Historical Volatility of Advanced Equity Markets: The Role of Local and Global Crises[#]

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Highlights

- We ask whether domestic crises and global can predict stock market volatility.
- Quantiles-based approach is applied historical data of developed countries.
- Global crises tends to have a stronger causal impact on volatility.
- Domestic stock market crashes play important role for Germany, the UK and the US.
- Extreme ends of the conditional distribution of volatility cannot be predicted.

Abstract

We use a nonparametric quantiles-based model to analyse the predictability of long-spans (nearly or over one century) of annual volatility of Canada, France, Germany, Italy, Japan, Switzerland, the United Kingdom (UK) and the United States (US), based on information contained in domestic (banking, currency, inflation, sovereign debt, and stock market) and global crises. We find that, in general, global crises tends to have a stronger causal impact on market volatility than domestic crises, but domestic stock market crashes also plays an important role in explaining equity market volatility of Germany, the UK and the US. Interestingly, extreme ends of the conditional distribution of market volatility cannot be predicted, irrespective of whether domestic or global crises are used as predictors.

Keywords: Realized Volatility, Domestic and Global Crises, Causality-in-Quantiles, Advanced Economies

JEL Codes: C22, G10, G15

1. Introduction

The present value model of stock prices of Shiller (1981a, b) can be used to show that stock market volatility depends on the volatility of cash flows, and the discount factor. Given that financial crises affect the volatility of variables that reflect future cash flows by generating economic uncertainty (Bernanke, 1983), and the discount factor (Schwert, 1989a), many studies have related historical stock market volatility of primarly advanced economies with specific equity market crises, such as the stock market crash during the "Great Depression", "Black Monday" (i.e., the crash on the 19th October, 1987), the recent "Global Financial Crises", etc., (see for example, Schwert, 1989b, 1990, 1998, 2011).

It must be realized that, over and above domestic stock market crises, other forms of crises, for example, banking, currency, inflation, (domestic and external) sovereign debt turmoils can also affect the stock market volatility directly based on inter-market spillovers (Tiwari et al., 2018),

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and indirectly via their impact on uncertainty of macroeconomic variables and policy decisions, which in turn affects the discount factor and future projections of earnings (Diebold and Yilmaz, 2010; Kaminska, 2018; Mumtaz and Surico, 2018). Further, besides the various forms of domestic crises, similar crises in foreign countries, can also impact the volatility of domestic stock markets due to the historical interlinkages between stocks markets of especially developed economies (Ji et al., 2018)[1].

Against this backdrop, the objective of this paper is to analyse the role of various domestic and global crises on the predictability of (realized) volatilities of stock markets of Canada, France, Germany, Italy, Japan, Switzerland, the United Kingdom (UK), and the United States (US), covering respectively the historical annual periods of: 1915-2010, 1898-2010, 1870-2010, 1905-2010, 1914-2010, 1916-2010, 1800-2010, and 1800-2010, with the start date governed by stock market data, and the end date by crises data. The choice of these countries is purely driven by the availability of long-span monthly equity market data from where annual realized volatilities are computed, besides their importance in the global world, with these economies representing nearly two-third of global net wealth, and nearly half of world output. As far as the econometric approach is concerned, we rely on the non-parametric causality-in-quantiles test of Jeong et al., (2012), which in turn allows us to test for predictability over the entire conditional distribution of stock market volatility by controlling for misspecification due to uncaptured nonlinearity – a feature which is known to exist widely in the relationship between realized volatility and its predictors (McAleer and Medeiros, 2011). Note that, a quantiles-based model is inherently a time-varying approach, as the different quantiles of the conditional distribution of the stock market volatility captures the various phases through which volatility evolves. Further, the decision to use a causality-based approach rather than a predictive regression framework, emanate from the need to control for possible endogeneity issues while dealing with stock market volatility and crises (Danielsson et al., 2018).[2]

To the best of our knowledge, this is the first paper to study the impact of different types of domestic and global crises on the historical volatility of eight advanced stock markets based on a nonparametric causality-in-quantiles approach. The remainder of the paper is organized as follows: Section 2 lays out the methodology, with Section 3 presenting the data and results, and Section 4 concluding the paper.

