1.40%
Theoretical Real Rate	2.40%	1.74%	1.78%	1.10%	1.23%	2.35%
Real Rate on 30Nov06	2.51%	1.61%	1.66%	1.10%	1.16%	2.16%

Our analysis also uses historical inflation as an estimate of expected future inflation. This may not produce an accurate valuation estimate, if the historical average level of inflation is not a good predictor of average future inflation levels. For example, if expected future inflation is lower than historical inflation, required returns will be lower. Also, if one were to assume a very different scenario, involving a prolonged recession, accompanied by deflation, then one could argue that government bond markets are actually undervalued today.

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 may primarily reflect

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prevailing liquidity and jump (regime shift) risk conditions. The second is the difference between BBB and AAA rated bonds, which may tell us more about the level of compensation required by investors for bearing default risk. For example, between August and October, 1998 (around the time of the Russian debt default and Long Term Capital Management crises), the AAA-Treasury spread jumped from 1.18% to 1.84%, while the BBB-AAA spread increased by much less, from .62% to .81%.

The following table shows the average level of these spreads between January, 1970 and December, 2005 (based on monthly Federal Reserve data), along with their standard deviations and 67% (average plus or minus one standard deviation) and 95% (average plus or minus two standard deviations) confidence range (i.e., based on historical data, 95% of the time you would expect the current spreads to be within two standard deviations of the long term average).

	AAA – 10 Year Treasury	**BBB-AAA**
Average	.97%	1.08%
Standard Deviation	.47%	.42%
Avg. +/- 1 SD	1.44% - .50%	1.51% - .66%
Avg. +/- 2 SD	1.91% - .03%	1.93% - .23%

At 30 November 2006 the AAA minus 10 year Treasury spread was .73%. This was below the long-term average compensation for bearing liquidity and jump risk (assuming our model is correct).

At the end of the month, the BBB minus AAA spread was .90%, below the long-term average compensation for bearing default risk. The stability of this spread in the face of other

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developments (e.g., rising concern over the future strength of the global economy) leads us to conclude that it is more likely that corporate bonds today are overvalued than undervalued.

Finally, 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. At best, you can make an estimate that is justified in theory, knowing that in practice it will not turn out to be accurate. That is what we have chosen to do here. Specifically, 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. This information is summarized in the following table:

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Annual Exchange Rate Changes Implied by Bond Market Yields

	To AUD	To CAD	To EUR	To JPY	To GBP	To USD	To CHF	To INR
From								
AUD	0.00%	-1.67%	-1.88%	-3.91%	-1.05%	-1.10%	-3.27%	2.23%
CAD	1.67%	0.00%	-0.21%	-2.24%	0.62%	0.57%	-1.60%	3.90%
EUR	1.88%	0.21%	0.00%	-2.03%	0.83%	0.78%	-1.39%	4.11%
JPY	3.91%	2.24%	2.03%	0.00%	2.86%	2.81%	0.64%	6.14%
GBP	1.05%	-0.62%	-0.83%	-2.86%	0.00%	-0.05%	-2.22%	3.28%
USD	1.10%	-0.57%	-0.78%	-2.81%	0.05%	0.00%	-2.17%	3.33%
CHF	3.27%	1.60%	1.39%	-0.64%	2.22%	2.17%	0.00%	5.50%
INR	-2.23%	-3.90%	-4.11%	-6.14%	-3.28%	-3.33%	-5.50%	0.00%

Our approach to valuing commercial property securities as an asset class is hindered by a lack of historical data about rates of dividend growth. To overcome this limitation, we have assumed that markets are fairly valued today (i.e., the expect supply of returns equals the expected returns demanded by investors), and "backed out" the implied growth rates to see if they are reasonable in light of other evidence about the state of the economy (see below). This analysis assumes that investors require a 2.5% risk premium above the yield on real return bonds to compensate them for the risk of securitized commercial property as an asset class. The following table shows the results of this analysis:

Country	Real Bond Yield	Plus Commercial Property Risk Premium	Less Dividend Yield on Commercial Property Securities	Equals Expected Rate of Future Real Dividend Growth
Australia	2.51%	2.50%	5.8%	-0.8%
Canada	1.61%	2.50%	4.3%	-0.2%
Eurozone	1.66%	2.50%	2.6%	1.6%
Japan	1.10%	2.50%	1.2%	2.4%
Switzerland	1.20%	2.50%	3.9%	-0.2%
United Kingdom	1.16%	2.50%	1.9%	1.8%
United States	2.16%	2.50%	3.7%	1.0%

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A very rough way to test the reasonableness of these expected growth assumptions is to compare them to the expected real annual change in commercial rental income over the next five years. If you think the real growth estimates are too high, that implies overvaluation. On the other hand, if you think they are too low, that implies undervaluation. Since we expect a significant slowdown in the global economy over the next few years, we are inclined to view strongly positive implied real growth assumptions as too optimistic, and therefore to believe that the balance of business cycle and valuation evidence suggests that commercial property in such markets is probably overvalued today.

To estimate the likely direction of short term commodity futures price changes, we compare the current price to the historical distribution of futures index prices. Between 1991 and 2005 period, the Dow Jones AIG Commodities Index (DJAIG) had an average value of 107.6, with a standard deviation of 21.9. The November 30th closing price of 175.21 was slightly more than 3.0 standard deviations above the average. This places it outside the range within which prices are expected to lie 99% of the time (i.e., the average price plus or minus two standard deviations). Given this, the probability of a near term decline in the spot price of the DJAIG seems much higher than the probability of an increase.

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, 2005, the average value of the VIX Index was 19.45, with a standard deviation of 6.40. The one standard deviation (67% confidence interval) range was 13.05 to 28.85, and the two standard deviations (95% confidence) range was from 6.65 to 32.25. On November 30, 2006, the VIX closed at 10.91. This is 1.33 standard deviations below the VIX's long term average value, which seems unusual in light of rising uncertainty in the economy and financial markets. Hence, we conclude that equity volatility is probably undervalued today.

Sector and Style Rotation Watch

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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 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, and implementing them via index funds 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. That being said, the highest rolling three month returns in the table give 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 most investors 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

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agreement (or disagreement) investors about the most likely upcoming changes in the state of the economy.

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

Rolling 3 Month Returns Through	***30Nov06***			
Economy	Bottoming	Strengthening	Peaking	Weakening
Interest Rates	Falling	Bottom	Rising	Peak
Style and Size Rotation	Small Growth (DSG) **10.05%**	Small Value (DSV) **8.50%**	Large Value (ELV) **8.00%**	Large Growth (ELG) **8.34%**
Sector Rotation	Cyclicals (IYC) **11.06%**	Basic Materials (IYM) **10.20%**	Energy (IYE) **9.55%**	Utilities (IDU) **5.11%**
	Technology (IYW) **11.80%**	Industrials (IYJ) **8.43%**	Staples (IYK) **5.03%**	Financials (IYF) **6.84%**
Bond Market Rotation	Higher Risk (LQD) **3.34%**	Short Maturity (SHY) **1.34%**	Low Risk (TIP) **-0.47%**	Long Maturity (TLT) **5.11%**

The next tables describe the typical cycles in the markets for commercial property and commodities. We believe they should be read in conjunction with current situation in the bond market. However, rather than being leading indicators of future economic conditions, commercial property and commodity market returns tend to coincide with current economic and interest rate conditions (i.e., those at the top of the same column, rather than the next one to the right). When many investors share the same expectations about future economic conditions, one would expect to see alignment between bond and equity market year-to-date returns, and conditions in commodity and commercial property markets. However, we also note that this is when markets are most fragile; large moves can occur if something happens to

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change these closely aligned expectations. In contrast, when investors do not share the same expectations for the future, you would expect to see misalignment between year-to-date returns in bond, equity, commodity and commercial property markets.

