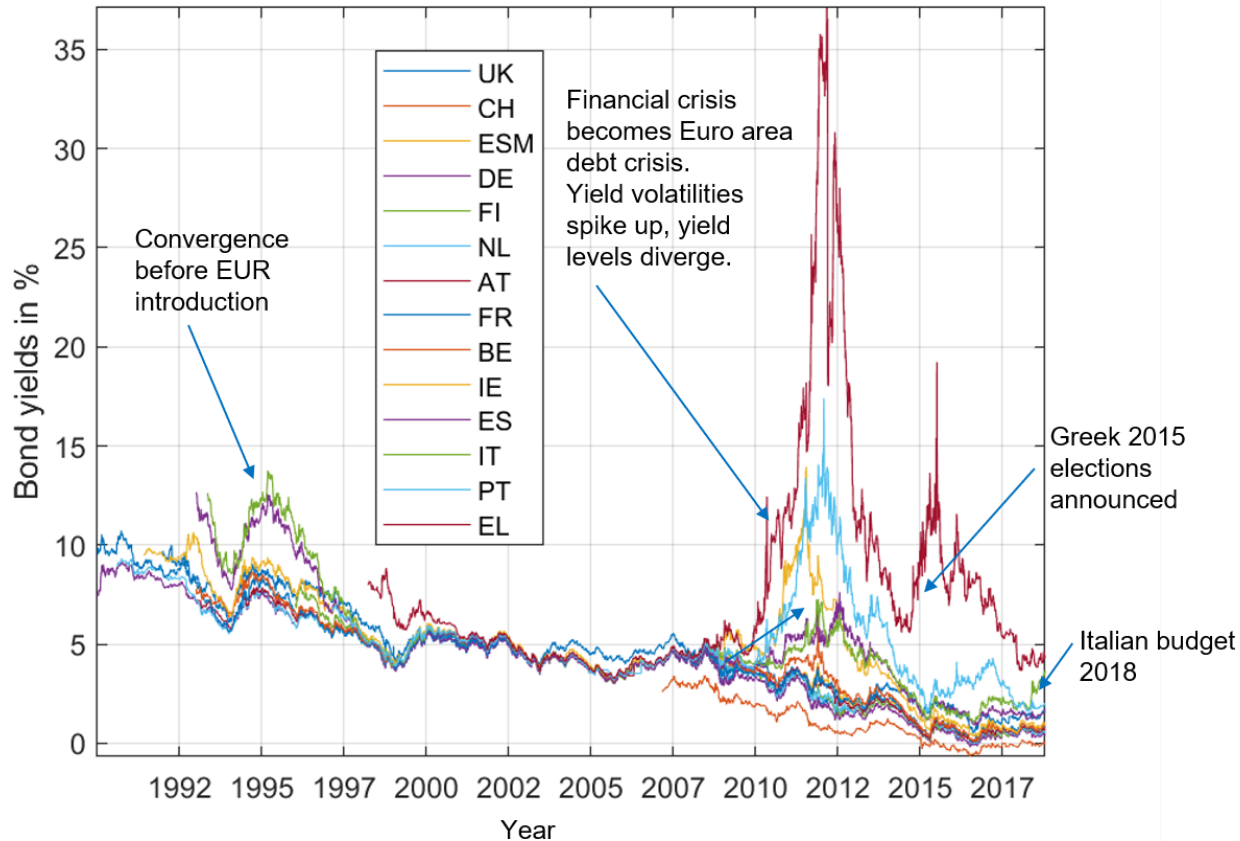# MUNI

Convergence and Divergence in European Bond Correlations
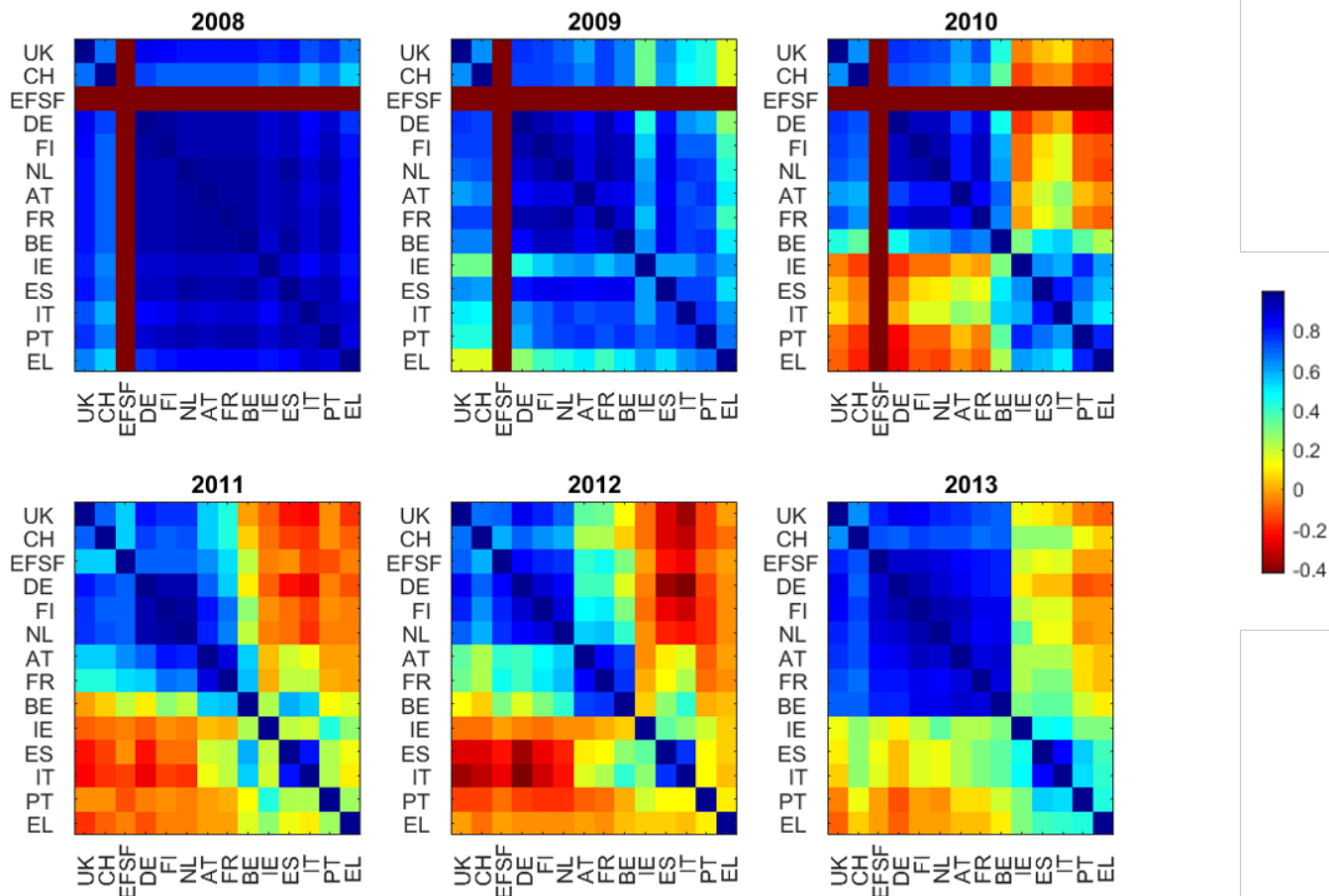
by Schwendner P., Schüle M., Hillebrand M.

