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Are green and dirty cryptocurrencies connected with climate risk attention?

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Supplementary material (online appendix)

R^2 connectedness approach

We utilize an asymmetric variant of the R^2 connectedness proposed by Gabauer, Chatziantoniou, and Stenfors (2023). We initiate our estimation process by segregating the positive and negative changes of the variables, based on Adekoya, Akinseye, Antonakakis, Chatziantoniou, Gabauer, and Oliyide (2022) as:

$$S_{i,t} = \begin{cases} 0, & if\ r_{i,t} < 0 \\ 1, & if\ r_{i,t} \geq 0 \end{cases} \quad (1)$$

$$r_{i,t}^{+} = S_{i,t} \cdot r_{i,t} \quad (2)$$

$$r_{i,t}^{-} = (1 - S_{i,t}) \cdot r_{i,t} \quad (3)$$

here $r_{i,t}^{-}$ negative change and $r_{i,t}^{+}$ denotes positive change in the variable.

In the main analysis, the R^2 connectedness method serves as a baseline assumption, suggesting that lagged variables have no effect on z_t. This assumption implies B coefficients being zero, causing the model and its related generalized forecasting error variance decomposition (GFEVD) as:

$$z_t = u_t \qquad z_t, u_t \sim N(0, \Sigma) \quad (4)$$

$$A_0 = I_k \qquad A_i = 0 \qquad i = 1, \dots, p \quad (5)$$

$$\phi_{i \leftarrow j}^{gen} = \frac{\Sigma_{ij}^2}{\Sigma_{jj}\Sigma_{ii}} = \left(\frac{\Sigma_{ij}}{\sqrt{\Sigma_{jj}\Sigma_{ii}}}\right) = \rho_{ij}^2 = R_{ij}^2 \quad (6)$$

This metric remains constant irrespective of the forecast horizon (referred to as H) and is essentially the squared Pearson correlation coefficient. This coefficient signifies the goodness-of-fit measure R^2 in a two-variable linear regression involving variables i and j. Consequently, it leads to the following equalities: $R_{ii}^2 = 1$ and $R_{ij}^2 = R_{ji}^2$. The scaled GFEVD is normalized as:

$$gSOT_{i \leftarrow j} = \frac{R_{ij}^2}{\sum_{l=1}^{k} R_{il}^2} \quad (7)$$

When the total of the values in row i equals one, it signifies that variable i can be accurately predicted by all other variables j, and these j variables are independent of one another. Because of this characteristic, the sum of bivariate R_{ij}^2 does not equal the R_i^2 value in the multivariate linear regression. Nevertheless, when all variables j are mutually independent, $gSOT_{ij}$ illustrates the relative R_i^2 contribution that variable j has on variable i. Consequently, the total connectedness index (TCI) measured as:

$$TCI = 1 - \frac{1}{k}\sum_{i=1}^{k} gSOT_{i \leftarrow i} \quad (8)$$

$$= 1 - \frac{1}{k}\sum_{i=1}^{k} \frac{R_{ii}^2}{\sum_{l=1}^{k} R_{il}^2} \quad (9)$$

Finally, the measurement of total directional connectedness (TO), directional connectedness from other variables (FROM), and the net total directional connectedness (NET) is assessed.[1]

