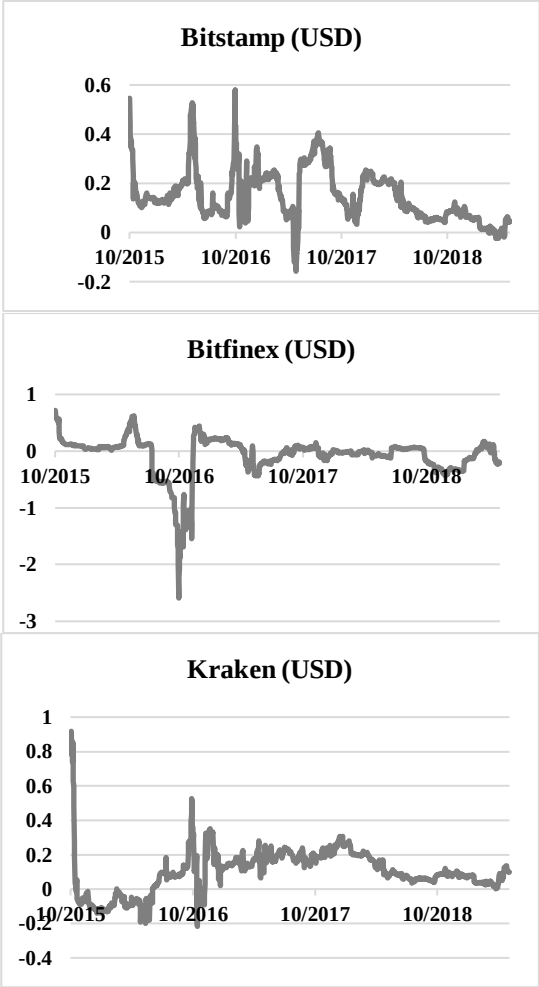
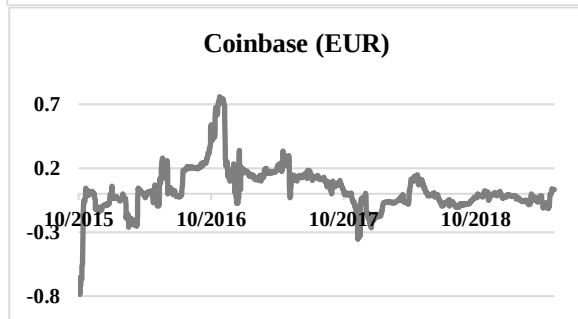
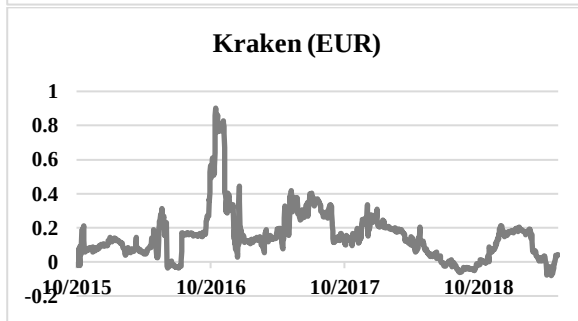
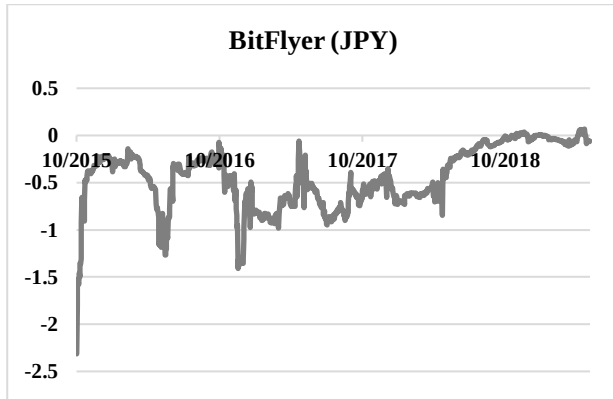


