

GEM2 Factor Returns and Volatilities

Research Notes Supplement

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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.

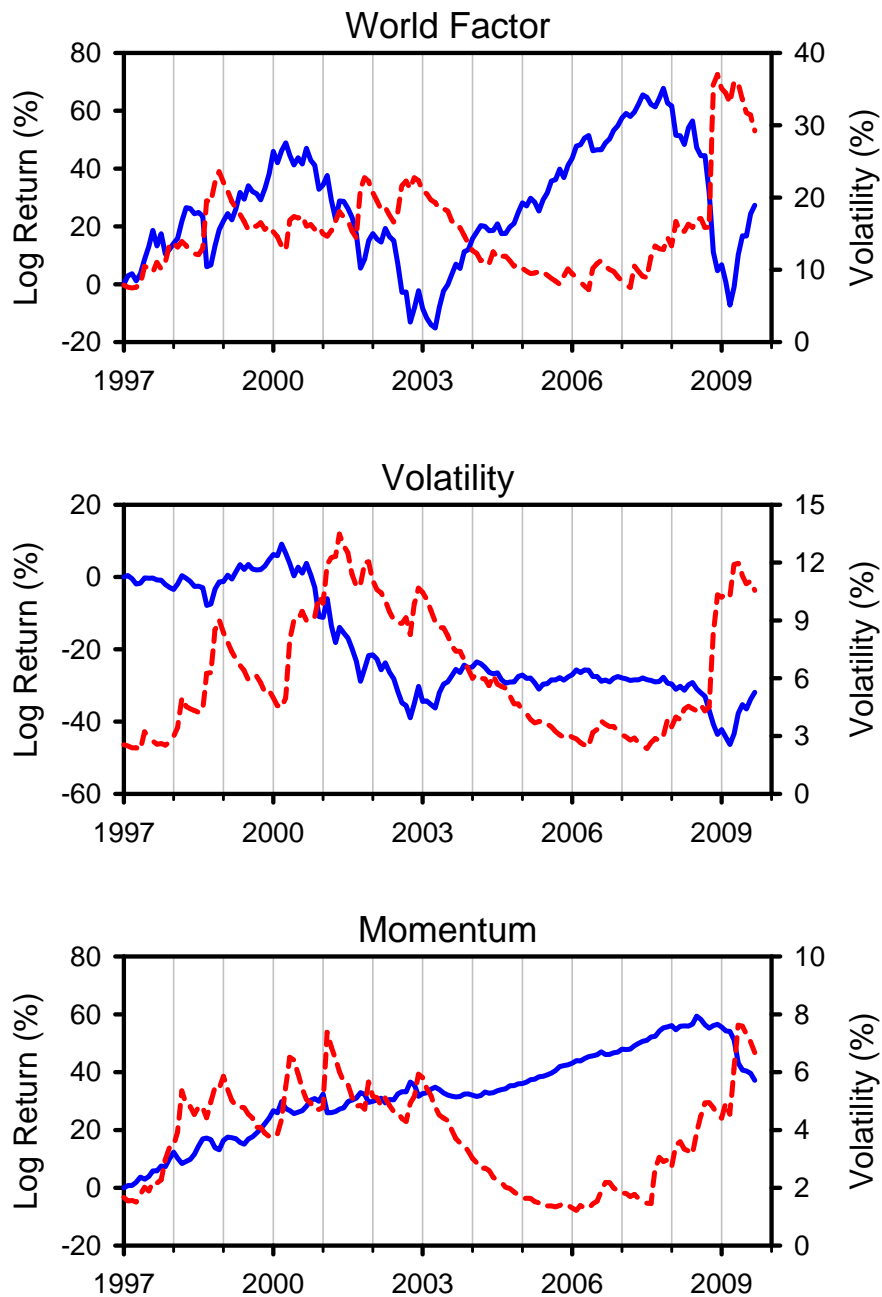
Performance is measured in terms of cumulative log returns. Log returns are better than conventional returns for visualizing performance over long intervals of time since every period is treated on an equal basis. Log returns are described in greater detail in the technical appendix.

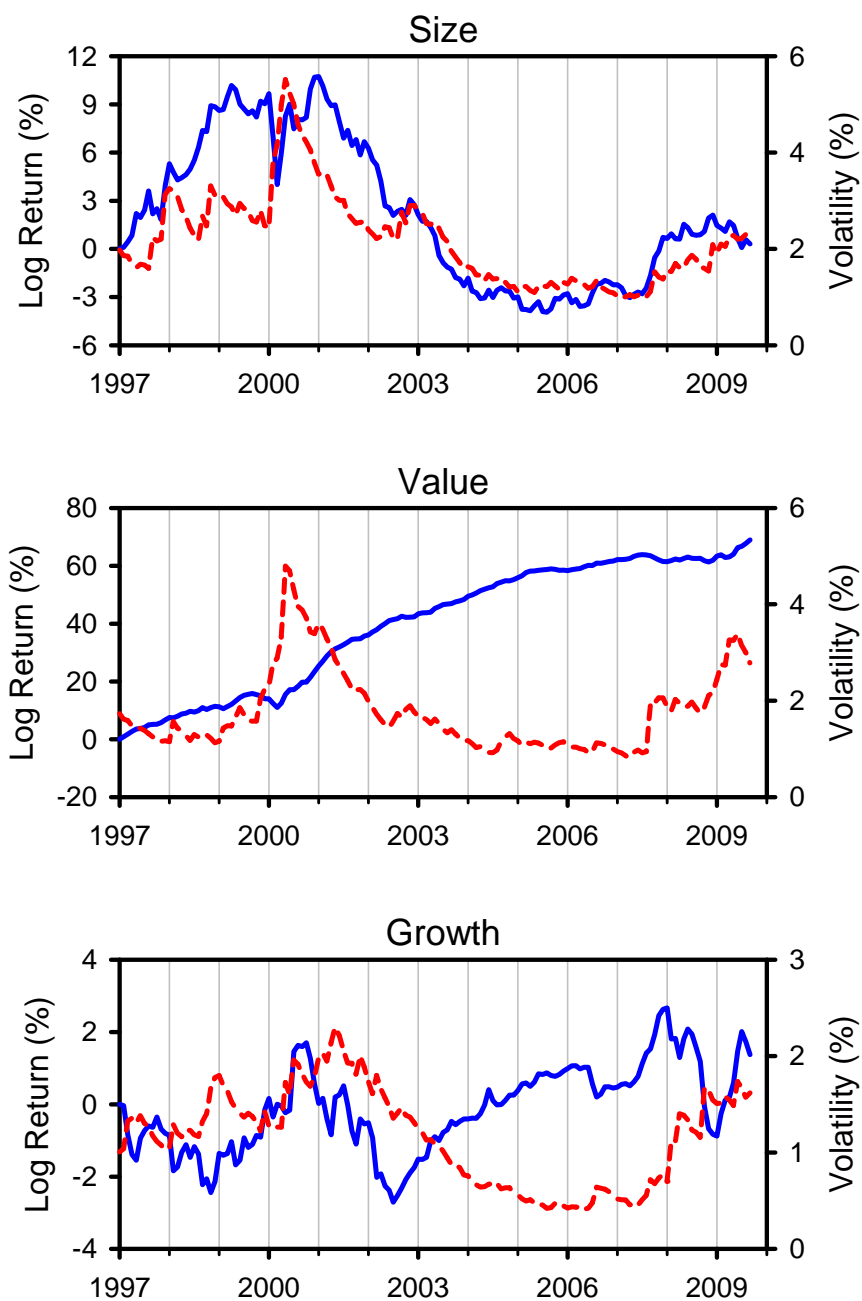
In the following plots, log returns are plotted as solid blue lines, with the scale shown on the left vertical axis. Volatilities are plotted as dashed red lines, with the scales given on the right vertical axis.

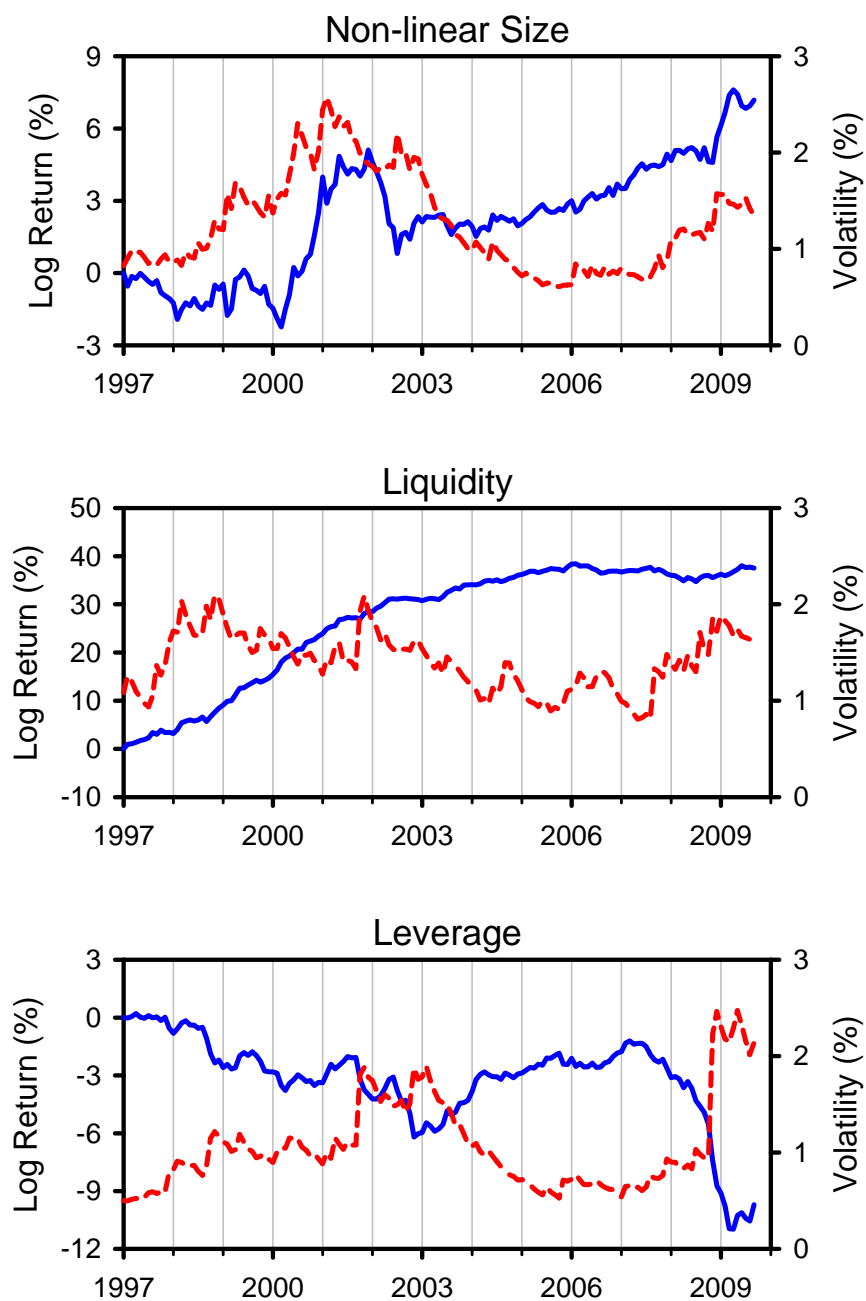


The plots are organized as follows: the World factor and style factors are presented first, followed by industry factors, country factors, and finally currencies.

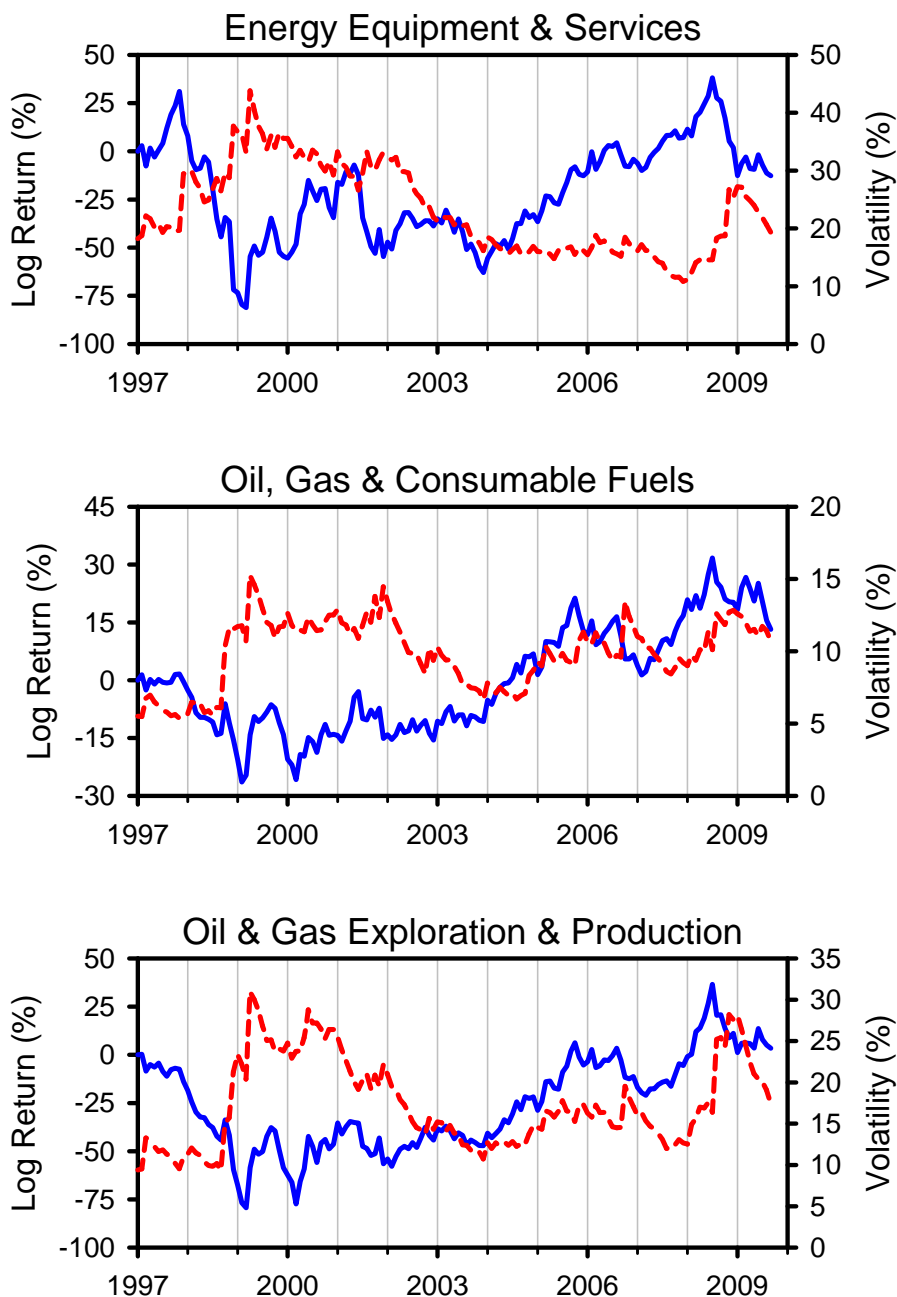
The World and Style Factors

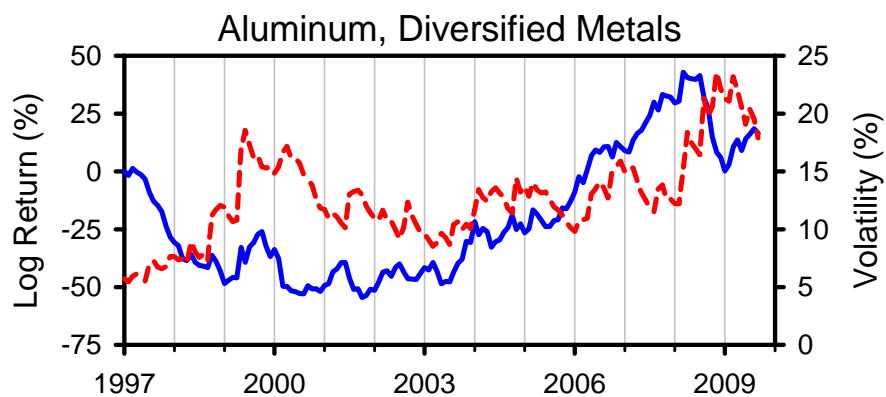
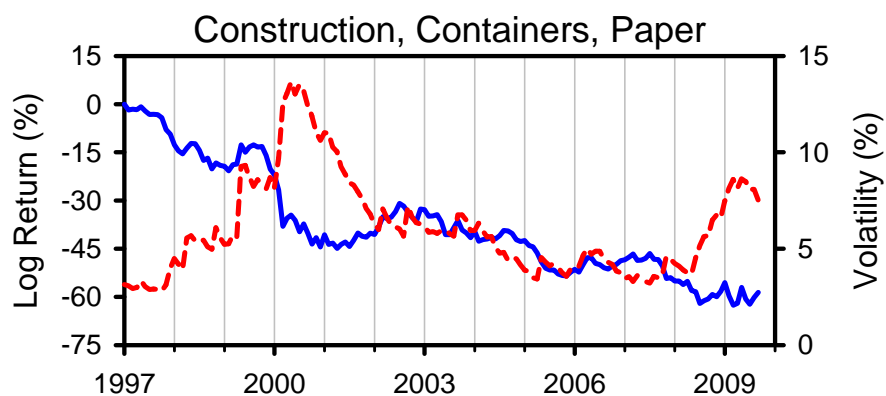
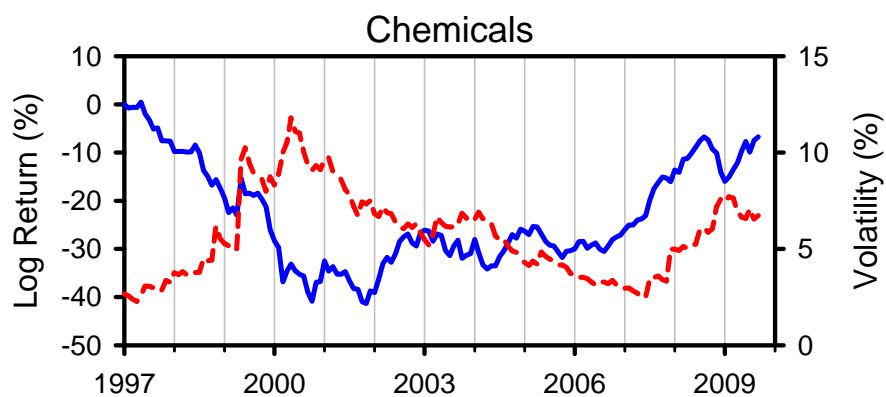


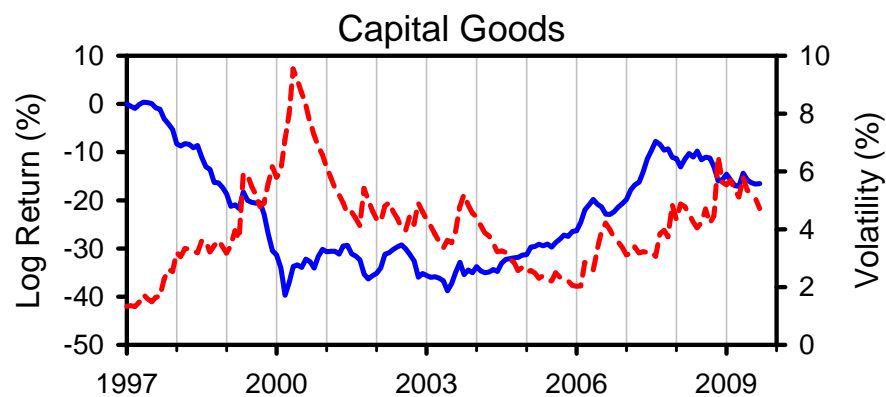
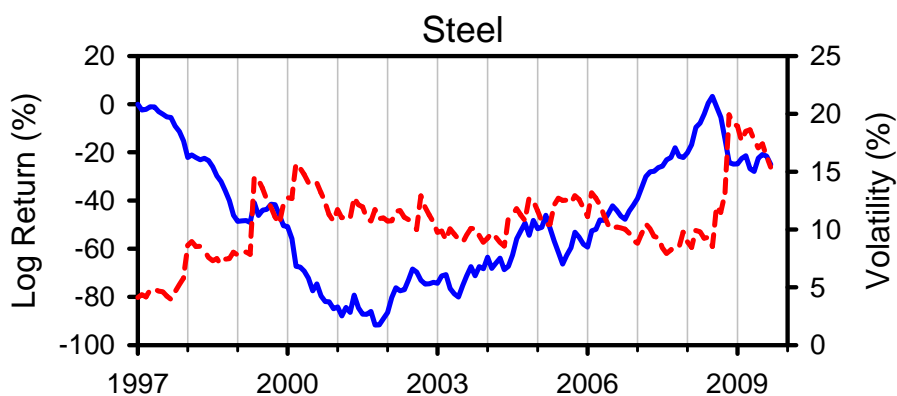
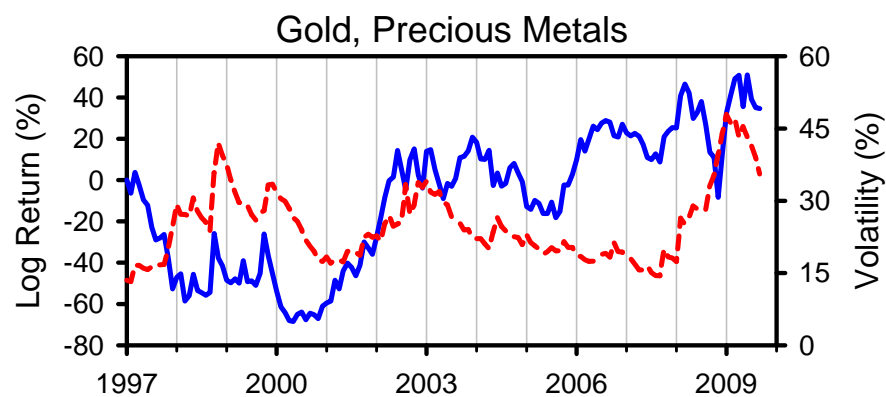