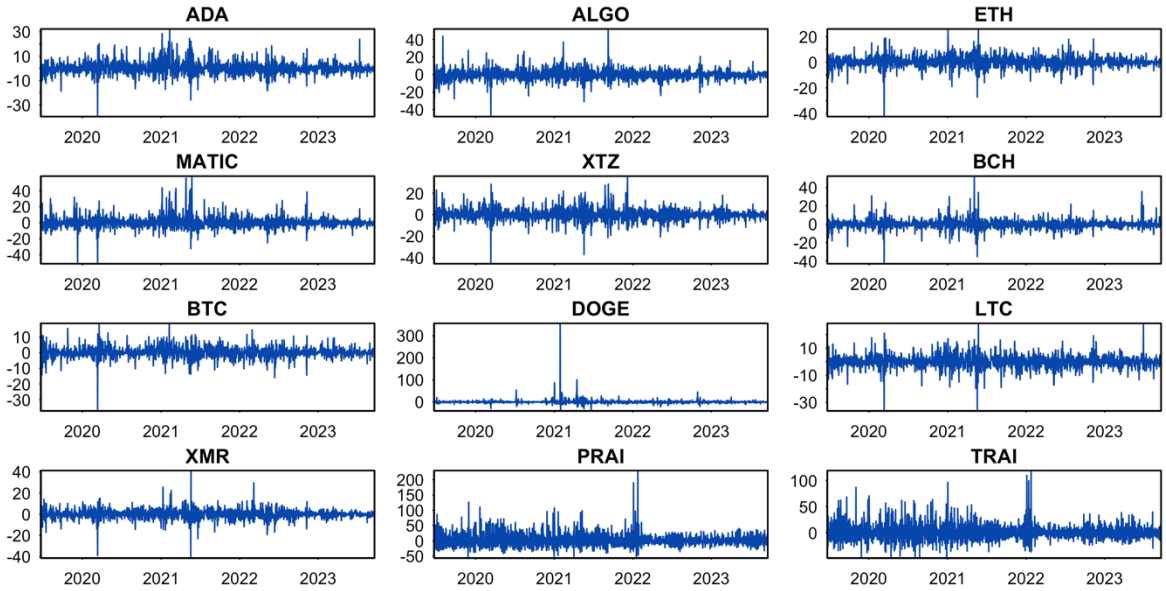


Figure S.1: Changes in daily series.

[1] For a more detailed explanations refer to the work by Gabauer et al. (2023).

Table S.1: Summary statistics of changes in variable

	N	Mean	Standard deviation	Minimum	Maximum	Skewness	Kurtosis	ADF	PP
ADA	1551	0.208	5.34	-39.568	32.238	0.411	5.483	-10.152***	-1745.042***
ALGO	1551	-0.017	6.398	-47.806	51.923	0.329	8.701	-11.337***	-1659.308***
ETH	1551	0.217	4.575	-42.347	25.948	-0.458	8.229	-11.111***	-1734.476***
MATIC	1551	0.488	7.573	-51.116	58.052	1.202	11.118	-10.923***	-1633.678***
XTZ	1551	0.135	5.799	-45.516	35.78	0.012	6.385	-12.138***	-1655.134***
BCH	1551	0.099	5.401	-42.956	52.32	0.754	14.561	-11.452***	-1808.999***
BTC	1551	0.129	3.589	-37.17	18.746	-0.531	10.168	-11.286***	-1697.43***
DOGE	1551	0.549	11.505	-40.257	355.571	19.925	591.638	-10.435***	-1515.208***
LTC	1551	0.075	4.93	-36.177	28.202	-0.293	6.326	-11.701***	-1629.606***
XMR	1551	0.134	4.718	-41.386	41.192	-0.295	12.961	-12.125***	-1852.466***
PRAI	1551	1.979	21.467	-56.776	229.905	2.223	14.503	-14.712***	-1269.476***
TRAI	1551	1.258	16.223	-48.347	118.89	1.32	6.269	-14.736***	-1597.277***

Note: N= number of observations. ADF= augmented Dickey-Fuller unit-root test, PP= Phillips-Perron unit-root test. ***, and ** indicate significance at the 1%, and 5% level, respectively.