2. Methodology

In this section, we briefly present the methodology for testing nonlinear causality as developed by Jeong et al., (2012). Let y_t denote realized stock market volatility (RV_t) and x_t the specific crisis variable. Details on the measure of volatility and crises are provided in the next section. Further, let $Y_{t-1} \equiv (y_{t-1}, \dots, y_{t-p})$, $X_{t-1} \equiv (x_{t-1}, \dots, x_{t-p})$, $Z_t = (X_t, Y_t)$, and $F_{y_t|}.(y_t|\bullet)$ denote the conditional distribution of y_t given $\bullet$. Defining $Q_\theta(Z_{t-1}) \equiv Q_\theta(y_t|Z_{t-1})$ and $Q_\theta(Y_{t-1}) \equiv Q_\theta(y_t|Y_{t-1})$, we have $F_{y_t|Z_{t-1}}\{Q_\theta(Z_{t-1})|Z_{t-1}\} = \theta$ with probability one. The (non) causality in the q-th quantile hypotheses to be tested are:

$$H_0: \; P\{F_{y_t|Z_{t-1}}\{Q_\theta(Y_{t-1})|Z_{t-1}\} = \theta\} = 1 \qquad (1)$$

[1] Indirect effects of crises on equity market can arise due the impact of global turmoil on other markets such as oil (Ma et al., 2019) and currency (Kumar et al., 2019), which are intertwined closely with the equity markets.

[2] In fact, we did observe stock market volatility to cause some of the domestic crises (in particular, currency, inflation, and stock market crises) for all the economies, with volatility in Italy, Switzerland, the UK and the US, also predicting global crises. Since the focus of this paper is to explain volatility due to crises, we do not report the results of the reverse causality explicitly in the paper, but are available upon request from the authors.

$$H_1: \; P\{F_{y_t|Z_{t-1}}\{Q_\theta(Y_{t-1})|Z_{t-1}\} = \theta\} < 1 \tag{2}$$

Jeong et al., (2012) show that the feasible kernel-based test statistics has the following formulation:

$$\hat{J}_T = \frac{1}{T(T-1)h^{2p}} \sum_{t=p+1}^{T} \sum_{s=p+1, s\neq t}^{T} K\left(\frac{Z_{t-1} - Z_{s-1}}{h}\right) \hat{\varepsilon}_t \hat{\varepsilon}_s \tag{3}$$

where $K(\bullet)$ is the kernel function with bandwidth h, T is the sample size, p is the lag order, and $\hat{\varepsilon}_t = \mathbf{1}\{y_t \leq \hat{Q}_\theta(Y_{t-1})\} - \theta$ is the regression error, where $\hat{Q}_\theta(Y_{t-1})$ is an estimate of the θ-th conditional quantile and $\mathbf{1}\{\bullet\}$ is the indicator function. The *Nadarya-Watson* kernel estimator of $\hat{Q}_\theta(Y_{t-1})$ is given by:

$$\hat{Q}_\theta(Y_{t-1}) = \frac{\sum_{s=p+1, s\neq t}^{T} L\left(\frac{Y_{t-1} - Y_{s-1}}{h}\right) \mathbf{1}\{y_s \leq y_t\}}{\sum_{s=p+1, s\neq t}^{T} L\left(\frac{Y_{t-1} - Y_{s-1}}{h}\right)} \tag{4}$$

with $L(\bullet)$ denoting the kernel function.

The empirical implementation of causality testing via quantiles entails specifying three key parameters: the bandwidth (*h*), the lag order (*p*), and the kernel types for $K(\cdot)$ and $L(\cdot)$. We use a lag order of one based on the Schwarz Information Criterion (SIC). We determine h by the leave-one-out least-squares cross validation. Finally, for $K(\cdot)$ and $L(\cdot)$, we use Gaussian kernels.

