

Emerging Market Spillover under Geopolitical Uncertainty

Axel Hedström^a, Nathalie Zelande^a, Juha Juntilla^b, Gazi S. Uddin^a

September 14, 2017

Linköping University^a
University of Jyväskylä^b

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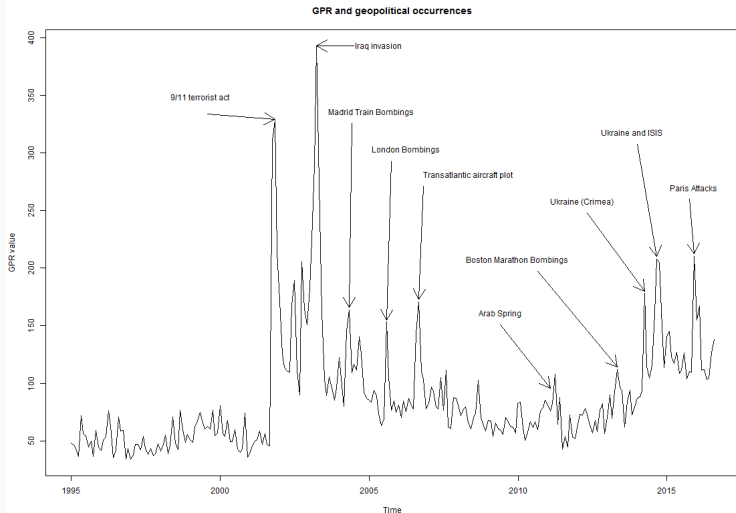
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The geopolitical uncertainty and its impact on the financial markets is a hot topic. Lately, the focus has been on North Korea, but events such as Crimean annexation, ISIS, terrorist attacks (9/11), the effect on the markets and economy has been discussed.

We use the Geopolitical Risk Index (GPR) to capture this uncertainty.

We take the perspective of an international investor that want to diversify the portfolio, and therefore, we focus on the emerging markets. Difference in response to the geopolitical risk.

We compare geopolitical risk to other risk factors, namely, financial risk (VIX) and oil price as proxy for economic activity.



To investigate the risk associated with investment, we look at the spillover effects between markets.

As we also want to consider different uncertainty measures affect on the spillover, then we have use a methodology that can incorporate neatly into the estimations, hence we follow the Diebold and Yilmaz (2014) paper.

Emerging Markets: Chile, Peru, China, Korea, Indonesia, Thailand, Malaysia, Czech Republic, Russian Federation and Turkey.

The financial sectors of the emerging markets have been growing. - China and Korea stands out with high growth in Market capitalization, and firm listing. The rest has stable or lower growth.

Trade and investments in these markets has also been growing. - The trade percentage has been stable or growing for all countries. China stands out in foreign investment outflow, the rest has been stable or slight inflow. China and Korea has the highest and growing equity inflows, the rest are quite low and stable.

We show that the geopolitical risk (GPR) have weak to no spillover to all stock markets (less than 1.5%). Geopolitical issues in general have weak impact on the stock markets.

We find that the spillovers are higher at a regional level than at the global level, and we argue this relationship is strengthened by trade agreements. This could guide policy legislation when negotiating the agreements to minimize the contagion effects.

1. Has shown cross-correlation using different correlations and dependence structures, (e.g. Balli et al., 2015 and Kundu and Sarkar, 2016)
2. Used Diebold and Yilmaz (2009), Pukthuanthong and Roll (2009) but has not controlled for uncertainty measures
3. The most related is Tsai (2017) but only looks at country specific Economic Policy Uncertainty index (EPU).

We construct a spillover index both for return series and volatility series, to catch the different market behaviours.

To estimate the volatility we use different GARCH processes. As we the best specification can vary from different series, we check against a variety of GARCH processes and distinguish between them using AIC.

"standard" GARCH, gjrGARCH, eGARCH, iGARCH, csGARCH and also checking for normal, students's, and general distributions.