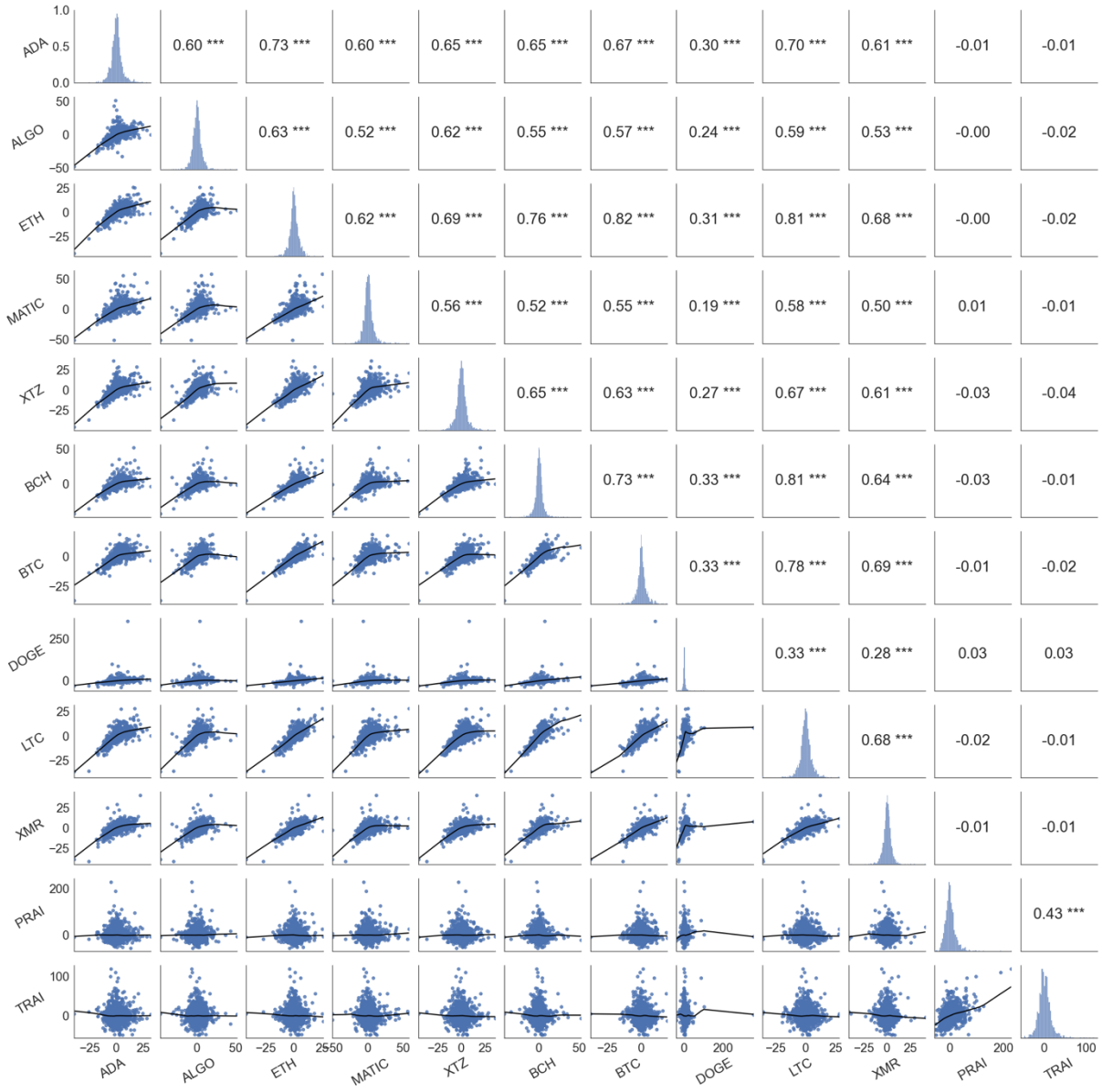
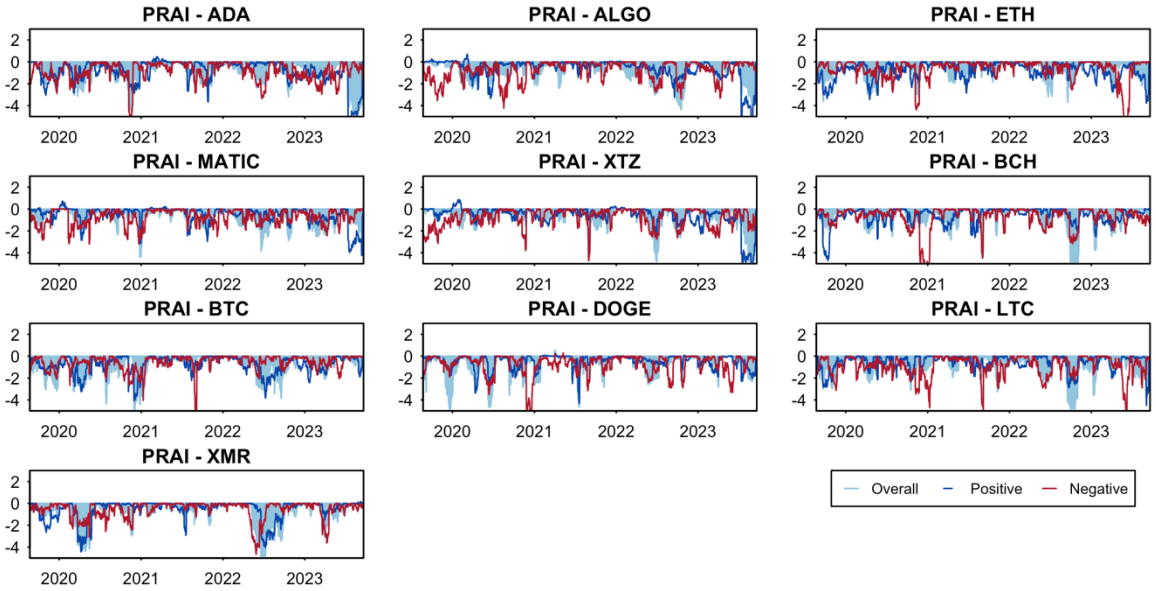
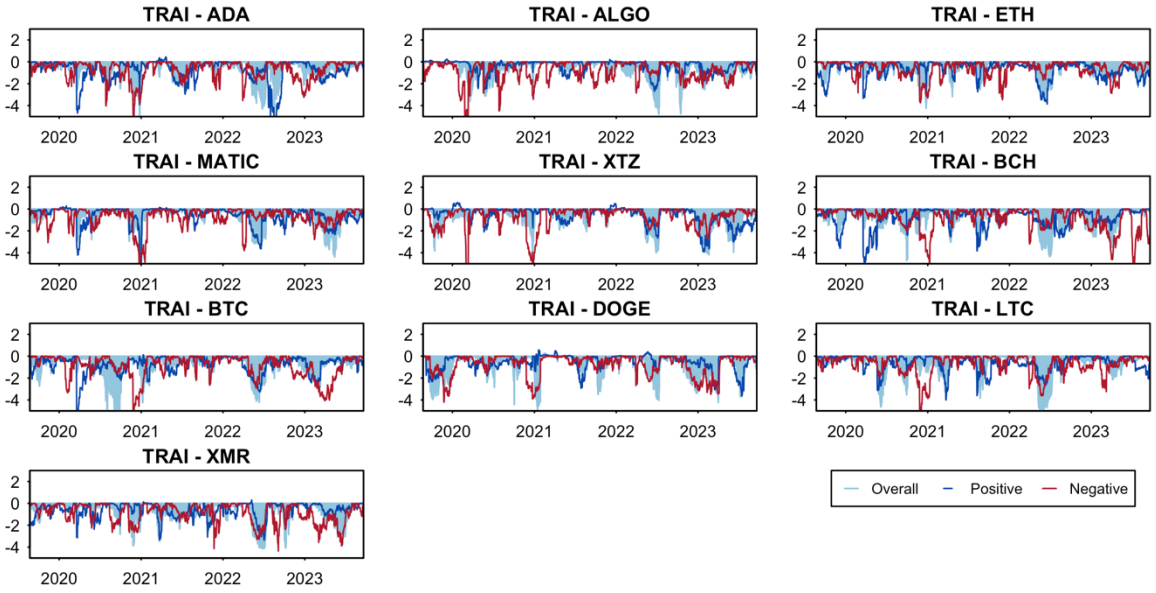


