# An Application of the High-Low Spread Estimator to Non-U.S. Markets using Datastream

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Corwin and Schultz (2009) derive an estimator for the bid-ask spread based on daily high and low prices. To demonstrate the applicability of the high-low estimator to non-U.S. markets, they estimate high-low spreads for individual stocks in Hong Kong and India using daily high and low prices from Datastream. Here, we provide results for nine additional countries covered by Datastream. High-low spread estimates are calculated for each two-day interval following the derivation in Corwin and Schultz (2009). We then calculate monthly spreads for each sample stock, by averaging across all overlapping two-day intervals within the month. Following Corwin and Schultz (2009), we include only those stock-months with at least 12 daily spread observations and we set all negative estimates to zero before taking the monthly average.[1] Finally, for each country, we calculate the cross-sectional average of high-low spreads by month using all stocks with sufficient data.

Table 1 provides summary statistics for the monthly high-low spreads for eleven countries covered by Datastream. The period of data coverage differs by country. We therefore provide results based on the period from January 1994 through December 2007, when data is available for all eleven countries. As the results show, the market-wide average spread varies substantially across countries, ranging from a low of 0.58% for New Zealand to a high of 1.47% for Korea. Among countries with at least 100 sample firms, the minimum monthly spread is lowest in the UK, at 0.90%. The monthly market-wide average spreads exhibit even more variation across time within individual countries. In India, for example, monthly average spreads range from a low of 0.96% to a high of 5.23%. Similarly, monthly average spreads in Italy range from a low of 0.58% to a high of 3.91%. The number of firms with sufficient data to allow spread estimation also varies widely across countries, with the average number of firms ranging from 54 for New Zealand to 2,481 for Japan.

To examine the relation between spreads across countries, we compute time-series correlations between the monthly market-wide spreads for each pair of countries. The results are provided in Table 2. The paired correlations range from a low of -0.441 for Hong Kong and India to a high of 0.736 for Sweden and France. The average time-series correlation across all country pairs is 0.214.

To illustrate the time-series patterns in high-low spreads, we plot the monthly cross-sectional average by country in Panels A through I of Figure 1. Because data coverage in Datastream increases over

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[1] We adjust for overnight returns as in Corwin and Schultz (2009) based on a comparison of daily high and low prices to the prior day's close. Spreads are not estimated in cases where the daily high and low are either equal or missing.

time, the graphs also plot the number of firms used to compute the market-wide average in each month. Similar graphs for Hong Kong and India are available in Corwin and Schultz (2009).

Results for Korea and Japan are shown in Panels A and B of Figure 1. As is the case for Hong Kong, as discussed in Corwin and Schultz (2009), average spreads in Korea and Japan exhibit a sharp increase at the time of the Asian currency crisis in October 1997. In Korea, mean high-low spreads range from 0.5% to 1.0% prior to the currency crisis, but jump to over 2% during much of 1998, 1999, and 2000. Spreads come down in early 2001, stabilizing at approximately 1.5%. While spreads appear to be high in 2002-2007 relative to the pre-crisis period, this may simply reflect the substantial increase in Datastream coverage in the later period. The results are similar for Japan, where high-low spreads exhibit a sharp increase in October 1997 and a subsequent decrease from late 2003 through early 2005. For both countries, the patterns in high-low spreads are consistent with a substantial increase in execution costs during the Asian currency crisis. For the period starting in January 1994, the average paired correlation between market-wide average spreads of Korea, Japan, and Hong Kong is 0.640.

Results for Italy, France, Belgium, and Sweden are provided in Panels C through F of Figure 1. For all four countries, the most striking feature is a significant increase in spreads in December 1994. In Italy, for example, spreads increased from an average of less than 1.0% to a peak of nearly 4.0%. Similar increases are evident in the other three countries and all four countries experience a significant decrease in spreads in December of 1995. These effects correspond to the Mexican peso crisis in 1994-1995 and suggest that contagion effects or exposure to Mexican debt led to large increases in execution costs for these countries. For Sweden, the graph also points to an increase in spreads from late 1990 through 1993. This increase in execution costs may reflect the banking problems and subsequent kroner depreciation experienced in Sweden during this period. For the period starting in January 1994, the average paired correlation between market-wide average spreads in these four countries is 0.609.