3. Data and Results

Following Andersen and Bollerslev (1998), the stock market realized volatility (*RV*) is computed as the annual sum of squared monthly stock returns (i.e. the first-difference of the natural logarithm of the stock index times 100) for Canada, France, Germany, Italy, Japan, Switzerland, the UK and the US.[3] Specifically, we consider the S&P/TSX 300 Composite (Canada, 1915-2010), the CAC All-Tradable Index (France, 1898-2010), the CDAX Composite Index (Germany, 1870-2010), the Banca Commerciale Italiana Index (Italy, 1905-2010), the Nikkei 225 (Japan, 1914-2010), the Switzerland Composite Stock Price Index (Switzerland, 1916-2010), the FTSE All Share Index (UK, 1800-2010), and the S&P500 (USA, 1800-2010), obtained in their level-form from the Global Financial Database. Note that, barring the case of the UK and the US, for which data is available from 1693 and 1791 respectively, the starting year for the remaining six countries begins from the date of inception of these stock exchanges. But we can only start from 1800, as it is the year from which the various crises data are available, which we discuss in detail next.

The data on the annual number of country-specific banking (bank runs that involves closure, merging or takeover by public sector or one or more financial institutions, but if there are no bank runs, the crisis refers to large scale assistance by government of important financial institutions), currency (an annual depreciation of 15% or higher), inflation (an annual rate of 20% or higher), (domestic and external) sovereign debt (failure to meet a principal or an interest payment on due date or grace period), stock market (return of less than -25% or less) crises, the overall count of domestic crises (number count of all the domestic crises across each year), and

[3] The Jarque-Bera test of normality detected strong evidence of non-normality in *RV*, which in turn provided a preliminary motivation to conduct a quantiles-based, rather than a conditional mean-based linear predictive analysis.

the two indices capturing global crises (BCDI and BCDI+) are derived from Reinhart and Rogoff (2009, 2011), and Reinhart and Reinhart (2010).[4] To our knowledge, BCDI and BCDI+ offers the broadest representation of crises globally as it includes 13 African countries, 12 Asian countries, 19 European countries, 18 Latin American countries, Australia, New Zealand and the two countries in North America, covering a total of 66 countries that account for about 90% of the world's Gross Domestic Product (GDP). These two global indices are calculated annually by first summing the number of crises for each country in a given year and then calculating a weighted average across countries with the weight determined by the country's share of world income. Note that since information on crises related to the international equity markets is available from 1864 only, the BCDI+ index starts from this date.[5]

We report the results from our nonparametric causality-in-quantiles test in Table 1 for the quantile range of 0.10 to 0.90.[6] In cases where there are no results reported, which are primarily associated with sovereign debt crises, it must be realized that all entries for the specific crisis-type was zero. The test statistic of Jeong et al., (2012) follows a standard normal distribution, and checks whether the null of no-Granger causality is rejected (or not) at a specific quantile. As can be seen from Table 1, for Canada, France, Japan, and Italy, what matters primarily is the measure of global crises in predicting the volatility of the equity markets, with the strongest impact (in terms of the size of the test statistic) concentrated around the median or just below it. For Germany, Switzerland, and the US, a similar picture emerges, though there is indeed evidence of predictability that emerges due to domestic crises as well, with a dominant role for stock market crises – a result in line with Schwert (1989a, b, 1990, 1998, 2011). As far as the UK is concerned, while global crises are again important like the other seven countries, all the domestic crises tends to also play an equally prominent role in explaining various phases of market volatility, i.e., the conditional quantiles of RV. Besides the relative importance of global crises, which is possibly due to strongly integrated developed equity markets and risk spillovers as discussed earlier, another interesting common observation, is the lack or weak (at the 10 percent level of significance) causal impact of both domestic and global crises on the extreme quantiles of the conditional distribution of RV for all countries. In other words, when market volatility is extremely low or high, the information content of crises, irrespective of its type, i.e., domestic or global, is irrelevant, with all that mattering being the past levels of RV. Understandably, when volatility is low (i.e., markets are calm), agents do not require information from predictors (in our case, domestic and global crises) to predict the path of future volatility, and when volatility is already at its upper end, information from crises is possibly of no value, given that agents are likely to be herding (Gupta, et al., 2018).[7]

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[4] The data is available for download from the website of Professor Carmen M. Reinhart at: http://www.carmenreinhart.com/data/browse-by-topic/.