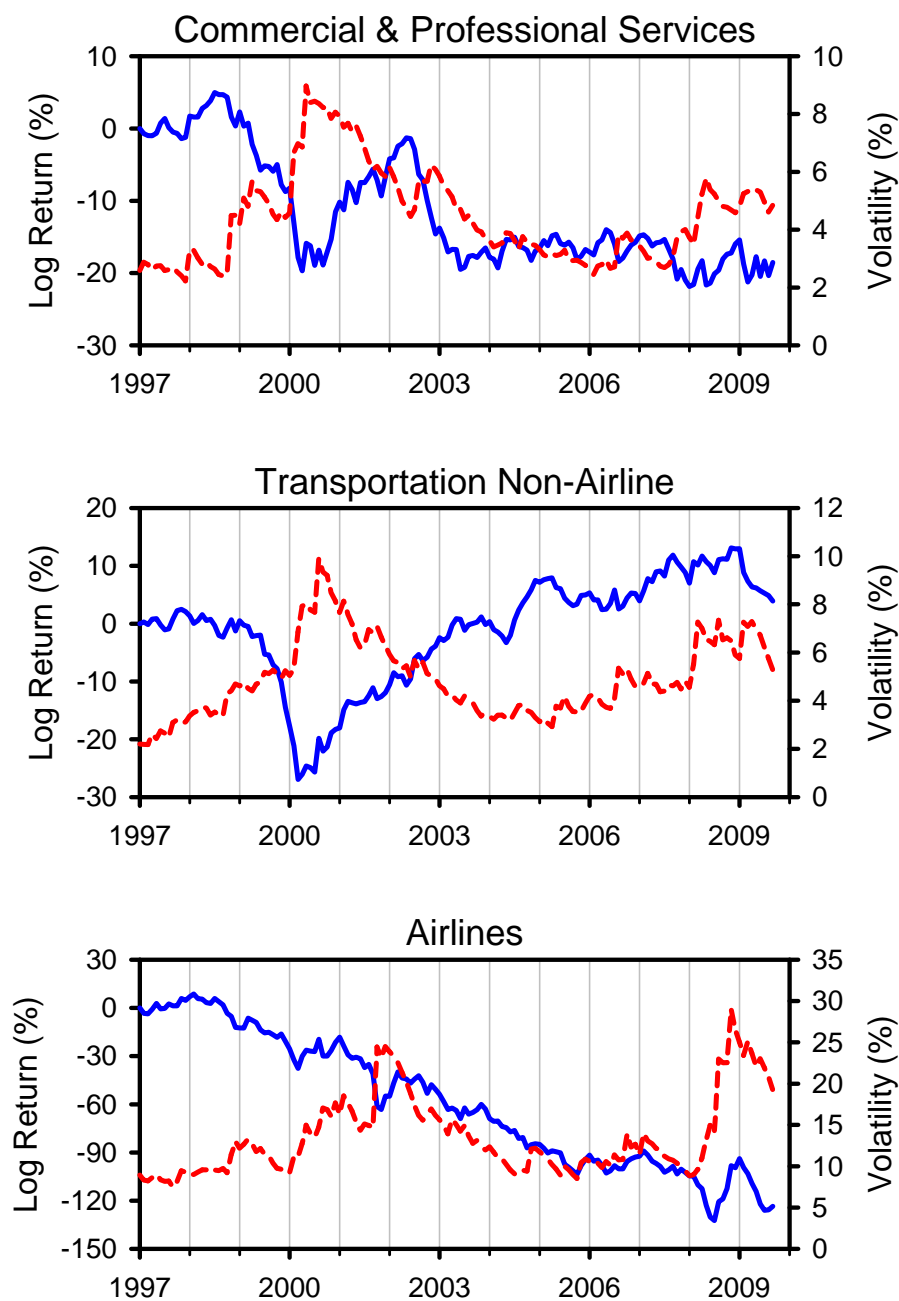


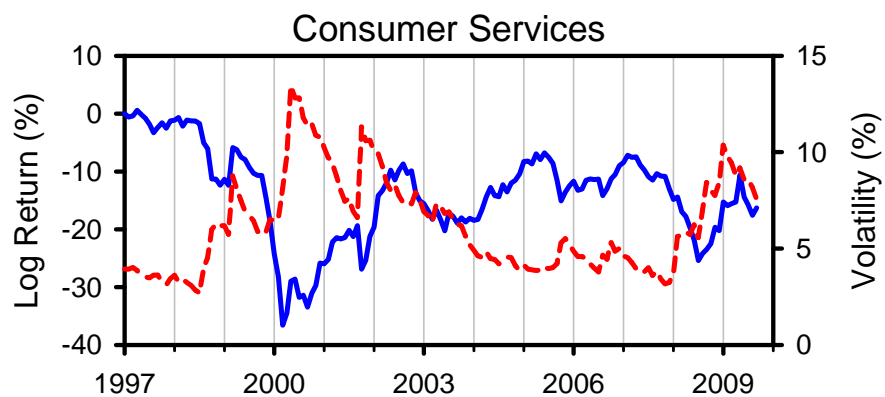
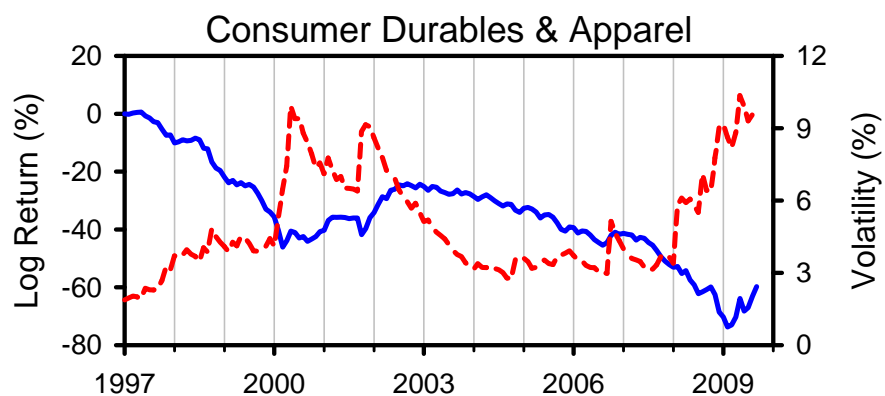
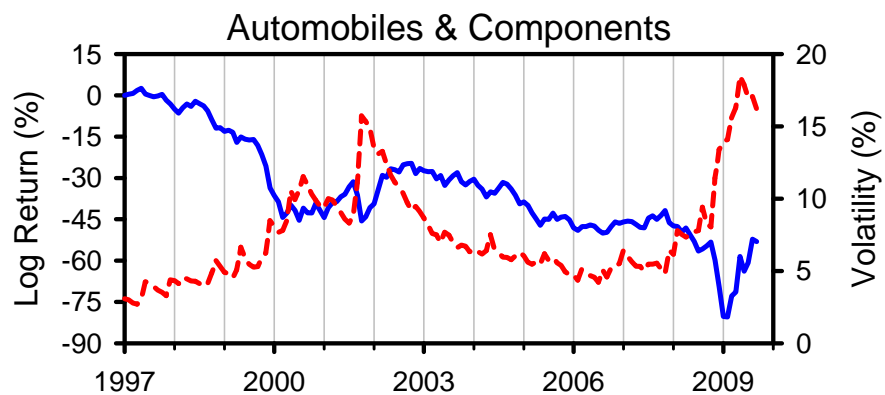
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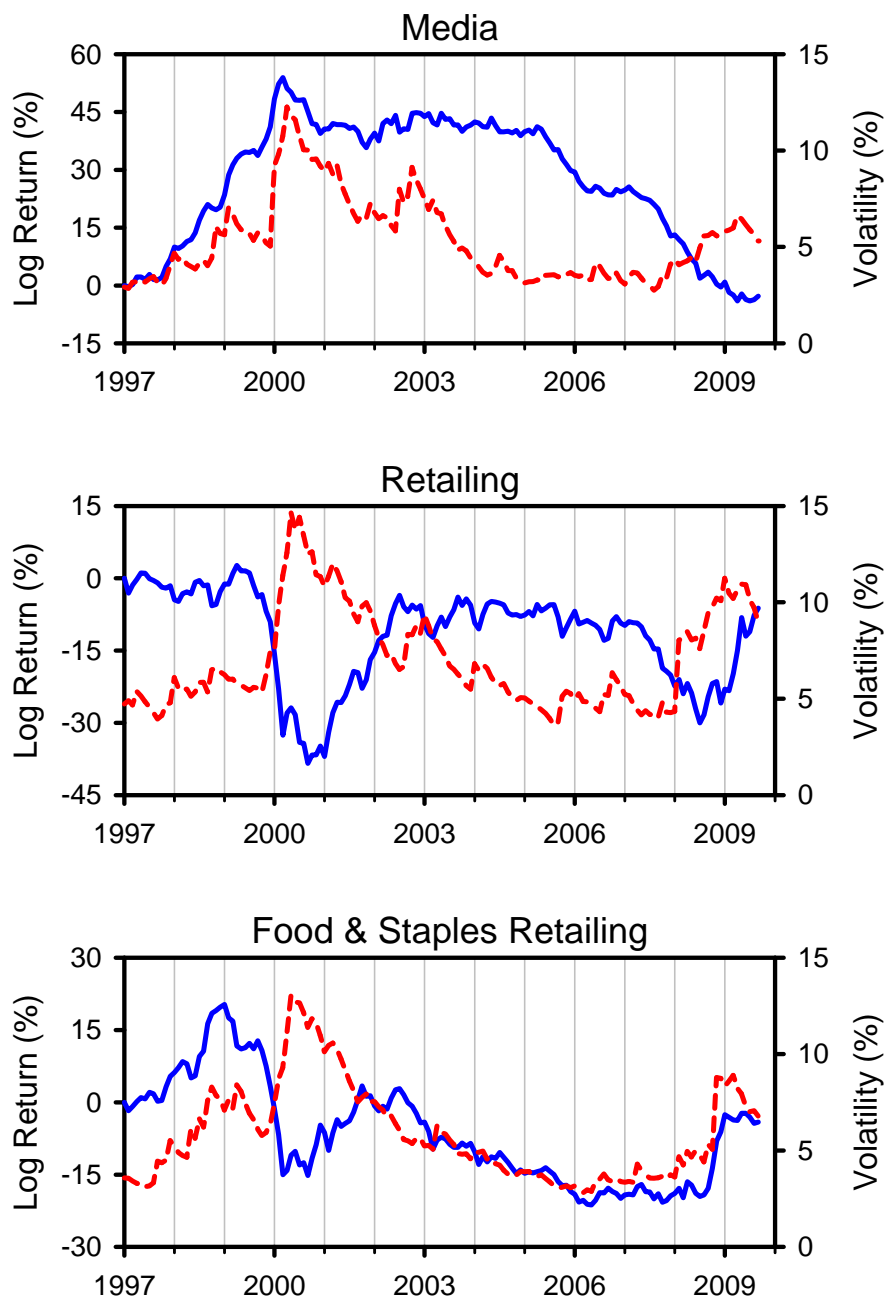


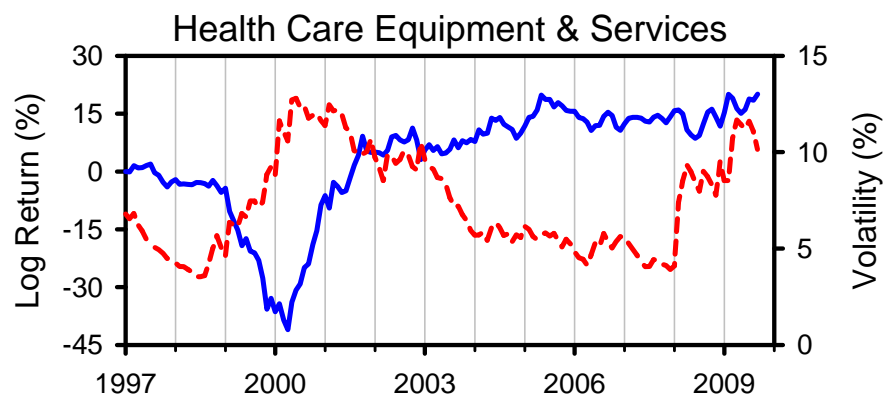
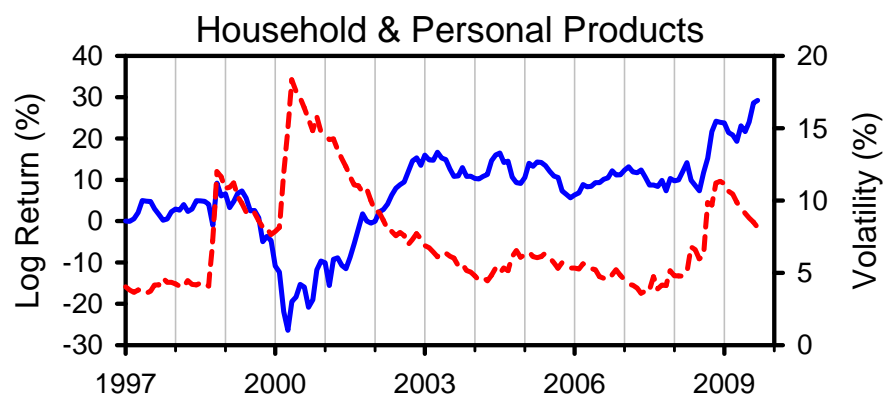
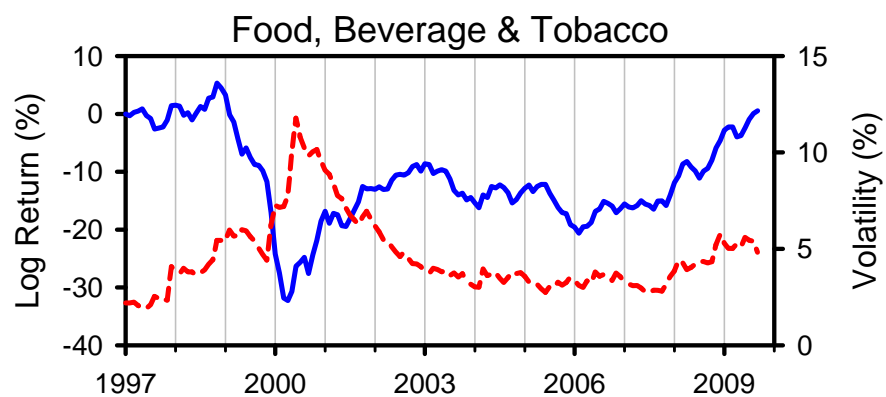


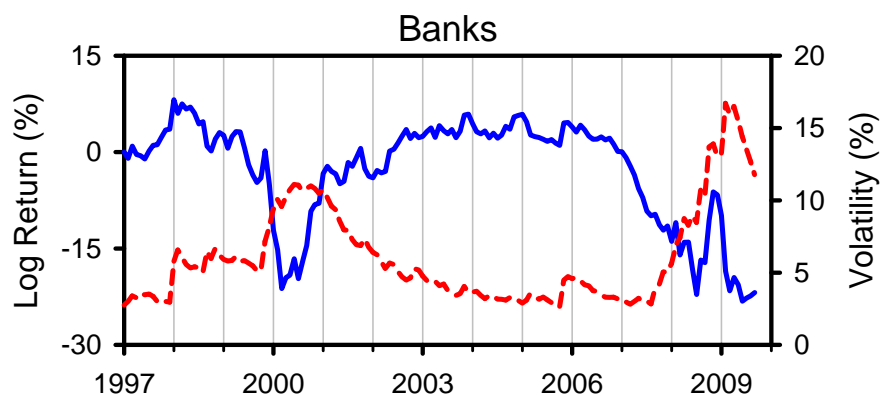
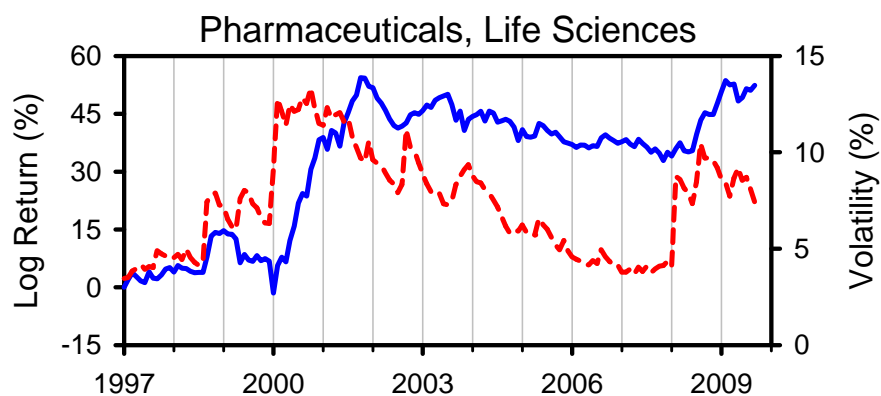
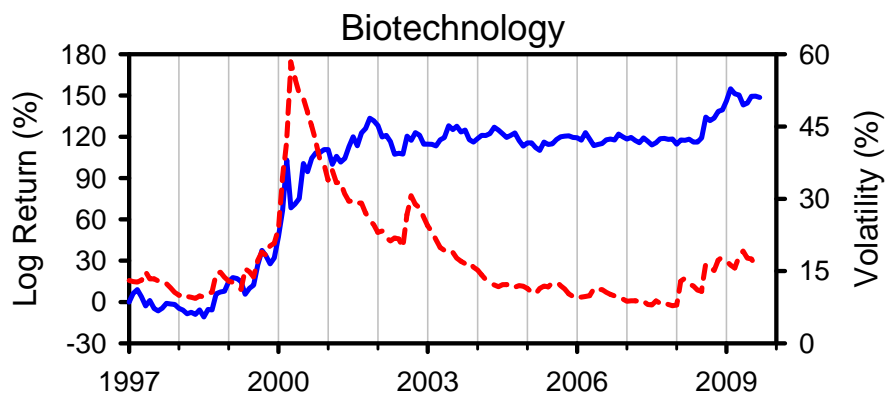


