Capital Market Assumptions

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OVERVIEW AND SUMMARY

Capital market assumptions (CMAs) are the foundation of any long-term investment policy. GEM takes a building-blocks approach to establishing our CMAs. That is, we begin with market-implied expectations for cash and inflation and then add risk premia for fixed income and equities. For fixed income, we add term and credit premiums.[1] For equities, we add the Equity Risk Premium (ERP), which we derive through a three-stage dividend discount model: we forecast earnings for three years using analysts' consensus estimates, and we set long term nominal earnings growth to mirror survey-based estimates of long-term real GDP growth plus our inflation expectation. In the middle stage, we assume that earnings growth scales down to the long-term growth rate smoothly over three years. Our approach thus incorporates market-based pricing and reduces subjective overrides to the extent possible. Even so, we intend for CMAs to be long-term forecasts.

For GEM's asset classes we adjust for beta, and add an alpha expectation. These asset classes are not "investable" in the traditional sense, but we believe they reflect GEM's opportunity set.

	Expected Risk Premium	(x) Beta	(+) Cash	(+) Alpha	=	Expected Return	Expected Volatility
Equity	5.7%	0.90	2.4%	2.5%		10.0%	19.0%
Hedge Funds	5.7%	0.25	2.4%	3.0%		6.8%	12.0%
Real Assets	3.7%	1.00	2.4%	2.0%		8.1%	17.0%
Fixed Income	-0.1%	1.00	2.4%	0.0%		2.2%	6.0%
			2.4%				
S&P 500	3.7%	1.00	2.4%	0.0%		6.0%	18.5%
BarCap Aggregate	0.4%	1.00	2.4%	0.0%		2.8%	6.0%
Inflation	1.9%					1.9%	1.2%
Passive Global 70/30						6.5%	13.5%
Policy Portfolio						7.9%	12.5%

Note, as required for the purposes of modeling, these assumptions are presented as arithmetic returns and volatility. Translating these into geometric (i.e., compound) returns requires adjusting them down by their volatility (the volatility drag is approximated well by subtracting half of the variance from the arithmetic return). This means the Global 70/30 portfolio has an expected geometric return of 5.5% per annum and the Policy Portfolio 7.1% p.a.[2]

The next section details each of these assumptions by asset class and the GEM Policy Portfolio in aggregate.

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[1] *Credit Premium is the option-adjusted spread of the Barclays Aggregate Index. See Fixed Income section below. We use the Barclays Treasury benchmark for our Policy Portfolio, but Core Bonds, i.e., the Aggregate Index, for the 70/30 portfolio.*

[2] *Returns are not guaranteed.*

CMA Building Blocks

Inflation = 1.9%

We average the US 10-year break-even inflation (BEI) from Treasury Inflation Protected Securities and the 10-year CPI projection of the Livingston Survey (produced semi-annually by the Philadelphia Federal Reserve). During the last 10 years, TIPS have become very sensitive to other market prices (even equities), weakening their predictive ability. Survey data on inflation tends to respond more slowly to change than market-based estimates, making it more stable and less prone to overreaction. Averaging the TIPS and Livingston series produces a more accurate estimate of future realized inflation than either measure individually. As of December 31, the 10-year BEI was 1.6% and the latest Livingston survey median was 2.2%, producing an average of 1.9%.

Cash = 2.4%

We use the average rate of Eurodollar futures for the next 10 years. Each Eurodollar represents the forward interest rate on a three-month time deposit in the future. While this interest rate includes a small measure of credit risk, we believe it represents a reasonable estimate of forward cash returns. The forecasting error for cash tends to be high because cash yields are highly sensitive to changes in market environment, which has an immediate impact on forward short-term rates. On average, we would expect this estimate to represent a positive return after inflation. As of December 31, the average rate of Eurodollar futures for the next 10 years was 2.4%.

