GEM2 Factor Returns and Volatilities

Research Notes Supplement

January 2010

Jose Menchero
Jun Wang
## Table of Contents

Overview 3

Factor Returns and Volatilities

- World and Styles 4
- Industries 7
- Countries 19
- Currencies 38

Appendix: Log Returns 53
Overview

This document catalogs the performance and volatility of all factors and currencies in the Barra Global Equity Model, GEM2. The analysis period runs from January 1997 to August 2009. Volatility forecasts are reported on an annualized basis and are obtained from the short-horizon version of the model, GEM2S. For currencies, the volatility forecasts are from the US Dollar numeraire perspective.

Performance is measured in terms of cumulative log returns. Log returns are better than conventional returns for visualizing performance over long intervals of time since every period is treated on an equal basis. Log returns are described in greater detail in the technical appendix.

In the following plots, log returns are plotted as solid blue lines, with the scale shown on the left vertical axis. Volatilities are plotted as dashed red lines, with the scales given on the right vertical axis.

The plots are organized as follows: the World factor and style factors are presented first, followed by industry factors, country factors, and finally currencies.
The World and Style Factors

World Factor

Volatility

Momentum

MSCI Barra Research
© 2010 MSCI Barra. All rights reserved.
Please refer to the disclaimer at the end of this document.
Industry Factors

Energy Equipment & Services

Log Return (%)

-100 -75 -50 -25 0 25 50

Volatility (%)

0 10 20 30 40 50


Oil, Gas & Consumable Fuels

Log Return (%)

-30 -15 0 15 30 45

Volatility (%)

0 5 10 15 20


Oil & Gas Exploration & Production

Log Return (%)

-100 -75 -50 -25 0 25 50

Volatility (%)

0 5 10 15 20 25 30 35

Country Factors

Argentina

Log Return (%)

Volatility (%)

Australia

Log Return (%)

Volatility (%)

Austria

Log Return (%)

Volatility (%)
Bahrain

Log Return (%)

Volatility (%)

Belgium

Log Return (%)

Volatility (%)

Brazil

Log Return (%)

Volatility (%)
Indonesia

Log Return (%)

Volatility (%)


Ireland

Log Return (%)

Volatility (%)


Israel

Log Return (%)

Volatility (%)

Switzerland

Taiwan

Thailand
Currencies

Argentine Peso

Australian Dollar

Bahraini Dinar

Please refer to the disclaimer at the end of this document.
GEM2 Factor Returns and Volatilities
January 2010

MSCI Barra Research
© 2010 MSCI Barra. All rights reserved.
Please refer to the disclaimer at the end of this document.
UAE Dirham

Log Return (%)

Volatility (%)

Appendix: Log Returns

Let $R_t$ be the return to a portfolio (or factor) over period $t$. The compound return over $T$ periods is given by the usual expression

$$1 + R_T = \prod_{t=1}^{T} (1 + R_t).$$

(A1)

The log return of the portfolio is given by,

$$\ln (1 + R_T) = \sum_{t=1}^{T} \ln (1 + R_t).$$

(A2)

A nice property of log returns is that they cumulate additively over time. Also note that log returns are approximately equal to standard returns if the returns are small. That is,

$$\ln (1 + R_t) \approx R_t,$$

if $|R_t| << 1$. Standard returns can be derived from log returns using the following equation:

$$R_T = \exp \left[ \sum_{t=1}^{T} \ln (1 + R_t) \right] - 1.$$  

(A4)

For instance, consider the World factor (page 4) from the market low of early 2003 to the market peak in late 2007. The cumulative log return increased from -15% to about 65%. Plugging these numbers into Equation A4 gives a return of $\exp[0.8] - 1$, or 123 percent, during this period.
## Contact Information

clientservice@mscibarra.com

### Americas

<table>
<thead>
<tr>
<th>City</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Americas</td>
<td>1.888.588.4567 (toll free)</td>
</tr>
<tr>
<td>Atlanta</td>
<td>+ 1.404.551.3212</td>
</tr>
<tr>
<td>Boston</td>
<td>+ 1.617.532.0920</td>
</tr>
<tr>
<td>Chicago</td>
<td>+ 1.312.675.0545</td>
</tr>
<tr>
<td>Montreal</td>
<td>+ 1.514.847.7506</td>
</tr>
<tr>
<td>Monterrey</td>
<td>+ 52.81.1253.4020</td>
</tr>
<tr>
<td>New York</td>
<td>+ 1.212.804.3901</td>
</tr>
<tr>
<td>San Francisco</td>
<td>+ 1.415.836.8800</td>
</tr>
<tr>
<td>Sao Paulo</td>
<td>+ 55.11.3706.1360</td>
</tr>
<tr>
<td>Stamford</td>
<td>+1.203.325.5630</td>
</tr>
<tr>
<td>Toronto</td>
<td>+ 1.416.628.1007</td>
</tr>
</tbody>
</table>