Economy	Bottoming	Strengthening	Peaking	Weakening
Interest Rates	Falling	Bottom	Rising	Peak
Commodities				
Commodity Inventories	Peaking	Falling	Bottoming	Rising
Spot Prices	Bottoming	Rising	Peaking	Falling
Futures Prices Relative to Spot Price	Contango (futures higher than spot)	Uncertain	Backwardation (futures lower than spot)	Uncertain
Profitability of long commodity futures position, before diversification and collateral yields	Negative (falling spot and negative roll yield)	Uncertain (rising spot, uncertain roll yield)	Positive (rising spot and positive roll yield)	Uncertain (falling spot, uncertain roll yield)
Comm'l Property				
Commercial Property Vacancy Rates	Peaking	Falling	Bottoming	Rising
Rents	Low	Rising	High	Falling
New Construction Completion (space coming onto the market)	Falling	Bottoming	Rising	Peaking
Property Valuation Ratios	Bottoming	Rising	Peaking	Falling
Expected Future Property Returns	Peaking	Falling	Bottoming	Rising

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The following table sums up our subjective view of possible asset class under and overvaluations at the end of November 2006. The distinction between possible, likely and probable reflects a rising degree of confidence in our conclusion.

Probably Overvalued	Commodities, Corporate Bonds
Likely Overvalued	Commercial Property, Most Equity Markets
Possibly Overvalued	
Possibly Undervalued	Real Return Bonds
Likely Undervalued	
Probably Undervalued	Non-U.S. Dollar Bonds, Equity Volatility

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Longevity Risk

We're pretty sure that longevity risk is going to be a hot topic in 2007. That's why we thought our readers would like a head start. This overview will begin by defining longevity risk, and why it is important. We will then review the different approaches to managing it. Finally, we will explore whether longevity risk could be a new asset class that we might one day add to our model portfolios.

So what is longevity risk? It depends who you ask. Different people can give you very different answers to that question. By one definition, it is just the opposite of mortality risk: living too long (i.e., outliving your assets) instead of dying too soon (without having saved enough money). While that is a good definition of longevity risk from an individual's point of view, things get a bit more complicated when you are an institution.

Say you are the trustee of a defined benefit pension plan, which has obligations to provide retirees with lifetime incomes after they retire. In this case, the longevity risk you face is that your average retiree lives longer than you have assumed in your projections, raising the probability that your fund won't have enough money available for payments due to retirees.

Or suppose you are the chief actuary at an insurance company that has sold annuities to individuals (or perhaps group annuities to pension funds) to enable them to hedge their longevity risk (assuming your company doesn't go bankrupt). Like the pension fund trustee, you still worry at night that the longevity assumptions you have used when pricing those annuities are incorrect, which could result in there not being enough money available one day to make the payments due on those annuity policies.

Finally, assume you are a politician, considering the potential fiscal cost of your nation's national pension program (assuming it is funded on a pay-as-you-go basis). Based on your current projections for life expectancy, you can already see that the future fiscal costs of your nation's plan may be unbearable. The risk you face is that if you have underestimated average longevity, the changes you will have to make in the future (whether raising taxes, cutting spending elsewhere in your budget, increasing the benefits eligibility age, cutting benefits, or making them contingent on an income test) will be even more painful – and politically difficult – than you now imagine.

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These four simple examples illustrate a critical distinction. At the individual level, "longevity risk" means something very different than it does at the institutional or indeed national level. Individuals face idiosyncratic longevity risk, which is a function of how long they will live, the rate at which they are withdrawing money from their savings, and the effectiveness of their asset allocation policy. In contrast, the institutions face systemic longevity risk, involving changes in average life expectancy which can dramatically increase the size of the liabilities they face.

In his paper "Demographic Issues in Longevity Risk Analysis", Eric Stallard notes that between 1910 and 1991, mortality for older males in the United States declined by about one percent per year. To put it differently, the average years of remaining life for a 65 year old woman was 15.8 in 1960, and 12.8 for a 65 year old man. By 2000, these had increased to 19.2 and 16.3, respectively. Stallard also reviews the many reasons for this decline, including:

- Better diagnosis and treatment of chronic diseases;
- Innovations in pharmaceuticals and preventative medicine;
- Improved health risk behaviors (e.g., reductions in smoking) that more than offset the rise in obesity;
- Reductions in hazardous exposures;
- Increased average levels of income and education.

Stallard also notes that while cancer related mortality rates have increased, they have been more than offset by declines in mortality from heart and cerebrovascular disease (e.g., strokes).

What makes systemic longevity a particularly challenging problem is that it involves both risk (where the outcomes are known along with their associated probabilities, as in a standard life expectancy table) and uncertainty, due to potential changes in diseases themselves, particularly in the case of viruses, as well as medical technology and other variables that would force revisions in the standard life tables. (As a side note, it is also important to remember that each cell in a life table – i.e., the expected years of remaining life

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for a person of a set age – is, in fact, only the mid-point of a distribution of possible outcomes. In other words, life tables only summarize a group of underlying statistical estimates).

Because of this, the quantification of longevity risk is subject to considerable uncertainty, due to both errors in the way it is modeled, and the values assumed for key variables in whatever model is used.

Let us now move on to how individuals and institutions manage longevity risk. Among individuals, the most common approach is to set a limit on annual portfolio withdrawals, while carefully managing one's portfolio, and, in many cases, treating equity in residential property as a strategic reserve, to be used for either unforeseen health care expenses, or as the core of a bequest to one's heirs. However, this approach is not without its problems. First, instead of focusing on total returns and careful tax management, too many people follow the rule of thumb that they should avoid "tapping their capital" or "reducing their principal" and instead obtain their target annual income from interest and dividend payments. Too often, in their search for yield, too many of these investors take on far more risk than they had intended, sometimes with disastrous results. Second, too many people focus on nominal income and returns, and find it hard to make appropriate adjustments to their portfolios when inflation changes. Finally, too many people take an overly simplistic approach to asset allocation, for example thinking they are holding down risk by keeping most of their funds in bonds ("but they're all high yield") rather than diversifying across a wider range of asset classes to reduce their overall portfolio risk. But even when an investor implements this approach the right way, there is no guarantee (short of investing in a portfolio of inflation protected government bonds sufficient to generate her target real income) that she won't outlive her money. To put it differently, the longevity risk will still be there.

In theory, individuals can manage their exposure to this risk by buying annuities. In its simplest form, an annuity is a contract with an insurance company that promises to pay the holder (the "annuitant") a specified sum each year until he or she dies, guaranteeing that he or she will never run out of money. By selling enough annuities to a wide range of people, the insurance company can diversify away its exposure to idiosyncratic longevity risk, leaving it with exposure only to systemic longevity risk – i.e., that average longevity will increase.