Figure S.2: Correlation matrix and distribution plots.



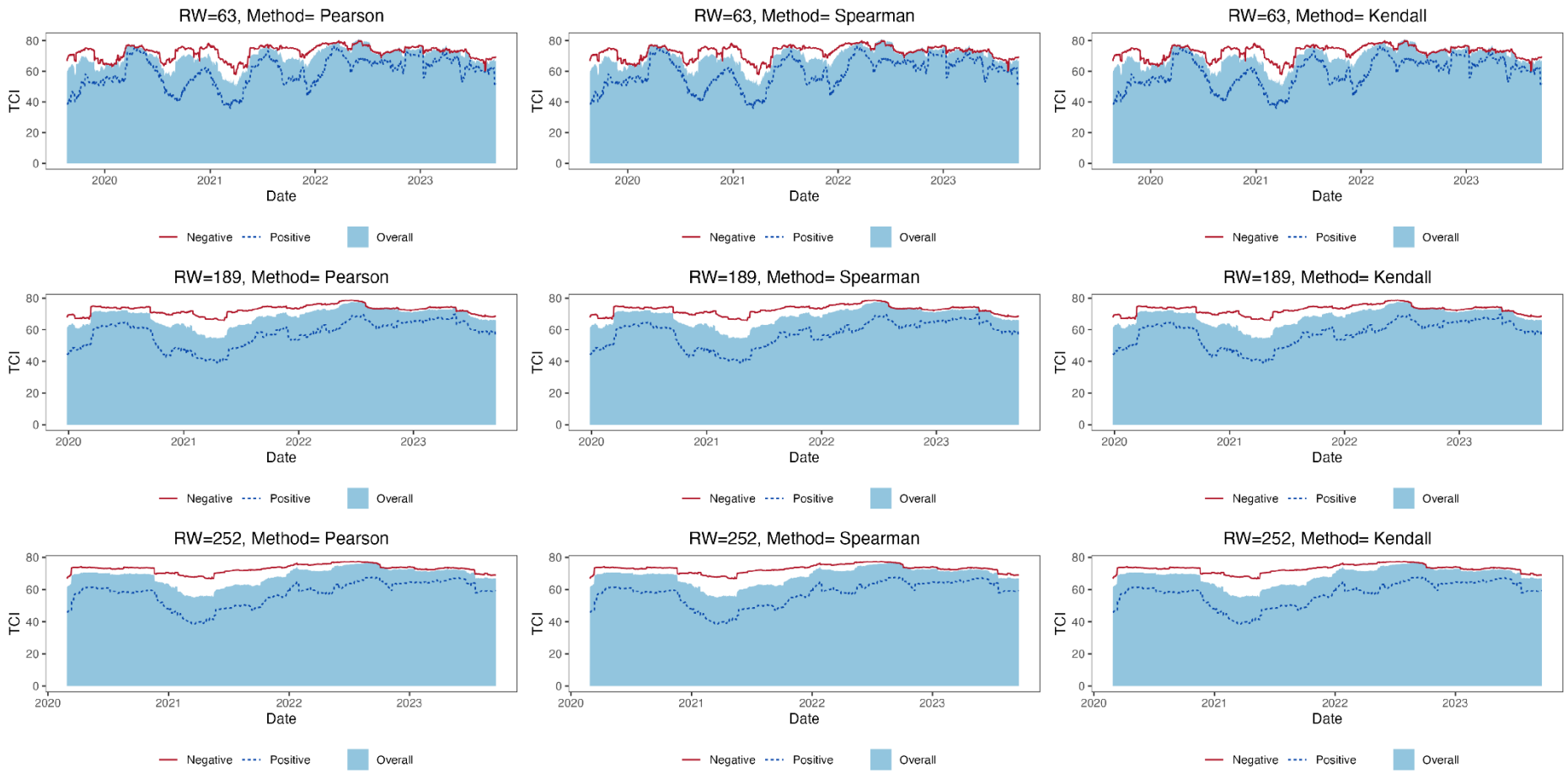
Note: The results are based on R^2 connectedness approach with 63 days quarterly trading window.