European Bond Yields

- Euro convergence for bonds yields during end of 1990s
- European sovereign debt crises 2010-2012: spreads reappeared.
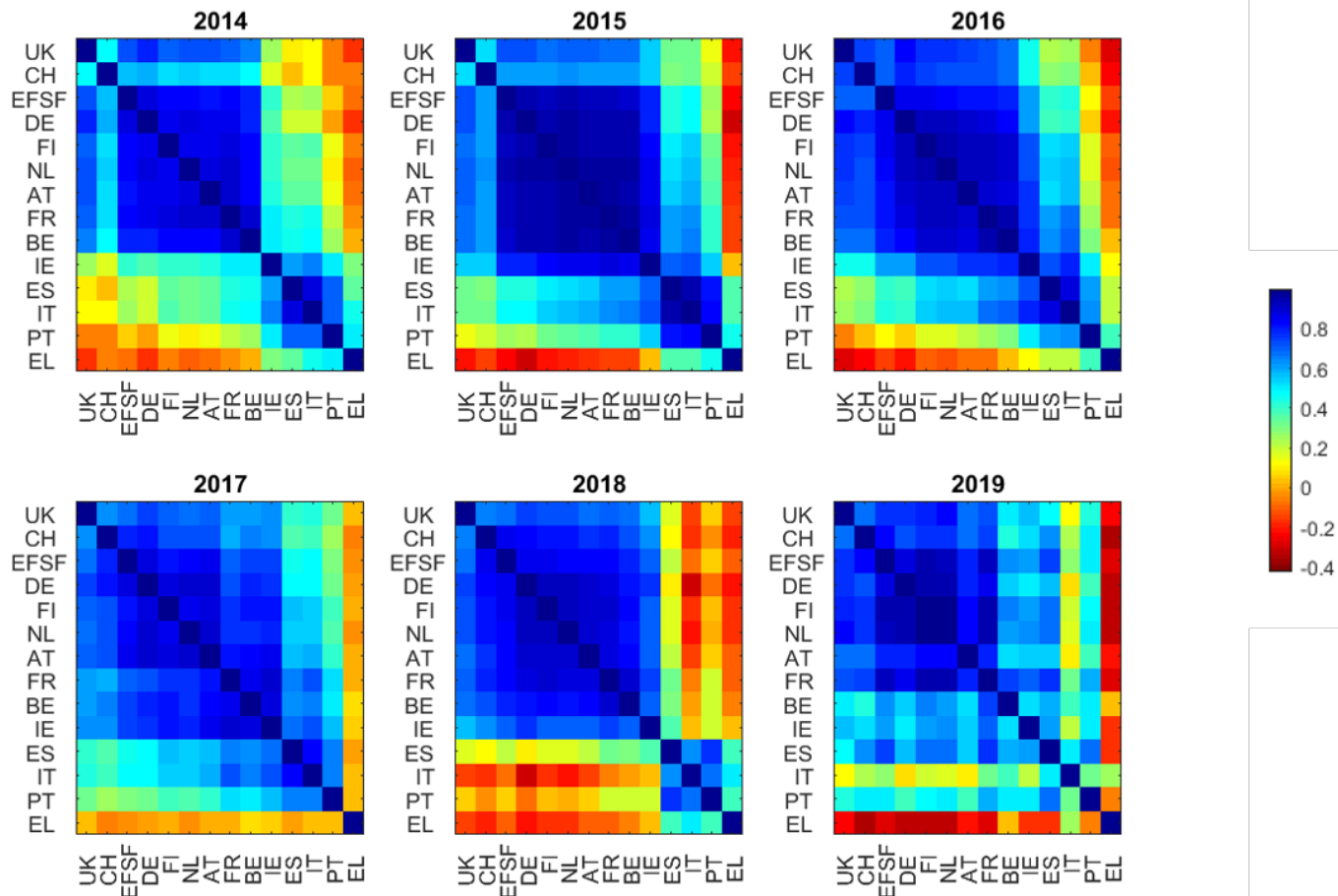- Since 2015, bond spreads primarily signal political divergence

European Bond Return Correlations 2008 - 2013

Containment of the 2010 sovereign bond crisis

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European Bond Return Correlations 2014 - 2019

From financial crisis to political divergence

Problems with correlations

— They are unstable in time
— **Common factors** may lead to spurious correlations
— Too many links: each market is correlated to any other market. Who is driving what?