Individual annuities come in many types, including ones which cover two people, ones whose payouts are either fixed (and in a few cases indexed to inflation) or vary (above a

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minimum) subject to the performance of the funds (technically, sub-accounts) in which it is invested. In this manner, individuals have the opportunity to directly integrate longevity and investment risk into a comprehensive financial plan.

And yet, study after study has found that only a very small portion of individual retirement savings is ever used to buy an annuity. The most frequent explanation for this is that people fear dying too soon more than living too long. Let me explain. In the case of a simple annuity, if you die the month after you purchase it, your estate doesn't get a refund from the insurance company. Instead, the gain the insurance company realizes from you dying so quickly is used to offset the risk it faces when other annuity holders live far longer than expected. Functionally, this is no different from the pooling of risk that happens when you buy homeowners or car insurance, or indeed, life insurance. Yet in all these cases, the fact that a payment was made and the insurance wasn't needed is far less unsettling than it is in the case of an annuity.

It isn't hard to see why. Just because I didn't make a claim on my homeowners or car or life insurance this year doesn't mean that I (or my family) won't make a claim next year. So I keep paying my insurance premiums "just in case", to reduce the probability that my family will experience a catastrophic financial loss. Now consider an annuity. In this case, when you die, there is no chance that you will make a claim in the future. Instead, there is the certainty that your heirs (or estate) won't get the money you used to purchase it, which instead will be used to hedge the longevity risk of other people who have the good fortune to live longer than you. While functionally annuities are just another form of risk pooling, emotionally they are very different from what most people think of when they hear the word "insurance." And that has made them a very tough sell, despite their logical attractiveness as a way to hedge individuals' exposure to longevity risk.

To be sure, there are ways to reduce this resistance. For example, "money back" annuities have been proposed that would repay to an estate the difference between an annuity's initial cost and the cumulative value of payments received by the annuitant before his or her death. In effect, these products reduce the amount of longevity risk protection provided to the risk pool in order to reduce the perceived financial costs of "dying too soon."

Even in the absence of creative new annuity products, there are other ways individuals can reduce their exposure to the risk of dying too soon. As described at length in an article in

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the May 2006 issue of Retired Investor by Rick Miller (a Chicago PhD in Economics, and founder of Sensible Financial Planning), the key is to remember that the decision whether to annuitize one's savings is a series of options over time, rather than a one time decision. This is important for two reasons. First, the annual income that can be purchased for a given amount of money varies over time with interest rates. So, in some cases, it may pay to defer the purchase of an annuity or annuities when rates are low. Second, and more important, studies have shown that individuals are generally quite accurate judges of their own health, and likely remaining years of life. As an investor progresses through his or her retirement years, he or she will receive a continuing stream of information, not only about the state of his or her portfolio, but also about the state of his or her health. Staggering or delaying the purchase of annuities should therefore enable people most at risk of dying too soon to avoid overinvesting in annuities, and people most at risk of outliving their savings to adequately hedge their longevity risk.

In sum, while too few individuals take advantage of them, it cannot be said that they lack for ways to manage their exposure to longevity risk. Unfortunately, until very recently, the same could not be said for institutions.

If you are an insurance company with a portfolio of annuity contracts you have sold, or a defined benefit pension fund facing a liability to provide incomes to your retirees (and sometimes their spouses) until they die, there is no easy way to hedge your exposure to longevity risk. Instead, you have been in a similar situation to our individual investor who is trying to avoid outliving her savings. That may be about to dramatically change in 2007.

The main innovation we expect to see is the launch of new bonds whose payout is tied to longevity risk (increasing if, based on some index, people start living longer, on average, than currently expected). The European Investment Bank tried to launch a bond like this a couple of years ago, but it met with only a tepid response, and was eventually pulled. Since then, however, there have been a number of developments that suggest future issues will be much better received by the market. First and foremost, many institutions are much more aware of the size of their exposure to longevity risk. Second, a number of transactions have been undertaken (e.g., by SwissRe) that securitized the mortality risk associated with life insurance policies. Third, a new index has been launched by Credit Suisse that makes it much easier for market participants to agree on and track longevity risk (see

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http://www.csfb.com/institutional/fixed_income/longevity_index.shtml). Finally, the establishment of this index will speed the development of derivative products, including longevity swaps, futures and options. This will make it much easier for hedge funds to invest in longevity risk, which will, in turn, stimulate new issuance of longevity bonds (because issuers will be able to hedge their exposure to the underlying risk by transferring it to the hedge funds). Hedge funds have already demonstrated a healthy appetite for property and casualty catastrophe risk (via their purchase of catastrophe bonds, whose principal is reduced when hurricanes, earthquakes, and other disasters occur within a specified period, but which pay attractive returns if they don't). So it seems logical that they would also seek to profit from longevity risk.

The logical buyers of longevity bonds are clear: pension funds and insurance companies with large annuity businesses should snap them up. The more challenging question is who the logical issuers are: who wants to be holding longevity risk, given the uncertainties involved? In the absence of deep derivative markets which would facilitate the separation of longevity risk from the bond itself, the logical answer is that governments will be the initial issuers of these new instruments, since it is very much in their interest to create a liquid market for longevity risk. The EIA has already attempted to take the lead here, and may well be followed by other issuers with a reputation for creativity like the World Bank. In addition, expect to see more very long-term bond issues by governments (like the UK's 50 year bond) as, given the long time frames involved in longevity risk, long maturity, low credit risk issues will be needed to execute many of the creative capital market structures for managing longevity risk that are now on the drawing boards of investment banks around the world.

Finally, will longevity bonds have a role as a new asset class in individual investors' portfolios? In an excellent paper ("Life is Cheap: Using Mortality Bonds to Hedge Aggregate Mortality Risk"), Friedberg and Webb take an initial stab at answering this question. They begin by noting that assets whose return rises and falls at the same time as overall consumption rises and falls generally offer higher returns than those whose returns are either unrelated or negatively correlated with aggregate consumption spending in the economy. The logic here is clear: assuming investors' want to smooth their personal consumption over time, they will demand higher returns to hold an asset that falls in value just when aggregate

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consumption is falling (e.g., due to a decline in the real economy), while they will require a much lower return to hold an asset whose value goes up when aggregate consumption falls.

Friedberg and Webb note that since most of the change in average mortality will be concentrated among older people who are already retired, these shocks should not have an impact on aggregate output. Rather, their main effect will be a fall in per-capita consumption (because a constant level of output will be split among more people). Hence, a bond whose returns increase when longevity risk increases should carry a relatively low rate of return, because it enables investors to hedge the exposure of their desired consumption level to unexpected increases in average longevity. Friedberg and Webb confirm this hypothesis by calculating the theoretical returns on a longevity bond between 1959 and 1999. However, despite their relatively low expected returns, longevity bonds may still play an attractive role in a portfolio because their return generating process is basically uncorrelated with the return generating processes in other asset classes – in other words, they might well provide excellent diversification benefits to a portfolio (for an initial exploration of this question, see "The Role of Longevity Bonds in Optimal Portfolios" by Francesco Menoncin).