[5] Understandably, the entries corresponding to the number of stock market crises prior to this date (i.e., over 1800-1863), used in the case of the UK and the US is zero.

[6] We also conducted the standard linear Granger causality test, and found that barring the cases of Germany and Japan, and to some extent Italy, the causal impact of the domestic and global crises metrics are quite weak on RV, even if we allow for a significance level of 10 percent. But when we applied the Brock et al., (1996, BDS) test, we found strong evidence of nonlinearity in the relationships between RV and the various crises, suggesting that the linear model is in fact misspecified and the corresponding results cannot be deemed reliable. Complete details of the linear causality and the BDS tests results are available upon request from the authors.

[7] Based on the suggestion of an anonymous referee, we also conducted the causality-in-quantiles-based predictability of returns based on the various crises variables. Interestingly, barring the case of the UK under the BCDI+, we were unable to detect any evidence of causality from local and global crises on equity market returns. This result suggested that crises are likely to have higher order effects based on the channels discussed in the introduction.

Table 1: Nonparametric Causality-in-Quantiles Test Results for Realized Volatility (RV)

Country	Type of crisis	Quantile (θ)								
		0.1	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
Canada	Banking crises	1.023	1.368	1.031	1.155	1.418	1.526	0.902	0.819	0.543
	Currency crises	1.192	1.659*	1.071	1.232	1.403	1.317	0.887	0.881	0.521
	Inflation crises	0.974	1.406	0.959	1.108	1.364	1.252	0.847	0.819	0.516
	Domestic sovereign debt crises	1.217	1.666*	1.079	1.200	1.414	1.289	0.862	0.862	0.527
	External sovereign debt crises	-	-	-	-	-	-	-	-	-
	Stock market crashes	1.261	1.730*	1.084	1.245	1.367	1.255	0.874	1.090	0.638
	Yearly crisis tally	1.17	1.44	1.09	1.18	1.38	1.51	0.91	1.00	0.58
	BCDI	2.049**	2.933***	3.229***	3.641***	3.531***	3.411***	3.315***	2.642***	1.815*
	BCDI+	2.379**	3.028***	3.447***	3.556***	3.404***	3.281***	3.222***	2.551**	1.710*
France	Banking crises	0.546	0.489	1.030	0.742	0.400	0.577	0.522	0.360	0.318
	Currency crises	0.335	0.621	1.009	0.822	0.761	0.887	0.947	0.694	0.473
	Inflation crises	0.448	0.612	0.997	0.940	0.676	0.775	0.701	0.573	0.286
	Domestic sovereign debt crises	-	-	-	-	-	-	-	-	-
	External sovereign debt crises	-	-	-	-	-	-	-	-	-
	Stock market crashes	0.622	0.925	1.483	1.901*	1.023	0.972	0.681	0.765	0.693
	Yearly crisis tally	0.601	0.876	1.513	1.850*	1.118	1.111	0.803	0.784	0.719
	BCDI	1.198	1.422	1.693*	2.361**	2.115**	2.621***	2.172**	1.378	1.109
	BCDI+	1.147	1.407	1.854*	2.606**	1.958*	2.452**	2.269**	1.220	0.754
Germany	Banking crises	1.322	2.896***	3.216***	3.027***	1.196	1.146	1.043	0.483	0.143
	Currency crises	0.859	2.361**	3.037***	3.036***	0.955	1.096	1.190	0.306	0.210
	Inflation crises	1.083	2.701***	3.386***	3.395***	1.174	1.284	1.083	0.394	0.145
	Domestic sovereign debt crises	1.048	2.609***	3.228***	3.216***	1.058	1.173	1.140	0.326	0.153
	External sovereign debt crises	1.413	1.961**	2.455**	2.649***	1.031	0.931	0.949	0.336	0.199
	Stock market crashes	0.708	2.488**	3.914***	4.666***	2.267**	2.772***	2.010**	0.698	0.216
	Yearly crisis tally	0.679	2.523**	2.857***	2.587***	1.247	1.156	1.395	0.448	0.523
	BCDI	2.423**	2.594***	3.009***	3.381***	3.251***	3.050***	2.705***	2.011**	1.087
	BCDI+	2.764***	3.058***	3.105***	3.587***	3.218***	2.978***	2.777***	1.936*	1.029
Italy	Banking crises	0.741	0.854	0.649	1.146	1.110	0.876	0.602	0.320	0.278
	Currency crises	0.734	0.776	0.618	0.566	0.730	0.596	0.645	0.305	0.256
	Inflation crises	0.709	0.791	0.495	0.764	0.742	0.737	0.694	0.315	0.182