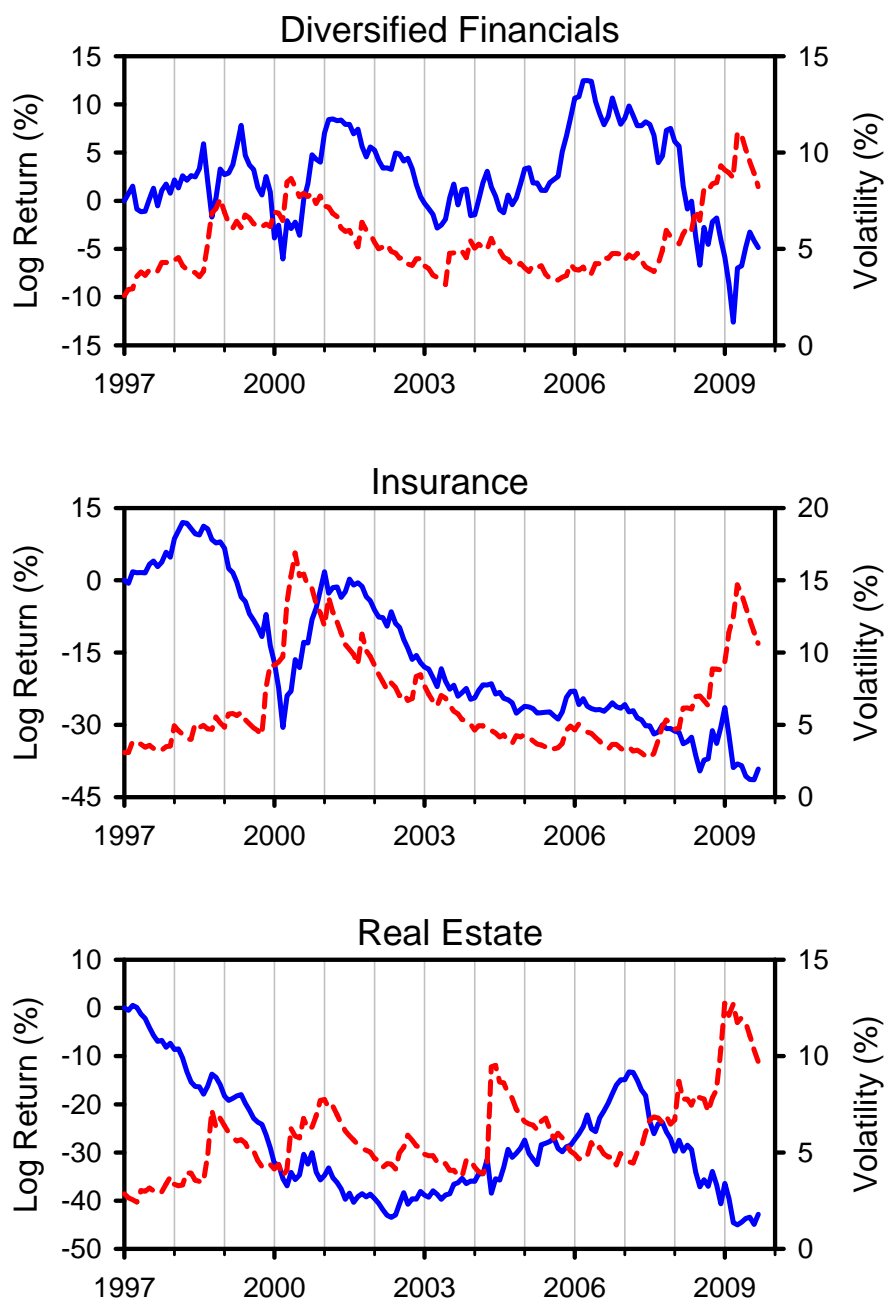


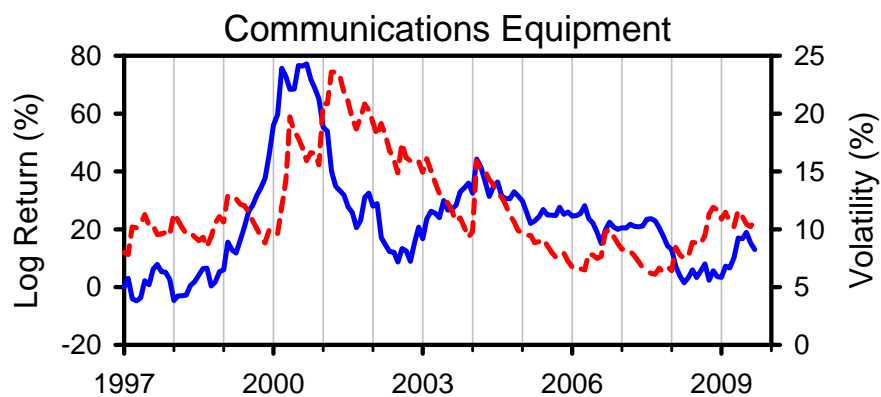
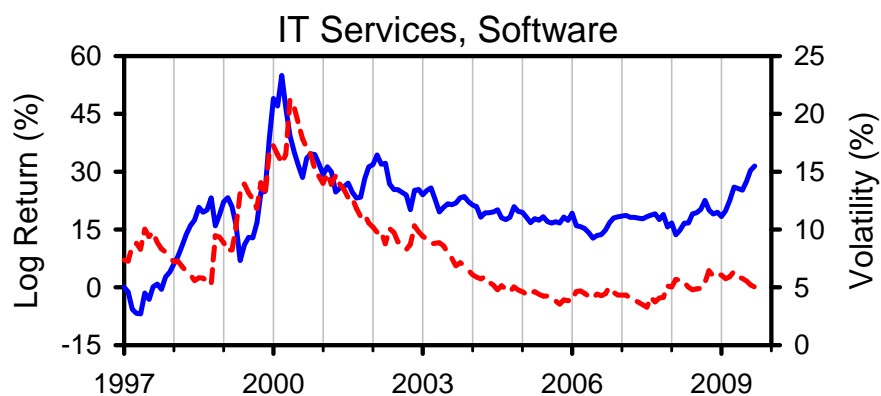
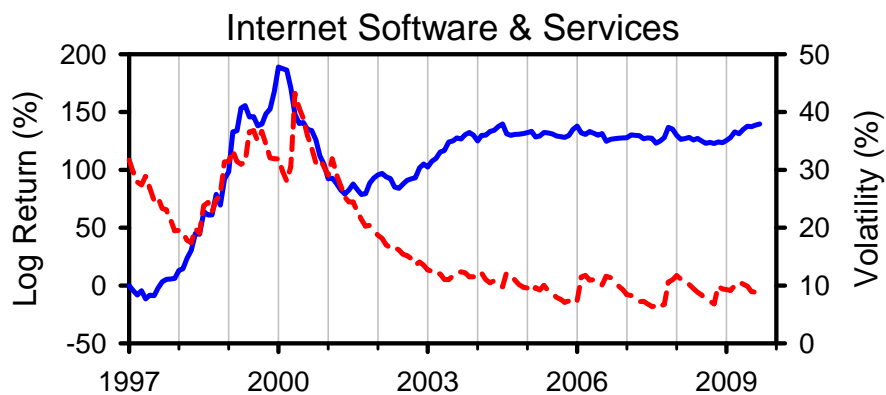






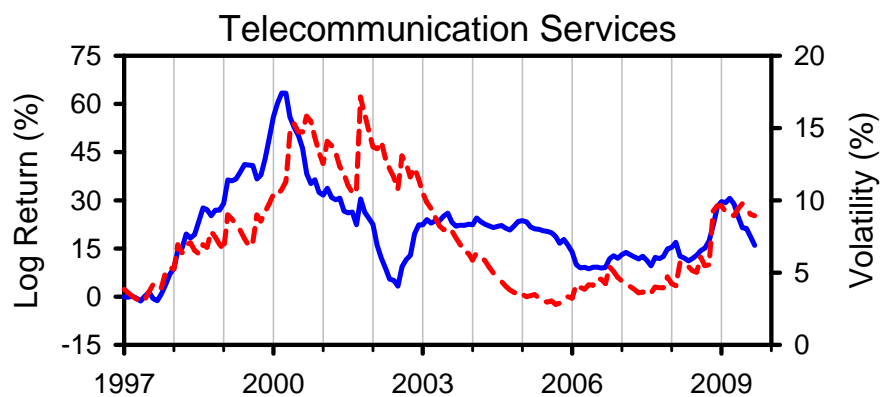
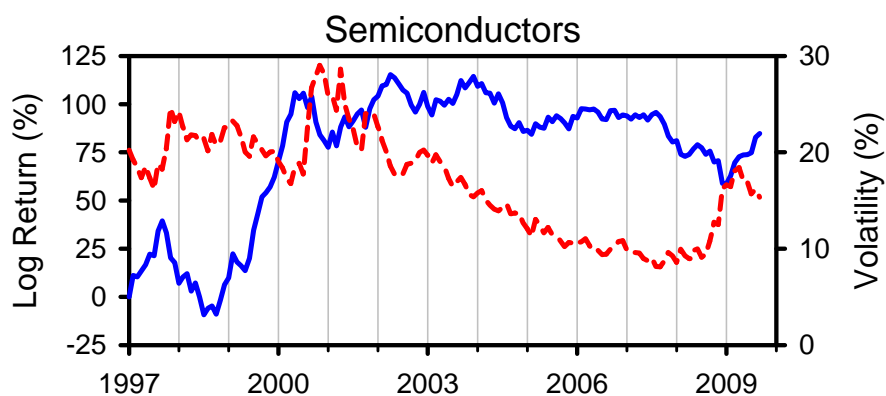
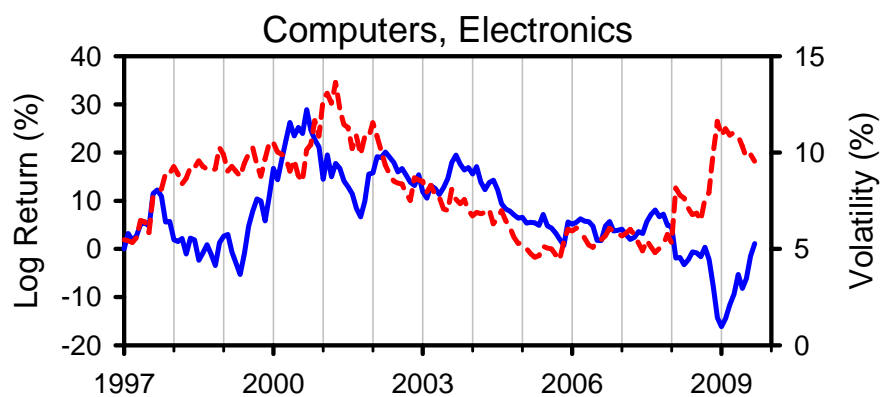


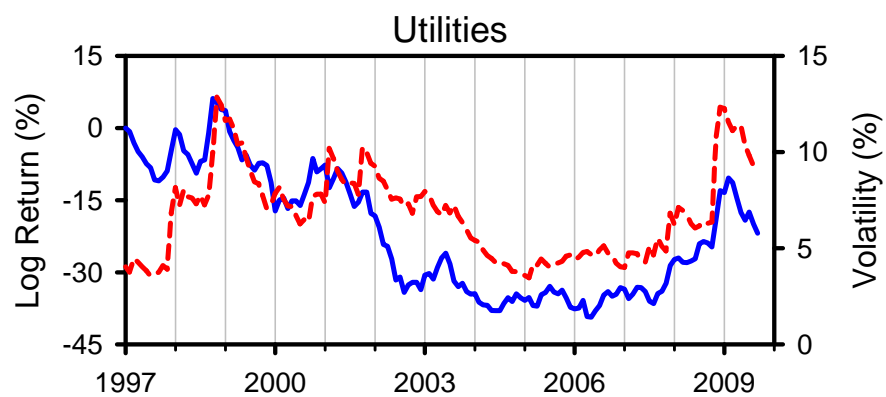




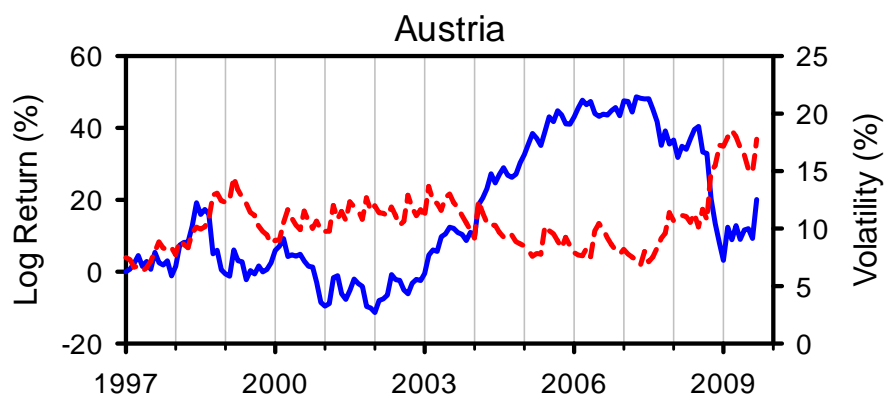
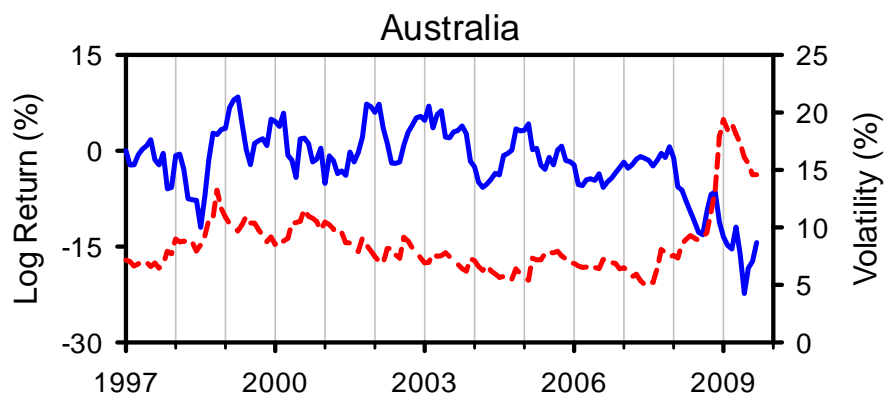
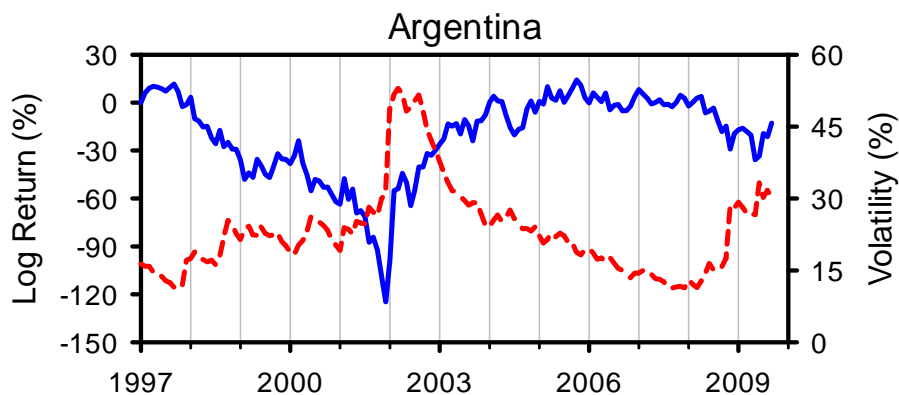
GEM2 Factor Returns and Volatilities

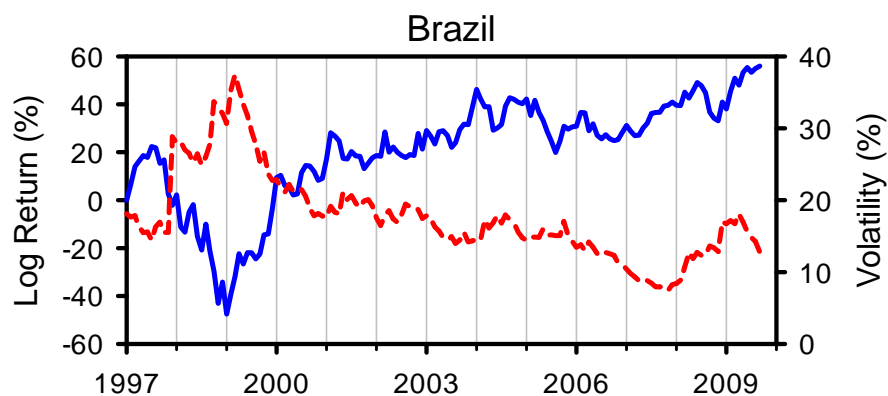
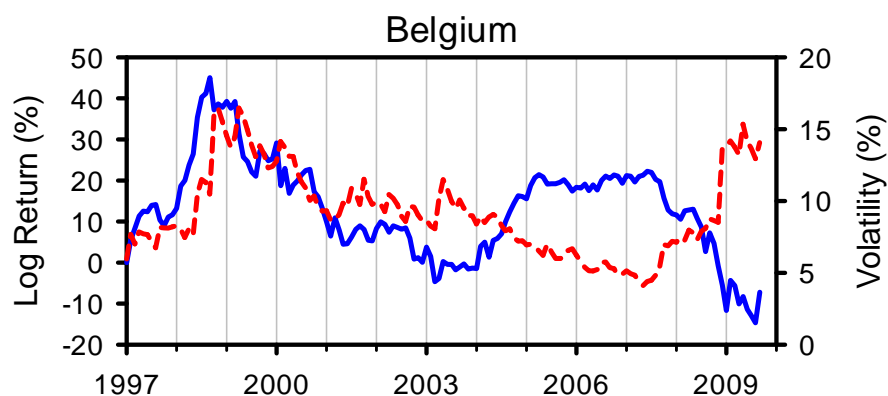
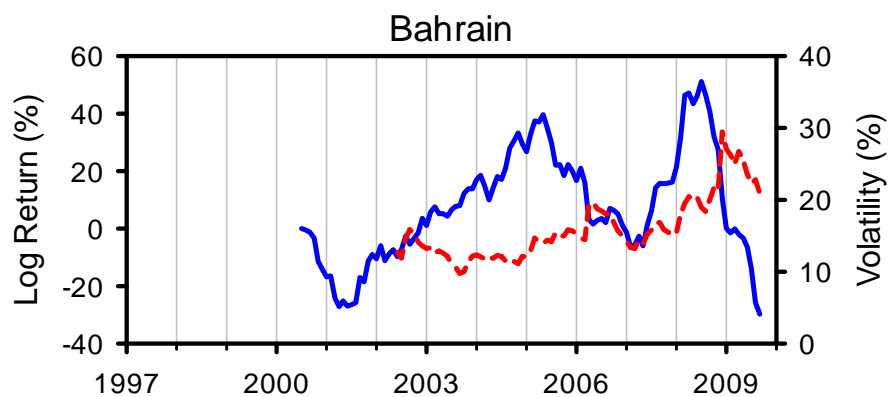
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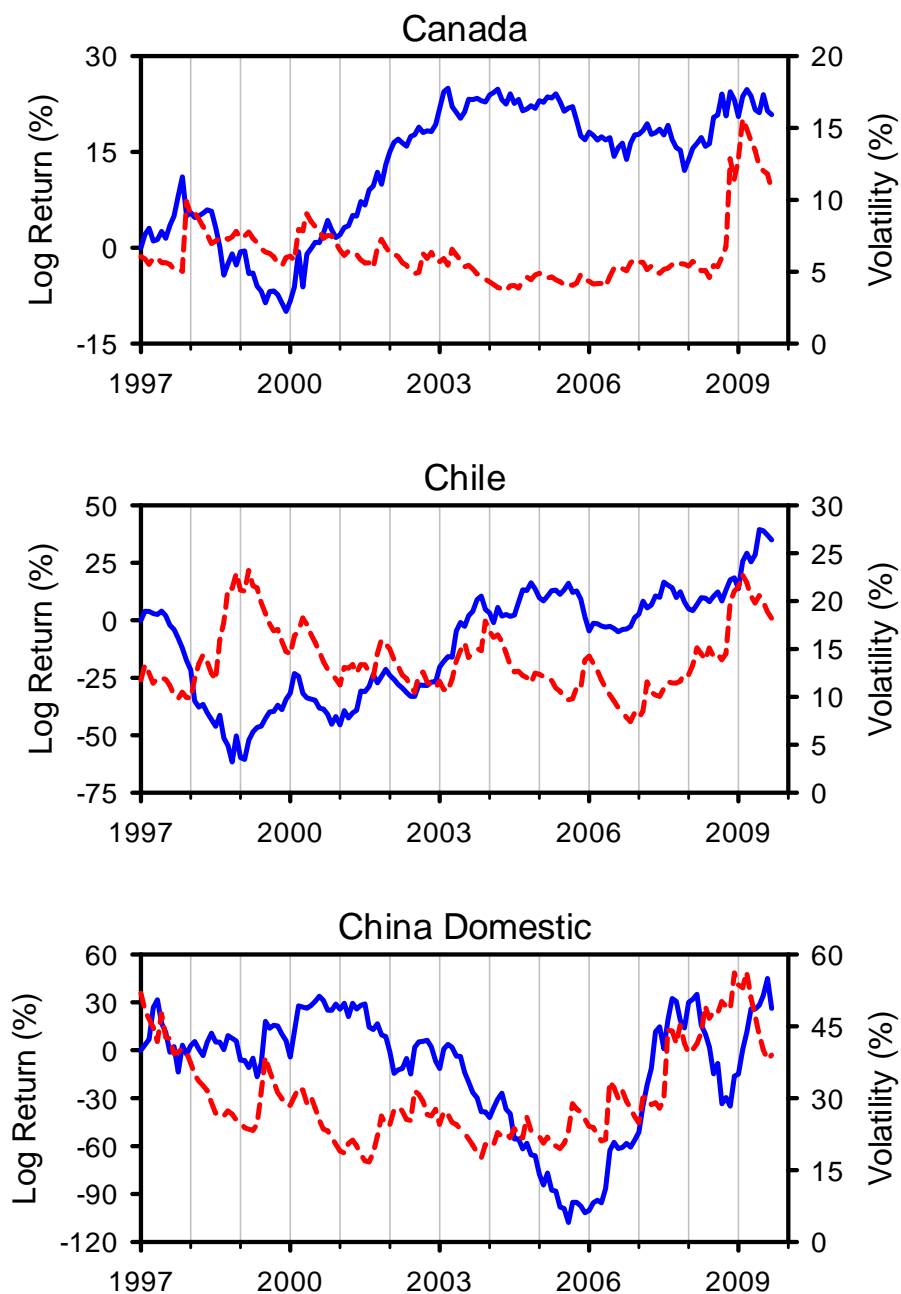
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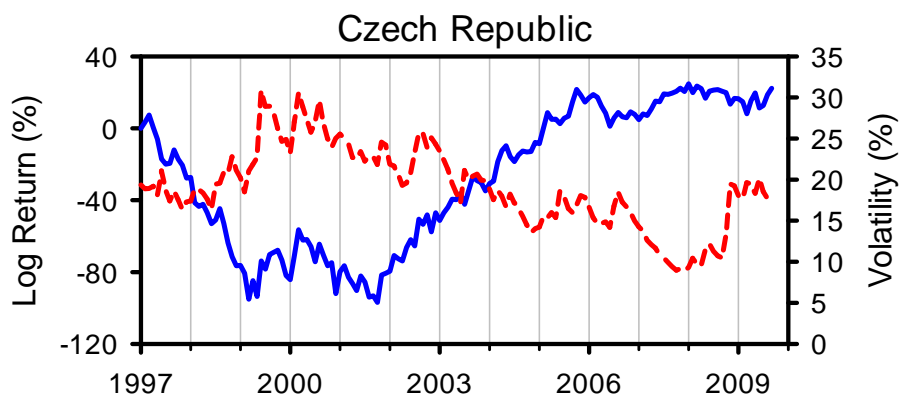
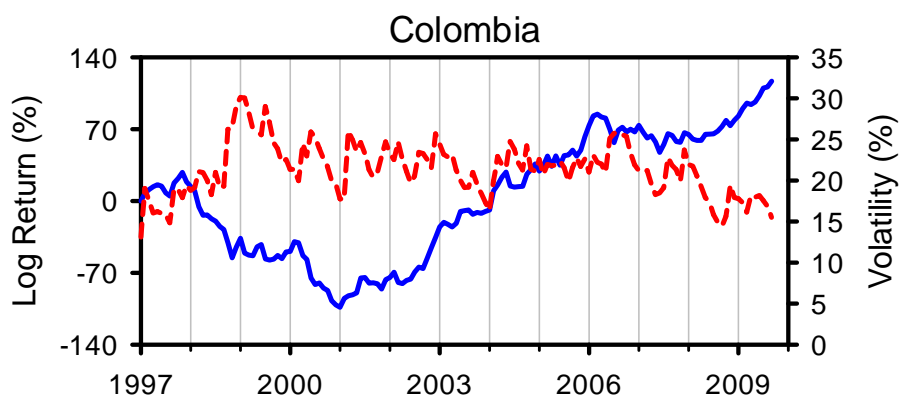
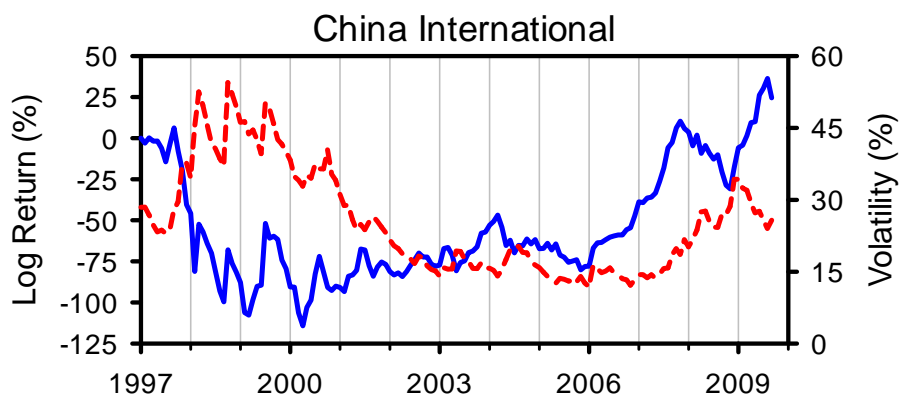