In sum, longevity risk is one of the most important challenges facing not only individuals, but indeed the overall financial system. We look forward to an exciting wave of innovation in this area in 2007.

Private Equity Update

It is hard to pick up a paper these days, without news of another buyout deal, or another institutional investor who has decided to shift a greater portion of its portfolio into private equity. Strangely, these shifts come at a time when the balance of academic research seems to be headed the other way. With that in mind, we thought it was a good time to take another look at investing in private equity, which we define as buyout funds (as opposed to venture capital, which we consider separately). We will start with an excellent new study by the UK Financial Services Authority of the issues raised by the growing volume of private equity deals. We will then review the latest academic research on the returns that limited partners are actually earning on their private equity investments. Finally, we will summarize another

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piece of research on enhanced due diligence techniques for investors evaluating private equity funds.

The FSA Report (which can be downloaded at: http://www.fsa.gov.uk/pages/library/policy/dp/2006/06_06.shtml) highlights "a number of risks arising within the private equity market as a consequence of specific market practices, structures or products." In our view, the two most important are excessive leverage and unclear ownership of economic risk. One can argue that both have raised the level of systemic risk in the global financial system.

With respect to leverage, the FSA begins by noting that, "Leverage can occur at four levels in private equity investment:

(1) At the transaction level: The average debt/equity ratio (at the time the transaction was finalized) for the top five deals reported in firms' responses to our LBO survey was 6.41. This high leverage level comes against a backdrop of rising purchase price multiples, rising debt/equity ratios (our LBO survey revealed that equity represented just 21% of the capital base of the 5 largest transactions to which each bank committed capital). Leverage in transactions – particularly in large transactions – has been rising over recent years. However, the rate of change appears to be slowing as both the interest rate cycle is turning and the ability of companies to support additional debt (even with advances in financial structuring) is becoming exhausted. As room for manoeuvre in the top tier transactions declines, we may see the complex financial structures and higher leverage levels that typify this part of the private equity market extend their reach into smaller, mid-market, transactions.

(2) At the fund level: Typically, private equity funds are not leveraged. Individual managers may find that the Limited Partnership agreement prevents them from leveraging the fund (i.e. their investors may not want them to take on the additional risk inherent in leveraged investment) or there may be a cap on allowed leverage. Even where leverage is allowed, this may not be employed – fund managers have typically been generating sufficient return without needing to have recourse to leverage in recent years. As competition increases and the ability to generate substantial non-levered returns declines we may see the use of leverage increasing.

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(3) At the fund of fund level: The British Venture Capital Association noted in a report that private equity performance was strongly correlated to manager selection. This would suggest that leverage need not be employed at fund of fund level as they would be able to generate substantial unleveraged returns as a consequence of their advanced manager selection techniques. In practice leverage facilities at the fund of fund level do occur. Leverage levels are rising but from a low base, according to firms visited in our thematic review, typically fund of funds leverage may be around 10-20% of the fund.

(4) In investment products based on the equity component of private equity investments: These are still rare but do exist. An example of such a structure might be a CFO (Collateralised Fund Obligation) based on private equity funds. This type of fund might comprise around 2mn of investment grade bonds for every 1mn of preferred equity shares. The investment grade bonds are included to allow international fixed income investors exposure to the private equity asset class at various levels of credit risk. The CFO could incorporate drawable equity investments and over commitment strategies (e.g. an over commitment facility of say 133%, i.e. substantive leverage is included)."

The FSA goes on to note that "the amount of credit that lenders are willing to extend on private equity transactions has risen substantially. Lending limits are increasing, multiples are rising, transaction structures are being extended and covenants are weakening." The authors of the FSA report note that they have "identified two different schools of thought prevailing in the private equity market on the leverage levels currently being employed, in particular with respect to the larger transactions."

The argument supporting the aggressive use of leverage runs as follows: "Leverage levels in UK firms, particularly in public companies, are inefficiently low. Private equity fund managers are simply transforming the companies they back into capital efficient operations that can make the most of the generous tax treatment and flexible financing options associated with debt capital. The reason why leverage levels in private equity backed companies are increasing relative to historical levels is because larger companies are being invested in today. These larger companies are generally considered to be inherently more stable, better able to

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withstand a downturn, better able to defend their market share, and therefore their medium/long term ability to pay interest/capital on debt finance should be stronger. They are frequently cash generative, asset rich companies (such as infrastructure companies). Interest rates are low so these companies currently have enhanced ability to service large amounts of debt and at least 50% of their interest rate exposure will typically be hedged (for around three years). This means the impact of potential future rate rises is mitigated. Even if companies do get into trouble, the stable interest rate and wider economic environment means that it should be possible to re-finance them at competitive rates. Although the short term exposures of the bank underwriters may be increasing as they finance larger transactions, their medium and long term exposures may be decreasing or becoming increasingly diverse as the debt becomes more widely distributable. Should a company default, the risk is spread so broadly given the extent of syndication and risk transfer that no one party should bear catastrophic losses."

In contrast, the negative case begins with the observation that "banks face increasing competition in their bids to win the mandate to provide the debt finance for private equity transactions. Such finance provision (particularly in relation to the top tier of private equity transactions i.e. the largest deals) is now generally the subject of a competitive auction. The private equity fund manager frequently takes the most advantageous elements of individual banks' bids (i.e. the most debt finance offered on the cheapest and most flexible terms) and combines them into one highly leveraged package, asking the banks to accept those terms or lose the mandate. Winning a mandate can be highly lucrative in terms of both transaction fees and other fee-earning ancillary services the banks may be invited to provide, so there are strong incentives for banks to participate in these auctions. As private equity firms frequently re-use the same banks for consecutive deals, the banks are reluctant to impair their relationship with the private equity fund manager by rejecting a particular transaction, potentially losing the right to provide lucrative debt finance packages for future deals. Leverage levels are being competed upwards because of this process and increasingly appear to approach the limits of prudence."

"Banks accept these leverage levels as they are increasingly able to distribute the debt (including bridge finance) as a consequence of the recent substantial growth and innovation in the institutional debt market. An increasing number of banks now target minimal or even zero final [debt retention on their books]. Credit terms are therefore increasingly of secondary

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importance in the lending decision to the appetite of the institutional debt market for the credit. Some lenders may no longer be prioritising strict risk-return criteria based on the credit quality, transaction value and interest rate when deciding how much to lend. Rather, they may be focusing on ensuring that any distribution will be successful, with the fees they generate from the process being maximised and the duration and extent of their exposure minimised. Purchasers of this debt may be either unaware of, or under-pricing, the inherent risk. On the assumption that a re-financing on more favourable terms will be possible, private equity owned companies are increasingly being initially financed with a capital structure that is unsustainable1 in the long term."