	Domestic sovereign debt crises	-	-	-	-	-	-	-	-	-
	External sovereign debt crises	0.731	0.793	0.501	0.659	0.605	0.547	0.595	0.279	0.365
	Stock market crashes	0.788	1.016	0.950	1.218	0.949	0.773	0.865	0.667	0.390
	Yearly crisis tally	0.941	1.221	1.399	1.660*	1.282	1.391	1.215	0.850	0.477
	BCDI	1.489	1.831*	2.461**	2.751***	2.276**	2.790***	2.469**	1.609	1.303
	BCDI+	1.332	1.849*	2.438**	2.349**	2.293**	2.506**	2.172**	1.460	1.190
Japan	Banking crises	0.256	0.593	0.869	0.746	0.616	0.438	0.116	0.251	0.135
	Currency crises	0.303	0.607	1.053	0.933	0.589	0.207	0.129	0.357	0.326
	Inflation crises	0.392	0.610	1.322	1.203	0.779	0.402	0.130	0.317	0.320
	Domestic sovereign debt crises	0.319	0.665	1.151	1.010	0.559	0.247	0.128	0.275	0.119
	External sovereign debt crises	0.272	0.608	0.916	0.814	0.419	0.200	0.228	0.513	0.419
	Stock market crashes	0.473	0.839	1.574	1.702*	1.390	0.772	0.138	0.297	0.243
	Yearly crisis tally	0.285	0.556	1.040	1.413	1.446	0.803	0.229	0.736	0.351
	BCDI	0.407	1.209	1.627	1.243	1.322	0.549	0.471	0.720	0.364
	BCDI+	0.587	1.145	1.975**	1.816*	1.383	0.633	0.495	0.706	0.473
Switzerland	Banking crises	0.302	0.835	1.964**	1.488	1.352	1.148	1.722	0.624	0.352
	Currency crises	0.358	0.985	2.190**	1.730*	1.801*	1.527	1.864*	0.726	0.319
	Inflation crises	0.340	0.989	1.779*	1.456	1.472	1.181	1.896*	0.745	0.317
	Domestic sovereign debt crises	-	-	-	-	-	-	-	-	-
	External sovereign debt crises	-	-	-	-	-	-	-	-	-
	Stock market crashes	0.518	1.570	3.325***	2.540**	1.466	1.186	1.597	0.512	0.469
	Yearly crisis tally	0.736	2.159**	3.655***	3.226***	1.742*	1.426	1.869*	0.889	0.399
	BCDI	1.414	2.153**	3.175***	3.200***	2.619***	2.610***	2.444**	1.625	1.282
	BCDI+	1.435	2.213**	2.967***	3.070***	2.713***	2.690***	2.521**	1.532	1.265
UK	Banking crises	1.157	3.781***	5.040***	8.204***	5.001***	5.489***	2.848***	1.620	0.717
	Currency crises	1.337	4.352***	5.631***	8.674***	5.020***	5.389***	2.710***	1.592	0.828
	Inflation crises	1.351	4.314***	5.533***	8.576***	4.959***	5.399***	2.613***	1.438	0.789
	Domestic sovereign debt crises	1.275	4.137***	5.236***	8.064***	4.513***	4.936***	2.256**	1.441	0.749
	External sovereign debt crises	1.293	4.202***	5.410***	8.387***	4.709***	5.192***	2.399**	1.484	0.695
	Stock market crashes	1.473	4.379***	5.951***	8.664***	5.131***	5.138***	2.675***	1.352	0.598
	Yearly crisis tally	1.385	4.236***	6.225***	9.657***	6.404***	6.568***	4.130***	1.542	0.825
	BCDI	1.952*	3.302***	3.412***	4.485***	3.745***	4.349***	3.592***	2.917***	1.798*