Online APPENDIX

Figure A1 Net Price Spillovers

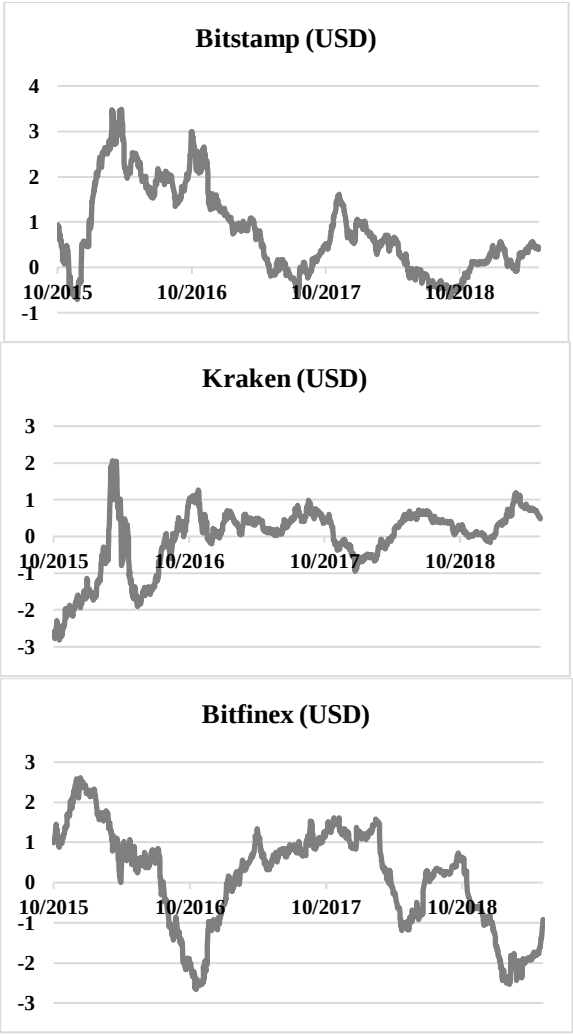


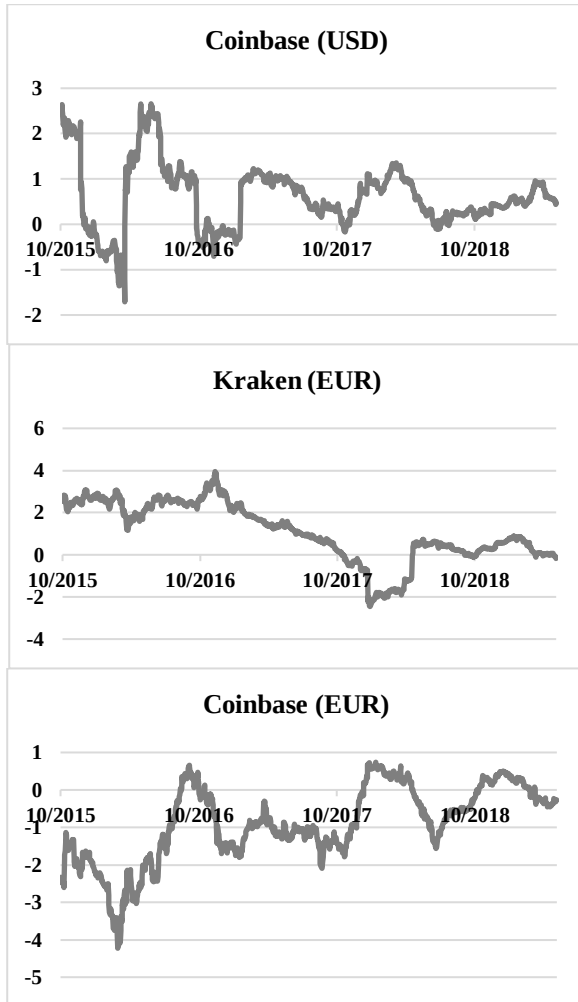


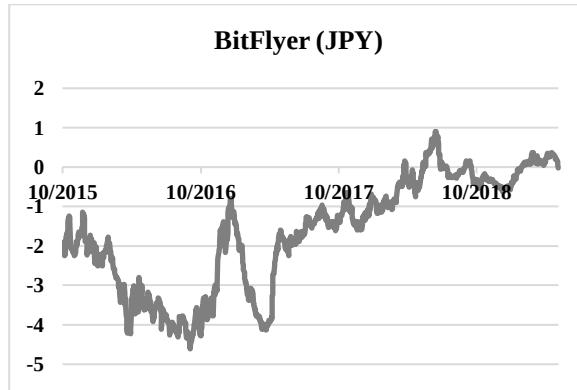


Notes: In the figure we present the values of net price spillovers (i.e. the difference between spillovers sent and received by a given market). The index was calculated based on the data from June 2015 to May 2019 for the window of 120 observations (about four months), taking into account one-step forecast horizon. Positive values of the index denote that the market transmitted more impulses than it received in a given period.

Figure A2 Net Volume Spillovers







Notes: In the figure we present the values of net volume spillovers (i.e. the difference between spillovers sent and received by a given market). The index was calculated based on the data from June 2015 to May 2019 for the window of 120 observations (about four months), taking into account one-step forecast horizon. Positive values of the index denote that the market transmitted more impulses than it received in a given period.

Table A1 Overall Price Spillover Table – The Sample Including Gemini

	<i>BitFlyer JPY</i>	<i>Bitstamp USD</i>	<i>Bitfinex USD</i>	<i>Kraken USD</i>	<i>Gemini USD</i>	<i>Coinbase USD</i>	<i>Coinbase EUR</i>	<i>Kraken EUR</i>	<i>FROM OTHERS</i>
BitFlyer JPY	13.24	12.48	12.19	12.38	12.39	12.46	12.42	12.43	10.84
Bitstamp USD	11.84	12.80	12.49	12.66	12.66	12.61	12.36	12.57	10.90