Solution:
— **Correlation influence** based on partial correlations shows driving factors
— **Bootstrap filter** ("wild bootstrap") to reduce unstable links in correlation matrix
— Influence networks to identify the markets that drive the correlations of other markets

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Bootstrap-filtered partial correlation
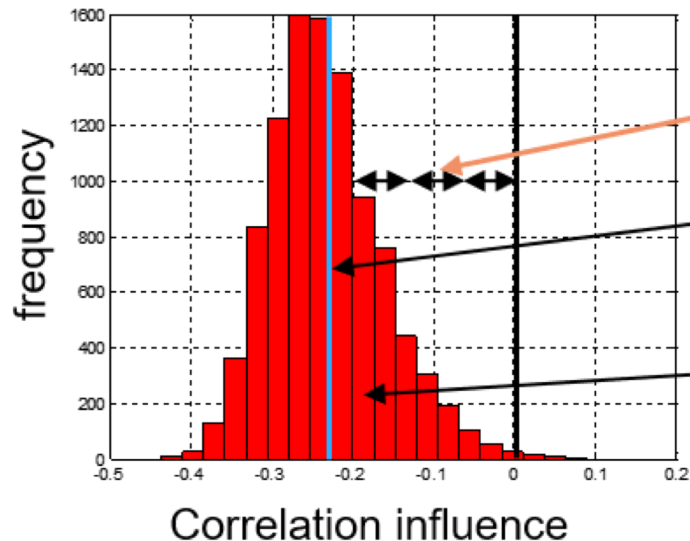
stddev of the bootstrap samples

abs(mean) > 3 * stddev => correlation influence is «significant»

Histogram of corr influence bootstrap Finland -> Greece in 2015

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Correlation influence

‒ The partial correlation measure is defined as

$$\rho_{ij:k} = \frac{C_{ij} - C_{ik}C_{kj}}{\sqrt{1 - C_{ik}^2}\sqrt{1 - C_{kj}^2}}$$

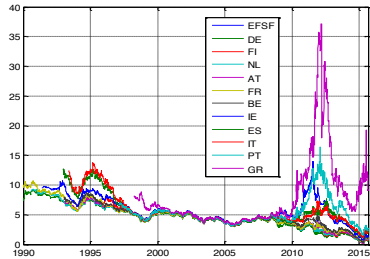‒ Correlation influence is defined as
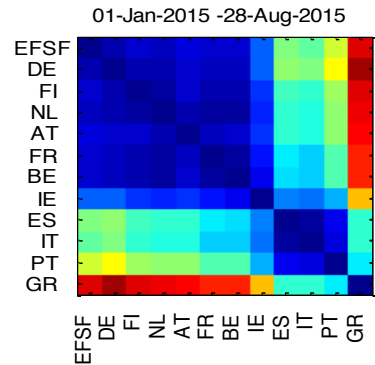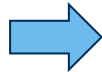
$$d_{i,j:k} = C_{ij} - \rho_{ij:k}$$

‒ The average correlation influence is defined as

$$d_{i:k} = d_{i,j:k}{}_{j \neq i,k}$$

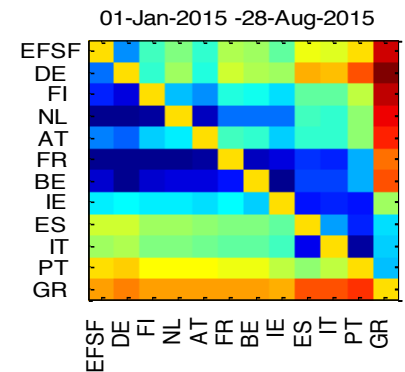Ref.: Kenett D. Y. et. al.: Dominating clasp of the financial sector revealed by partial correlation analysis of the stock market. PLoS ONE 5(12): e15032.

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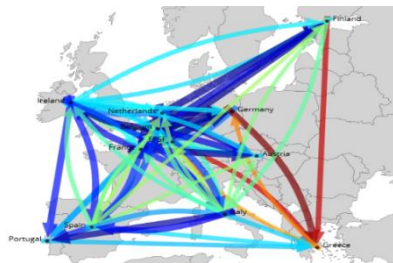# Generate Filtered Correlation Influence Network

Bond yield time series

Correlation matrix of yield changes

01-Jan-2015 -28-Aug-2015

Correlation influence

01-Jan-2015 -28-Aug-2015
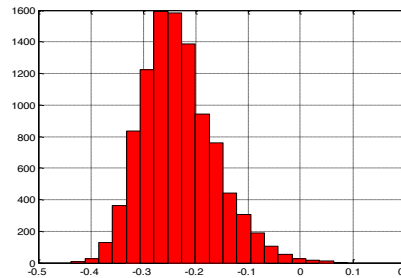
Filtered influence network
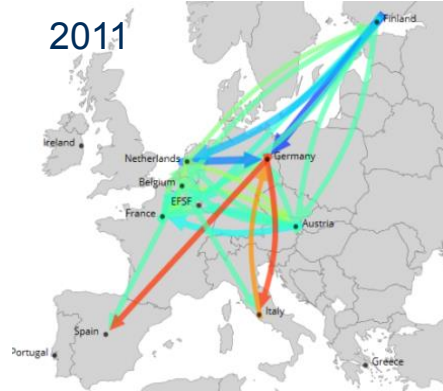
Bootstrap filter

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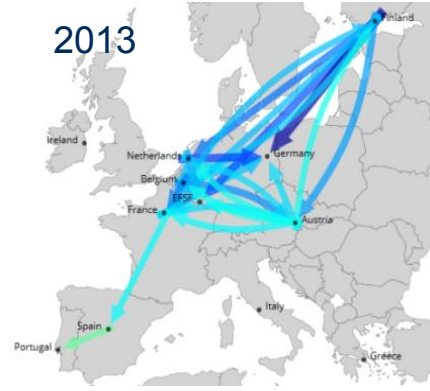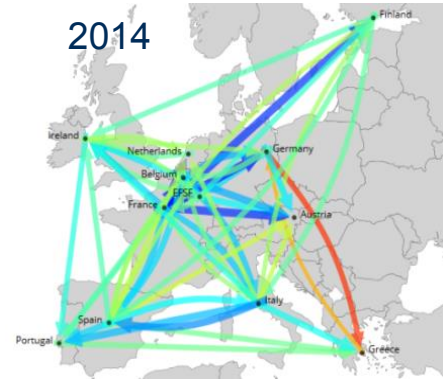# Filtered Correlation Influence