	BCDI+	1.173	2.953***	2.633***	5.317***	3.948***	3.529***	2.368***	1.719*	1.030
US	Banking crises	0.826	1.571	1.302	1.965**	1.282	0.826	0.942	0.689	0.447
	Currency crises	0.879	2.108**	1.814*	2.550**	2.033**	1.112	1.107	0.895	0.529
	Inflation crises	0.834	1.860*	1.634	2.608***	1.920*	0.925	0.902	0.674	0.409
	Domestic sovereign debt crises	0.874	1.619	1.579	2.486**	1.949*	1.107	0.982	0.756	0.327
	External sovereign debt crises	-	-	-	-	-	-	-	-	-
	Stock market crashes	0.971	1.827*	1.716*	2.492**	2.081**	1.735*	1.560	1.224	0.405
	Yearly crisis tally	1.624	2.479**	2.242**	2.504**	1.932*	1.567	1.720*	2.466**	0.595
	BCDI	1.216	2.927***	3.086***	2.750***	2.679***	2.409***	1.724*	1.534	0.642
	BCDI+	2.509**	3.976***	5.017***	5.651***	4.273***	3.596***	2.503**	1.854*	0.671

Note: ***, **, * indicate rejection of the null of no-Granger causality from the specific crisis variable to RV for a specific quantile (θ), at 1 percent, 5 percent and 10 percent levels of significance respectively, with corresponding critical values being 2.58, 1.96, and 1.645. Entries marked with "-" indicate that no result could be obtained as the number of for that specific crisis was zero over the entire sample period.

4. Conclusion

In this paper we use a nonparametric quantiles-based causality approach to analyse the predictability of historical annual realized volatility of Canada, France, Germany, Italy, Japan, Switzerland, the UK and the US, based on measures of domestic (banking, currency, inflation, sovereign debt, stock markets) and global crises. We find that, in general, over the long spans of data covering nearly or over one century, global crises tends to have a stronger causal impact on market volatility than domestic crises. Having said that, stock market crashes are also found to be important for Germany, the UK and the US. But predictability, irrespective of whether it is due to domestic or global crises, is unobserved at the extreme ends of the conditional distribution of market volatility.

Financial market volatility is of tremendous interest to policymakers, with them actively searching for signals of future financial instability, especially within the macro-prudential agenda in the wake of the Global Financial Crisis. With our results highlighting that global crises in particular can predict (moderate) future volatility, appropriate policy responses can be designed to mitigate the negative outcomes on the domestic economy.

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Since the focus of the paper is volatility, the results of equity market returns have been reported in the Appendix of the paper in Table A1.