Figure S.3: Pairwise direction connectedness between PRAI, green and dirty assets



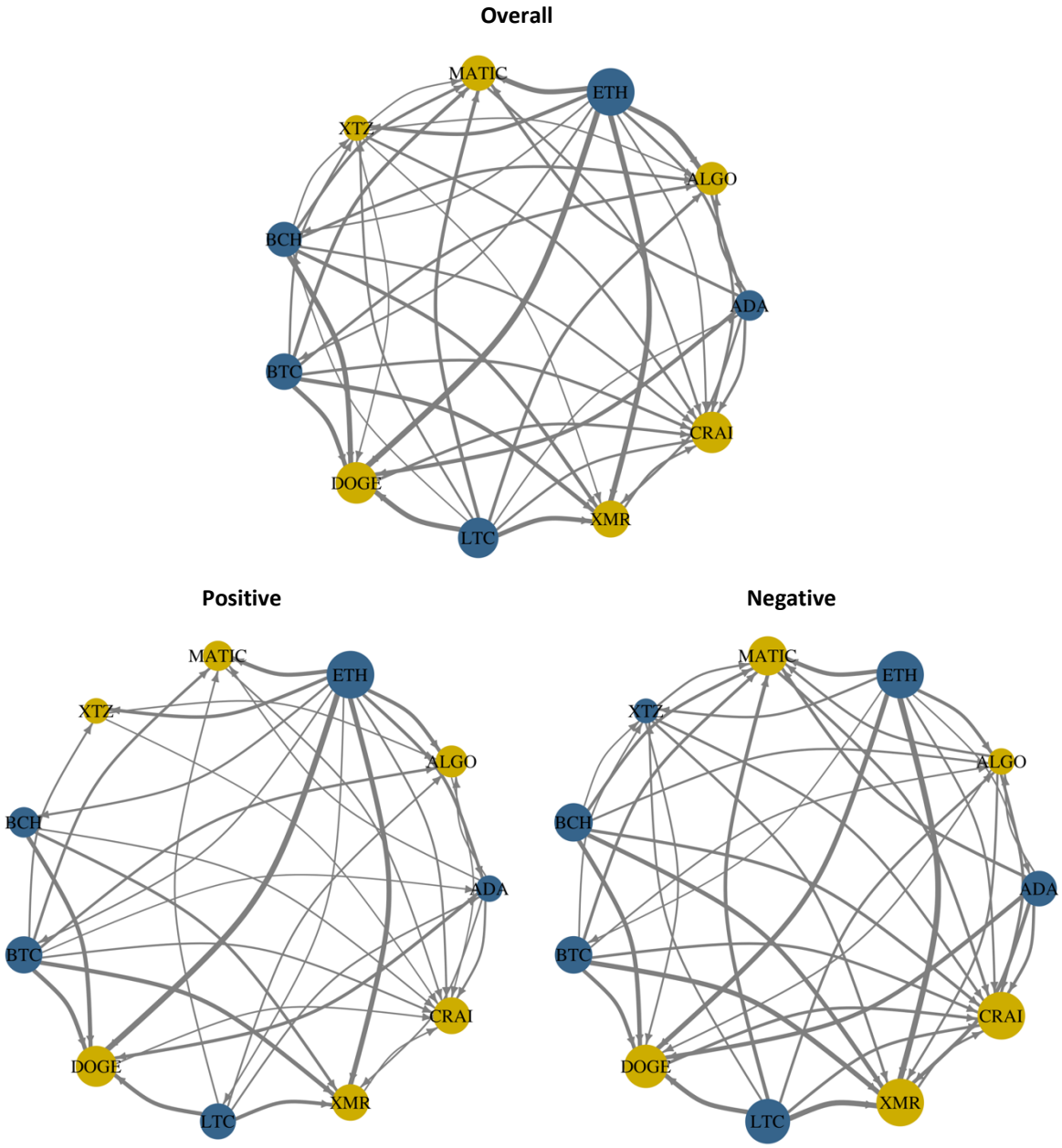
Note: The results are based on R^2 connectedness approach with 63 days quarterly trading window.