### Europe, Middle East & Africa

<table>
<thead>
<tr>
<th>City</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amsterdam</td>
<td>+ 31.20.462.1382</td>
</tr>
<tr>
<td>Cape Town</td>
<td>+ 27.21.673.0100</td>
</tr>
<tr>
<td>Frankfurt</td>
<td>+ 49.69.133.859.00</td>
</tr>
<tr>
<td>Geneva</td>
<td>+ 41.22.817.9777</td>
</tr>
<tr>
<td>London</td>
<td>+ 44.20.7618.2222</td>
</tr>
<tr>
<td>Madrid</td>
<td>+ 34.91.700.7275</td>
</tr>
<tr>
<td>Milan</td>
<td>+ 39.02.5849.0415</td>
</tr>
<tr>
<td>Paris</td>
<td>0800.91.59.17 (toll free)</td>
</tr>
<tr>
<td>Zurich</td>
<td>+ 41.44.220.9300</td>
</tr>
</tbody>
</table>

### Asia Pacific

<table>
<thead>
<tr>
<th>City</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>China North</td>
<td>10800.852.1032 (toll free)</td>
</tr>
<tr>
<td>China South</td>
<td>10800.152.1032 (toll free)</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>+ 852.2844.9333</td>
</tr>
<tr>
<td>Seoul</td>
<td>+ 822.2054.8538</td>
</tr>
<tr>
<td>Singapore</td>
<td>800.852.3749 (toll free)</td>
</tr>
<tr>
<td>Sydney</td>
<td>+ 61.2.9033.9333</td>
</tr>
<tr>
<td>Tokyo</td>
<td>+ 81.3.5226.8222</td>
</tr>
</tbody>
</table>

www.mscibarra.com
Notice and Disclaimer

- This document and all of the information contained in it, including without limitation all text, data, graphs, charts (collectively, the “Information”) is the property of MSCI Inc. (“MSCI”), Barra, Inc. (“Barra”), or their affiliates (including without limitation Financial Engineering Associates, Inc.) (alone or with one or more of them, “MSCI Barra”), or their direct or indirect suppliers or any third party involved in the making or compiling of the Information (collectively, the “MSCI Barra Parties”), as applicable, and is provided for informational purposes only. The Information may not be reproduced or redisseminated in whole or in part without prior written permission from MSCI or Barra, as applicable.

- The Information may not be used to verify or correct other data, to create indices, risk models or analytics, or in connection with issuing, offering, sponsoring, managing or marketing any securities, portfolios, financial products or other investment vehicles based on, linked to, tracking or otherwise derived from any MSCI or Barra product or data.

- Historical data and analysis should not be taken as an indication or guarantee of any future performance, analysis, forecast or prediction.

- None of the Information constitutes an offer to sell (or a solicitation of an offer to buy), or a promotion or recommendation of, any security, financial product or other investment vehicle or any trading strategy, and none of the MSCI Barra Parties endorses, approves or otherwise expresses any opinion regarding any issuer, securities, financial products or instruments or trading strategies. None of the Information, MSCI Barra indices, models or other products or services is intended to constitute investment advice or a recommendation to make (or refrain from making) any kind of investment decision and may not be relied on as such.

- The user of the Information assumes the entire risk of any use it may make or permit to be made of the Information.

- NONE OF THE MSCI BARRA PARTIES MAKES ANY EXPRESS OR IMPLIED WARRANTIES OR REPRESENTATIONS WITH RESPECT TO THE INFORMATION (OR THE RESULTS TO BE OBTAINED BY THE USE THEREOF), AND TO THE MAXIMUM EXTENT PERMITTED BY LAW, MSCI AND BARRA, EACH ON THEIR BEHALF AND ON THE BEHALF OF EACH MSCI BARRA PARTY, HEREBY EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES (INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF ORIGINALITY, ACCURACY, TIMELINESS, NON-INFRINGEMENT, COMPLETENESS, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE) WITH RESPECT TO ANY OF THE INFORMATION.

- Without limiting any of the foregoing and to the maximum extent permitted by law, in no event shall any of the MSCI Barra Parties have any liability regarding any of the Information for any direct, indirect, special, punitive, consequential (including lost profits) or any other damages even if notified of the possibility of such damages. The foregoing shall not exclude or limit any liability that may not by applicable law be excluded or limited, including without limitation (as applicable), any liability for death or personal injury to the extent that such injury results from the negligence or wilful default of itself, its servants, agents or sub-contractors.

- Any use of or access to products, services or information of MSCI or Barra or their subsidiaries requires a license from MSCI or Barra, or their subsidiaries, as applicable. MSCI, Barra, MSCI Barra, EAFE, Aegis, Cosmos, BarraOne, and all other MSCI and Barra product names are the trademarks, registered trademarks, or service marks of MSCI, Barra or their affiliates, in the United States and other jurisdictions. The Global Industry Classification Standard (GICS) was developed by and is the exclusive property of MSCI and Standard & Poor’s. “Global Industry Classification Standard (GICS)” is a service mark of MSCI and Standard & Poor’s.

© 2008 MSCI Barra. All rights reserved.

About MSCI Barra

MSCI Barra is a leading provider of investment decision support tools to investment institutions worldwide. MSCI Barra products include indices and portfolio risk and performance analytics for use in managing equity, fixed income and multi-asset class portfolios.

The company’s flagship products are the MSCI International Equity Indices, which include over 120,000 indices calculated daily across more than 70 countries, and the Barra risk models and portfolio analytics, which cover 59 equity and 48 fixed income markets. MSCI Barra is headquartered in New York, with research and commercial offices around the world.