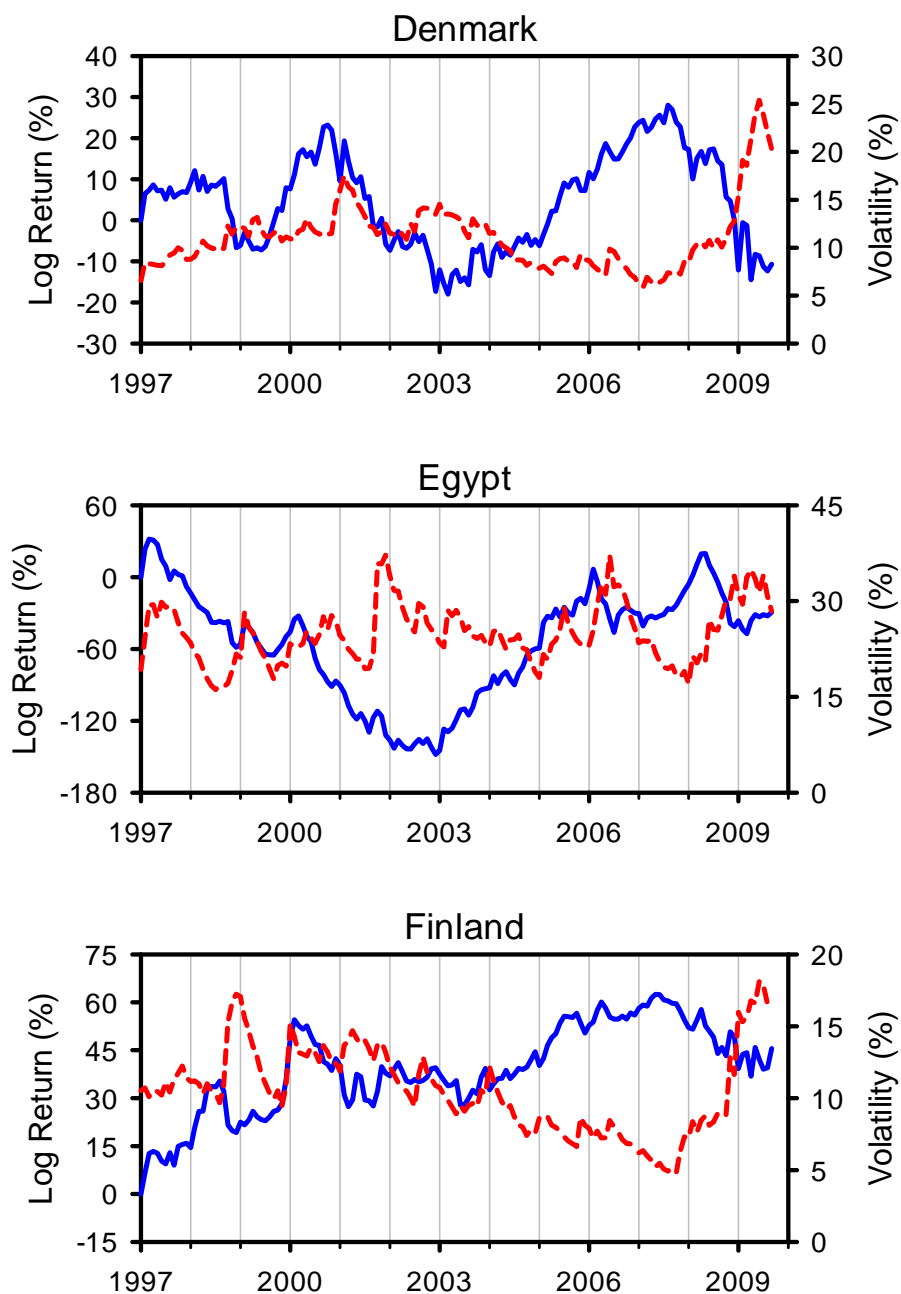


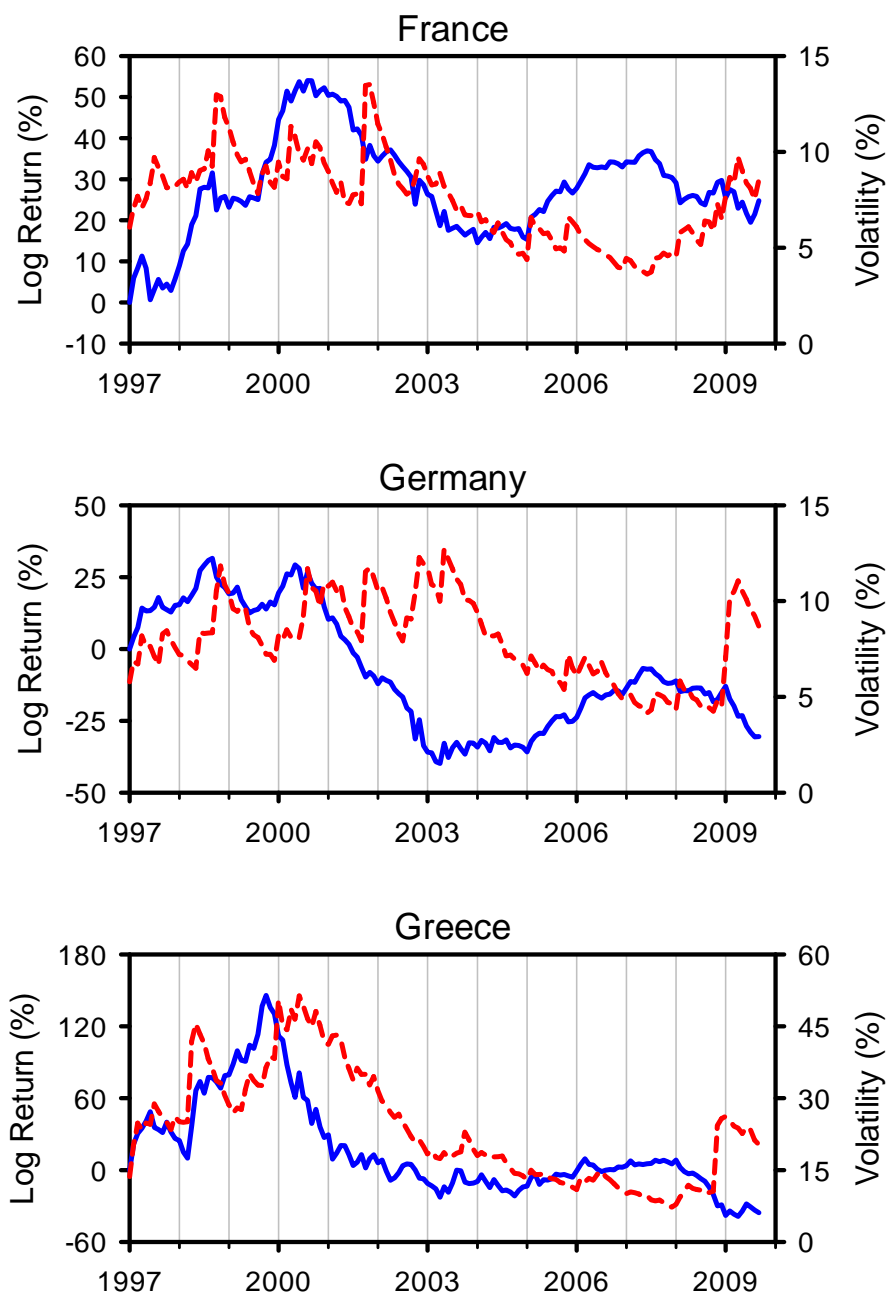
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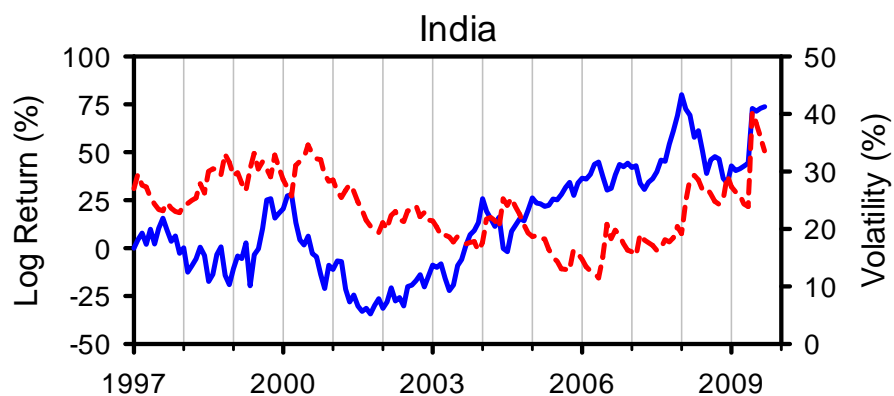
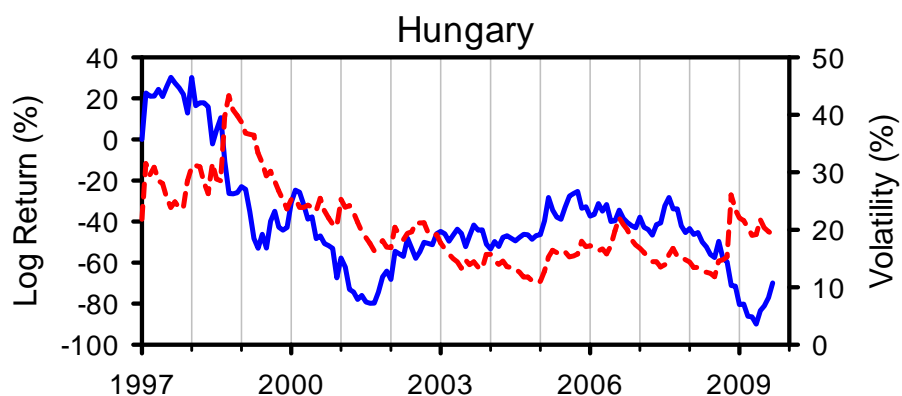
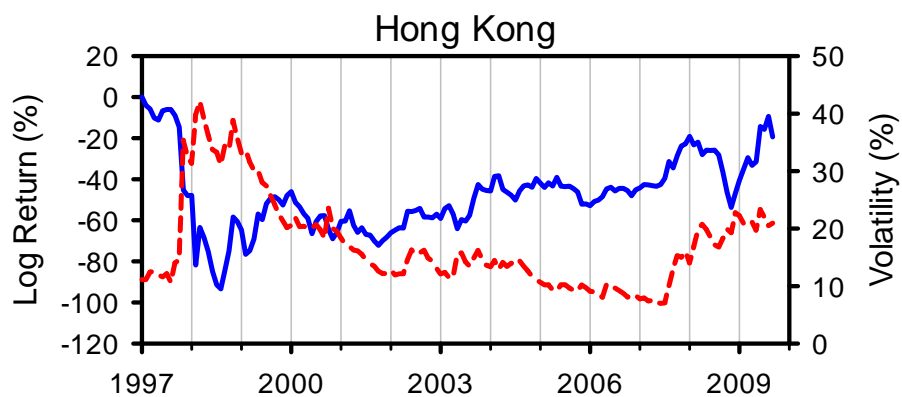
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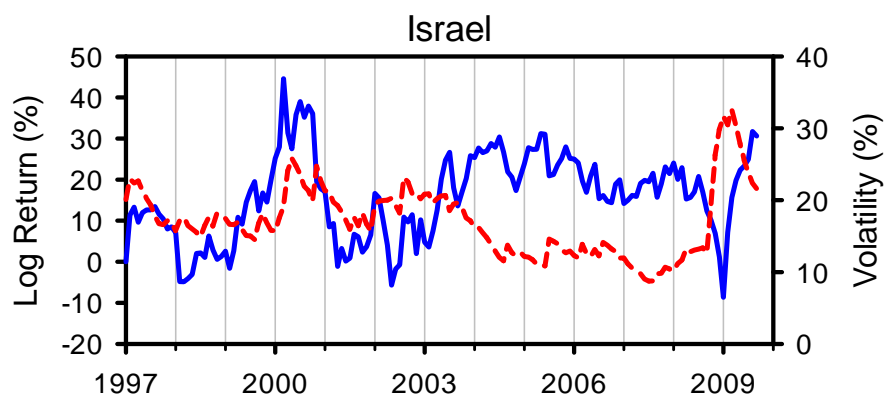
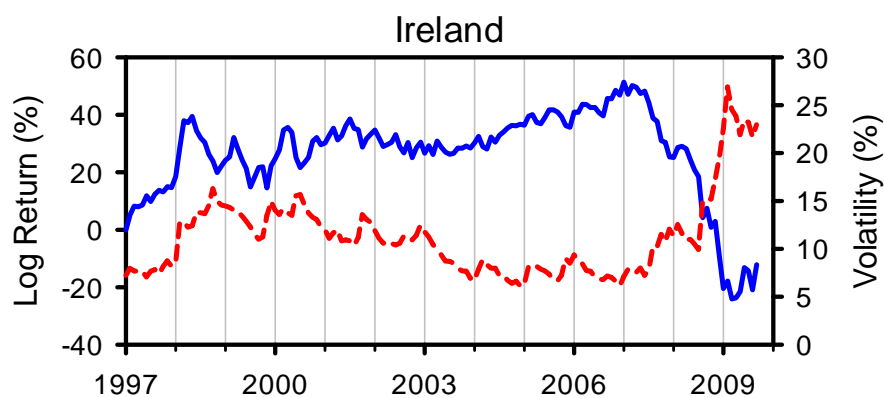
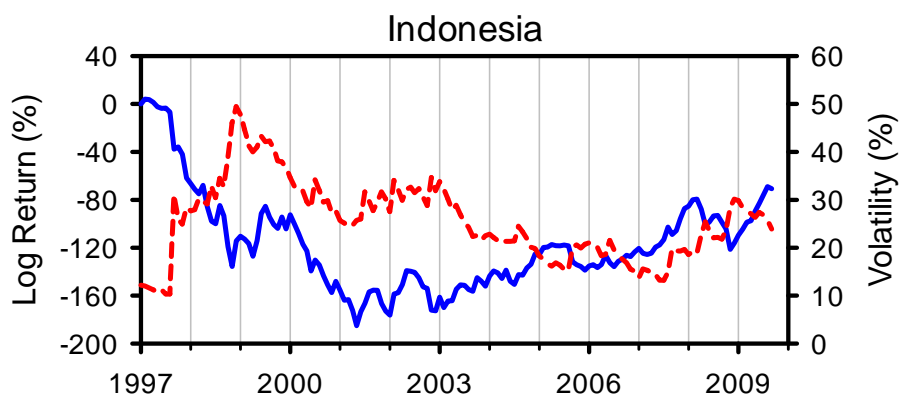


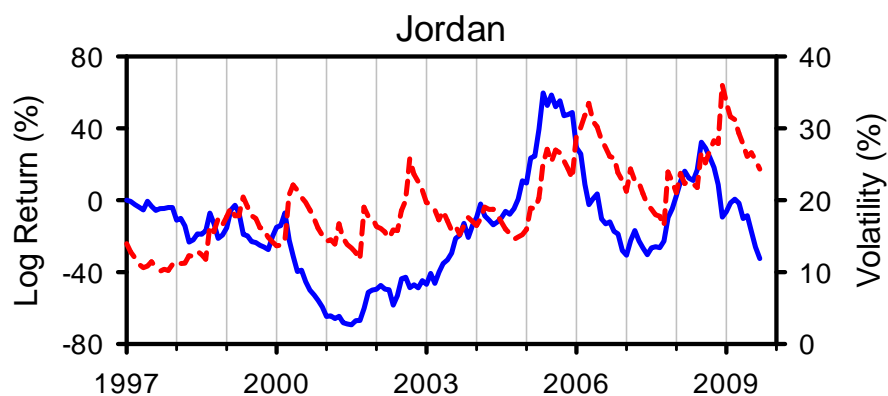
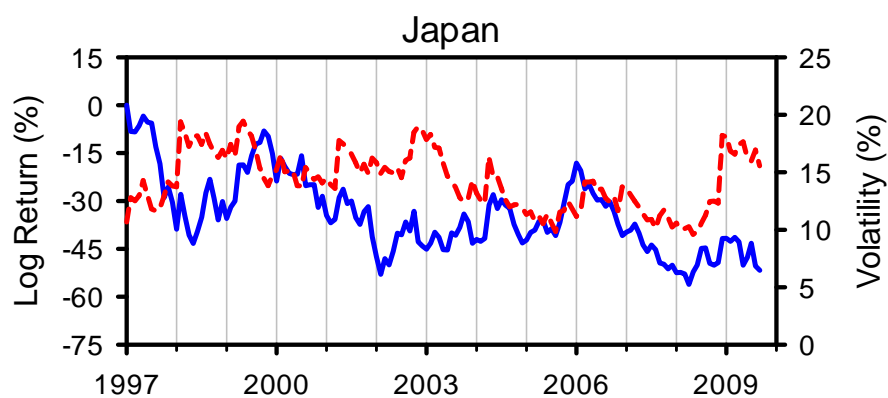
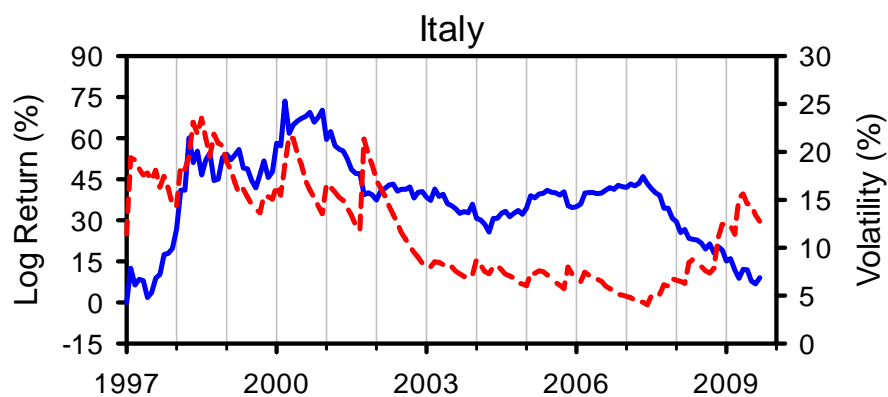