Then for both return and volatility series we construct a spillover index, that start from a VAR model

$$R_t = \Theta R_{t-1} + \epsilon_t R_t \quad (1)$$

Then by using the moving average representation $x_{t+1,t} = \phi x_t$, which simplify the representation of the covariance matrix to

$$E(e_{t+1,t} e'_{t+1,t}) = A_0 A'_0$$

For example, consider the 2×2 setting,

$$A_0 A'_0 = \begin{pmatrix} a_{0,11}^2 + a_{0,12}^2 & a_{0,11} a_{0,21} + a_{0,22} a_{0,21} \\ a_{0,11} a_{0,21} + a_{0,22} a_{0,12} & a_{0,21}^2 + a_{0,22}^2 \end{pmatrix} \quad (2)$$

To make an index of the spillover, the trace of the matrix $a_{0,11}^2 + a_{0,12}^2 + a_{0,21}^2 + a_{0,22}^2$ is used, resulting in

$$S_{i=1,j=2}^{h=0} = \frac{a_{0,12}^2 + a_{0,21}^2}{a_{0,11}^2 + a_{0,12}^2 + a_{0,21}^2 + a_{0,22}^2} 100 \quad (3)$$

More generally

$$S_{i,j}^h = \frac{\sum_{h=0}^{H-1} \sum_{j=1}^N a_{h,ij}^2}{\sum_{h=0}^{H-1} \text{Tr}(A_h A_h')} \quad (4)$$

Where i, j are the spillovers from $i \rightarrow j$ ($i \neq j$) and h is the forecast step.

We have monthly data going from Jan 1995 to Dec 2016.

We are considering, the "top ten" emerging countries going by definition created by Bloomberg, and we are considering three uncertainty variables: Geopolitical Risk index (GPR) Caldara and Iacoviello (2017),

VIX Chicago Board Options Exchange (CBOE),

Oil series Datastream and,

Global Economic Policy Uncertainty index (GEPU) Davis (2016).

All the stock indices are collected from the Morgan Stanley Capital International (MSCI) website, and covers 85% of respective countries equity market.

To also compare how the emerging market react to the global and developed market, we added U.S., Japanese, and European stock market.

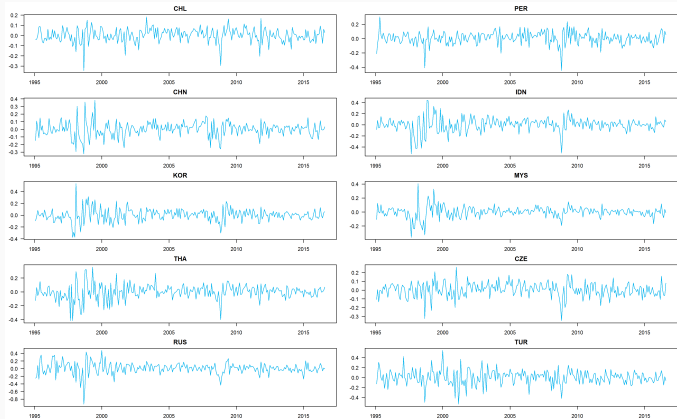
Most return series have positive returns, are non-normal and have an autoregressive process.

Table 1: Descriptive statistics of the sample and the Sharpe-ratio for the stock and oil market returns.

	Obs.	Mean	Std. Dev.	Jarque-Bera	ARCH-LM(5)	Sharpe
CHL	259	0.002	0.068	170.392***	4.497	0.029
PER	259	0.008	0.088	205.254***	8.006	0.108
CHN	259	-0.001	0.097	41.414***	31.576***	0.019
IDN	259	0.002	0.127	140.605***	57.889***	0.062
KOR	259	0.003	0.106	128.529***	45.087***	0.060
MYS	259	0.000	0.081	331.756***	62.012***	0.018
THA	259	-0.002	0.109	94.565***	39.142***	0.021
CZE	259	0.004	0.083	47.082***	10.509*	0.064
RUS	259	0.006	0.152	426.061***	36.692***	0.103
TUR	259	0.005	0.143	40.805***	8.010	0.089
US	259	0.006	0.044	56.527***	23.472***	0.116
JPN	259	-0.001	0.052	0.270	15.932***	-0.026
EUR	259	0.003	0.052	74.877***	28.793***	0.053
Oil	259	0.005	0.095	22.979***	12.117**	0.081
VIX	260	20.546	7.814	290.059***	167.750***	
GPR	260	87.473	50.401	1139.106***	141.231***	
GEP U	235	103.777	38.844	88.119***	147.588***	

Note: *, ** and *** refer to the significance level of the test statistics at 10%, 5%, and 1% level, respectively.

Especially for the Asian Market we see interdependence during the Asian stock market crash around 1997/8, and "the great recession" of 2008.



Result

Description of the Output

Spillover index The position i,j in the matrix represent the spillover from country i to country j .