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APPENDIX:

Table A1: Nonparametric Causality-in-Quantiles Test Results for Returns

Country	Type of crisis	Quantile (θ)								
		0.1	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.7**	**0.8**	**0.9**
Canada	Banking crises	0.006	0.019	0.004	0.015	0.004	0.015	0.004	0.019	0.006
	Currency crises	0.006	0.019	0.004	0.015	0.004	0.015	0.004	0.019	0.006
	Inflation crises	0.006	0.019	0.004	0.015	0.004	0.015	0.004	0.019	0.006
	Domestic sovereign debt crises	0.006	0.019	0.004	0.015	0.004	0.015	0.004	0.019	0.006
	External sovereign debt crises	-	-	-	-	-	-	-	-	-
	Stock market crashes	0.006	0.019	0.004	0.015	0.004	0.015	0.004	0.019	0.006
	Yearly crisis tally	0.006	0.019	0.004	0.015	0.004	0.015	0.004	0.019	0.006
	BCDI	0.006	0.019	0.004	0.015	0.004	0.015	0.004	0.019	0.006
	BCDI+	0.006	0.019	0.004	0.015	0.004	0.015	0.004	0.019	0.006
France	Banking crises	0.070	0.007	0.007	0.019	0.016	0.011	0.006	0.044	0.001
	Currency crises	0.068	0.020	0.011	0.027	0.016	0.010	0.007	0.036	0.002
	Inflation crises	0.067	0.013	0.036	0.029	0.017	0.012	0.009	0.036	0.001
	Domestic sovereign debt crises	-	-	-	-	-	-	-	-	-
	External sovereign debt crises	-	-	-	-	-	-	-	-	-
	Stock market crashes	0.071	0.014	0.020	0.029	0.016	0.011	0.009	0.039	0.001
	Yearly crisis tally	0.069	0.024	0.030	0.045	0.015	0.010	0.008	0.035	0.001
	BCDI	0.081	0.028	0.016	0.024	0.016	0.013	0.009	0.039	0.003
	BCDI+	0.082	0.030	0.017	0.023	0.018	0.014	0.008	0.040	0.003
Germany	Banking crises	0.109	0.186	0.322	0.394	0.447	0.424	0.163	0.189	0.059
	Currency crises	0.170	0.101	0.060	0.184	0.293	0.423	0.219	0.244	0.134
	Inflation crises	0.048	0.080	0.064	0.224	0.384	0.475	0.232	0.268	0.069
	Domestic sovereign debt crises	0.036	0.080	0.059	0.195	0.313	0.409	0.174	0.167	0.057
	External sovereign debt crises	0.073	0.237	0.350	0.395	0.543	0.538	0.163	0.180	0.064
	Stock market crashes	0.085	0.371	0.212	0.653	0.598	0.555	0.186	0.158	0.075
	Yearly crisis tally	0.083	0.123	0.090	0.202	0.308	0.416	0.168	0.201	0.084
	BCDI	0.088	0.099	0.079	0.190	0.334	0.477	0.169	0.195	0.063
	BCDI+	0.144	0.103	0.057	0.178	0.316	0.420	0.159	0.169	0.059
Italy	Banking crises	0.052	0.333	0.203	0.148	0.269	0.240	0.281	0.202	0.060