"An inability to re-finance on competitive terms could push the company into default. Re-financing may not be as easy as expected as the credit cycle may deteriorate and/or the appetite of institutional investors for debt may dry up. There are a number of factors which could cause illiquidity, or dislocation in the leveraged finance market. If institutional investors…and hedge funds were in financial trouble, then the availability of debt capital could deteriorate and its cost could increase. This could be triggered by a number of factors either related or completely unrelated to the private equity market itself. For example, if the institutional debt market participants had made significant losses on the debt elements of private equity transactions then clearly this could reduce their appetite for taking on new private equity related risk. If they had made losses on investments in other asset classes and were forced sellers in order to meet redemption requests this could require the disposal of some LBO related assets and also trigger a reduction in their appetite for taking on new risk – this is a risk we have observed crystallising recently. Even if a re-financing does not appear necessary from the outset, private equity backed companies are highly vulnerable to interest rate rises wherever they are carrying a significant debt burden. Interest rate hedging is far from perfect (and is less comprehensive than was observed historically) so capital structures that once looked sustainable may become unsustainable over time. Transactions with capital structures that were designed before the trend towards using nonamortizing debt and before the interest rate cycle turn was anticipated may be particularly vulnerable to a continued deterioration in the credit cycle. This is because their short term exposures may be significant, which means they could get into difficulties more rapidly."

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"Due to the increase in debt financing, the credit quality of private equity backed companies/leveraged finance instruments is declining rapidly. There have been a number of significant and rapid downgrades. The market is also experiencing a rise in covenant waivers and amendments as firms become unable to meet their commitments or come close to that. Effective defaults where companies are starting to have difficulty meeting their commitments are being masked by 'involuntary refinancings' which are being undertaken when a default is imminent."

On balance, the FSA concludes that, "which of these two schools of thought, positive or negative, is correct is not certain, although the number of market participants expressing concerns over current leverage levels is high and rising. There are also signs that firms have begun preparing for the possibility of a market downturn, for example by increasing resources in their distressed debt and restructuring teams. If those who support the negative view of private equity transaction leverage are correct, it is not clear whether we will see a gradual adjustment or a sharp correction."

"A gradual adjustment could take the form of lower returns leading to reduced capital inflows and hence less competition for deals. A sharp correction could involve a major transaction or cluster of transactions failing suddenly. Some market participants feel that the market is still supported by sound fundamentals and is well placed to bear a shock. They point to the efficiency with which the market dealt with recent events including significant downgrades, where, after some turbulence, new liquidity emerged and the market found its level. Other participants believe a 'hard landing' in the near future is more likely as multiples contract towards long-term averages and risk is re-priced. Some such market participants are speculating that a correction might come about in the next 12 months, although others feel the market will continue to test its boundaries in 2007 with the correction coming after that. Given the real possibility of a correction occurring, it is sensible to consider in more detail what the implications of such a correction might be."

Equity investors bear the first loss of any failure and so there is potential for a credit event to reduce private equity fund returns and even cause fund losses (particularly if multiple companies fail, more than one of which may be backed by a single fund). Investors' losses may be more significant in the context of club deals as attempts by the investors to diversify their risk may be countered by different funds investing in the same deal. Losses may also be

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high where the institutional debt market collapses while bridge finance is in place on a transaction. Although the private equity fund is not directly exposed to the debt, it can have knock on implications. Deals may be structured assuming the replacement of bridges at a lower cost – if this proves unfeasible the company may be faced with a higher debt repayment burden than was expected." [That being said], it is also "worth noting that the potential scale of losses in a private equity fund is capped. A fund can never lose on an investment more than the capital it committed as they do not employ derivatives, or short selling – investment techniques associated with other forms of alternative investment. It is also worth highlighting that the ramifications of equity losses are not as great as they might first appear. Private equity funds are not vulnerable to one of the more acute risks faced by other alternative asset managers, such as hedge fund managers, namely liquidity mis-match risk. Liquidity mis-match risk is the fund management equivalent of a bank run and involves a fund manager being forced to rapidly liquidate fund assets in order to meet redemption requests from investors. As private equity funds do not offer liquidity to their investors this risk does not arise."

However, "there is also potential for losses to be made on private equity related lending. If the finance providers are unlucky and the transaction becomes distressed in the period before an expected syndication, their losses may be particularly high. Some lenders may face losses on multiple transactions as different deals may be vulnerable to some of the same triggers and therefore may become distressed at the same time. There is also potential for losses to be made post syndication by investors in the debt tranches of private equity backed companies. If these investors have built up material exposures, perhaps buying into multiple private equity investments or committing heavily to individual transactions (perhaps on a leveraged basis) then losses could be material. Recovery rates on distressed debt vary considerably so it may be some time before the scale of any losses is known (unless the debt holders trade out of their positions – the ability to do this will be linked to the scale of their exposures and the circumstances of the default)."

Rating agencies are increasingly trying to produce loss given default probability distributions to help market participants understand and manage this risk. The distress of specific private equity backed companies and the related debt will clearly have implications for the market in such debt. We could see a period of instability and corrections triggered by

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corporate distress/default. Capital markets are increasingly inter-related. What happens in the leveraged loan market could have knock on effects in the markets for other asset classes. The transmission mechanisms to other markets are not always as clear as they might be as they involve a complex set of variables, however, there is evidence of correlation in price movements, albeit often with a time lag. We could therefore see instability in the leveraged loan market having consequential effects in the wider debt markets and indeed the markets in other asset classes such as equity. The impact could be greater if private equity transaction related losses lead investors to consider risk to be under priced more generally. This could lead to a broad retreat from certain types of asset, in particular high yield assets. Such a development is more likely to occur if investors in private equity related debt are forced into large scale sell-offs of other assets. They might, for example, do this to meet redemption requests from investors nervous about private equity related losses or to reduce overall capital at risk if risk managers/limits set in fund documentation require it."

"Market turbulence and substantial losses amongst private equity investors and finance providers have the potential to create a financial stability level event. This is more likely if risk holdings are concentrated and/or leveraged, particularly where there is uncertainty about actual net exposures, leading to liquidity withdrawal and an inability to trade out of positions. The appetite for the riskiest tranches of leveraged finance debt is reported to be concentrated amongst a relatively small number of investors… A financial stability level event is also more likely if a high profile transaction fails or if multiple transactions fail that have no clear link between them other than their private equity ownership/high leverage levels as this could undermine confidence in the asset class as a whole."

So, what would happen in the case of a system-wide shock? This brings us to the second major risk identified by the FSA, which is what they term the "unclear ownership of economic risk." They note that "here is potential for debt markets to become disorderly in the immediate aftermath of a leveraged buyout related credit event. The leveraged loan market is well known for its time consuming and arcane processes in terms of transaction confirmation and settlement, particularly with respect to the use of sub-participation and assignment as techniques for transferring risk. This fact could create uncertainty for investors in the debt of private equity backed companies about quite how much risk, and of what type, they are

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exposed to at a single point in time. This situation could, perversely, be exacerbated by the development of more efficient risk management in the form of hedging via loan credit default swaps, which may themselves be unconfirmed, and could further complicate the picture of who owns the risk."

"The added complications caused by credit derivatives do not just relate to the confirmation status. Issues also arise from the fact that increasingly, trading volume in credit derivatives far outweighs that in the underlying and it may be that firms find themselves unable to obtain the underlying in order to physically settle a transaction [when an obligation under a credit default swap is triggered, the party making the claim – that is, receiving compensatory payment – usually must deliver the defaulted loan or bond to the party making the payment triggered by the event of default]. In a number of cases industry bodies have facilitated a cash settled work out, but these arrangements have yet to be truly tested as the defaulting companies have not yet included entities whose securities and risk were particularly heavily traded. Neither have they really tested the complex array of insolvency regimes found across the EU, with their very different levels and forms of creditor protection."