Panel G of Figure 1 presents results for the UK. Several notable patterns are evident from the graph. First, there is a sharp increase in spreads from late 1989 through early 1991. This is followed by a significant drop in spreads during 1993. From late 1999 through early 2003, spreads in the UK roughly double, from less than 1.0% to over 1.8%. Finally, the graph shows a significant decrease in spreads in August 2003, coupled with a significant drop in the number of firms. While we cannot place economic meaning on all of these patterns, the decrease in spreads during 1993 coincides with the UK's exit from the European exchange rate mechanism.

Results for Brazil and New Zealand are provided in Panels H and I of Figure 1. There do not appear to be any systematic patterns in spreads for either of these countries. While spreads in Brazil are significantly higher in 1993 than in later years, this appears to reflect the small sample size during this period. For New Zealand, there are several spikes in spreads, including a general increase in spreads from

mid-1998 through 2002.  However, the number of stocks included in the sample for New Zealand is relatively small, making it difficult to draw firm conclusions.

Overall, the results presented in Figure 1 point to several economically important patterns in execution costs across multiple countries.  These examples illustrate the potential use of the high-low spread estimator for analyzing execution costs in non-U.S. markets using Datastream data.

## Table 1 – Summary Statistics for High-Low Spreads by Country

The table provides summary statistics for the cross-section of high-low spread estimates for each of eleven countries covered by Datastream. Monthly high-low spreads for each stock-month with at least 12 daily spread estimates within the month. For each country, we then calculate the cross-sectional average high-low spread each month. The table reports the time series properties of these country-specific cross-sectional averages, along with information on the number of firms included in each average each month. Data are from January 1994 through December 2007.

| Country | Monthly High-Low Spread | | | Number of Firms in Cross-Sectional Avg | | |
|---|---|---|---|---|---|---|
| | Mean | Min | Max | Mean | Minimum | Maximum |
| Korea | 1.47% | 0.73% | 2.59% | 1265 | 350 | 1865 |
| Japan | 0.76% | 0.48% | 1.12% | 2481 | 1582 | 3623 |
| Hong Kong | 1.16% | 0.50% | 2.29% | 475 | 198 | 957 |
| India | 1.65% | 0.90% | 5.23% | 1083 | 406 | 1482 |
| Italy | 1.02% | 0.55% | 3.91% | 264 | 147 | 315 |
| France | 0.95% | 0.57% | 2.01% | 451 | 249 | 569 |
| Belgium | 0.83% | 0.32% | 2.26% | 83 | 37 | 107 |
| Sweden | 1.10% | 0.54% | 2.95% | 295 | 142 | 435 |
| UK | 0.90% | 0.50% | 1.85% | 1189 | 673 | 1581 |
| Brazil | 1.31% | 0.68% | 3.73% | 144 | 62 | 326 |
| New Zealand | 0.58% | 0.34% | 1.17% | 54 | 15 | 79 |

## Table 2 – Correlations in High-Low Spreads Across Countries

The table provides paired time-series correlations between market-wide high-low spreads for each of eleven countries covered by Datastream. Monthly high-low spreads for each stock-month with at least 12 daily spread estimates within the month. For each country, we then calculate the cross-sectional average high-low spread each month. The table reports the paired time-series correlations between these country-specific cross-sectional averages. Data are from January 1994 through December 2007.