2010.
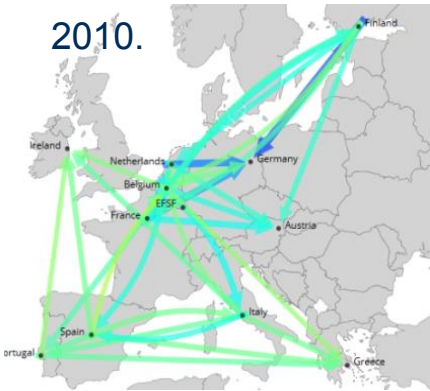
2011

2012

2013

2014

2015

Blue arrows: dominating positive correlations => reinforcing movements
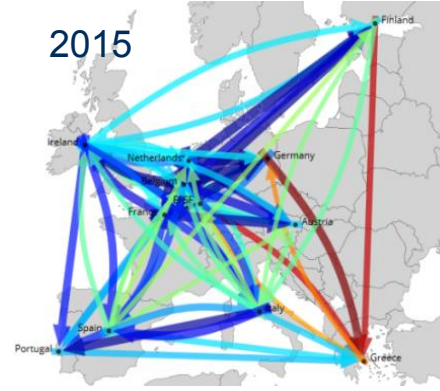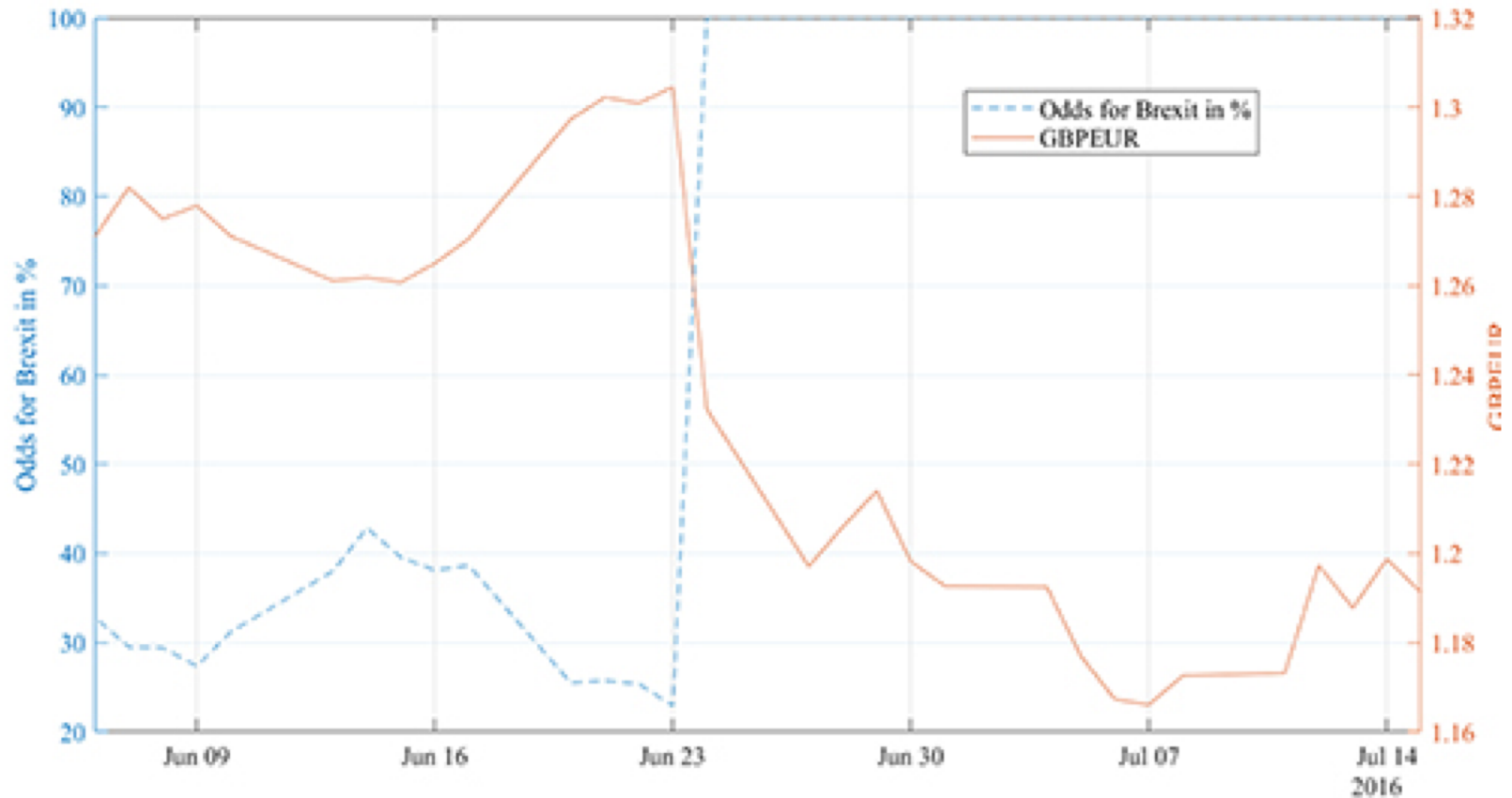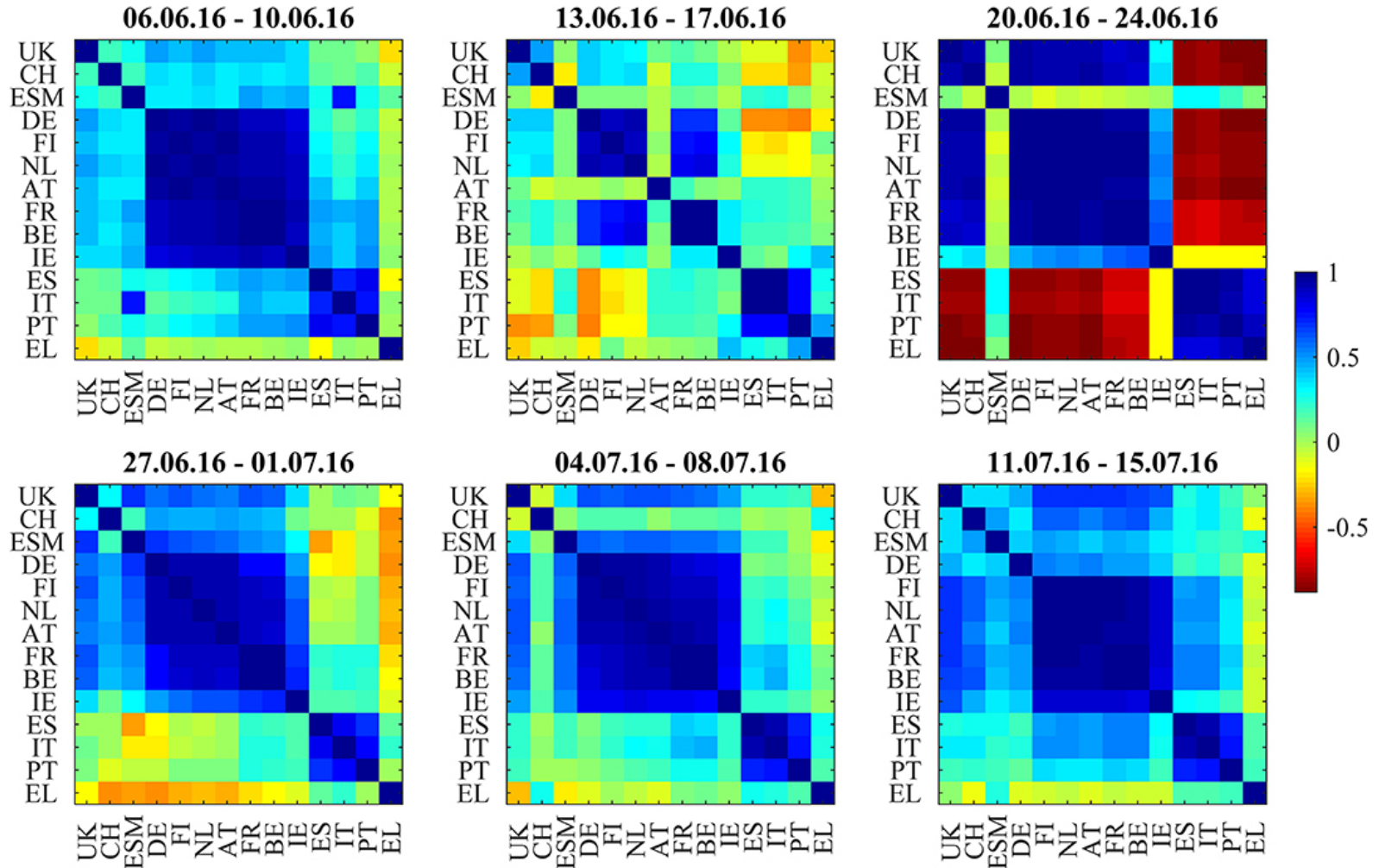
Red arrows: dominating negative correlations => diverging movements