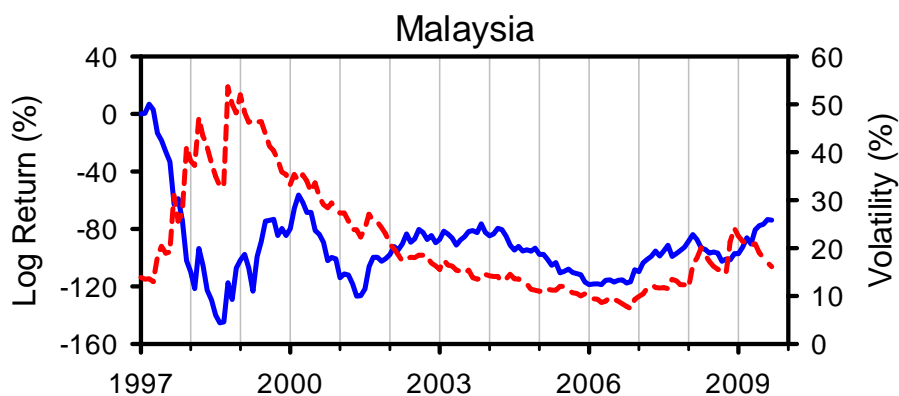
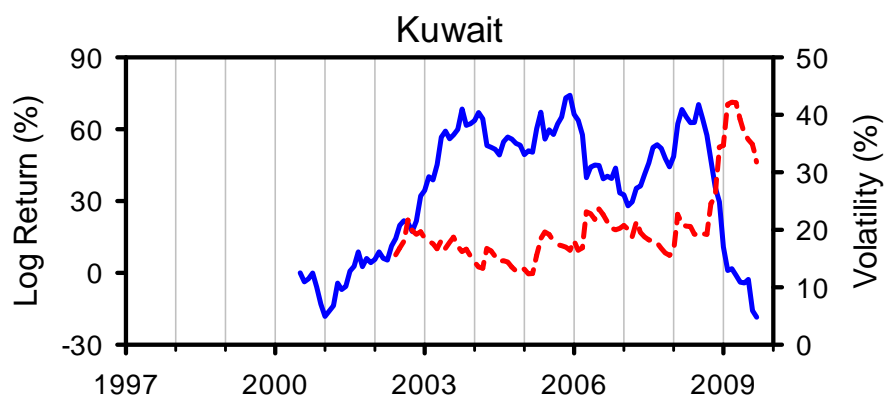
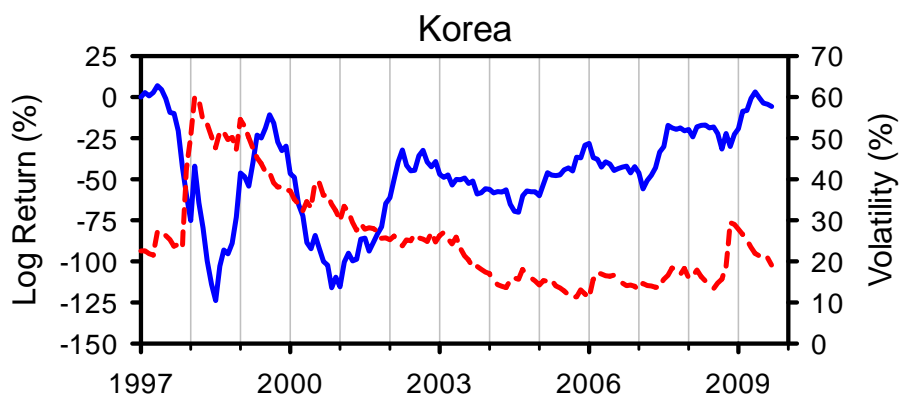






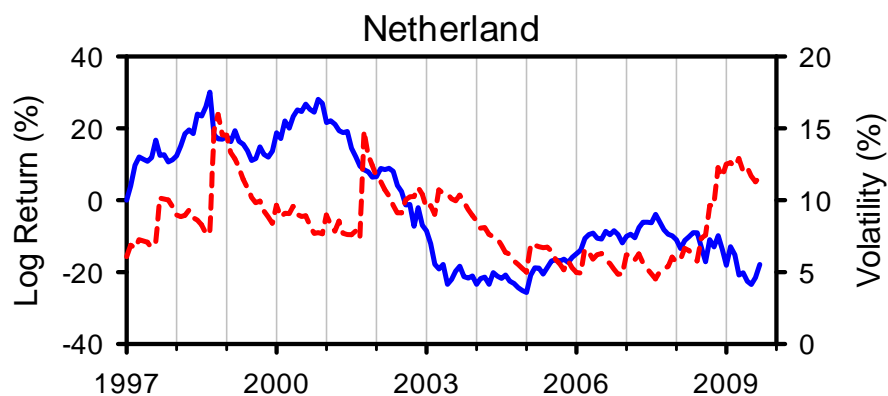
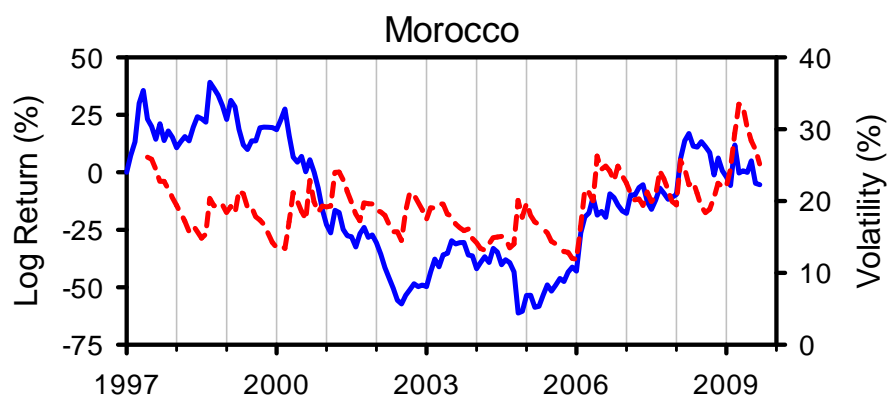
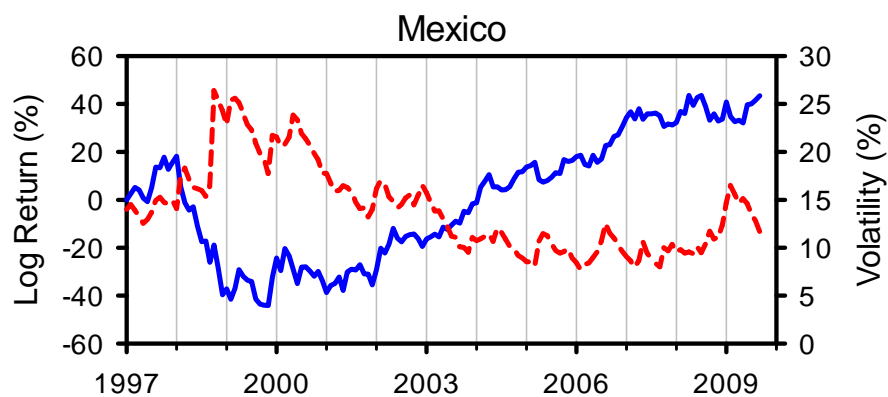


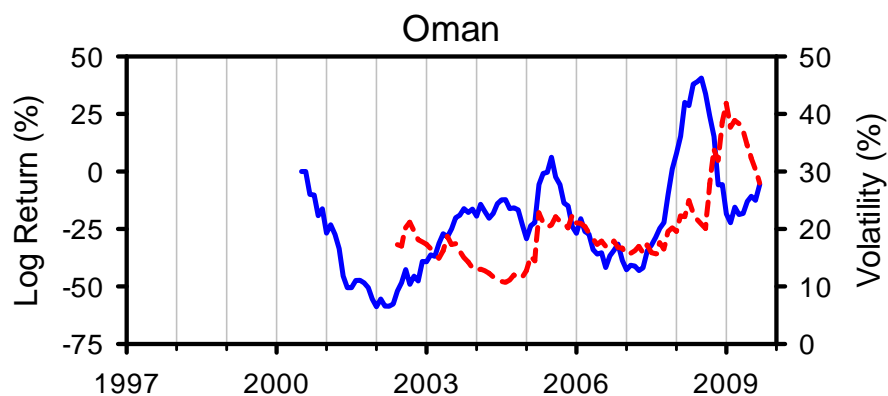
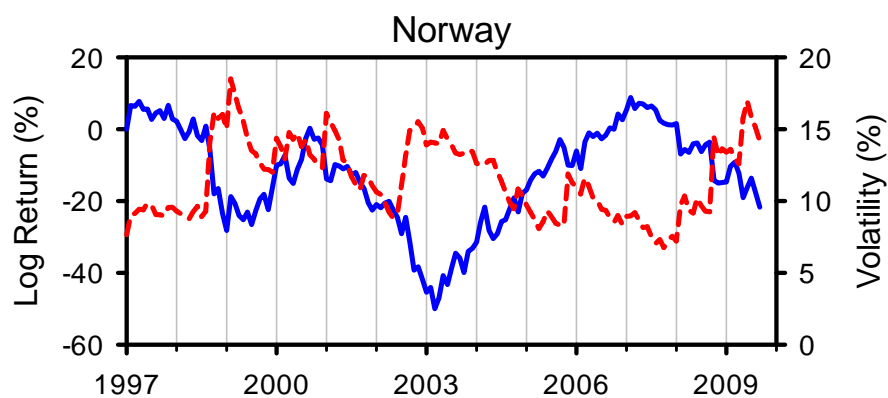
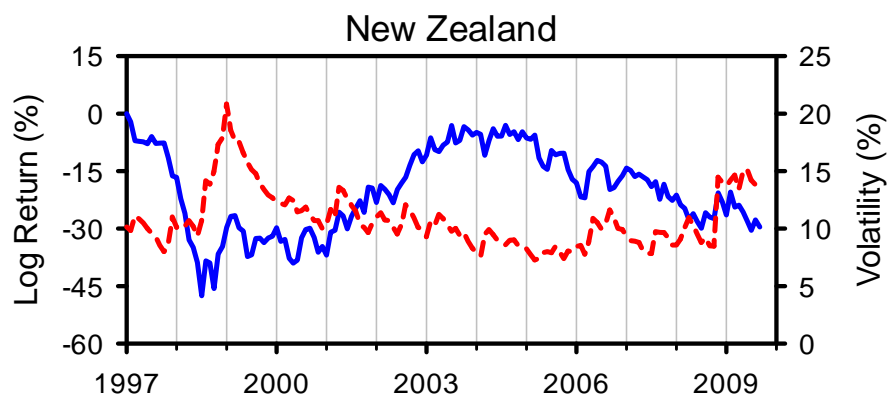


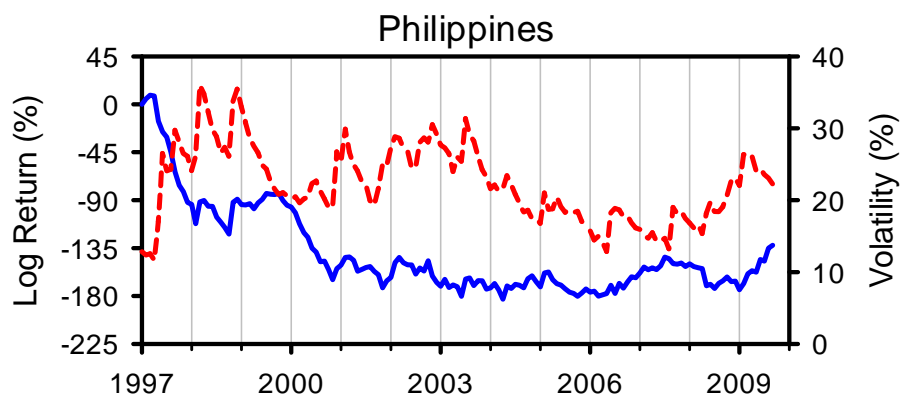
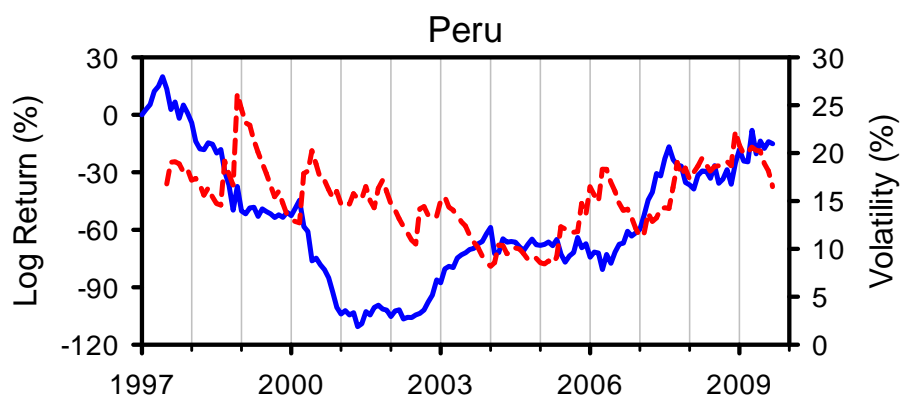
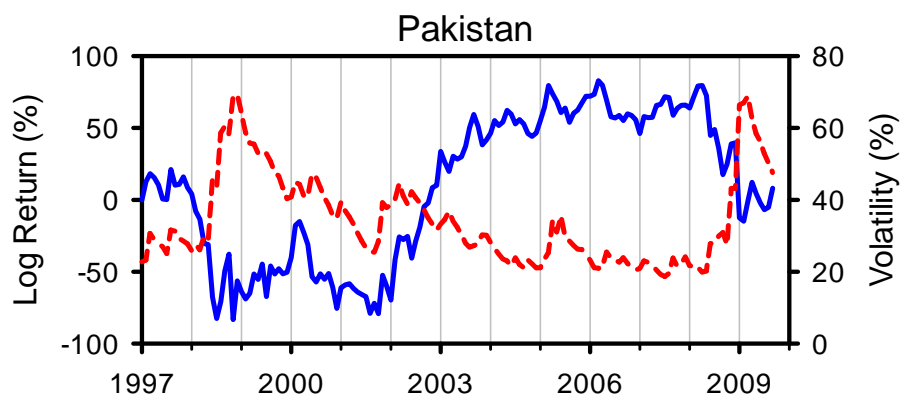


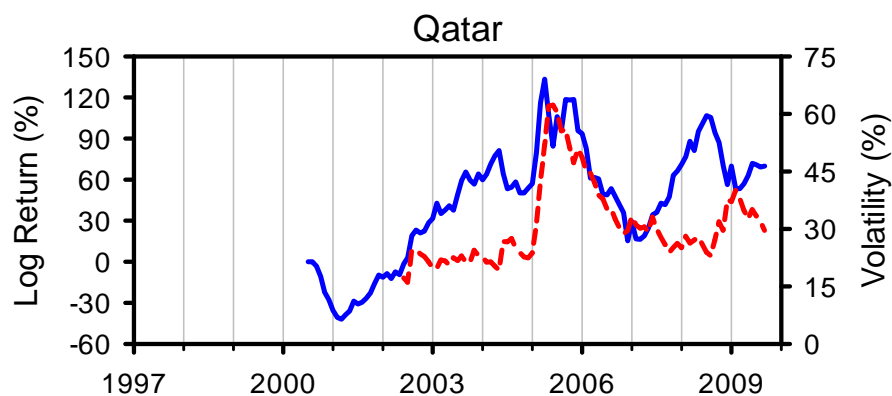
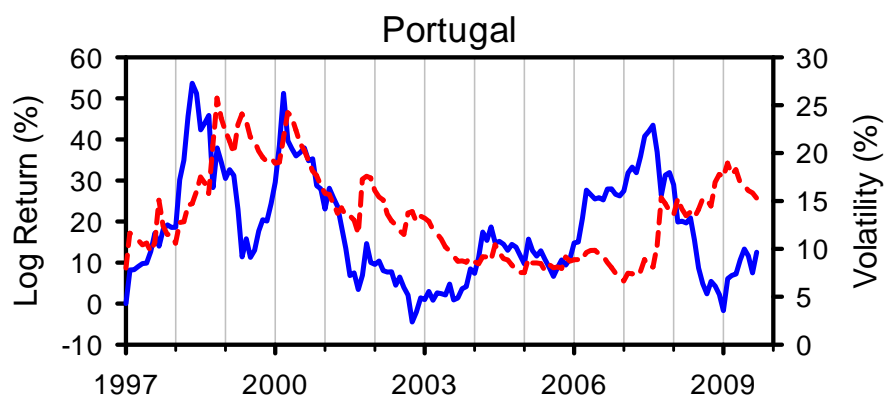
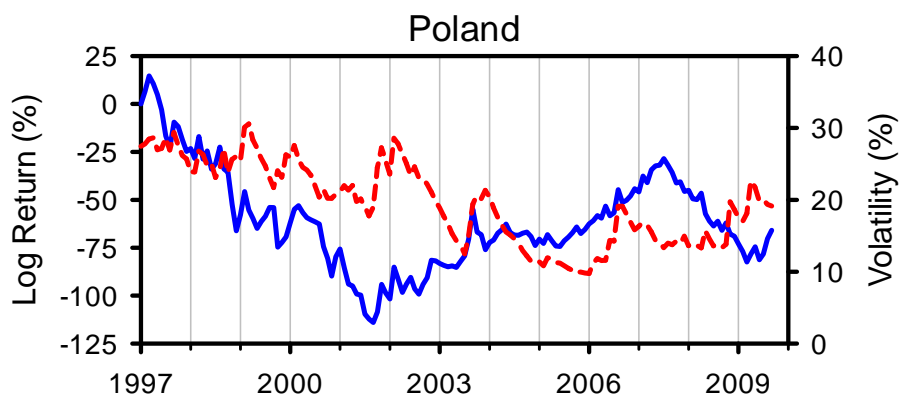
GEM2 Factor Returns and Volatilities