US Equity Risk Premium (ERP) = 3.7%

We use a three-stage S&P 500 dividend discount model to calculate US ERP. In the first stage, we employ three years of dividend forecasts based on Bloomberg consensus estimates. For the terminal stage, we use the US long-term trend real growth rate of 1.6% forecast by The Conference Board, increased by the expected inflation rate. The Conference Board updates forecasts periodically, and the "trend growth" estimate tends to begin about six years in the future. For the second stage, we use a growth rate interpolated between the first and terminal stage. With a US long-term nominal trend growth rate of 3.5%, a nominal discount rate of 6.1% would discount forecast dividends to the present price, equating to a 3.7% US ERP.

Global Equity Risk Premium = 5.7%

We use the same three-stage dividend discount model approach for global ERP based on MSCI All Country World Index. For the terminal stage, we use the global long-term real trend growth rate of 2.8% forecast by The Conference Board. The real growth rate is adjusted upward by a weighted average expected long-term inflation rate. The nominal discount rate is 8.0%. Note, two factors cause the gap between the global and US ERP: the assumed higher growth rate drives about three-quarters of the excess ERP for global equities, with higher US valuations driving the balance of the difference. The current global ERP relative to US cash is 5.7%.

Real Asset Risk Premium = 3.3%

Over time, we expect the majority of GEM's Real Assets exposure to be invested in private real estate. Therefore, we believe that the best proxy for Real Assets is a discounted cash flow model to forecast real estate return. The model uses net operating income growth and capitalization rate change supplied by Green Street Advisors. Our current estimate assumes an entry cap rate of 5.4% and an exit cap rate of 7.0%. Net Operating Income (NOI) growth is expected to average about 3.6% through 2018, with long-term NOI growth of 1%. We assume a loan-to-value ratio of 60% and a commercial mortgage rate (based on triple-B bond yields) of 4.75%. This model results in a nominal expected return of 5.8%, which leaves a risk premium relative to cash of 3.3%.

GEM Policy Portfolio Alpha and Beta Assumptions

Once we have calculated our basic CMAs, we add estimates for alpha and beta to each asset class. Our beta estimates represent the relative risk we expect from each asset class versus its benchmark. The alpha is the amount of excess return we expect relative to the asset class benchmark on a risk-adjusted basis. Where possible, we perform a linear regression on actual results to produce estimates of historical alpha and beta. The alpha assumption is an important element in determining an "optimal" mix of assets. In the case of Hedge Funds, for example, the alpha opportunity is the only reason to invest in the asset class; without alpha, the expected return simply would be a fraction of the ERP combined with cash returns.
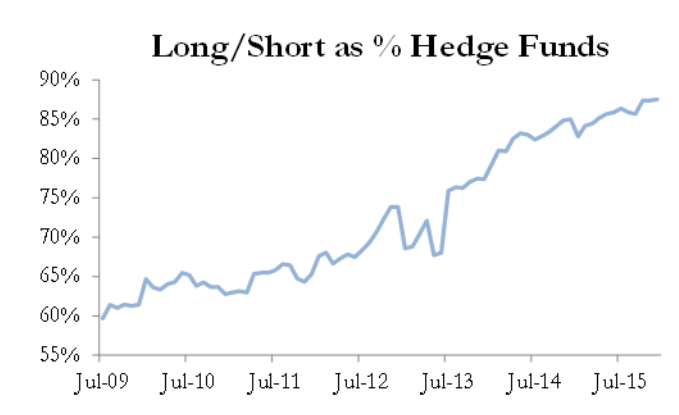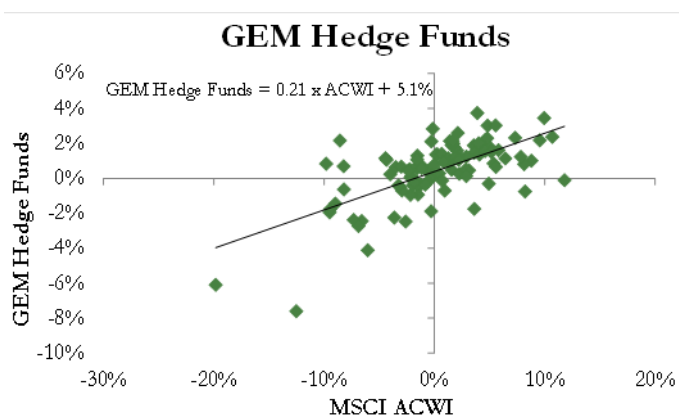
Equity: Beta = 0.9, Alpha = 2.5%