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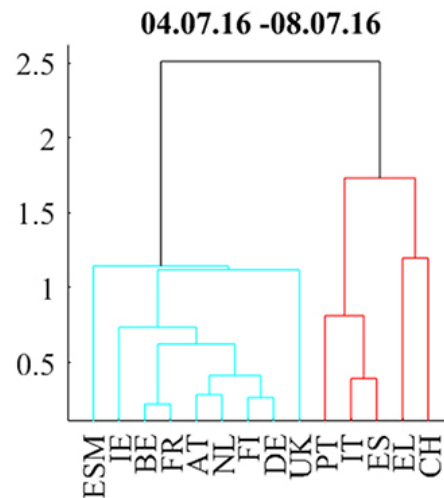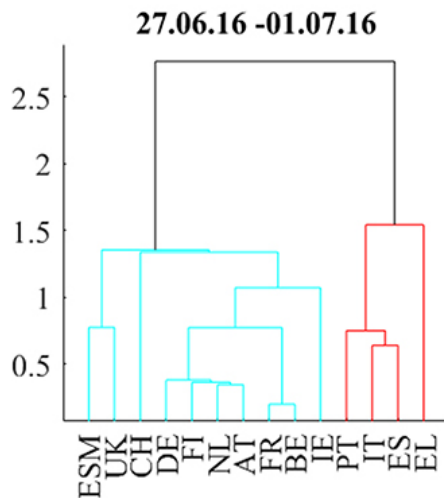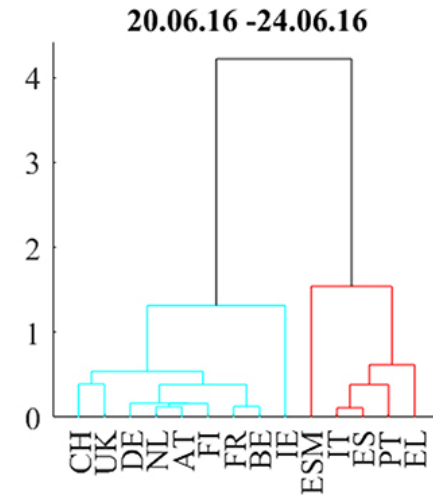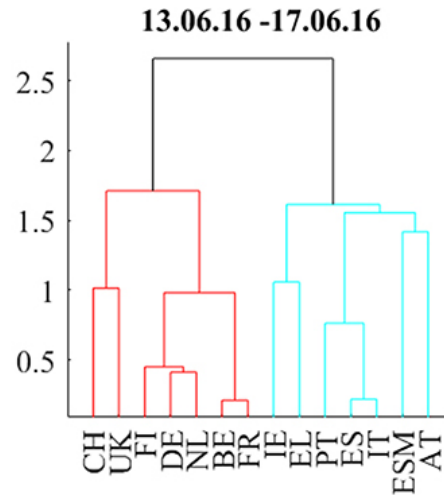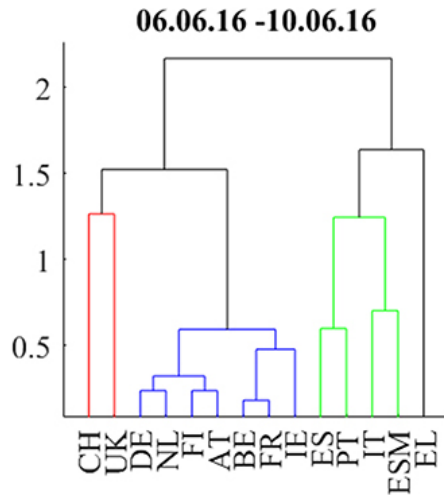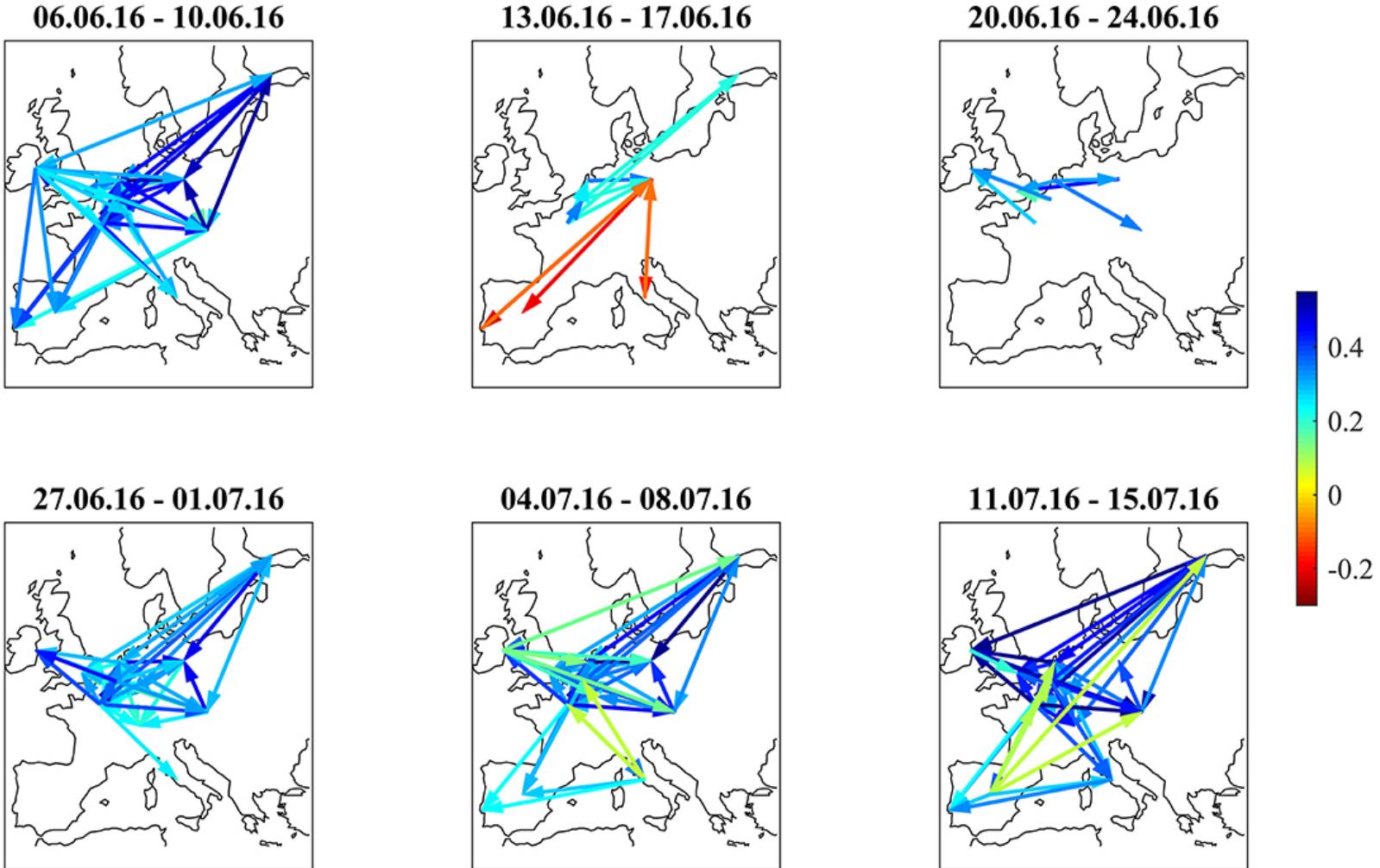MUNI

