

# Additional Material for Volatility Transmission in Global Financial Markets

A.E. Clements, A.S. Hurn and V.V. Volkov

Forthcoming in Journal of Empirical Finance

The empirical work in the paper uses a data set which is U.S. based, namely, the ¥/\$ exchange rate together with United States Treasury and Equity returns across three trading zones. This approach is consistent with similar papers in this area (Engle, Ito and Lin, 1990, Fleming and Lopez, 1999; Savva, Osborn and Gill, 2005). In order to test the robustness of the volatility patterns to the choice of assets, we repeated all the analysis using both Japanese (Topix equity futures and JGB bond futures) and German (DAX equity futures and BUND bond futures) data in the respective trading zones. While we do not present the full set of results here, the results revisiting the meteor shower and heatwave patterns for the equity and bond markets based on Japanese, German and U.S. data are presented in Table 1 below for comparative purposes.

In terms of the equity market, the structure between the countries is quite similar to the patterns observed across the zones for U.S. equities. Apart from link from  $\epsilon_{jp,t}^2$  to Europe on the same day being insignificant, most of the structure remains the same. In the case of the Japanese bond market the pattern is a somewhat different, indicating that this market is virtually disconnected from the other markets. This result is not surprising given the unique circumstances in Japanese macroeconomic and interest rate conditions over recent years. The linkages between Germany and the U.S. reflect the same pattern as that observed in U.S. Treasury volatility across the two trading zones. Overall, apart from the impact (or lack thereof) of the Japanese bond market volatility on volatility in the other trading zones, the structure between the different markets is similar to the patterns observed using the U.S. assets.

All the models estimated in the paper were re-estimated using this non-U.S. centric data and the results indicate that the volatility patterns reported in the paper are robust. Both data sets are available for download at <http://www.ncer.edu.au/data/data.jsp>.

Table 1: Coefficient estimates equivalent to Table 2, for the foreign exchange, equity and bond markets based on Japanese, German and U.S. equity and bond returns. Coefficients that are significant at the 5% level are marked (\*).

	Japan	Europe	United States	
<b>Equity Market</b>	$\epsilon_{jp,t}^2$	-	0.0043 (0.72)	0.0159* (2.00)
	$\epsilon_{eu,t}^2$	-	-	0.0474* (3.07)
	$\epsilon_{us,t}^2$	-	-	-
	$\epsilon_{jp,t-1}^2$	0.0916* (4.14)	-	-
	$\epsilon_{eu,t-1}^2$	-0.0100* (2.13)	0.0584* (4.50)	-
	$\epsilon_{us,t-1}^2$	0.0592* (3.12)	0.0246* (2.71)	0.1221* (5.32)
	$h_{t-1}^i$	0.8160* (30.52)	0.9003* (55.7)	0.8049* (32.0)
	Japan	Europe	United States	
<b>Bond Market</b>	$\epsilon_{jp,t}^2$	-	-0.0009 (0.14)	0.0296* (3.01)
	$\epsilon_{eu,t}^2$	-	-	0.0012 (0.70)
	$\epsilon_{us,t}^2$	-	-	-
	$\epsilon_{jp,t-1}^2$	0.0405* (3.46)	-	-
	$\epsilon_{eu,t-1}^2$	-0.0003 (0.34)	0.0132* (2.00)	-
	$\epsilon_{us,t-1}^2$	0.0007 (0.45)	0.0030 (1.34)	0.0364* (4.12)
	$h_{t-1}^i$	0.9538* (64.9)	0.9826* (116)	0.9508* (93.6)