Backtesting GEM vs. GEM2: Country Risk Attribution | August 2009

Introduction

Backtesting the enhanced Barra Global Equity Model (GEM2) against the previous version, GEM, highlights key differences between the two models. One of the largest differences is in the risk attribution to country factors. For example, compared to GEM2, GEM attributes on average 8.5 times greater risk to countries when comparing the MSCI EAFE Value Index to the MSCI EAFE Index for the period January 2002 to May 2009. As we explain in this Research Bulletin, this result is due to GEM2's inclusion of the new World and Volatility factors, which allows the regression model to separate out country from global market effects. In contrast, GEM's regression model lumps together global market with country effects, leading to a substantially larger country risk attribution.

Risk Attribution Differences

GEM and GEM2 attribute risk differently across factor sets (countries, industries, risk indices, currencies, and asset selection) although the differences do not encompass every set of factors. We started with the MSCI EAFE Value Index, the managed portfolio, relative to the MSCI EAFE Index, the benchmark portfolio. We ran monthly risk attributions in Barra Aegis (version 4.3) using both GEM and GEM2 for the period January 2002 to May 2009.[1] For each month and factor set, we calculated the difference between GEM and GEM2 in the contribution to active risk.[2] We then computed the mean of the differences over the entire time period.

Table 1 shows that the largest mean differences in active risk contribution are for countries and asset selection. Contributions to active risk from the risk indices and covariance terms are approximately half as large in magnitude as those for countries and asset selection, while those for currencies and industries are less than a tenth as large.

Table 1: Mean Difference in Contribution to Active Risk, January 2002 to May 2009

Factors	GEM	GEM2	Contribution to Risk[1]
Countries	11.05	0.62	10.44
Covariance*2	15.65	10.57	5.08
Currencies	0.67	0.32	0.34
Industries	21.15	21.79	-0.63
Risk Indices	28.96	34.18	-5.22
Asset Selection	22.51	32.52	-10.01

[1] As a percent of squared total active risk

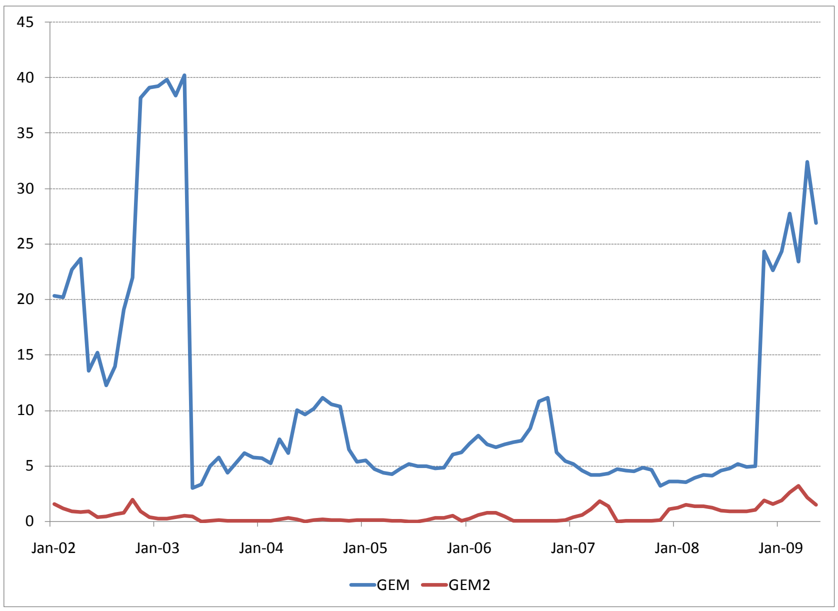
[1] Aegis attributes forecasted rather than realized risk. We use Barra Aegis Connect to obtain time series values for the risk attribution.
[2] Aegis calculates contribution to risk in terms of squared risk rather than risk. For example, the country contribution to risk is defined as the square of country risk divided by the square of total risk.

The World Factor

We focus on the largest difference in contribution to risk, that of countries. As Figure 1 shows, GEM country contribution to active risk is consistently higher than that of GEM2. Strikingly, there are periods during which GEM country risk is significantly higher – e.g. around late 2002 to early 2003, and more recently, October 2008 to the present.

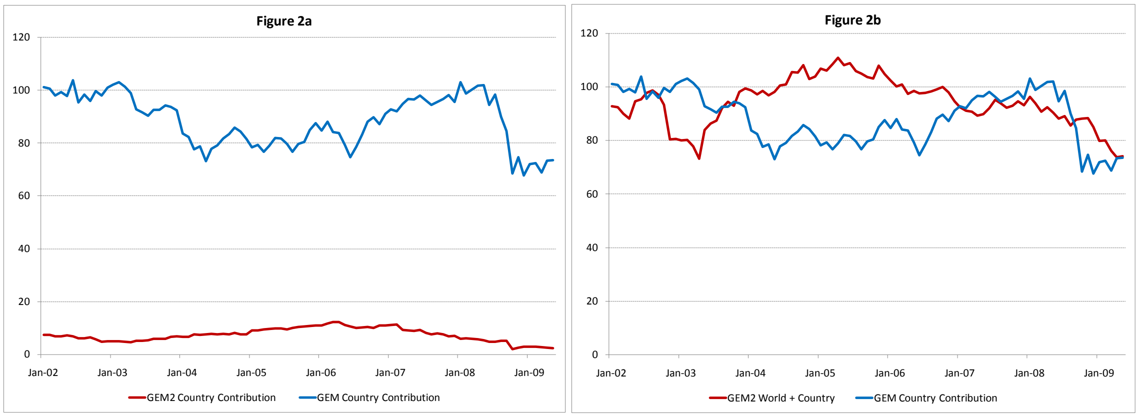
The reason for this difference is the fundamentally different regression methodology. Among the many differences between the two models, GEM2's inclusion of the World factor produces a substantial effect. With the World factor, GEM2 parses out the portion of an asset's return attributable to the general movements of the world markets and that which is specific to each country. In contrast, GEM lumps the two effects together, largely in the country factor returns.