To estimate GEM's long-term equity return, we multiply our expected beta versus the MSCI ACWI and add an assumption for alpha. Since inception, GEM's public Equity beta has been about 0.9 with alpha of over 4% annualized. The graph at right shows the historical regression of GEM's public Equity against the MSCI ACWI benchmark. Because GEM evaluates private equity investment opportunities relative to the public opportunity set, our public portfolio assumptions serve as a reasonable proxy for overall equity expectations. GEM's total Equity portfolio has produced a 5.7% annualized alpha since inception; however, going forward we assume only 2.5% annualized alpha to be conservative.
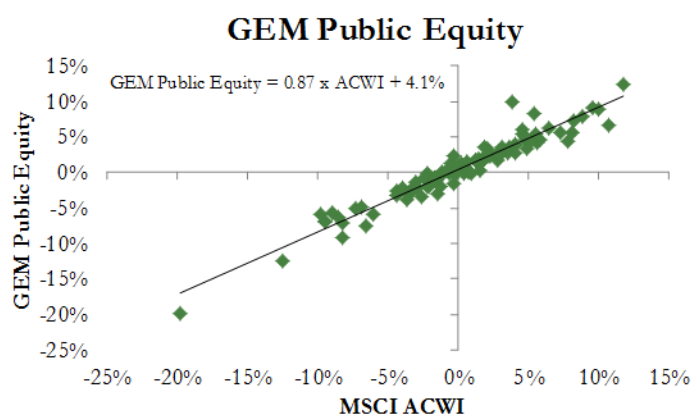
Hedge Funds: Beta = 0.25, Alpha = 3.0%

For Hedge Funds, we also use expected beta versus the MSCI ACWI and add an assumption for alpha. Since inception, the beta of GEM's Hedge Fund portfolio has been 0.21 with annualized alpha of 5.1%. The second graph at right shows the historical regression of GEM's Hedge Funds against the MSCI ACWI benchmark. Over time we have increased the portion of GEM's Hedge Fund portfolio invested in long/short equity funds (versus "absolute return" funds). While hedge fund beta remains moderate, we expect a slightly higher level of market exposure than in the past, and assume lower alpha opportunities in the future.

GEM Public Equity

GEM Public Equity = 0.87 x ACWI + 4.1%

GEM Hedge Funds

GEM Hedge Funds = 0.21 x ACWI + 5.1%

Long/Short as % Hedge Funds

Real Assets: Beta = 1.0; Alpha = 2%

Given the data limitations of predominately private portfolios, and the relatively young age of GEM's Real Assets investments, a time series regression is not sufficient for developing an alpha assumption. We do have data on several GEM Select portfolios that have historically comprised about one quarter of the Real Assets portfolio. Within commodities (which comprise 15% of the benchmark), GEM's internally-managed portfolio has outperformed the benchmark on a beta-adjusted basis by 8%. Real asset equities also account for 15% of the benchmark, and GEM's performance within REITs and MLPs has been slightly less than 2%.

GEM Select	Inception	Beta	Alpha
Commodities	Nov-07	0.90	8.1%
REITs	Oct-09	1.02	1.6%
MLPs	Aug-10	0.99	1.5%

Our goal within private Real Assets is to invest with top quartile managers. According to data from Burgiss, top quartile funds outperformed median funds by over 5% per annum over 10 years. Because these returns are IRRs (rather than time-weighted returns), we also looked at multiples of capital for the Burgiss universe. Top quartile funds returned 2.2x capital over 10 years versus about 1.7x for the median fund. Over 10 years, this translates into an annualized premium of about 2.8%. Overall, we assume a beta of 1.0 and a conservative estimate of 2% annualized alpha.