Odds vs Exchange rate

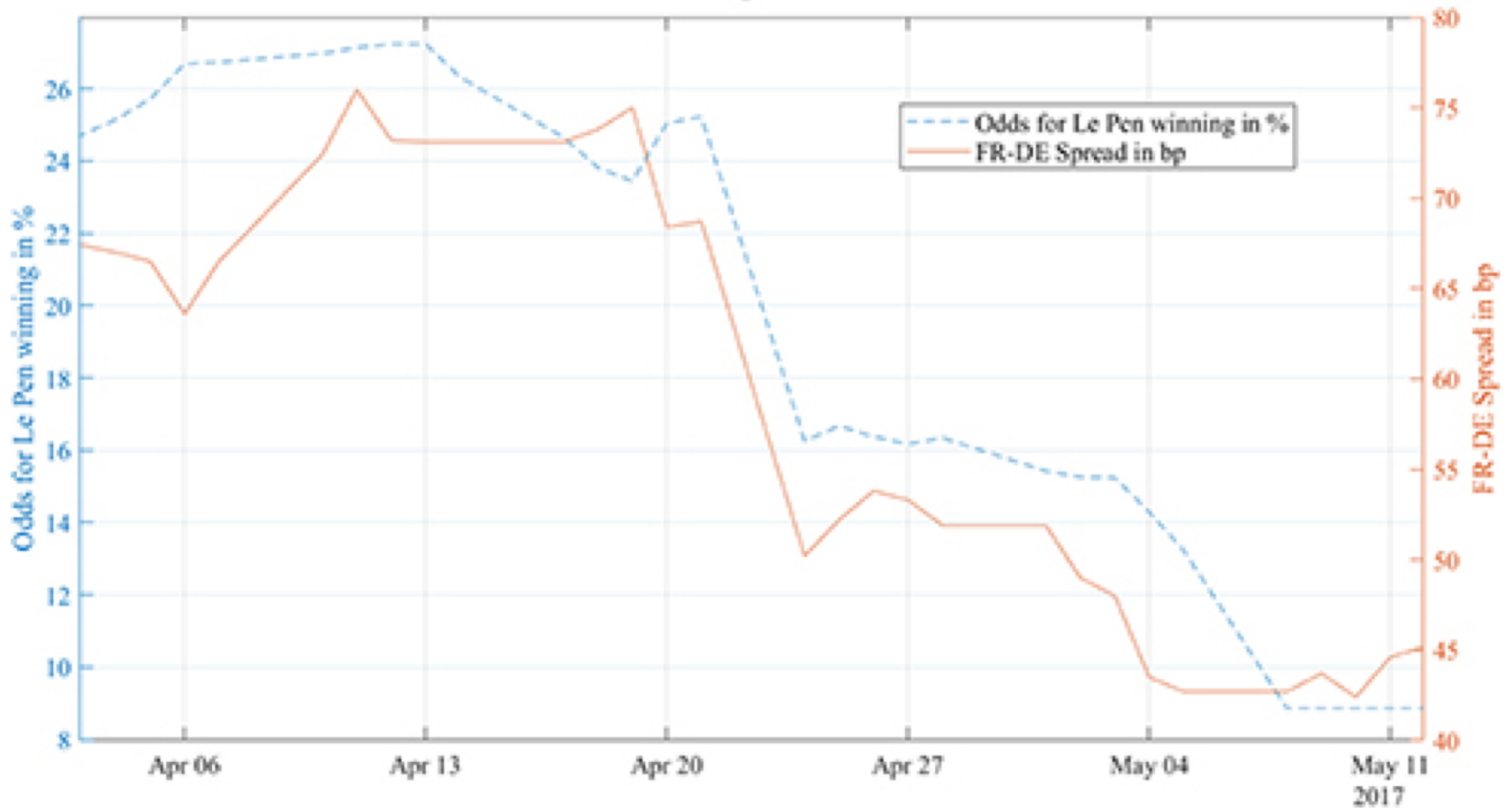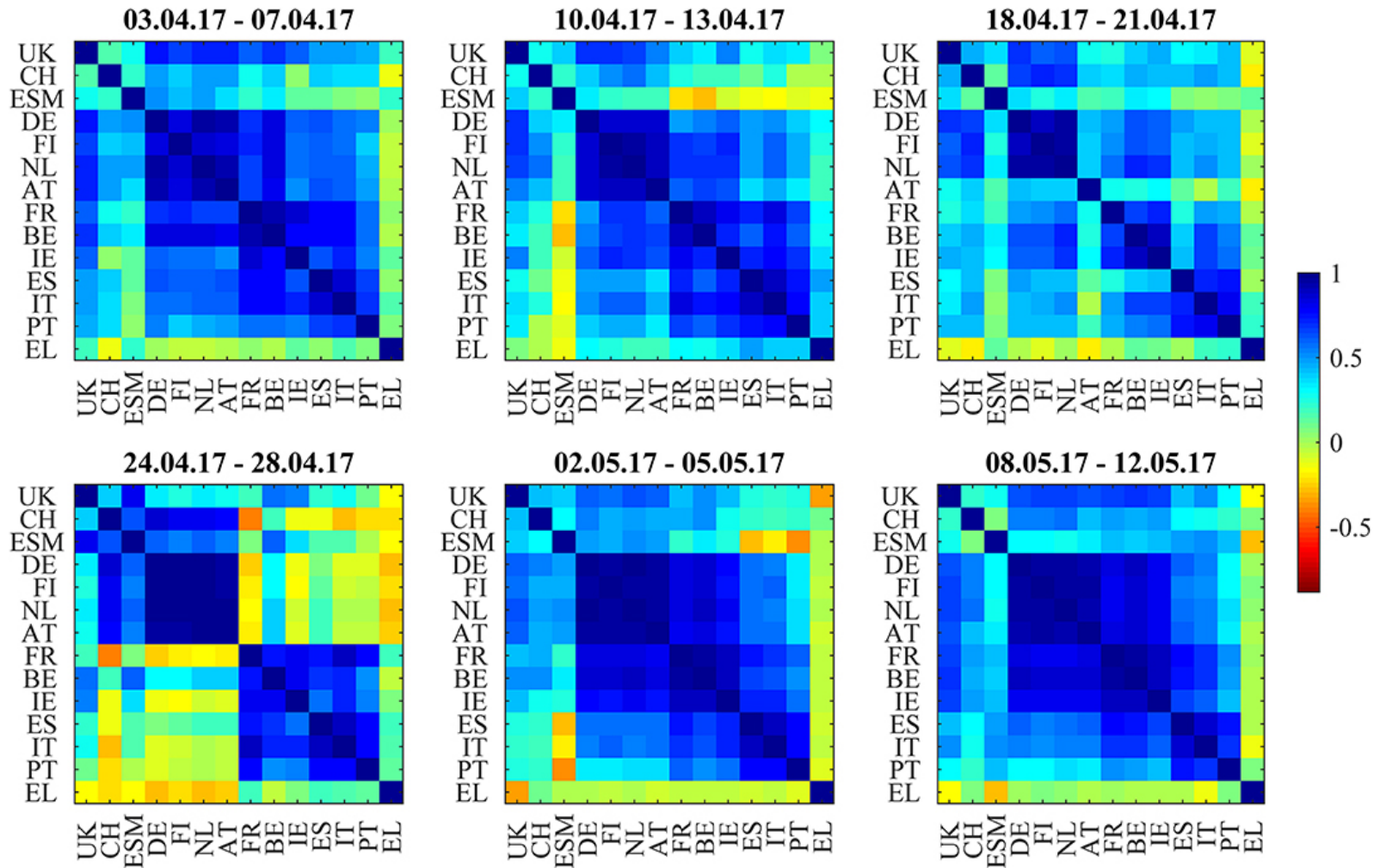MUNI