| | Korea | Japan | Hong Kong | India | Italy | France | Belgium | Sweden | UK | Brazil |
|---|---|---|---|---|---|---|---|---|---|---|
| Japan | 0.563 | | | | | | | | | |
| Hong Kong | 0.720 | 0.637 | | | | | | | | |
| India | -0.424 | -0.220 | -0.441 | | | | | | | |
| Italy | -0.284 | 0.198 | -0.258 | 0.146 | | | | | | |
| France | -0.067 | 0.494 | 0.097 | -0.066 | 0.574 | | | | | |
| Belgium | -0.050 | 0.305 | 0.051 | 0.007 | 0.542 | 0.628 | | | | |
| Sweden | 0.061 | 0.496 | 0.213 | 0.004 | 0.589 | 0.736 | 0.583 | | | |
| UK | 0.274 | 0.471 | 0.425 | -0.220 | -0.005 | 0.542 | 0.266 | 0.323 | | |
| Brazil | 0.168 | 0.295 | 0.230 | 0.362 | -0.031 | 0.045 | -0.105 | 0.096 | 0.176 | |
| New Zealand | 0.277 | 0.451 | 0.350 | 0.081 | 0.058 | 0.332 | 0.044 | 0.293 | 0.362 | 0.389 |
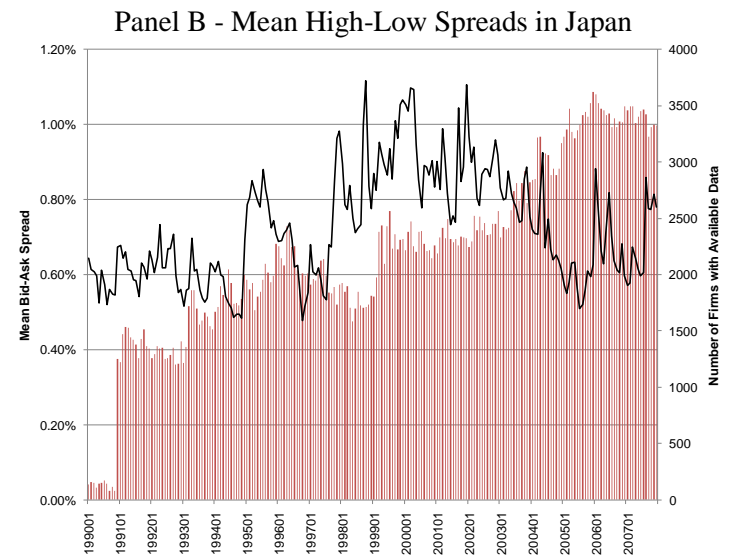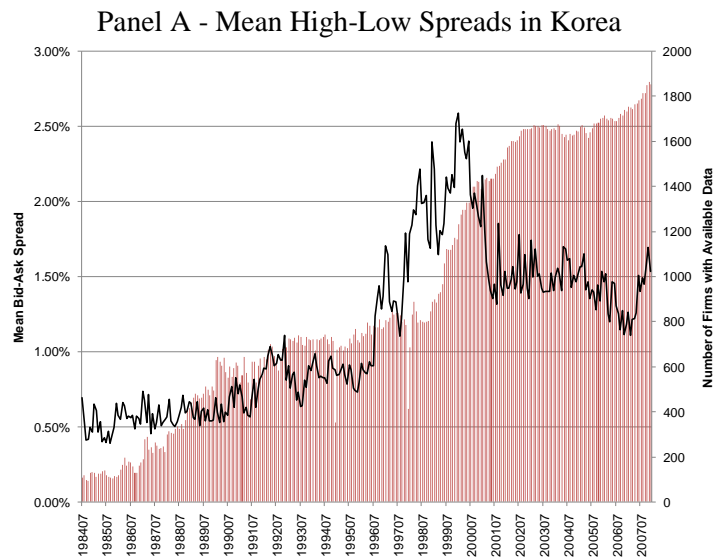
**Figure 1 - Average High-Low Spreads by Month based on Datastream Data**
High-low spreads are estimated for each stock each month by averaging all overlapping two-day spread estimates within the month. The graph plots the equally weighted average spread by month across all stocks with at least 12 daily spread observations within the month. The graph also shows the number of firms included in the average each month. Panels A through I show results for stocks in Korea, Japan, Italy, France, Belgium, Sweden, the U.K., Brazil, and New Zealand, respectively. All data are from Datastream.
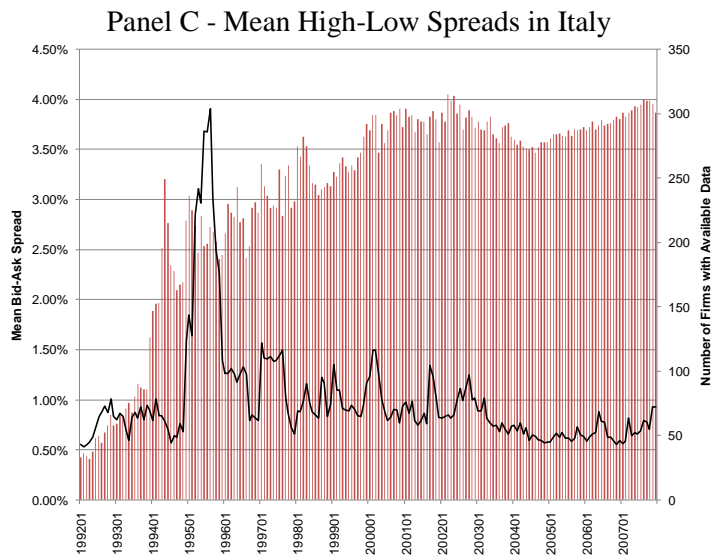
Panel C - Mean High-Low Spreads in Italy