Figure 1: Country Contribution to Active Risk, January 2002 to May 2009



One way to see this effect is to examine the total rather than active risk attribution. Figure 2a shows the large disparity, 81% on average, between GEM and GEM2 in the country attribution. Figure 2b shows that this disparity mostly disappears when we compare GEM country attribution to a sum of GEM2 country and world attribution. The average difference reduces to negative 6%. Thus, GEM country attribution approximately captures GEM2 country plus world attribution. Since both the active and benchmark portfolios have identical exposures of "1" to the World factor, this effect is not visible in the active risk attribution, where net attribution to the World factor is zero.

Figure 2: Contribution to Total Risk, January 2002 to May 2009



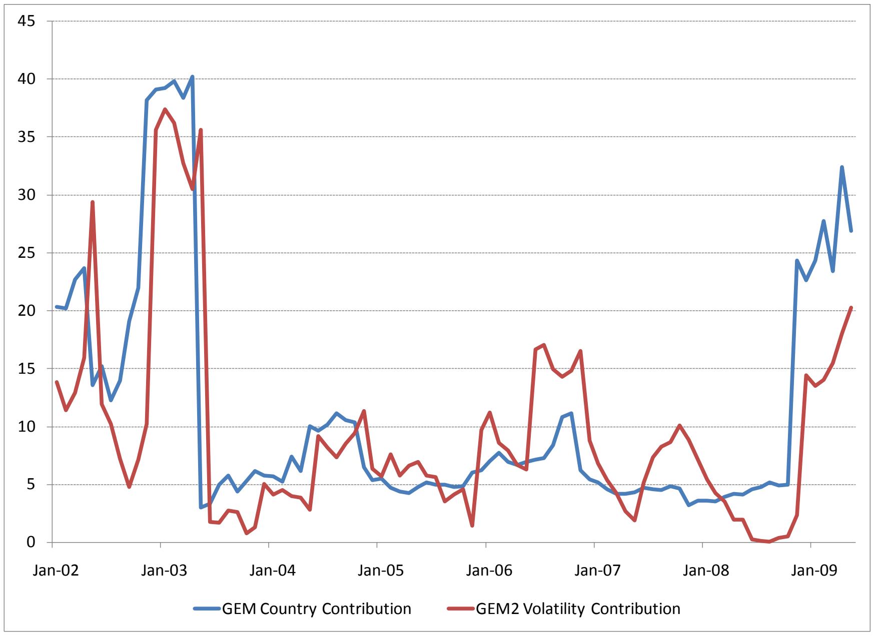
Market Risk, Part 2: The New Volatility Factor

In addition to the World factor, GEM2 includes the new Volatility factor, which captures market risk net of world market risk. Volatility is not a substantial factor in the total risk attribution, but it is significant in the active risk attribution. In the total risk attribution, Volatility contributes only 0.53% on average relative to the World factor's contribution of 87%. However, in the active risk attribution, Volatility contributes 9.5%, and more importantly, it is highly correlated with GEM's country contribution at 0.88. As Figure 3 shows, GEM's country contribution and GEM2's volatility contribution move closely together. Like the World effects, GEM's country contribution also includes those more appropriately attributable to the Volatility factor.

While GEM also has a volatility measure, it is more limited compared to that of GEM2. GEM's Variability in Markets (VIM) factor has a single descriptor, residual volatility, while GEM2's Volatility measure has four descriptors, only one of which is residual volatility. The other three are daily standard deviation, cumulative range, and, most importantly, historical beta. [3] GEM includes historical beta to local markets over 60 months as country exposures. In contrast, GEM2 uses exposures of 1 or 0 to countries and includes a historical beta to the universe over 104 weeks or approximately 24 months. The addition of the three additional descriptors, particularly historical beta, results in an increased contribution to risk by GEM2's Volatility relative to GEM's VIM.

[3] For more details, see Jose Menchero, Andrei Morozov, and Peter Shepard, *The Barra Global Equity Model (GEM2)*, Research Notes, MSCI Barra Model Insights, September 2008, p. 66.

Figure 3: Contribution to Active Risk, January 2002 to May 2009



Conclusion

The release of GEM2 historical data allows for comparative backtesting between GEM and GEM2. In this Research Bulletin, we have compared the risk attributions of the two models for the same managed (MSCI EAFE Value Index) versus benchmark (MSCI EAFE Index) portfolios. The risk attributions reveal a particularly large difference in country contribution to risk, which is explained by the different regression methodologies used in each model, specifically the inclusion of the World and Volatility factors in GEM2. The structure of the new GEM2 model produces more intuitive country risk attribution, which allows model users to better isolate country risk and assist them in making more efficient allocation decisions according to country risk.

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