Figure S.4: Pairwise direction connectedness between TRAI, green and dirty assets



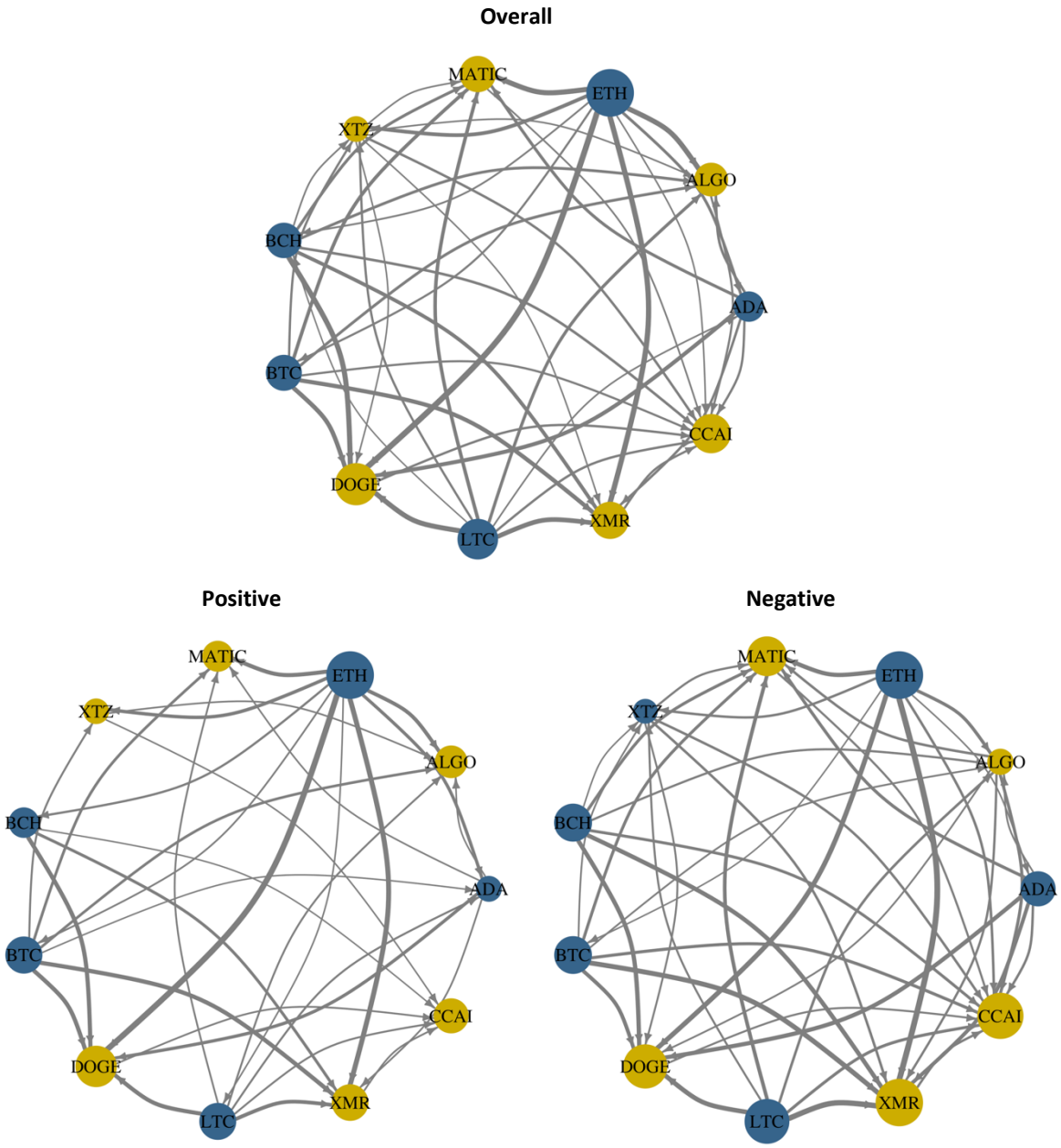
Note: RW= Rolling window.