Net spillover Is the difference between spillover values of two countries

Total net spillover The sum of all net spillovers

	CHL	PER	CHN	IDN	KOR	MYS	THA	CZE	RUS	TUR	US	JPN	EUR	GPR	TO INCL.	TO EXCL.
CHL	22.88	7.67	7.05	5.73	4.64	6.25	6.54	4.15	8.20	6.51	7.41	3.86	7.88	1.24	100.00	77.12
PER	10.46	30.14	6.83	5.30	3.27	5.10	5.87	5.95	6.68	4.79	5.26	3.61	6.70	0.04	100.00	69.86
CHN	7.58	5.65	27.75	4.57	5.83	6.34	7.89	4.97	5.63	3.64	8.38	4.66	6.94	0.17	100.00	72.25
IDN	7.39	5.11	6.62	25.05	6.68	9.66	10.00	4.22	6.04	2.94	6.26	4.66	5.09	0.29	100.00	74.95
KOR	5.53	3.07	6.57	5.22	26.93	5.66	11.02	4.66	3.04	3.66	8.15	8.52	7.38	0.59	100.00	73.07
MYS	7.13	3.99	6.45	9.16	7.15	26.31	10.20	3.56	6.01	4.17	5.93	3.96	5.58	0.40	100.00	73.69
THA	7.04	4.84	7.05	8.92	10.40	8.43	25.56	2.86	4.37	2.71	6.37	6.03	5.00	0.41	100.00	74.44
CZE	5.91	6.40	7.04	3.72	4.98	4.33	3.26	31.88	6.01	5.39	6.28	3.07	11.21	0.51	100.00	68.12
RUS	9.85	5.98	6.86	6.17	3.13	6.74	4.93	5.35	26.27	6.02	7.91	3.63	6.83	0.31	100.00	73.73
TUR	8.93	4.94	4.43	3.18	4.08	4.53	3.34	5.34	7.56	31.71	8.46	3.79	9.34	0.37	100.00	68.29
US	7.00	3.79	6.88	4.79	6.40	4.84	5.57	4.32	6.00	5.55	22.00	6.64	15.65	0.58	100.00	78.00
JPN	5.15	3.94	6.36	3.71	9.68	3.54	6.82	2.90	3.92	3.89	9.69	30.58	9.77	0.04	100.00	69.42
EUR	7.33	4.89	5.91	3.91	5.69	4.65	4.18	7.44	5.29	6.15	15.22	6.77	21.90	0.67	100.00	78.10
GPR	2.40	1.61	0.41	0.31	1.02	0.78	0.23	0.05	0.55	0.65	3.96	0.11	3.34	84.57	100.00	15.43
FROM INCL.	114.58	92.02	106.19	89.73	99.87	97.16	105.43	87.67	95.58	87.77	121.29	89.90	122.61	90.20	1400	966.47
FROM EXCL.	91.70	61.88	78.44	64.68	72.94	70.84	79.87	55.79	69.31	56.06	99.29	59.32	100.71	5.63	966.47	69.03
NET SPILL-OVER	14.58	-7.98	6.19	-10.27	-0.13	-2.84	5.43	-12.33	-4.42	-12.23	21.29	-10.10	22.61	-9.80	0.00	0.00

- GPR** The GPR has a low spillover effect on all variables, GPR has on average low predictability on stock markets.
- VIX** As expected the spillover from the VIX is high, the VIX more affecting the U.S. and EU.
- Oil** Oil is a net receiver of spillover from all markets. Even spillover from the Russian market with high petroleum based companies.

Consistently, we found stronger spillovers in the regional market, as Yarovaya et al. (2016) found

These market are affected by bilateral trade, however, it do not explain the lower spillovers from the developed to emerging markets. Though, the regional markets seem to be connected in free-trade agreements.

GPR The GPR has a low spillover effect on all variables, GPR also has low effect on the market volatility.

VIX The VIX index affect most markets. Meaning that the expectation of futures prices affects volatility.

There is weaker but not small spillovers from the developed to the emerging markets. Which could be beneficial for diversification.

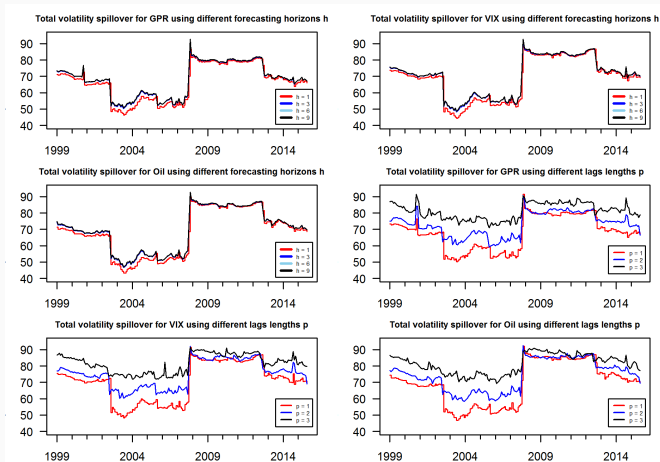
Oil We find that Oil is highly impacted by volatility on the stock markets, which points to financialization of the asset.