"Also, there may be complexities based on different understandings about the precise terms of the derivative, what actually constitutes a credit event, what securities might be deliverable against it and what the implications would be of any delay in delivery. A further complication arises from the fact that, for reasons of prevention of market abuse, individual departments of a bank may be completely unaware of exposures of other departments as Chinese walls may exist between them. As firms devote substantial front, middle and back office resources in an attempt to quantify and limit their exposures to a credit event (and meet their contractual obligations) they may withdraw from the market for a period. This could reduce market liquidity and increase market volatility."

"The period of time during which individual parties are unsure as to the extent of their own exposures and whether trades will be honoured by their counterparties on the terms they expect (in the absence of a confirmation/clear legal position) could be quite lengthy. The situation will be further complicated by the general opacity surrounding the transfer of leveraged loans and their related risk. There is no general market-wide transparency surrounding loan risk transfer. Risk transfer mechanisms allow lenders of record to have a

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materially different level of net exposure than their lender of record position may suggest. Lenders are unlikely to be under any legal or contractual obligation to disclose their true position, even if they form part of a work out committee. Even the debtor company and its private equity backer may be unaware of the true extent of the net exposure of the lenders of record so the chance of a counterparty possessing all of the relevant facts is extremely slim. This opacity as to counterparties' true exposures can create significant difficulties."

"Risk transfer mechanisms may distort incentives in any credit event negotiation, leading parties to act in ways that are unpredictable to, and potentially to the detriment of, their fellow debt holders. It is no longer the case that those who appear to have an exposure to a particular debt security will want to maximise the recovery rate for that security as they may have an off-setting position and will be focused on maximising their overall recovery rate. Those who retain or purchase material debt exposures are most vulnerable to this risk. They could find themselves extremely distracted by complex work outs in the wake of credit events, possibly leading to enhanced losses. They could also find themselves with material losses if the complexity of a particular work out causes it to fail. Market participants need to be aware of these risks and build them into their risk management and operational arrangements."

Let us now move beyond the systemic risks created by the rise of private equity, and turn to the most recent research into the returns actually earned by limited partnership investors in these funds.

In an October, 2006 article ("The Performance of Private Equity Funds"), Phallipou and Gottschalg study "a dataset of 1579 mature private equity funds" raised between 1980 and 1993, and "find that performance estimates found in previous research and used as industry benchmark are overstated." They show that "commonly used samples are biased towards better performing funds." They also show that "accounting values reported by mature funds for non-exited investments are substantial and provide evidence that they mostly represent living dead investments." After "correcting for sample bias and overstated accounting values", [the authors find that] "average fund performance changes from slight overperformance to substantial underperformance of -3.83% per year with respect to the S&P 500. Assuming a typical fee structure, they find that gross-of-fees these funds outperform by 2.96% per year." Phallipou and Gottschalg "conclude that the stunning growth in the amount

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[of money] allocated to this asset class cannot be attributed to genuinely high past performance."

In "Smart Institutions, Foolish Choices: the Limited Partners Performance Puzzle," Lerner, Schoar and Wong find that "the returns that institutional investors realize from private equity investments differ dramatically across institutions. Using detailed and hitherto unexplored records of fund investors and performance, [they] document large heterogeneity in the performance of different classes of limited partners. In particular, endowments' annual returns are nearly 14% greater than average, [while] funds selected by investment advisors and banks lag sharply." In a related paper ("the Return to Pension Funds' Private Equity Investments"), Kapser Nielsen finds that between 1995 and 2004, Danish pension funds' private equity investments trailed their public equity investments by five percent per year"(on a net return to limited partners basis). Nielsen concludes that "this points to a systematic overestimation of the probability of success in private equity [fund] investments."

What might be causing these disappointing returns? In "What Drives Private Equity Fund Performance?", Gottschalg and Zipser find that private equity experiences higher returns when macroeconomic conditions are good, with real GDP growing and interest rates falling. Specifically, they identify two dominant drivers of private equity returns: when average corporate bond yields are low and stock market performance is strong during the life of the private equity fund, its returns tend to be significantly higher than when these conditions do not exist.

In "The Pressure Chain of Private Equity and Venture Capital Financing", Calanog and Lauterbach find that "more capital inflows into PE and VC funds, as measured by a higher level of committed capital in the overall market, leads to an increase in the fund's speed of allocation." They "interpret this as a signal of greater investment pressure. This increase in the magnitude and speed of capital inflow and allocation results in a decrease in the return on investment (ROI). The authors "interpret lower ROI figures to be the joint product of fund managers making suboptimal capital allocation decisions, and portfolio companies receiving larger amounts of capital injections in a shorter period of time unable to harness surplus funds productively."

Gottschalg and Zipser reach a similar conclusion as Calanog and Latuerbach in their paper "Money Chasing Deals and Deals Chasing Money." Gottschalg and Zipser find that

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"buyout performance decreases when large volumes of private equity commitments are looking for suitable acquisition targets." They believe their findings "support the view that the market for buyout target companies is not necessarily efficient, but that instead acquisition prices (and thereby transaction performance) depend on the competition by a limited number of private equity fund managers for a limited number of attractive investment opportunities."

On balance, the most recent research does not give one great optimism that many of the investments being made today in private equity funds will generate their hoped for returns. It also raises many questions in our mind about the systemic risks that the rise of private equity funds have helped create in the global financial system, and how they may one day (perhaps soon) come back to haunt us. However, to end this article on an optimistic note, in "Quantitative Private Equity Fund Due Diligence", Gottschalg and Kreuter go beyond simple fund screening rules of thumb like "only invest with managers whose past performance puts them in the top quartile of all private equity fund managers." Besides the fact that it is notoriously hard to gain access to these funds at anything approaching a reasonable price (if at all), the authors show that using multiple criteria to assess private equity funds is a more effective approach than the simple "top quartile" rule. That being said, we remain firm in our belief that, rather than being a distinctive asset class, private equity is a tilt within the broad domestic equity asset class that most investors would be well advised to avoid taking.

Product and Strategy Notes

Harry Kat's Stimulating Papers

Harry Kat is a professor of risk management at the Cass Business School (City University, London). This year, he has published a series of papers that should be of particular interest to many of our readers.

In "How to Evaluate a Diversifier with Ten Simple Questions", Kat begins by noting that "the process leading up to the decision to invest in [alternative asset classes] is often seriously flawed, and appears to contain a strong 'keeping up with the Joneses' element…Many investors seems to lose sight of the ultimate goal of investment management, which is to put together a *portfolio* of assets that satisfies different goals and criteria." Kat observes that in

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too many cases, this doesn't happen, and proposed additions to a portfolio are evaluated on their own merits, rather than in the overall portfolio context. To make it easier to take the portfolio approach, he provides ten questions to ask before adding a new asset class to a portfolio. The first eight apply to all situations, while the last two apply if the portfolio is explicitly targeted at funding a changing liability benchmark (e.g., this would be the case for a defined benefits pension plan). The questions include:

1. What risk premium is offered?
2. How volatile are the returns?
3. Are returns positively or negatively skewed or explicitly floored or capped?
4. How certain are you of the above?
5. How liquid is the investment?
6. Is the fee charged fair in relation to the above?
7. What is the correlation with the existing portfolio?
8. What is the co-skewness with the existing portfolio?
9. What is the correlation with the liabilities?
10. What is the co-skewness with the liabilities?