Panel D - Mean High-Low Spreads in France

Panel E - Mean High-Low Spreads in Belgium

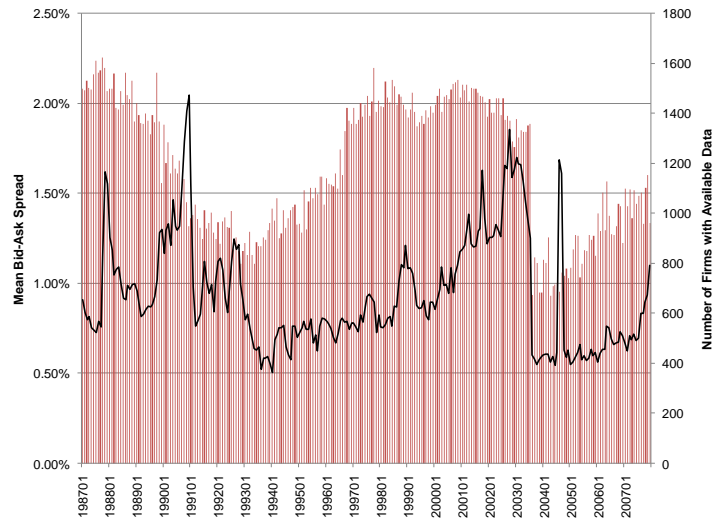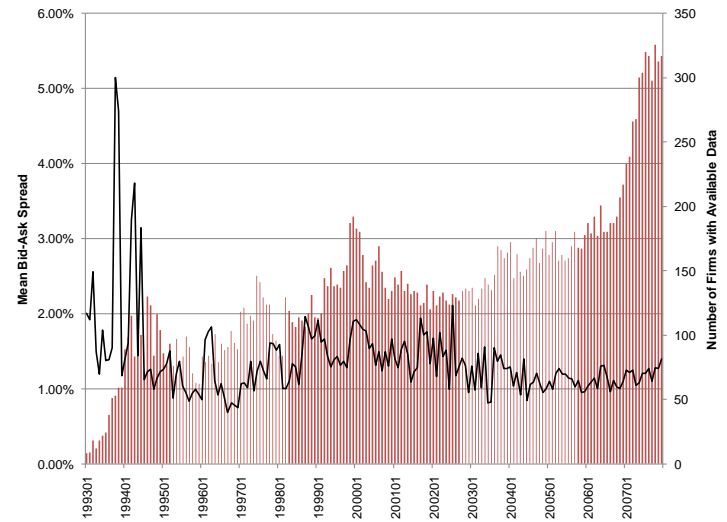Panel F - Mean High-Low Spreads in Sweden
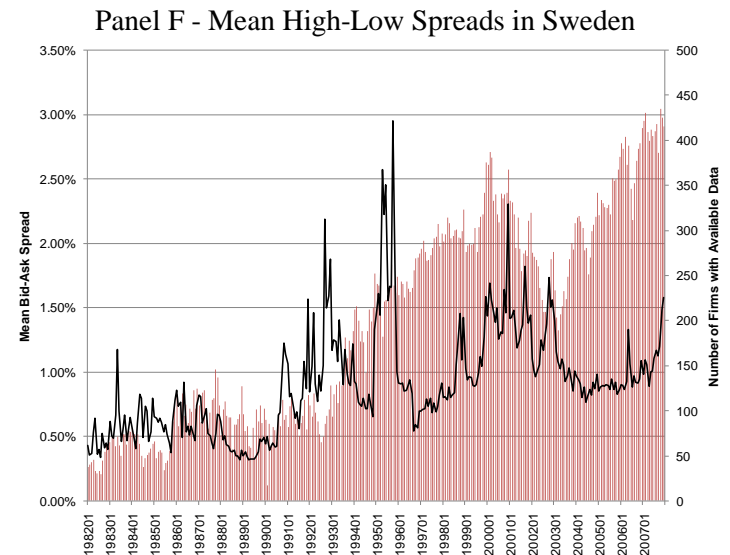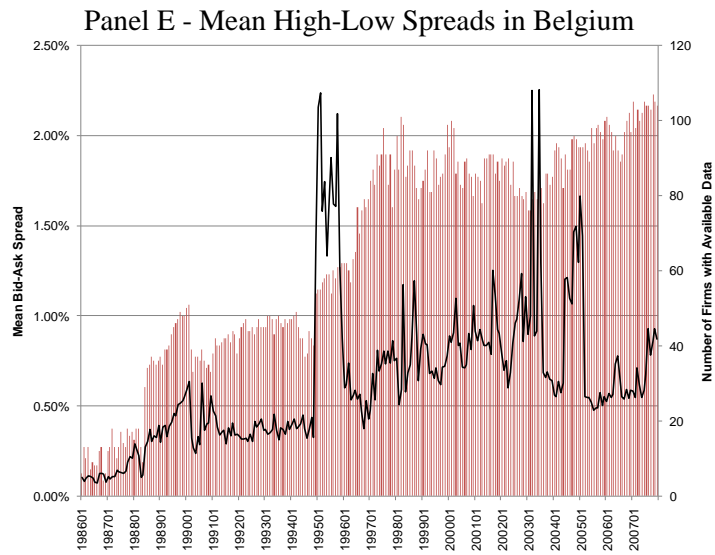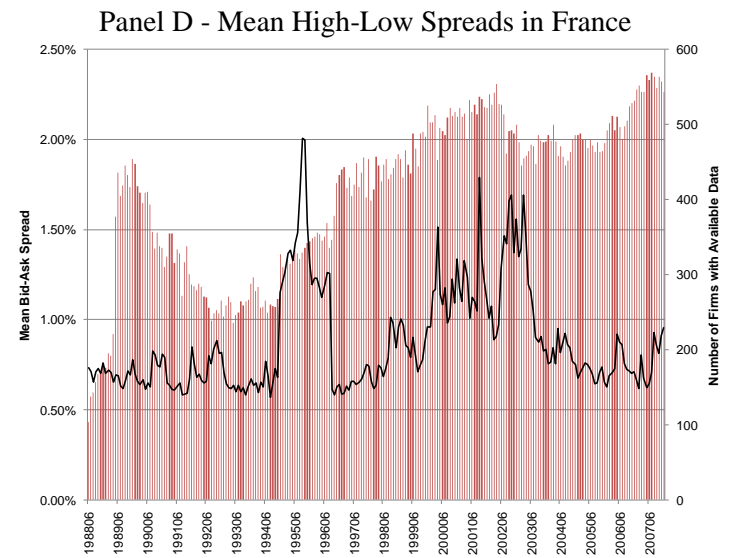
**Figure 1 - continued**