- There seem to be a regional market affinity for the spillover, effects, with higher interregional spillovers Yarovaya et al. (2016).
- Especially are countries withing free trade agreements. (e.g. (Malaysia, Thailand, Indonesia);(Peru and Chile),(EU and Czech Rep.)) but also the developed market.
- This indicate poor diversification benefits among the countries, connected with trade agreements.

To get a more in depth analysis of the effect of the GPR index, we test our results against the Global Economic Political Uncertainty index. Which is constructed from the local EPU indices: USA, Japan, China, etc.

We find it to have higher spillover effects to all financial markets.

We check how our estimates are affected, when our forecasting parameter h and lag length p changes.



The subsample estimation, show higher dependence of the GPR to the stock market, however it is still low.

	CHL	PER	CHN	IDN	KOR	MYS	THA	CZE	RUS	TUR	US	JPN	EUR	GPR	TO INCL.	TO EXCL.
CHL	15.26	5.22	7.95	7.38	7.46	7.85	9.77	5.14	8.06	5.23	5.51	5.04	6.70	3.44	100.00	84.74
PER	5.13	18.94	7.87	8.50	7.68	6.44	9.08	6.29	8.42	2.49	5.89	4.64	6.11	2.50	100.00	81.06
CHN	6.31	5.64	13.68	6.92	8.91	9.17	7.08	6.30	7.39	6.18	7.29	6.08	8.66	0.39	100.00	86.32
IDN	5.21	6.41	7.35	13.63	8.09	9.07	8.35	6.93	7.14	6.88	6.10	6.22	6.87	1.76	100.00	86.37
KOR	5.36	5.51	8.22	7.80	12.06	8.22	6.71	8.31	8.36	5.91	8.46	5.82	9.04	0.22	100.00	87.94
MYS	5.92	4.48	9.07	8.92	8.92	13.52	7.64	6.47	6.11	6.85	6.97	6.29	8.17	0.67	100.00	86.48
THA	8.16	6.91	7.70	8.90	7.39	8.49	13.27	5.65	7.11	5.51	5.87	6.64	7.24	1.16	100.00	86.73
CZE	4.20	4.94	7.07	7.73	9.74	7.31	5.73	14.18	8.92	6.08	7.79	5.85	9.98	0.49	100.00	85.82
RUS	6.14	6.03	7.71	7.40	9.62	7.12	6.52	7.73	13.00	5.16	7.99	5.86	9.47	0.26	100.00	87.00
TUR	4.56	2.95	7.48	8.51	7.76	8.27	6.12	7.04	6.05	15.62	7.41	7.44	8.39	2.41	100.00	84.38
US	4.66	4.16	7.80	6.44	9.34	7.50	5.56	7.62	7.88	6.75	13.07	7.62	11.33	0.27	100.00	86.93
JPN	4.47	4.08	7.76	6.85	7.69	7.33	6.35	6.72	6.43	7.59	8.88	16.09	9.64	0.12	100.00	83.91
EUR	4.82	4.05	8.01	6.47	8.98	7.76	6.17	8.77	8.45	6.53	10.06	7.34	12.14	0.46	100.00	87.86
GPR	1.57	5.99	0.10	0.71	0.09	0.46	0.04	0.49	0.19	0.59	2.00	0.72	2.08	84.96	100.00	15.04
FROM INCL.	81.76	85.28	107.79	106.16	113.72	108.53	98.36	97.64	103.52	87.36	103.31	91.65	115.81	99.10	1400.00	1130.58
FROM EXCL.	66.50	66.34	94.11	92.53	101.67	95.01	85.09	83.46	90.51	71.74	90.23	75.56	103.68	14.15	1130.58	80.76
NET SPILL-OVER	-	-	7.79	6.16	13.72	8.53	-1.64	-2.36	3.52	-12.64	3.31	-8.35	15.81	-0.90	0.00	0.00

Conclusion

1. The GPR shows weak to no spillover to all stock markets (less than 1.5%). This indicates that geopolitical issues in general have weak spillover effects on the stock markets, but it does not indicate that none of the geopolitical events have any effects.
2. The spillover effects are more essential at the regional level, and we argue that this relationship is strengthened by the trade agreements.
3. The oil market receives spillovers from all other markets, and this indicates the strong role of financialization of crude oil markets.

Comments?