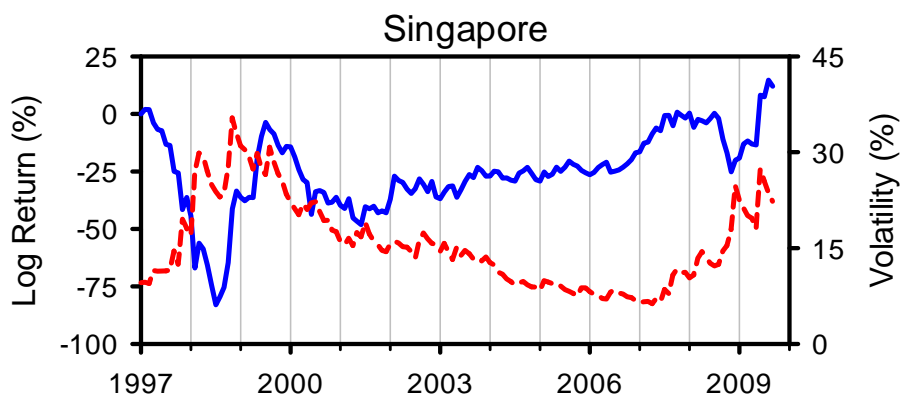
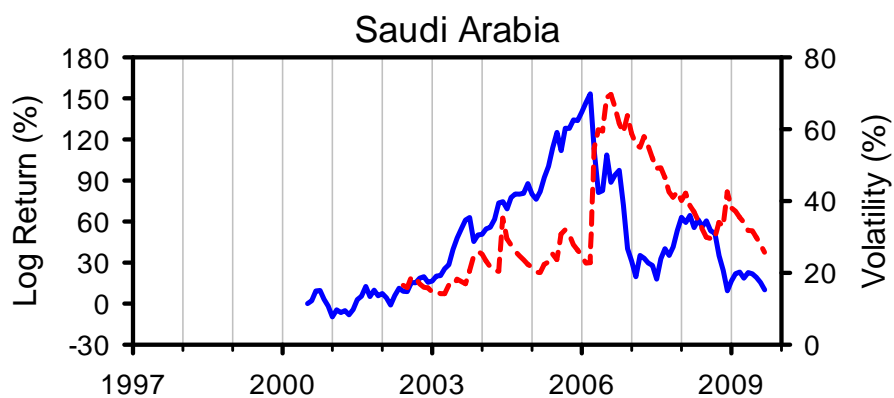
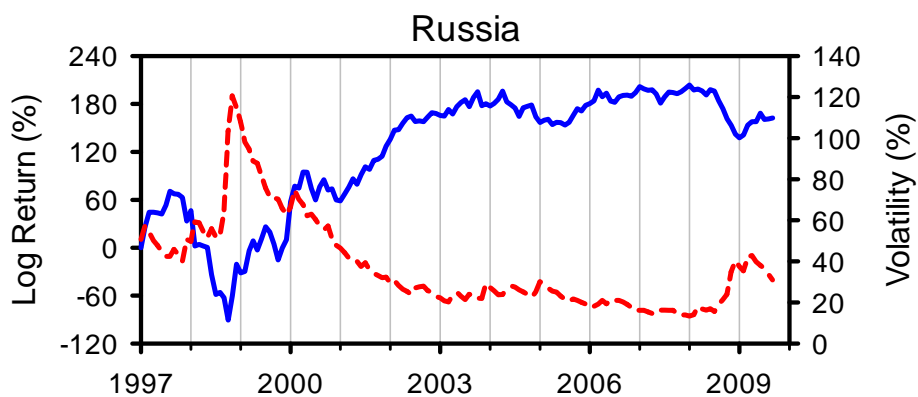
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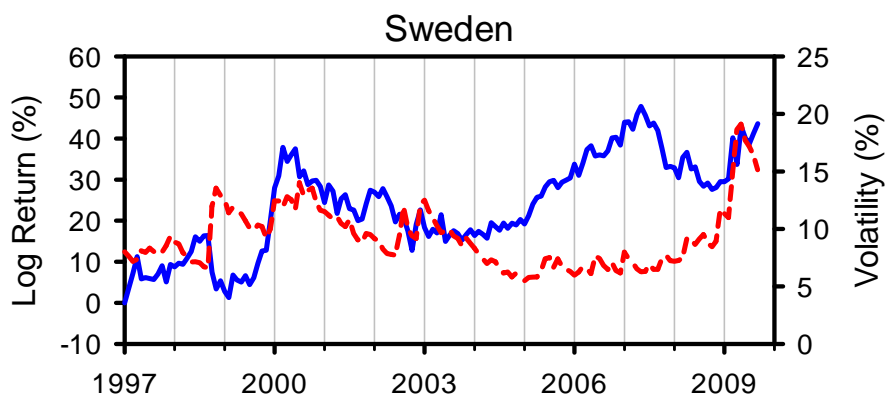
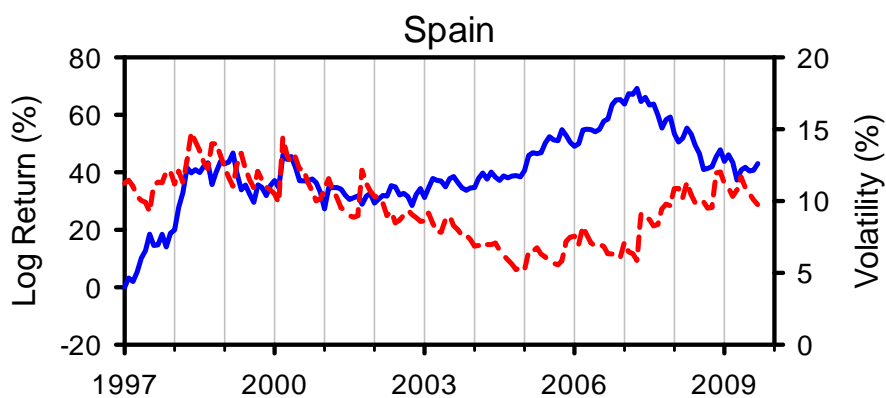
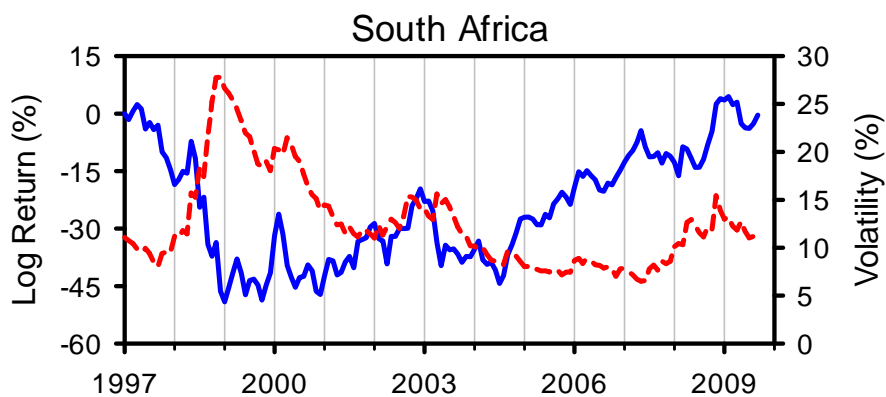


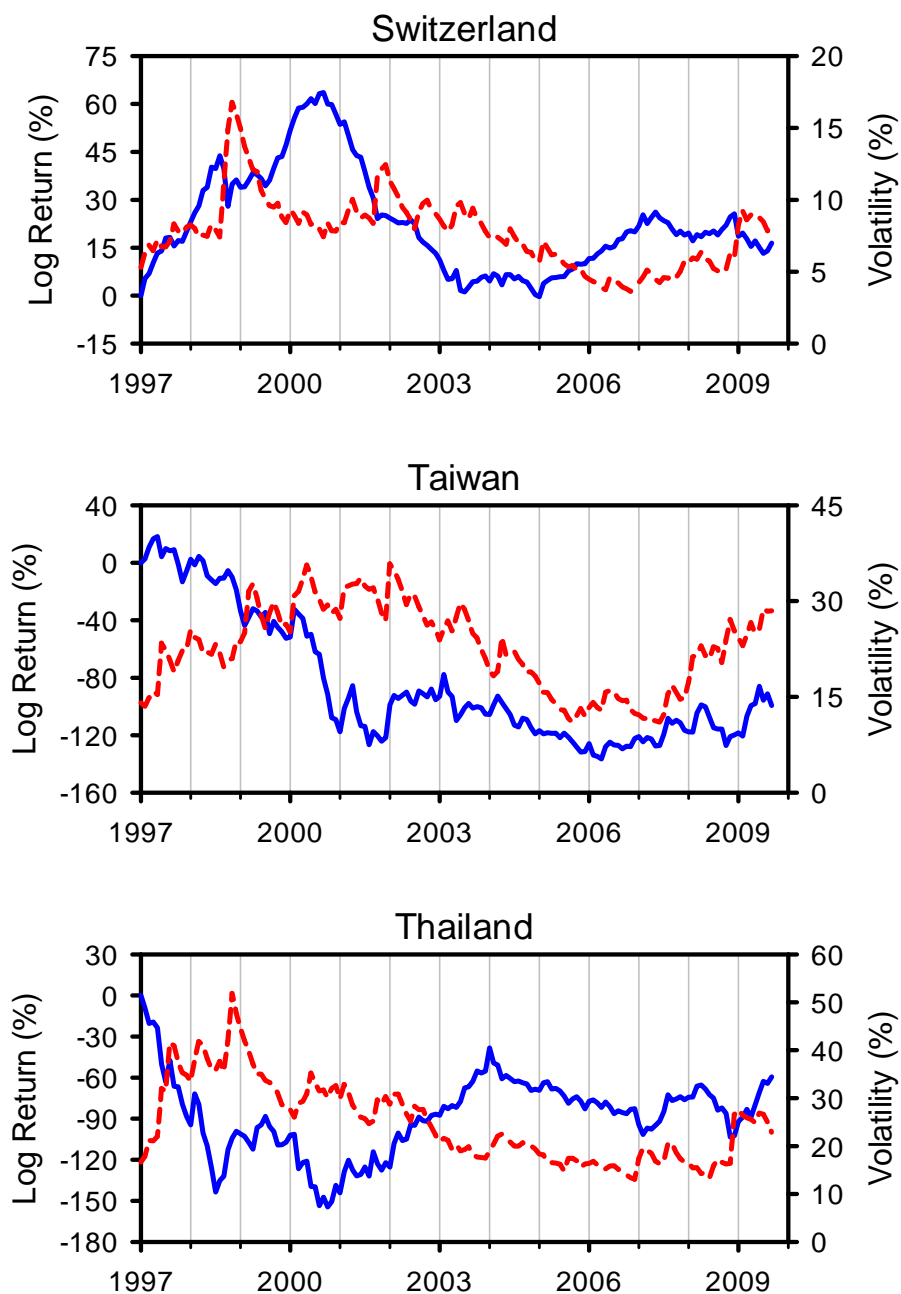


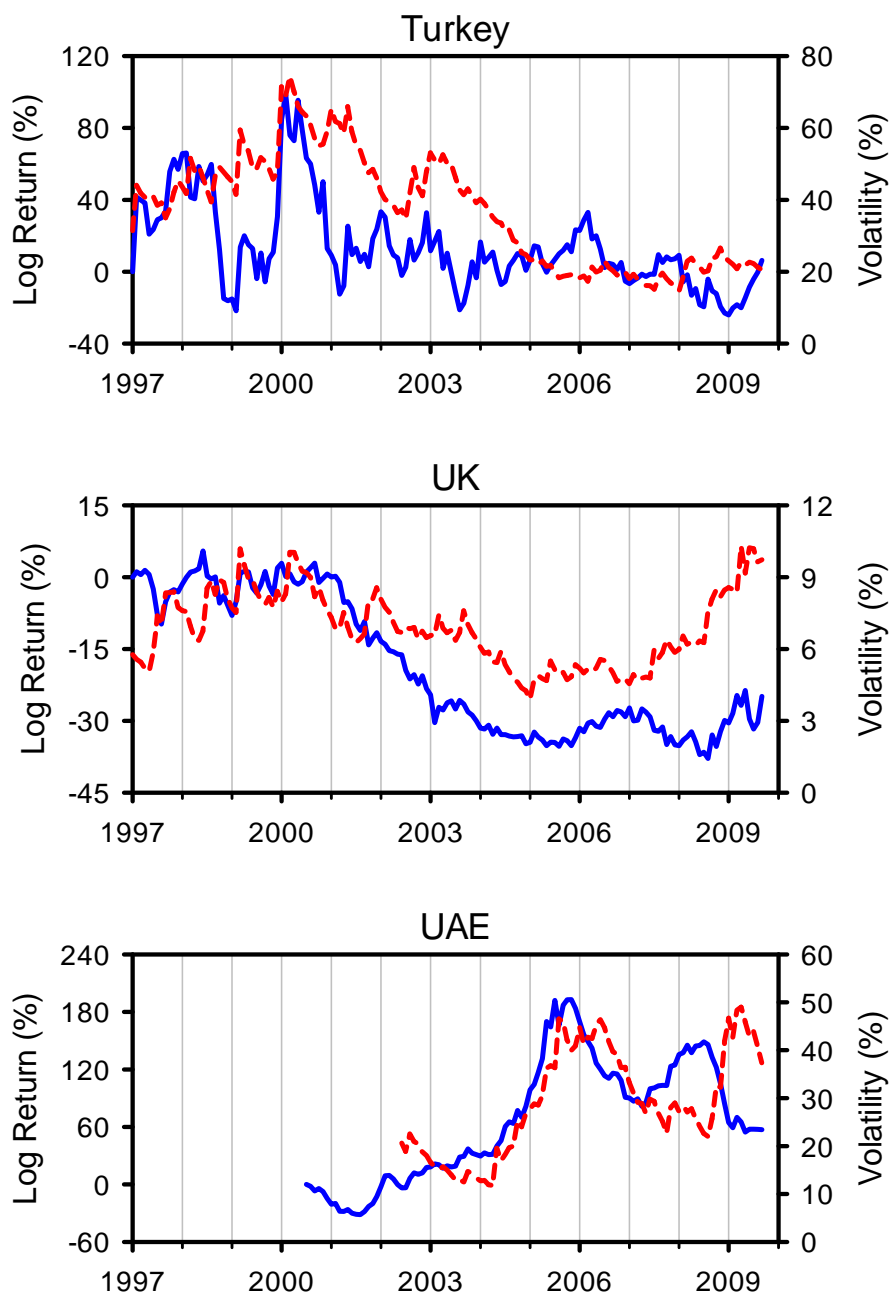


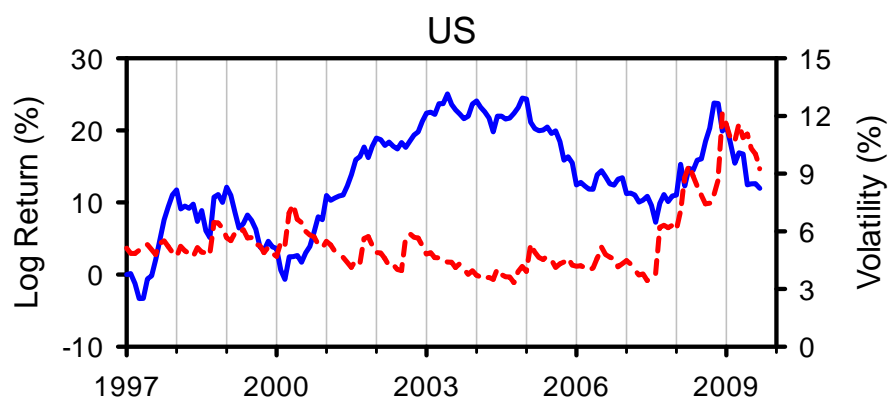




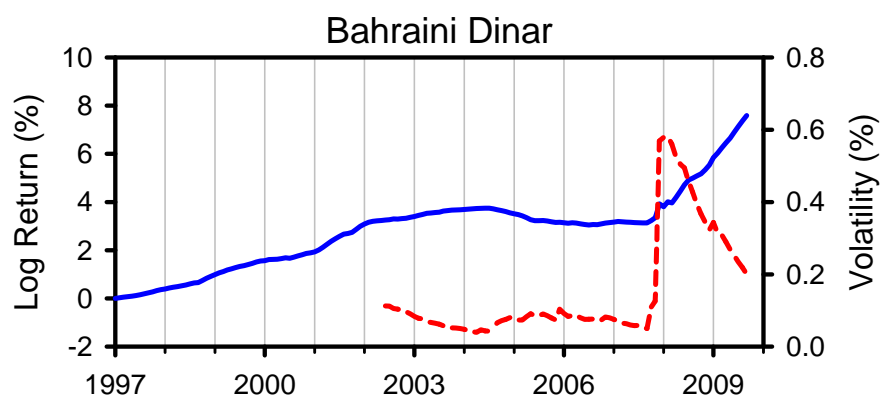
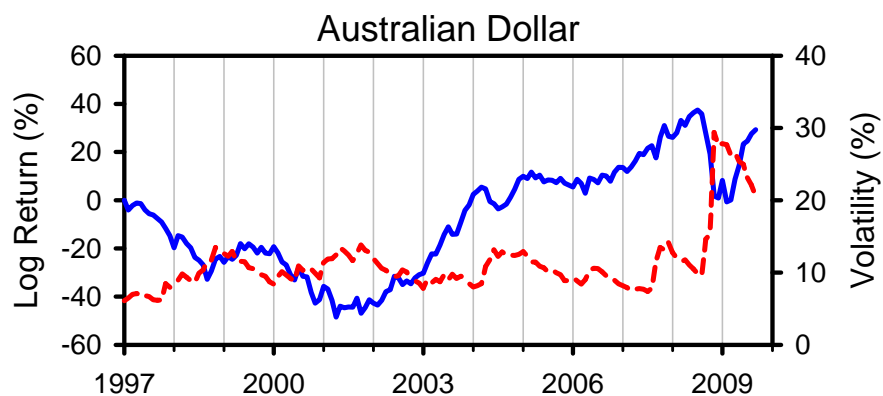
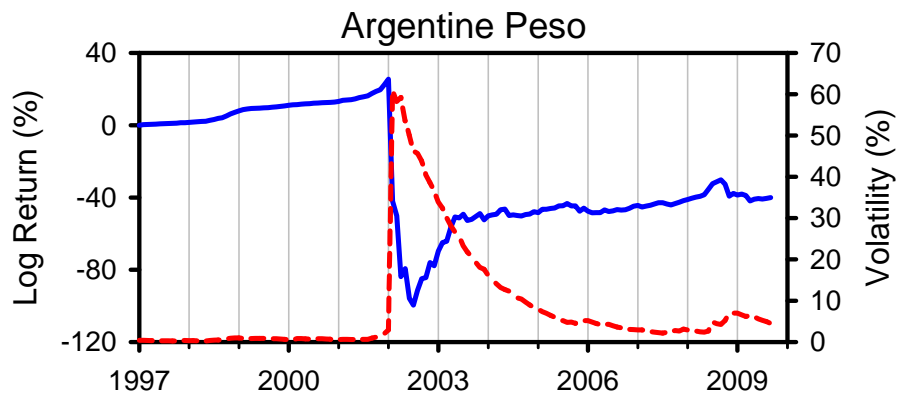


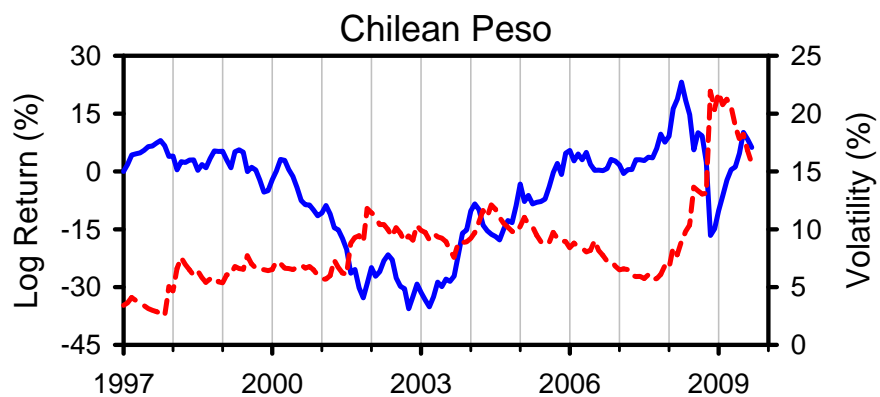
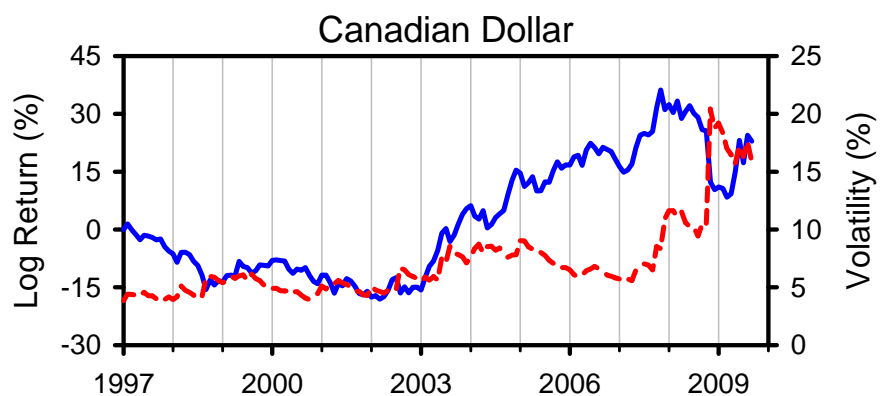
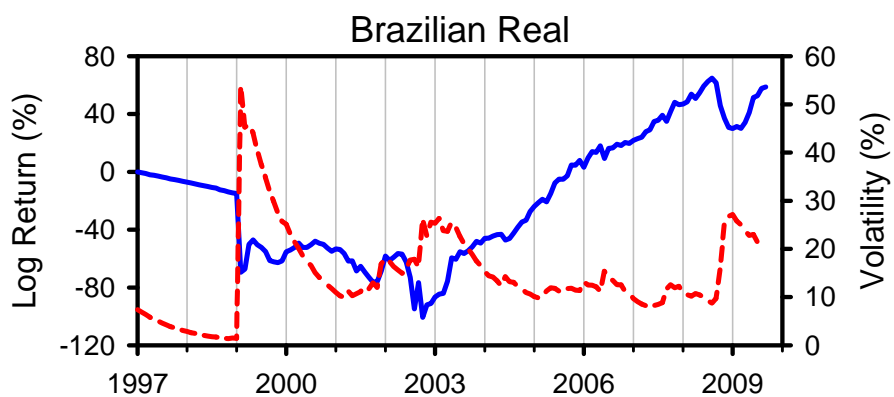


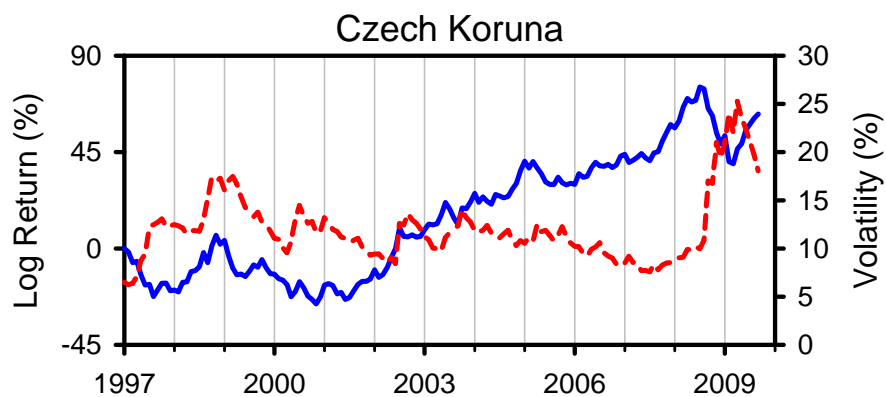
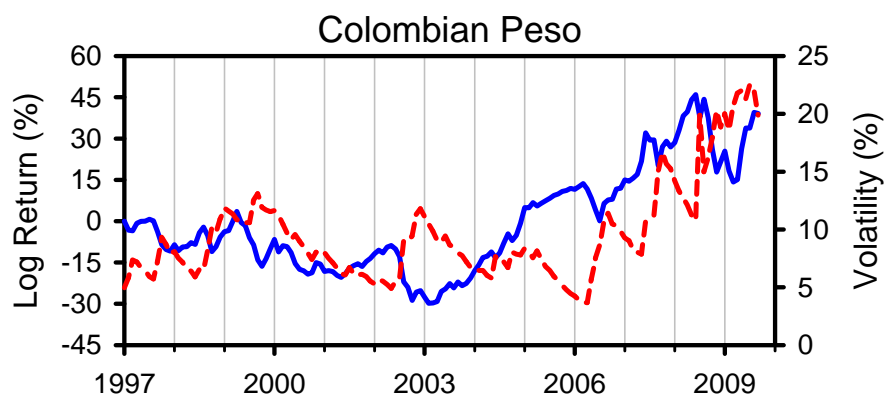
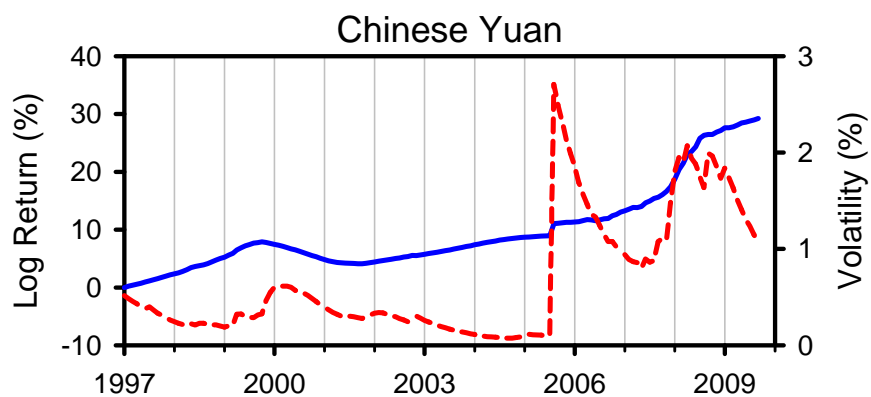