	Currency crises	0.051	0.116	0.212	0.226	0.564	0.490	0.284	0.202	0.194
	Inflation crises	0.087	0.173	0.248	0.124	0.303	0.273	0.346	0.205	0.091
	Domestic sovereign debt crises	-	-	-	-	-	-	-	-	-
	External sovereign debt crises	0.069	0.238	0.334	0.247	0.439	0.470	0.438	0.276	0.229
	Stock market crashes	0.291	0.528	1.367	0.901	0.556	0.295	0.259	0.181	0.160
	Yearly crisis tally	0.106	0.205	0.525	0.337	0.282	0.309	0.363	0.235	0.228
	BCDI	0.116	0.181	0.300	0.247	0.484	0.241	0.418	0.225	0.139
	BCDI+	0.088	0.164	0.256	0.176	0.341	0.236	0.333	0.219	0.108
Japan	Banking crises	0.004	0.012	0.023	0.005	0.015	0.030	0.010	0.001	0.009
	Currency crises	0.004	0.012	0.023	0.005	0.015	0.030	0.010	0.001	0.009
	Inflation crises	0.004	0.012	0.023	0.005	0.015	0.030	0.010	0.001	0.009
	Domestic sovereign debt crises	0.004	0.012	0.023	0.005	0.015	0.030	0.010	0.001	0.009
	External sovereign debt crises	0.004	0.012	0.023	0.005	0.015	0.030	0.010	0.001	0.009
	Stock market crashes	0.004	0.012	0.023	0.005	0.015	0.030	0.010	0.001	0.009
	Yearly crisis tally	0.004	0.012	0.023	0.005	0.015	0.030	0.010	0.001	0.009
	BCDI	0.004	0.012	0.023	0.005	0.015	0.030	0.010	0.001	0.009
	BCDI+	0.004	0.012	0.023	0.005	0.015	0.030	0.010	0.001	0.009
Switzerland	Banking crises	0.012	0.011	0.046	0.126	0.112	0.283	0.352	0.134	0.134
	Currency crises	0.058	0.044	0.055	0.129	0.112	0.232	0.299	0.184	0.090
	Inflation crises	0.010	0.006	0.022	0.052	0.066	0.124	0.171	0.062	0.046
	Domestic sovereign debt crises	0.012	0.010	0.079	0.102	0.177	0.159	0.182	0.078	0.061
	External sovereign debt crises	-	-	-	-	-	-	-	-	-
	Stock market crashes	0.099	0.098	0.057	0.085	0.086	0.231	0.232	0.107	0.064
	Yearly crisis tally	0.113	0.087	0.082	0.084	0.099	0.198	0.240	0.118	0.077
	BCDI	0.022	0.015	0.086	0.152	0.133	0.422	0.489	0.444	0.175
	BCDI+	0.071	0.036	0.060	0.130	0.161	0.587	0.635	0.498	0.181
UK	Banking crises	0.690	0.803	0.801	0.494	0.458	0.404	0.527	0.253	0.143
	Currency crises	0.285	0.255	0.580	0.649	0.683	0.541	0.448	0.455	0.572
	Inflation crises	0.684	0.921	0.728	0.564	0.582	0.620	0.817	0.344	0.198
	Domestic sovereign debt crises	0.430	0.669	0.619	0.557	0.490	0.443	0.663	0.456	0.240
	External sovereign debt crises	0.335	0.175	0.383	0.586	0.651	0.486	0.563	0.460	0.346
	Stock market crashes	0.439	0.567	0.799	0.790	1.020	0.602	0.573	0.378	0.276

	Yearly crisis tally	0.807	1.187	1.636	1.044	0.953	0.532	0.494	0.435	0.367
	BCDI	0.270	0.238	0.584	0.834	1.009	0.952	0.943	0.688	0.411
	BCDI+	1.939*	3.213***	3.483***	3.446***	3.435***	3.369***	2.789***	2.196**	1.882*
US	Banking crises	0.116	0.154	0.297	0.176	0.152	0.287	0.281	0.109	0.101
	Currency crises	0.116	0.164	0.323	0.121	0.186	0.488	0.259	0.113	0.254
	Inflation crises	0.050	0.124	0.247	0.166	0.062	0.177	0.127	0.054	0.092
	Domestic sovereign debt crises	-	-	-	-	-	-	-	-	-
	External sovereign debt crises	-	-	-	-	-	-	-	-	-
	Stock market crashes	0.103	0.195	0.371	0.257	0.206	0.187	0.334	0.135	0.098
	Yearly crisis tally	0.101	0.158	0.295	0.344	0.211	0.270	0.332	0.146	0.128
	BCDI	0.330	0.510	0.694	0.624	1.396	0.514	0.414	0.263	0.183
	BCDI+	0.208	0.362	0.386	0.404	0.774	0.397	0.540	0.316	0.196

Note: ***, **, * indicate rejection of the null of no-Granger causality from the specific crisis variable to equity returns for a specific quantile (θ), at 1 percent, 5 percent and 10 percent levels of significance respectively, with corresponding critical values being 2.58, 1.96, and 1.645. Entries marked with "-" indicate that no result could be obtained as the number of for that specific crisis was zero over the entire sample period.