Kat provides examples for each of these questions. Even more interesting, however, are two examples he provides, where he puts a fund-of-hedge funds and commodities through his ten question test. The latter ends up passing the test, while the former does not.

Kat makes his case for commodities even more strongly in two other papers. In "What Every Investor Should Know About Commodities, Part 2: Multivariate Return Analysis", Kat and Oomen have written a paper that ranks with the two previous seminal treatments of this subject (Harvey and Erb's "The Tactical and Strategic Value of Commodity Futures" and Gorton and Rouwenhosrt's "Facts and Fantasies About Commodity Futures"). It concludes that commodities make sense as an addition to investors' portfolios. In addition, Kat has recently published another paper ("Is the Case for Investing in Commodities Really That Obvious?", available at http://www.cass.city.ac.uk/airc/pdf/WP-FF-35-2006.pdf) that summarizes the argument in non-technical terms. It would be an excellent paper for an advisor to recommend to clients who are interested in learning more about this subject.

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As noted above, Kat is less enthusiastic about hedge funds than he is about commodities. His starting point has been the metrics that are used to measure hedge fund managers' investment performance. In a series of papers, he has described how a substantial portion of hedge fund returns can be replicated by using mechanical futures trading strategies. These papers include, "Who Needs Hedge Funds? A Copula Based Approach to Hedge Fund Return Replication", and "Hedge Fund Returns: You Can Make Them Yourself." In "Tell Me What You Want, What You Really, Really Want"), Kat and Palaro test their replication strategy out of sample (that is, in periods subsequent to the data set that was used to build their model), and find that it works quite well.

Armed with these replicating strategies, Kat and Palaro evaluate the net-of-fees performance of 1,917 hedge fund managers. In "Superstars or Average Joes?", they find that "no more than 17.7% of hedge fund managers beat their replication strategy benchmark" and that average hedge fund performance has experienced a substantial deterioration in recent years.

The next logical step is to customize futures trading strategies that can deliver specific return levels within risk parameters (including correlation with other asset classes) set by investors. (Of course, this assumes that Kat's model will continue to work in the future as it has in the past, which, as we all know, isn't always the case.) Kat describes this approach (again, in quite accessible terms) in "Synthetic Funds and the Mongolian Barbeque." Kat has recently launched a new site, www.fundcreator.com, where this and other papers can be found, and where his services (for futures trading strategy development, to create "synthetic" hedge funds) can be accessed. At this point, they are only available to institutional investors; however, we suspect that it won't be long before an enterprising institution launches a new ETF based on one or more "Kat Indexes" that track the performance of different synthetic hedge fund futures trading strategies.

Energy Master Limited Partnerships

Earlier this year, both Citigroup and Alerian Capital Management (www.alerian.com) launched new indexes that track the performance of energy master limited partnerships that trade on U.S. exchanges. These are not depleting royalty trusts (where the income stream is

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based on the continued – and uncertain – production from a set of wells), but rather are based on so-called "midstream" assets like natural gas gathering and processing systems. As was the case with the late, great Canadian Income Trust sector, U.S. MLPs pay no corporate level tax, and are attractive to many investors because of the high yield they provide.

The creation of these new indexes raises a number of interesting questions, such as "are they a distinct asset class?" and "if so, how would they fit into my portfolio?" To answer these questions, let us first consider the economic return generating process for a mid-stream MLP. As in the case of real estate, when it comes to deciding where to build a gas gathering and processing system, location is critical. These midstream operations collect gas from many wells and remove impurities from it so that it can be sent into a "mainline" distribution system, and shipped to end-use customers. As such, a company building a midstream operation must site it in an area that has access to many wells. So far, so good. However, there is also risk involved. Frequently, more than one company will be interested in building a midstream plant in a given location. When this happens, the exploration and production company which owns the gas wells will conduct an auction, in which midstreamers must submit bids based on the price they will charge to process the E+P company's gas (in this case, it is the low bid that wins). In determining its bid price, the midstream company must make a judgment about how much gas the wells will produce in the future (which is a function of the physical condition of the field, the cost of production, and the market price of gas), and, therefore, the future capacity utilization and cash flows of the midstream business. If a midstreamer guesses wrong (and bids too low), it can lose a lot of money. On the other hand, if a field produces more gas than the midstreamer expects, higher profits will result.

So, as you can see, the return generating process for a midstream energy MLP is a function of both physical factors (the future condition of the gas field) and market factors related to the state of the economy (the demand for and price of gas). In this sense, MLPs bear a close resemblance to timber investments, which have a similar return generating process, and a low correlation to returns on other asset classes. When we analyzed the historical real returns on the Alerian Total Returns Index, we found this was also true of MLPs. The following table shows the correlation of their quarterly real returns with those on other asset classes between 1996 and 2004 (during this period, the average annual real return on the MLP Index was 8.95%, with a standard deviation of 10.70%):

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Asset Class	Correlation	Asset Class	Correlation
Real Return Bonds	**.20**	**Timber**	**(.15)**
Domestic Bonds	**.16**	**Domestic Equity**	**(.01)**
Foreign Bonds	**(.09)**	**Foreign Equity**	**(.07)**
Domestic Property	**.37**	**Emerging Equity**	**(.04)**
Foreign Property	**.10**	**Equity Mkt Neutral**	**.29**
Commodities	**.12**	**Equity Volatility**	**(.07)**

Based on this analysis, we concluded that there is a case to be made for treating energy MLPs as a separate asset class. In our view, the critical distinction between midstream MLPs and utilities (or, to use the current term, "infrastructure") more generally is that the MLPs' returns are in part driven by a physical process that logically should have no correlation with other asset classes' return generating processes.

We then looked at how the inclusion of energy MLPs as an asset class might change the composition of one of our model portfolios. We chose the Index Investor 5% target real return accumulation portfolio, and capped the maximum allocation to energy MLPs at 10%. We also assumed that, in the future, energy MLPs would earn a premium over real return bonds of 1.50% -- the same as domestic commercial property. Our analysis produced the following portfolio:

Asset Class	Weight	Asset Class	Weight
Real Return Bonds	**5%**	**Timber**	**10%**
Domestic Bonds	**5%**	**Domestic Equity**	**0%**
Foreign Bonds	**0%**	**Foreign Equity**	**5%**
Domestic Property	**20%**	**Emerging Equity**	**10%**
Foreign Property	**15%**	**Equity Mkt Neutral**	**10%**
Commodities	**10%**	**Energy MLPs**	**10%**

So far, so good. However, there is a catch: today, there is no way to invest in an energy MLP index product. While there are a number of closed end funds available that invest in MLPs, they are taxed at the corporate level. The alternative is investing in individual MLPs, which

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requires active management skill. Unfortunately, we don't expect to see an investable MLP Index product any time soon: the total market capitalization of all U.S. energy MLPs is estimated to be only $125 billion, which makes it very difficult to create a liquid, investable product (e.g., by comparison, the market capitalization of Microsoft is $286 billion). Given this, we conclude that energy MLPs only belong in the portfolios of those investors who believe they either have, or can access, the active management skill needed to succeed in this small asset class.