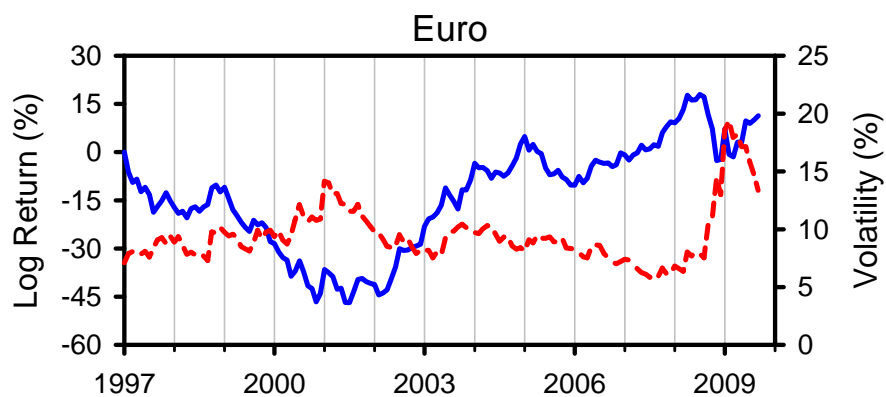
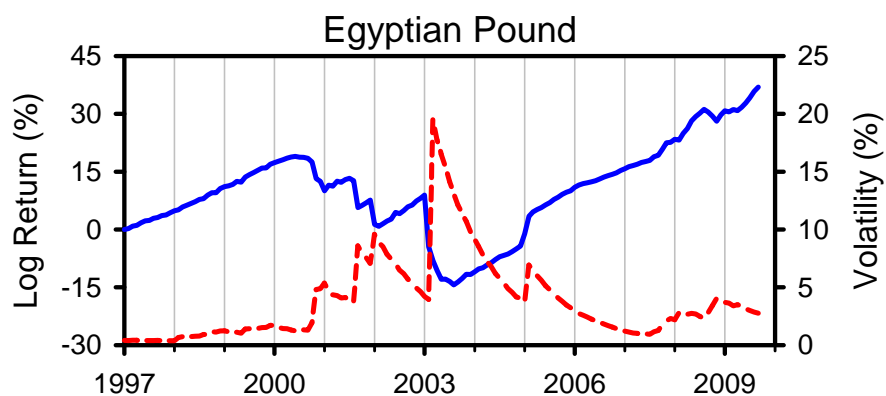
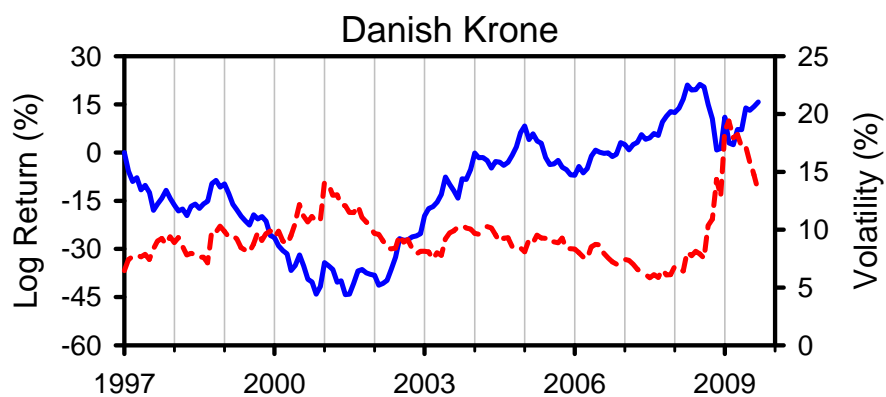


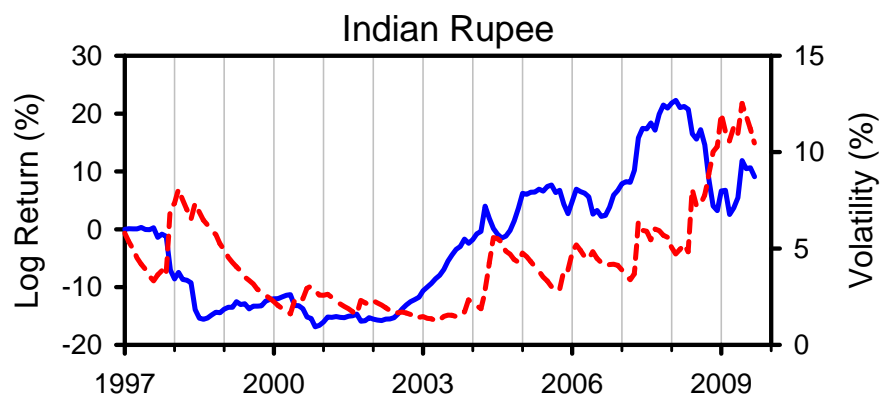
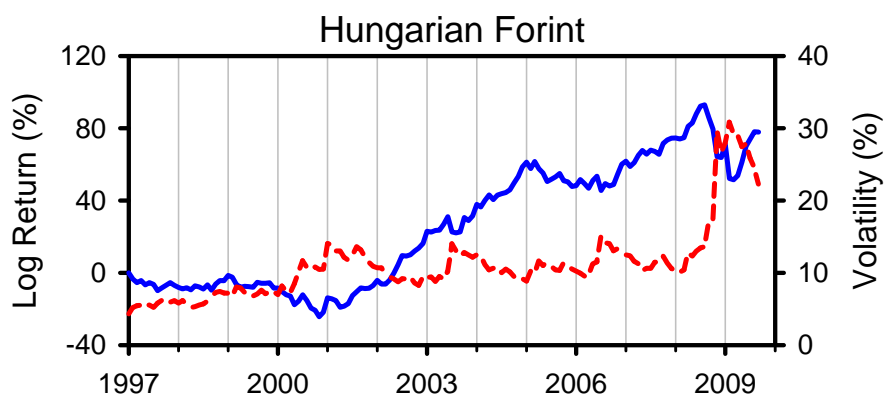
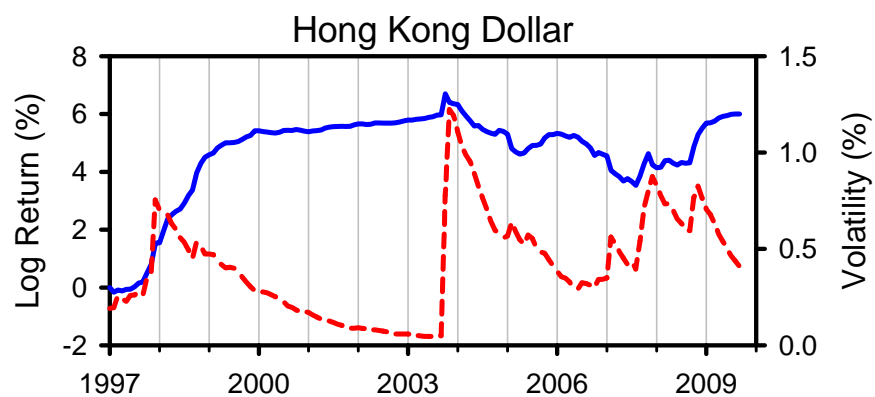
Currencies

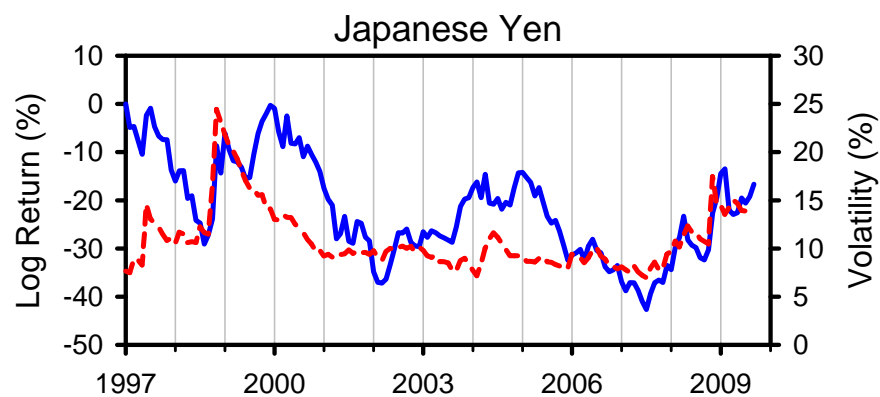
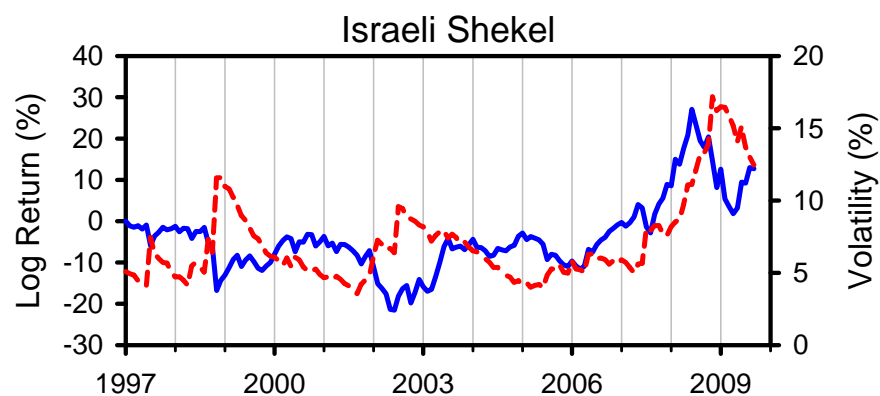
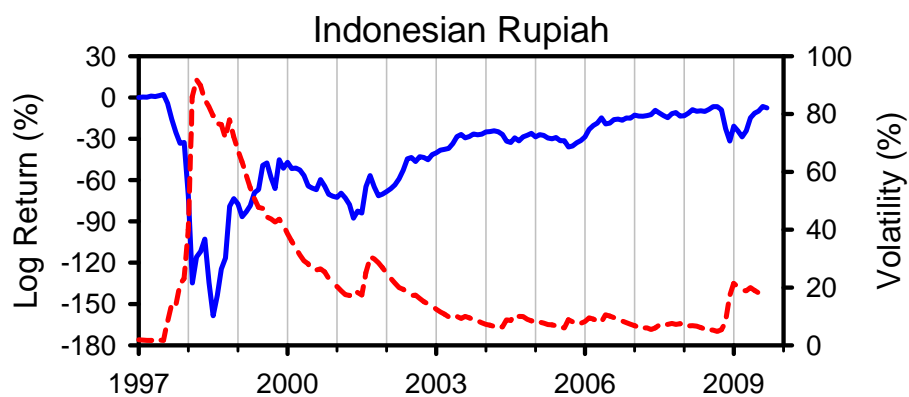


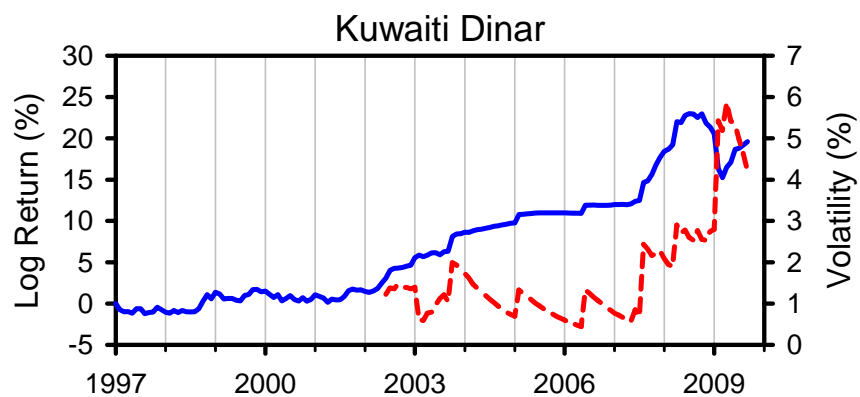
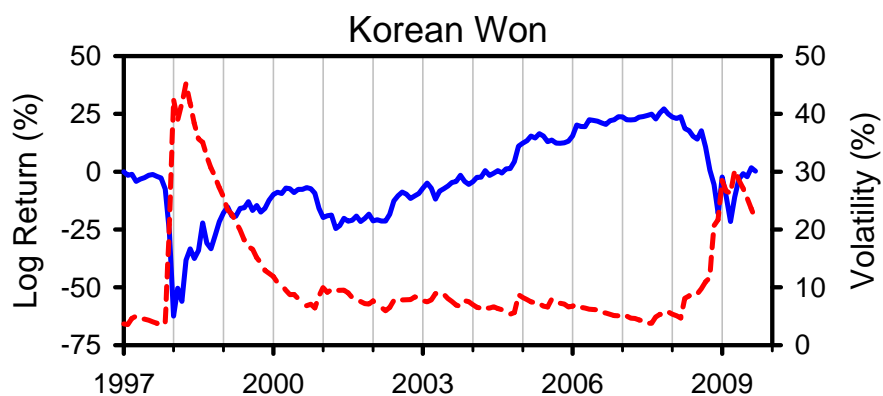
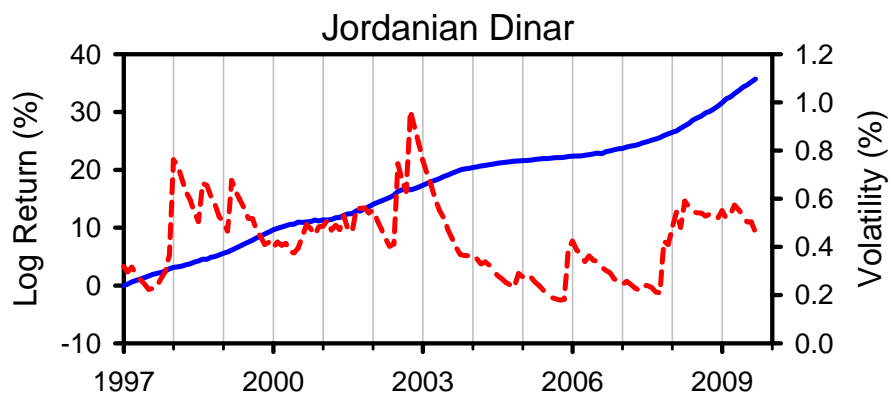


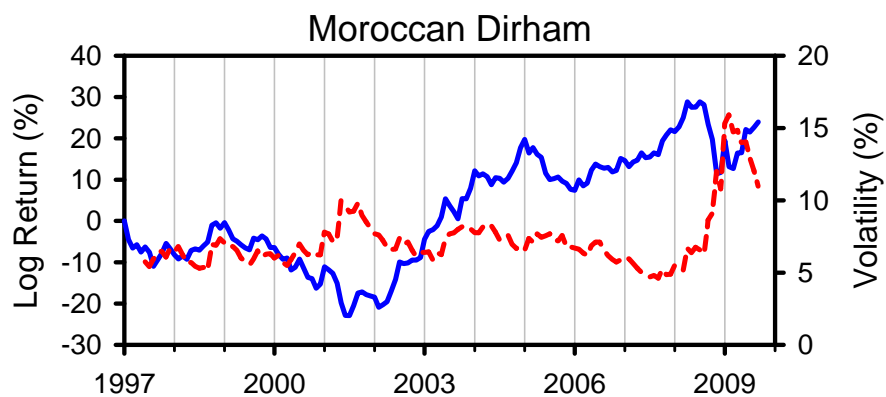
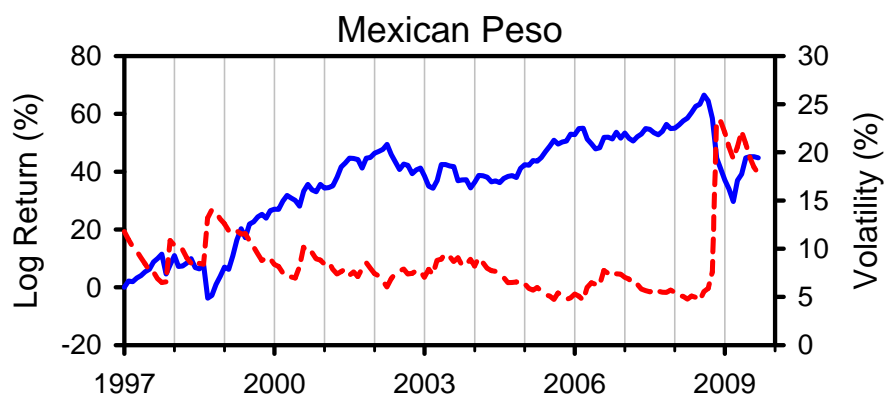
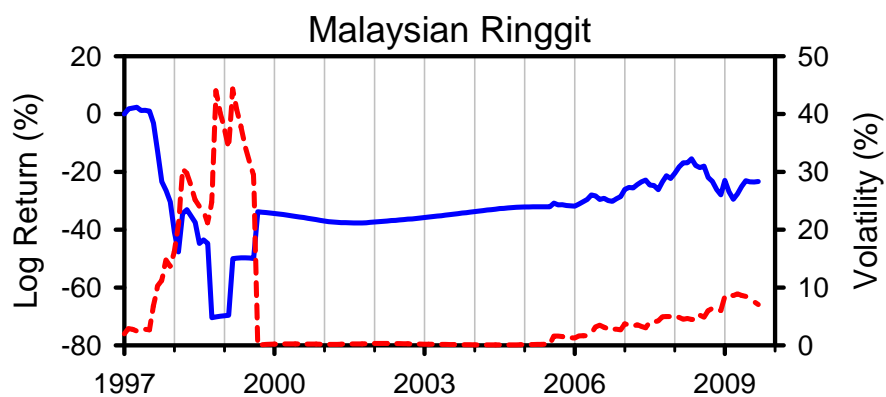






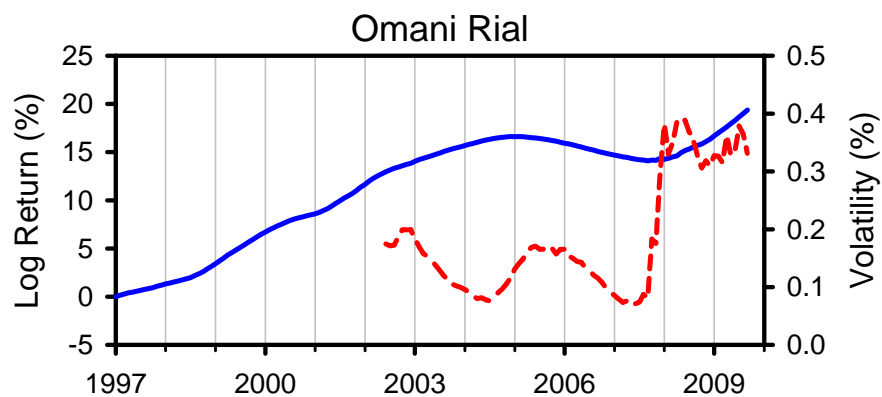
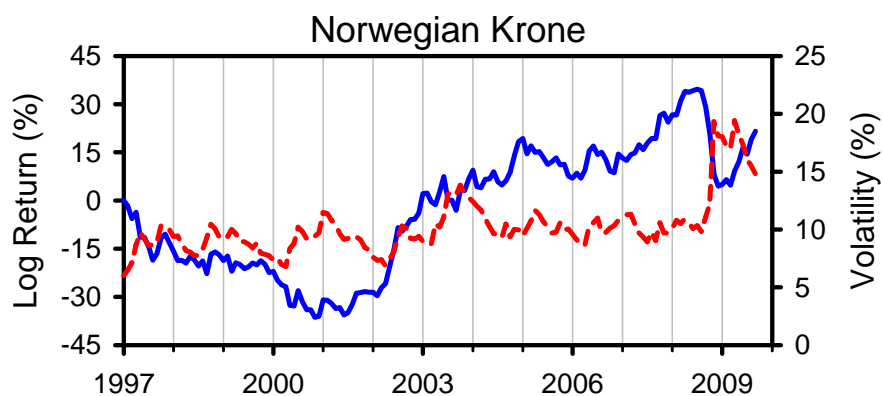
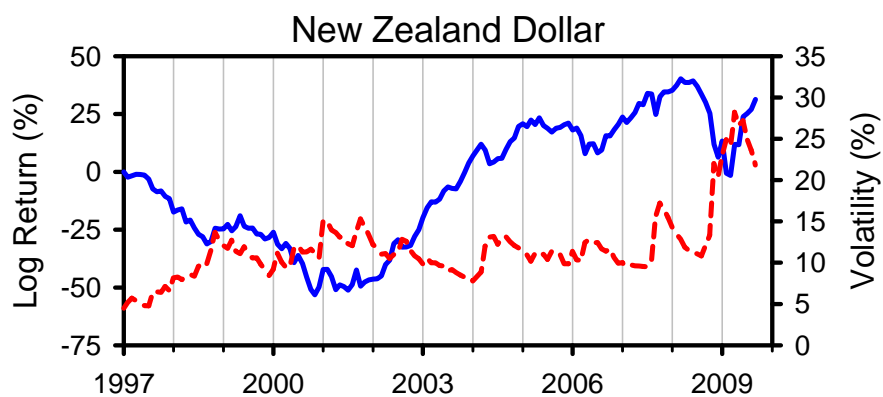