Bitfinex USD	11.76	12.72	12.98	12.64	12.63	12.54	12.22	12.51	10.88
Kraken USD	11.80	12.70	12.46	12.82	12.64	12.59	12.38	12.61	10.90
Gemini USD	11.80	12.71	12.44	12.64	12.79	12.68	12.40	12.54	10.90
Coinbase USD	11.87	12.68	12.38	12.61	12.69	12.78	12.49	12.51	10.90
Coinbase EUR	11.94	12.54	12.19	12.52	12.54	12.61	12.90	12.75	10.89
Kraken EUR	11.84	12.61	12.34	12.62	12.53	12.50	12.63	12.93	10.88
TO OTHERS	10.36	11.05	10.81	11.01	11.01	11.00	10.86	10.99	87.09

Notes: Calculations based on the data from 08.10.2015 to 26.05.2019.

Table A2 Overall Volume Spillover Table – The Sample Including Gemini

	<i>BitFlyer JPY</i>	<i>Bitstamp USD</i>	<i>Bitfinex USD</i>	8.99 <i>Kraken USD</i>	<i>Gemini USD</i>	<i>Coinbase USD</i>	<i>Coinbase EUR</i>	<i>Kraken EUR</i>	<i>FROM OTHERS</i>
BitFlyer JPY	26.35	12.02	11.17	9.48	7.41	11.98	9.17	12.41	9.21
Bitstamp USD	8.73	19.49	12.79	11.49	9.75	13.41	10.02	14.32	10.06
Bitfinex USD	9.22	14.02	22.37	11.42	6.82	13.08	9.06	14.02	9.70
Kraken USD	7.93	12.98	11.66	23.48	8.76	12.37	8.57	14.24	9.57
Gemini USD	7.21	13.16	8.66	10.48	25.63	12.68	9.52	12.66	9.30
Coinbase USD	8.92	13.45	12.13	11.05	9.44	19.70	11.77	13.54	10.04
Coinbase EUR	8.28	12.25	10.32	8.85	8.58	14.48	24.00	13.25	9.50
Kraken EUR	8.96	14.10	12.64	12.36	9.28	13.32	10.64	18.69	10.16
TO OTHERS	7.41	11.50	9.92	9.39	7.50	11.41	8.59	11.80	77.54

Notes: Calculations based on the data from 08.10.2015 to 26.05.2019.