Panel G - Mean High-Low Spreads in the U.K.



Panel H - Mean High-Low Spreads in Brazil



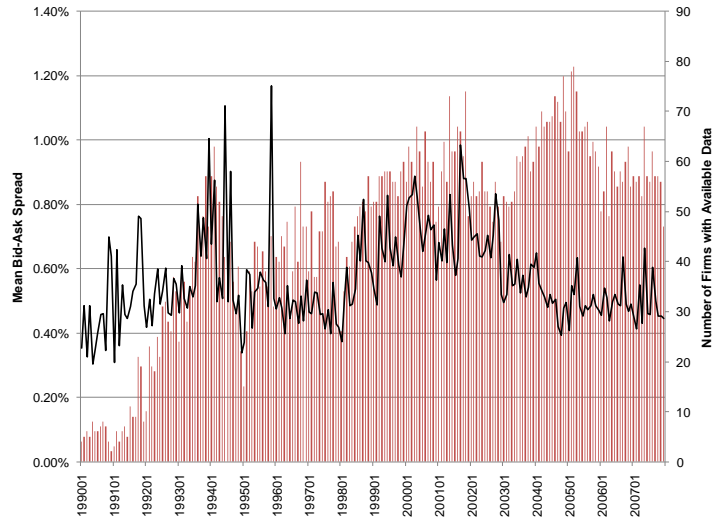Panel I - Mean High-Low Spreads in New Zealand

**Figure 1 - continued**

Corwin, Shane A., and Paul Schultz, 2009, A Simple Way to Estimate Bid-Ask Spreads from Daily High and Low Prices, working paper, University of Notre Dame.

http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1106193