Brexit Referendum: correlations

Brexit Referendum: dendrogram

MUNI
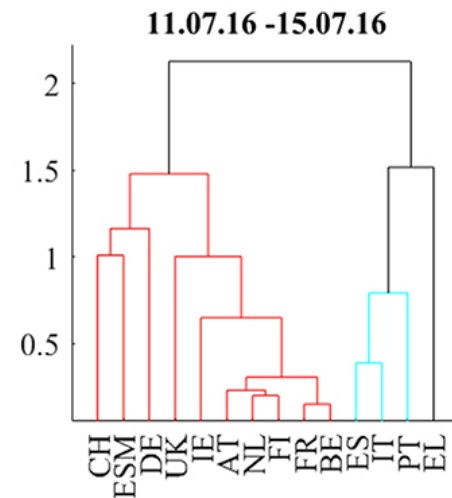
Brexit Referendum: influence

Odds vs FR-DE bond spread
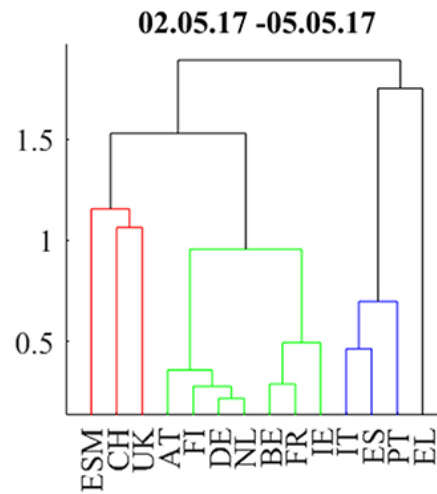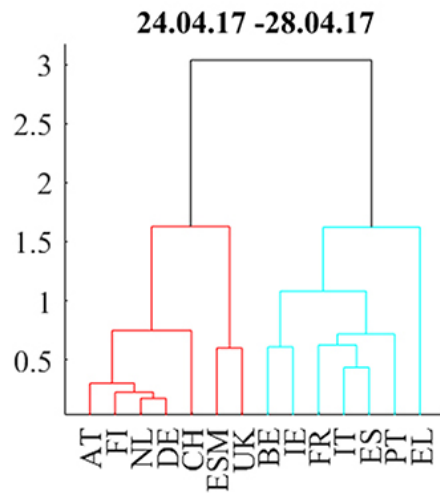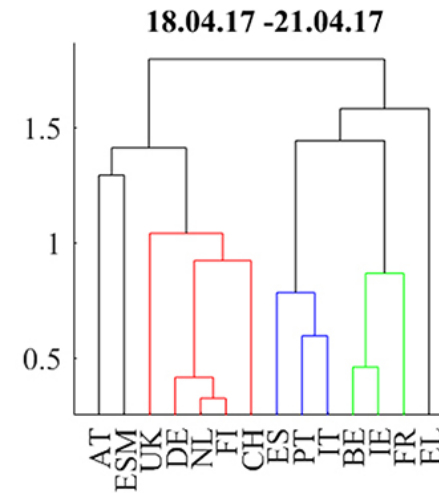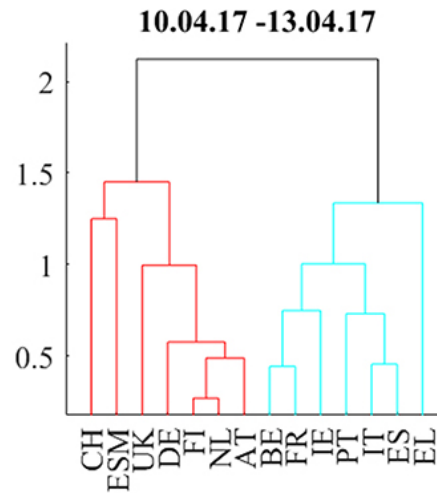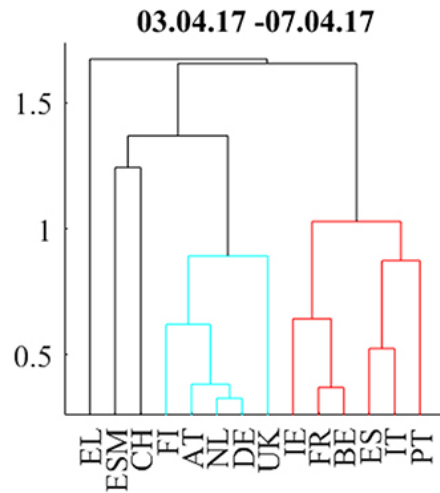
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French Elections: correlations

French Elections: dendrogram

MUNI
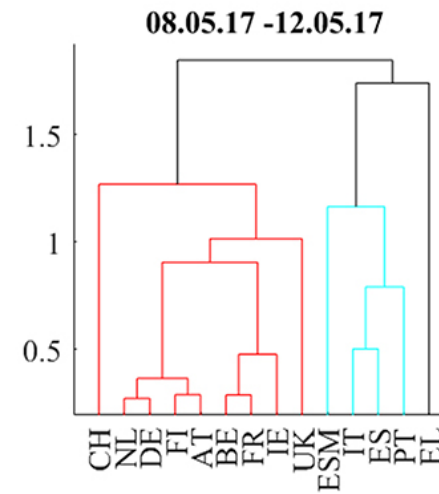
French Elections: influence

03.04.17 - 07.04.17

10.04.17 - 13.04.17
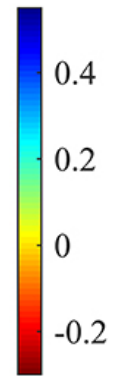
18.04.17 - 21.04.17

24.04.17 - 28.04.17

02.05.17 - 05.05.17

08.05.17 - 12.05.17

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Conclusions

— Since 2010, European bonds cluster into **core and periphery groups** according to their return correlations. We use filtered correlation influence networks to show the most significant drivers of convergence and divergence.

— During the European sovereign debt crisis 2010 - 2012, negative correlation influences between the core and periphery groups are the dominating force. Since 2013, the situation improved a lot.

— In 2015 during the negotiations between Greece and the Eurogroup and in 2018 during the Italian budget negotiations, the warning signals of negative correlation influences reappeared for short periods, although the absolute level of spreads is substantially smaller than during 2010 - 2012.

— In 2016, warning signals reappeared in the week before the Brexit referendum, but disappeared quickly thereafter.

— The findings point to markets becoming more **politically driven**.

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