Fixed Income: Beta = 1.0; Alpha = 0%

The primary role of Fixed Income in GEM's portfolio is to provide liquidity and negative correlation with equities. Credit doesn't provide deflation protection. Therefore, in our Policy Portfolio, we base our Fixed Income assumptions on the US Treasury market. We employ estimates of the term premium published by Federal Reserve Board staff and add it to the expected return of cash to arrive at the expected return for Fixed Income. For the Core Bond assumption (which is part of the 70/30 benchmark), we add the Barclays Aggregate Index's option-adjusted spread to add the effect of higher yields in the non-government segment of the benchmark.

Volatility Assumptions

With 28 years of data, we estimated volatility using annual returns. For most asset classes we used annual returns because the presence of autocorrelation in quarterly (or monthly) returns may dampen observed volatility. In general, we then rounded the standard deviation to avoid an overly precise estimate (for example, MSCI ACWI observed annual volatility was 18.2% and we assume 19% going forward). The exception to annual observations was for Real Assets, where we employed a technique to un-smooth the quarterly returns, arriving at our assumption of 17%.

The chart at right shows GEM's current market assumptions presented as a capital market line. First, the relationships are consistent with theory: expected returns rise with expected volatility. The spread between Equity and the S&P 500 for similar risk is notable. This difference is driven by 1) higher relative starting valuations for the S&P 500, and 2) GEM's alpha assumption for Equity outlined previously. In contrast, and not surprisingly (because of credit beta), the Aggregate Index assumption is higher than GEM's Fixed Income despite similar volatility. But the Aggregate Index's *correlation* with Equity is much less negative than it is for Treasuries – that is, the Agg provides less diversification (the higher return for similar volatility is no "free lunch").

Forecasted Capital Market Line
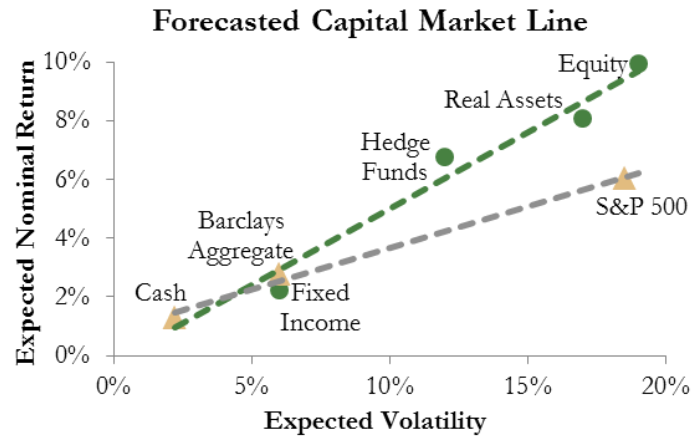
APPENDIX: REASONABLENESS CHECK

We believe using forward-looking assumptions that incorporate current capital market pricing is superior to using historical averages but that it is still useful to consider the longer-term averages as context. The table below shows the average real return for the S&P 500 and cash (the difference being the ERP) for various periods. Our current US Equity Risk Premium assumption is 3.7%, which would rank in the bottom 29th percentile of realized rolling 10-year periods during all of the historical periods shown. This is consistent with the relatively high valuation observed currently for stocks.

Historical Real Returns

Time Period	Length	S&P 500	T-Bills	ERP
Full History	90 Years	6.9%	0.6%	6.3%
Post-WWII	70 Years	6.9%	0.4%	6.4%
Last 50 Years	50 Years	5.4%	0.9%	4.4%
Last 30 Years	30 Years	7.6%	0.9%	6.7%

In their most recent yearbook, Credit Suisse calculates the historical ERP across 23 countries and weights each by its annual market capitalization to calculate global equity returns. Through 2015 they found an annualized real return for equities of 5.0% since 1900, exceeding US T-bills by 4.2%. That matches the ERP versus US cash during the last 50 years. For the US, they found a historical ERP of 5.6% since 1900 and 4.5% for the last 50 years. Our forward-looking estimates are higher than historical results for global equities but lower than historical for the US. These differences are driven by relatively low forward-looking valuations in the equity markets of the Euro zone and developing countries compared to the US.

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