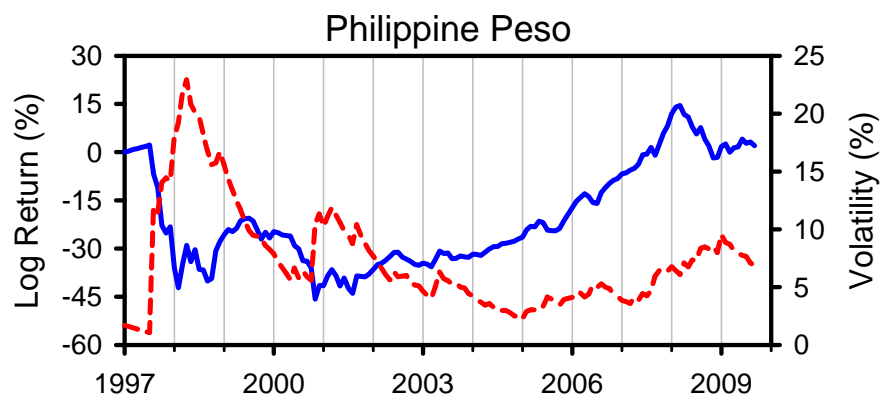
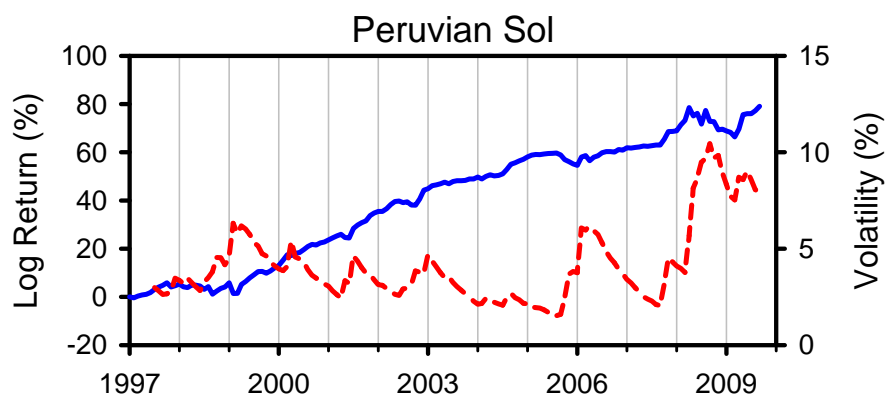
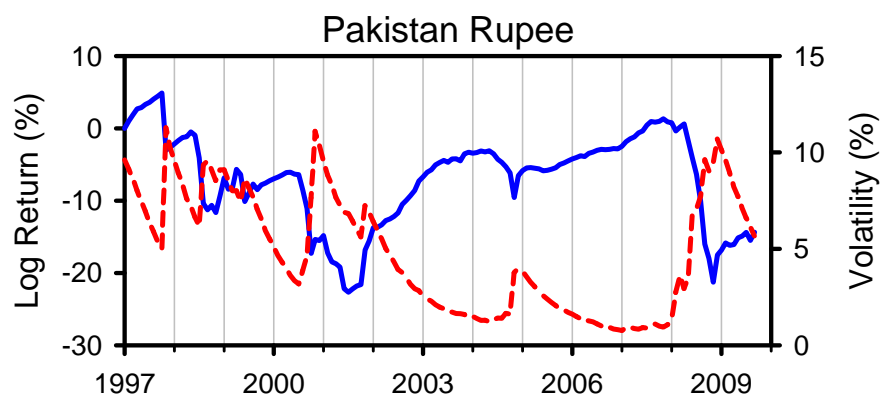




GEM2 Factor Returns and Volatilities

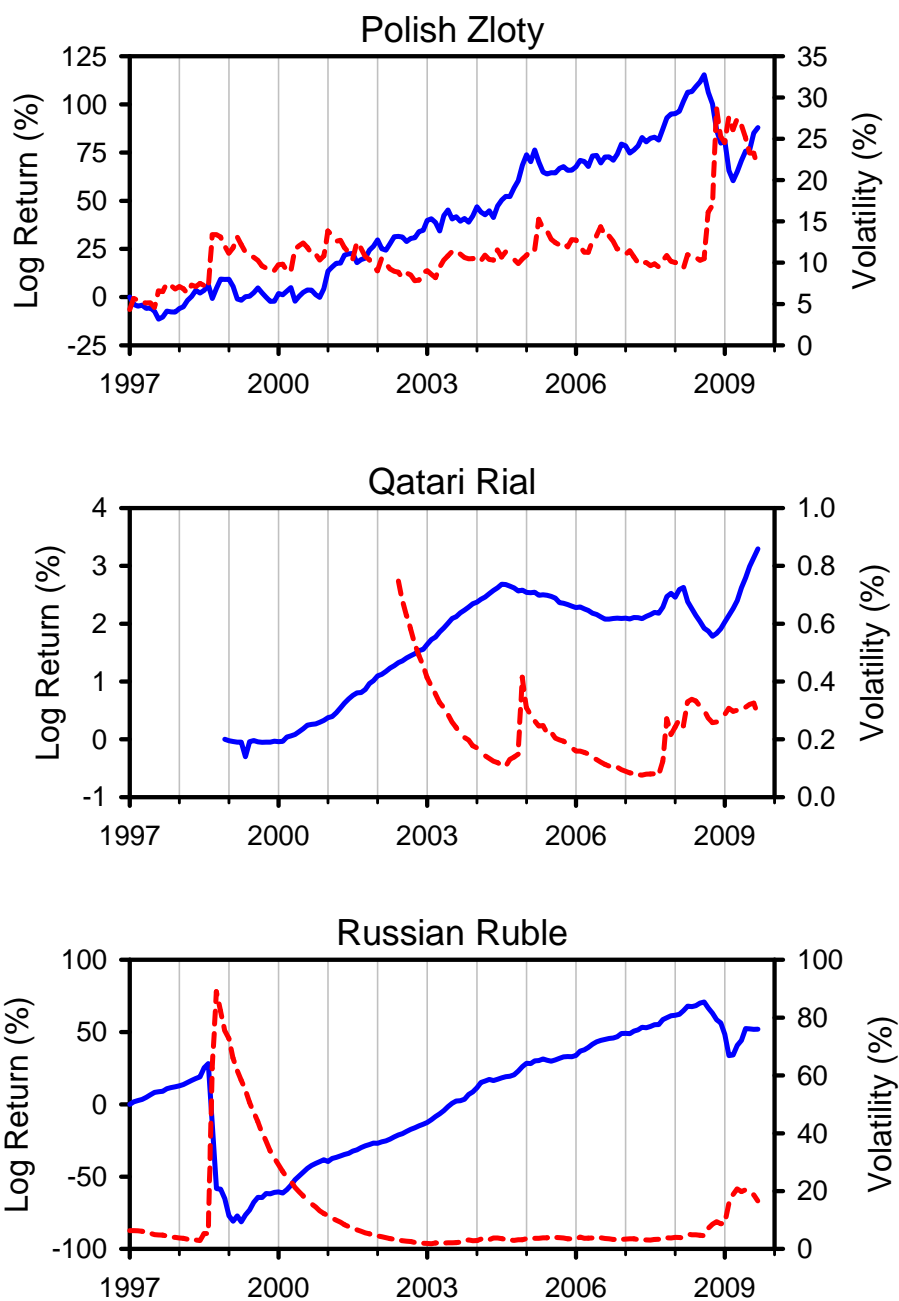
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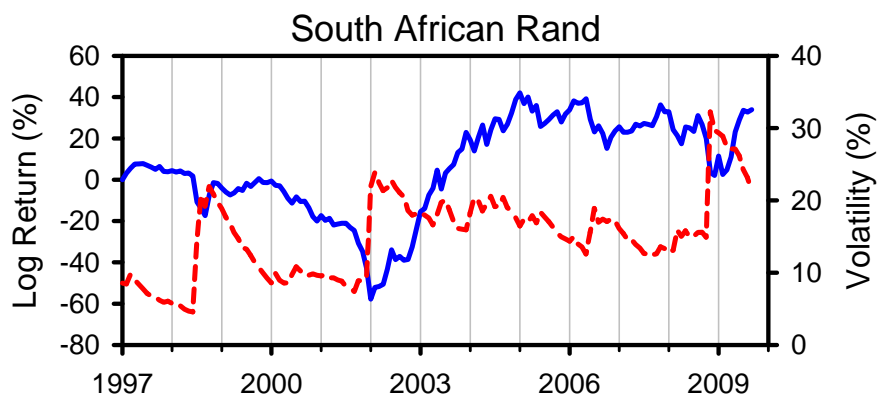
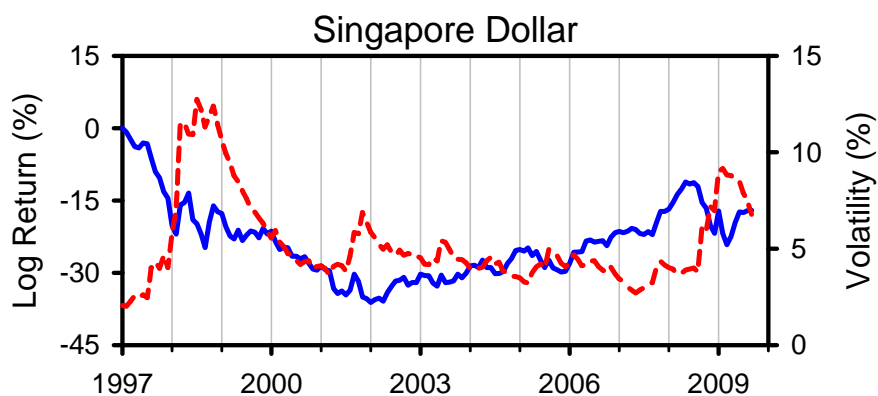
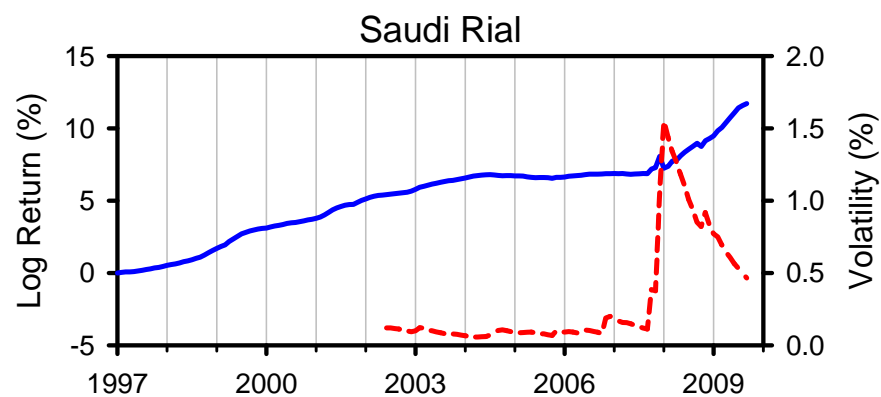


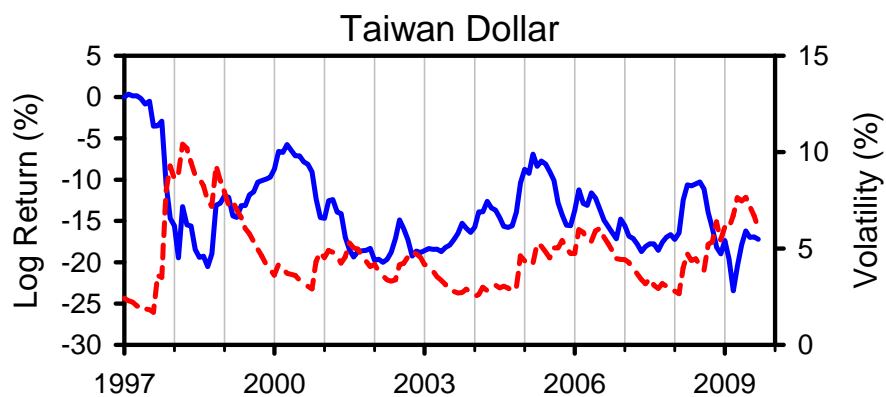
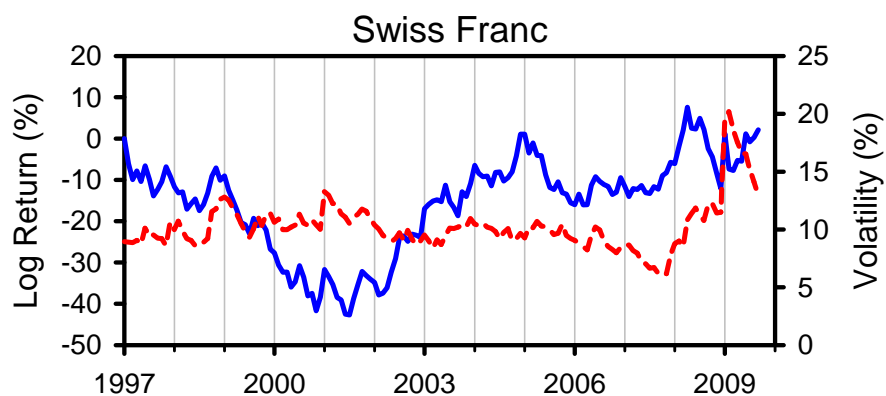
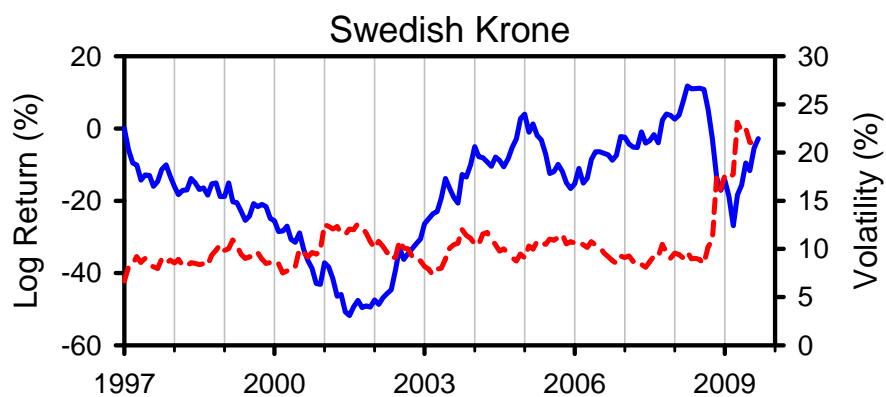


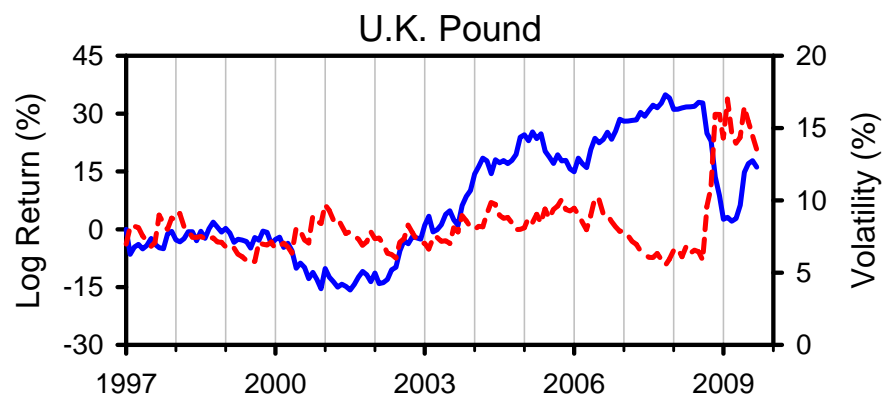
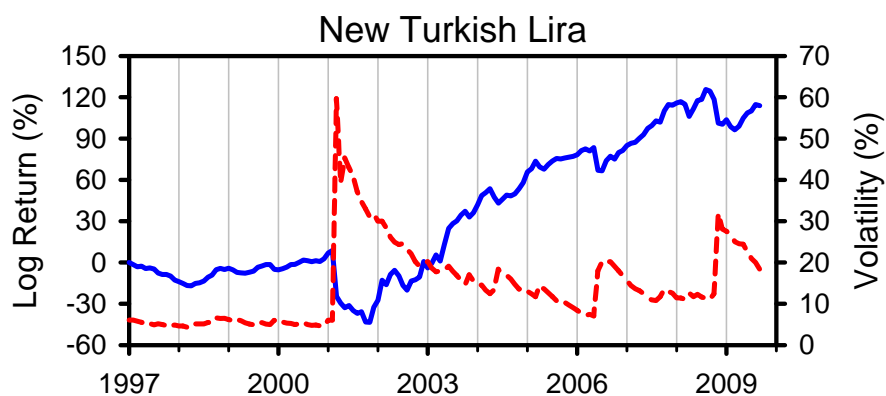
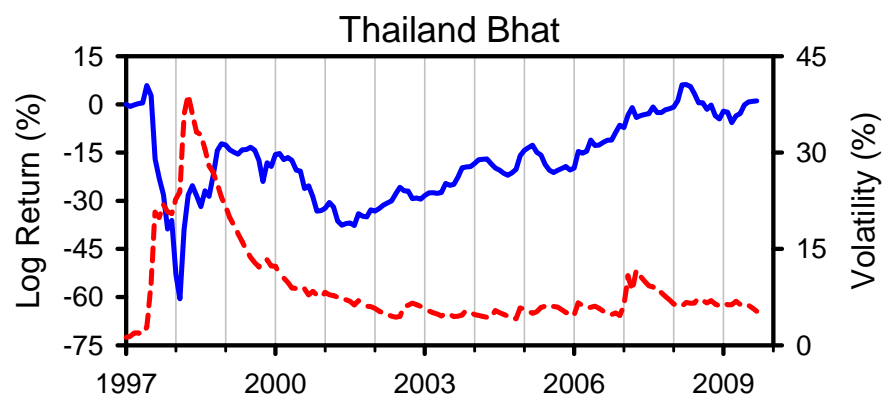
GEM2 Factor Returns and Volatilities

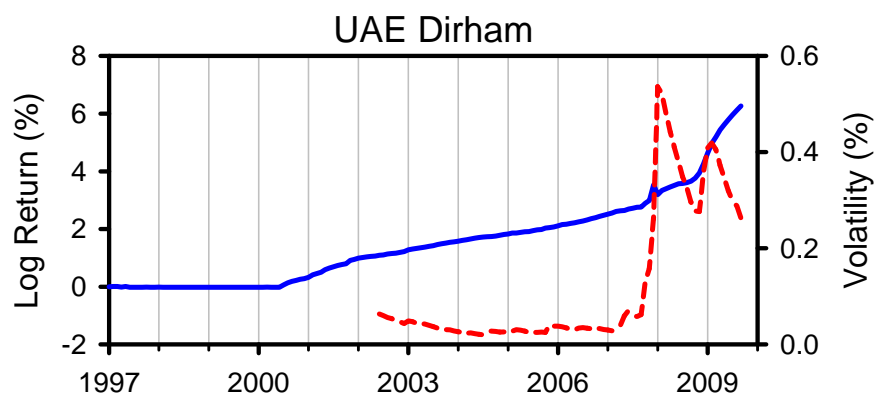
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Appendix: Log Returns

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

$$1 + R_T = \prod_{t=1}^T (1 + R_t). \quad (\text{A1})$$

The *log return* of the portfolio is given by,

$$\ln(1 + R_T) = \sum_{t=1}^T \ln(1 + R_t). \quad (\text{A2})$$

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,

$$\ln(1 + R_t) \approx R_t, \quad (\text{A3})$$

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

$$R_T = \exp \left[\sum_{t=1}^T \ln(1 + R_t) \right] - 1. \quad (\text{A4})$$

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.

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