Momentum Investing: Easy in Theory, Hard in Practice

Around the world, many papers have been written, and presentations made, that show substantial potential returns from following a momentum strategy: in essence, going long assets that have been rising in value, while shorting those whose price has been falling. However, a growing body of research has concluded that those returns are much harder to realize in practice. A new paper on this issue is "Will The Smart Institutional Investors Always Drive Prices to Fundamental Value?" by Boynton and Jordan. In theory, when the market price of an asset diverges from its fundamental value, arbitrageurs should act to bring it back into line, by buying undervalued assets and selling short overvalued assets.

Boynton and Jordan's starting point is the costs involved in implementing this strategy, which fall into two main areas. The first are those associated with setting up the short and long positions. When investment banks loan an investor shares to short, they require that the cash received from the short sale be kept by the bank as collateral. This means that the momentum investor's long position must be financed either with his own funds or with margin loans. Since the cost of margin loans is greater than the return earned on the collateral (a difference of roughly 2% today), there is a drag on the arbitrage strategy's returns.

The second set of costs incurred by an arbitrage strategy are those associated with its trading. Since many of the shares bought and sold are for smaller companies, the commissions and market impact costs (i.e., the change in the bid/ask spread and change in price caused by an increase in trading volume) can be quite large. Boynton and Jordan refer to these set up and trading costs as the "friction" associated with implementing an arbitrage

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strategy. They find that friction costs are substantial, and restricts arbitrageurs' trading activity. As a result, market prices, particularly for smaller stocks, can diverge from their fundamental values for significant periods of time.

Of course, the flip side of this is that the absence of arbitrage also gives rise to theoretical momentum profits, based on a simple comparison of the returns from buying (in the absence of friction costs) past winners and selling short past losers. Based on their historical analysis of potential momentum strategies, the authors conclude that "stocks that generate the highest momentum returns are precisely those with the highest trading [friction] costs," that, as a practical matter, "prevent profitable execution of standard relative strength [momentum] strategies." In sum, trading frictions drive a substantial wedge between the theoretical profits from momentum strategies and those that are actually realized in practice (Note: for another good paper on this subject, see "The Cost of Trend Chasing and The Illusion of Momentum Profits" by Donald Keim from The Wharton School).

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Is a Concentrated Portfolio a Sign of a Skilled Active Manager?

In "Fund Managers Who Take Big Bets", Baks, Busse and Green conclude that more often than not, it is. The authors begin by noting that concentrated portfolio positions can be a sign of either overconfidence or manager skill. After analyzing historical mutual fund data in the United States between 1979 and 2003, they conclude that more often than not, it is a sign of manager skill, since the higher returns earned by many of these funds are not associated with momentum or other factors (e.g., industry tilts). As important, the authors find that increasing fund size does not dissipate this effect, as many of the "big bet" funds they identify have substantial assets and invest in larger and more liquid large cap companies. Overall, "the evidence suggests that investors may enhance their performance by diversifying [their portfolios] across a number of focused managers, rather than by investing in highly diversified funds."

However, it is important to point out an important caveat about this study. It is based on gross returns, and does not include the impact of expenses and investor-level taxes. As Russ Wermers has pointed out (in "Mutual Fund Performance: An Empirical Decomposition"), on average, these more than offset the additional returns above a benchmark produced by manager skill. In sum, while this study is certainly insightful, it is by no means definitive when it comes to the active versus passive debate.

What Drives Changes in the Residential Property Rent/Price Ratio?

In an important new paper, Campbell, Davis, Gallin and Martin from the U.S. Federal Reserve analyze this question in their new paper, "A Trend and Variance Decomposition of the Rent-Price Ratio in Housing Markets." The authors' starting point is a housing valuation model that is based on the dividend discount model used to value equity markets. According to this methodology, the value of an asset is equal to the present value of its current cash flow, discounted at a rate equal to the return on risk free government bonds, plus a risk premium, less the expected rate at which cash flow will grow in the future. In applying this model to housing markets, the authors set current average rents equal to the value of the cash flow produced by housing assets.

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Between 1975 and 2005, they find that the real annual growth rate for rental cash flow was usually between minus and plus two percent, and averaged less than one percent per year in most areas (they use a combination of national, regional and metropolitan area data in their analysis). They also find that rent/price ratios varied more across regions than the growth rate of rental cash flows. Since real risk free rates were the same in all regions (with the fall in real rates between 1975 and 2005 accounting for 40% of the decline in the average rent/price ratio), the authors conclude that it was variations in the risk premia attached to residential property investment that caused not only 50% of the decline in the national rent/house price ratio, but also most of the observed variation in the rent/ price ratio between different regions and metropolitan areas.

At the national level, they find that the housing risk premium was 2.5% at the beginning of their sample in the mid 1970s, but had fallen to less than one percent by 2005. Within this average, there were also considerable regional variations, with the housing risk premium falling least in the south, and the most in the western United States. There was also considerable variation across metropolitan areas, with the lowest average premia found in New York, Los Angeles and San Francisco.

Finally, the authors find that, before 1997, changes in real rates and the housing risk premium were negatively correlated – when real rates rose, the housing risk premium declined, which tended to keep housing prices reasonably stable over time. Since 1997, however, they have become positively correlated (i.e., a fall in real rates has been accompanied by a fall in the housing risk premium). This not only accounts for the sharp rise in U.S. housing prices in the past few years, but also suggests that they will be much more volatile in the future. And remember: these authors work for the U.S. Federal Reserve Board, where their report must have been greeted with dismay.

What is the Right Ex-Ante Equity Risk Premium?

Speaking of risk premiums, the correct value for the additional return investors should require to invest in the domestic equity asset class is one of the most vexing issues in finance. The core of the problem is that analyses based on historical data estimate the equity risk premium by subtracting the realized return on risk free government bonds from the realized

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return on equities (for an excellent example of this approach, see "The Worldwide Equity Premium: A Smaller Puzzle" by Dimson, Marsh, and Staunton of London Business School). This runs the risk of including in the estimate of the equity risk premium factors which could not have been anticipated in advance (e.g., changes in the market price/earnings ratio, or reductions in average inflation rates). On the other hand, it is hard to estimate what is actually going through investors' minds when they contemplate a new investment in the equity asset class.

A new paper by Donaldson and Kamstra ("Estimating the Ex-Ante Equity Risk Premium") takes a very innovative simulation-based approach to this issue, and concludes that the correct ex-ante equity risk premium is 3.5%, plus or minus .5%.

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2006-2007 Model Portfolios Update

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 equity market neutral (uncorrelated alpha) 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 2006, our Canadian Dollar cash benchmark is 3.83% (in nominal terms). The second benchmark we use is a portfolio equally allocated between the ten asset classes we use (it does not include equity market neutral). 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 here:

http://www.indexinvestor.com/Members/YTDReturns/Canada.php

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