Figure S.5: Robustness test result based different methods and rolling window.



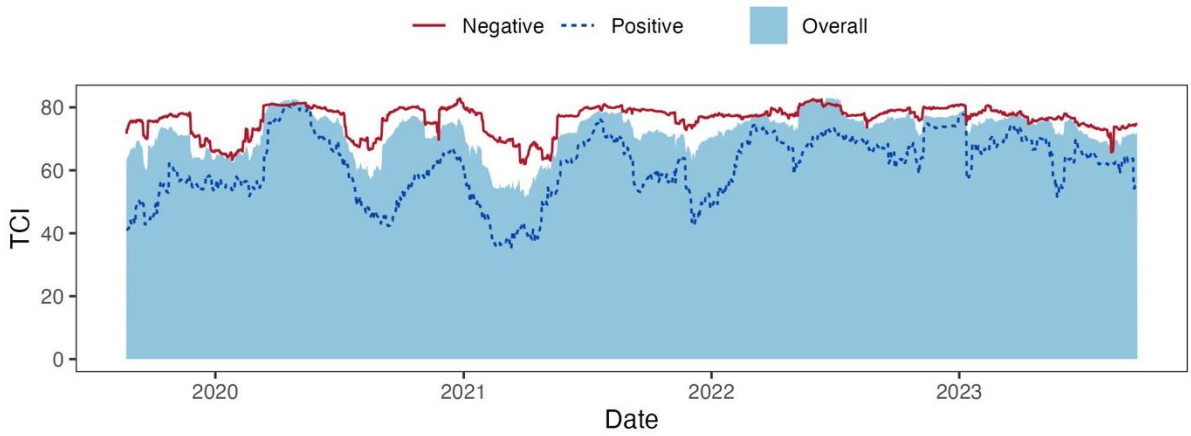
Note: The results are based on R^2 connectedness approach. The node size in the plot indicates spillover intensity, and the blue (yellow) hue indicates the net receiver (transmitter) of spillover. The direction of the arrow indicates the transmission direction, and the thickness indicates spillover intensity.

Figure S.6: Robustness test using alternative proxy CRAI network plot



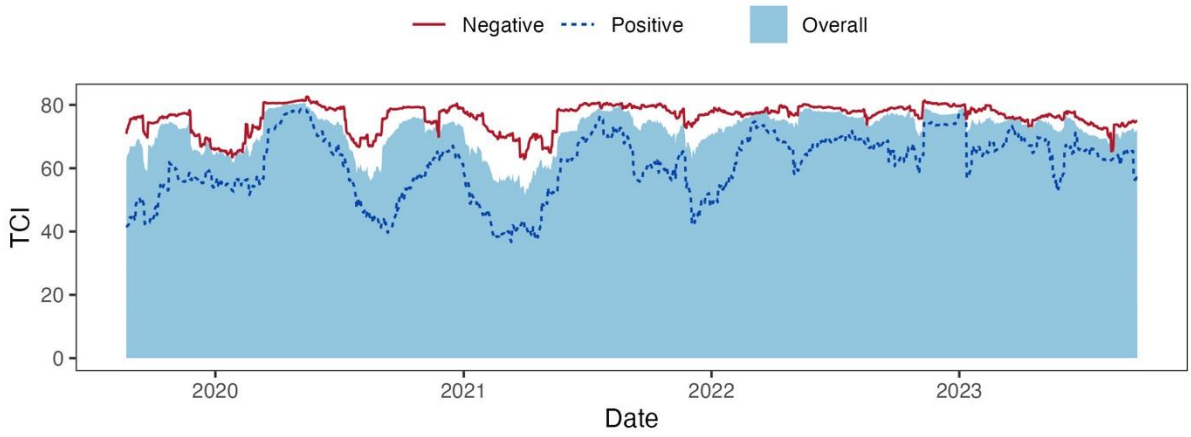
Note: The results are based on R^2 connectedness approach. The node size in the plot indicates spillover intensity, and the blue (yellow) hue indicates the net receiver (transmitter) of spillover. The direction of the arrow indicates the transmission direction, and the thickness indicates spillover intensity.

Figure S.7: Robustness test using alternative proxy CCAI network plot



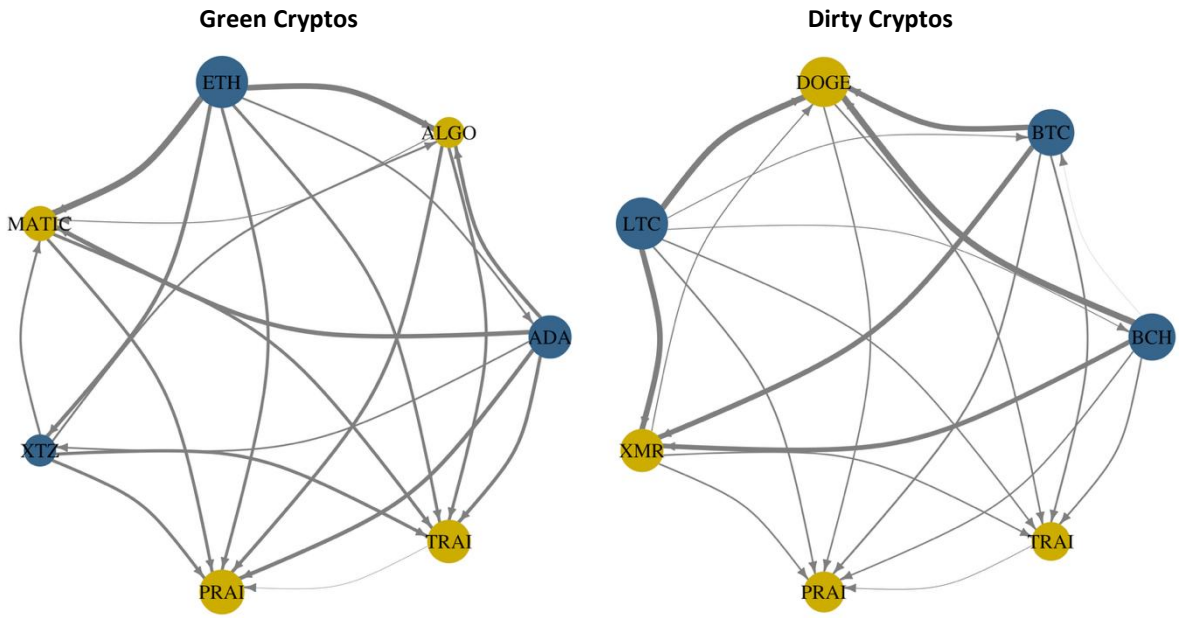
Note: The results are based on R^2 connectedness approach with 63 days quarterly trading window.

Figure S.8: Robustness test using alternative proxy CRAI (Dynamic TCI)



Note: The results are based on R^2 connectedness approach with 63 days quarterly trading window.

Figure S.9: Robustness test using alternative proxy CCAI (Dynamic TCI)



Note: The results are based on R^2 connectedness approach. The node size in the plot indicates spillover intensity, and the blue (yellow) hue indicates the net receiver (transmitter) of spillover. The direction of the arrow indicates the transmission direction, and the thickness indicates spillover intensity. Results are based on overall market conditions.

Figure S.10: Robustness test for green and dirty cryptocurrencies

Reference

Adekoya, O. B., Akinseye, A. B., Antonakakis, N., Chatziantoniou, I., Gabauer, D., & Oliyide, J. (2022) Crude oil and Islamic sectoral stocks: Asymmetric TVP-VAR connectedness and investment strategies, *Resources Policy, 78*, 102877. doi:https://doi.org/10.1016/j.resourpol.2022.102877

Gabauer, D., Chatziantoniou, I. and Stenfors, A. (2023) Model-free connectedness measures, *Finance Research Letters, 54*, 103804. doi:https://doi.org/10.1016/j.frl.2023.103804