

# US sneezing and Australian colds: economic spillovers in both conventional and unconventional monetary policy times

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## Supplementary Appendix

### **A1. Robustness: Time-varying parameter VAR (TVP-VAR analysis)**

As robustness checks, we present the results for the TVP-VAR analysis. As indicated earlier, the TVP-VAR approach of [Antonakakis et al. \(2020\)](#) combines the TVP-VAR model introduced by [Koop and Korobilis \(2014\)](#) and the dynamic connectedness approach of ([Diebold and Yilmaz, 2012](#); [Diebold and Yilmaz, 2014](#)). Unlike the approach of ([Diebold and Yilmaz, 2012](#); [Diebold and Yilmaz, 2014](#)) that requires setting rolling window size, the TVP-VAR approach is an improvement of ([Diebold and Yilmaz, 2012](#); [Diebold and Yilmaz, 2014](#)) as it does not require setting an arbitrary rolling window size hence prevents the loss of data and avoids erratic or flattened parameters making this approach insensitive to outliers. Here, through Kalman filter estimation which relies on decay factors, the variances are allowed to vary over time. Based on the Bayesian information criterion (BIC), a TVP-VAR(1) model is selected.

In Table [A1](#), the average dynamic total spillovers are presented. The results generally are qualitatively similar to those of the DY(12,14) results. From Table [A1](#), the total spillover index among the variables is 60.90% slightly lower than the 64.72% from the DY(12,14) analysis. This shows high spillovers among US monetary policy and Australia's domestic monetary policy and financial markets. Again, we still see the US as the dominant net transmitter of monetary policy spillovers compared to Australia's own monetary policy. Overall, US monetary policy is a net contributor of spillovers of

about 11.58% while Australia's monetary policy is a net receiver of spillovers of about 11%. Consistent with the earlier results, the main transmission channel is the interest rate channel followed by the asset price and foreign exchange channels respectively. Similar to the earlier results, US transmits net monetary policy spillover of about 6% to Australia's monetary policy (i.e. 17.18%-10.71%). The net transmission of US monetary policy to the sectoral equities is 4.18% with the consumer discretionary sector being the dominant net receiver of US monetary policy spillovers of about 0.93% (i.e. 2.1%-1.17%). The exchange rate is a net receiver of 1.16% (i.e. 2.14%-0.98%) spillovers from US monetary policy. The results further show that the industrial sector is the dominant transmitter of spillovers among the sectors followed by the materials and financial sectors. These results are consistent with the DY(12,14) approach.

Again, looking at the dynamic spillover plots, Figure A1 shows heterogeneous total spillovers over the sample period with the highest spillover observed during the COVID-19 pandemic followed by the ESDC and the GFC respectively. From Figure A2 also, we observe that over the sample period, US monetary policy is generally a net contributor of spillovers to Australian economy while Australia's monetary policy is generally a net receiver of spillovers. Particularly, we observe that while throughout the GFC US monetary policy was a net transmitter of spillovers to Australia's market, Australia's monetary policy was a net receiver of spillovers during the entire crisis period. The monetary policies of both countries were generally net receivers of spillovers during the COVID-19 pandemic. We again find that FX is a net receiver of spillovers in almost the entire period while US stock market is a dominant net transmitter of spillovers to Australia's economy in the entire period except at the onset of the COVID-19 pandemic where it received spillovers briefly. In regards to the sectors, we see from Figure A3 that the dominant sector that contributes net spillovers in most of the periods is the industrial sector followed by the materials and financial sectors. Consumer discretionary sector is generally a net transmitter of spillovers. The IT, communication services, health and utilities sectors are generally net receivers of spillovers most of the times. These results are generally consistent with the DY(12,14) results.

Table A1: Average dynamic spillovers: TVP-VAR

Variable	US_SSR	US_MSCI	FX	Australia_SSR	ENERGY	MATERIALS	INDUS	CONSDESC	CONSTAPLES	HEALTH	FINEXAREIT	REIT	IT	COMMSNS	UTILITIES	REALESTATE	METALS	Spillovers Others	FROM
US_SSR	66.44	8.24	0.98	10.71	1.34	1.53	0.95	1.17	0.65	0.71	1.42	0.85	1.16	0.85	0.63	0.89	1.48		33.56
US_MSCI	2.14	6.18	1.35	3.24	2.18	2.36	2.28	2.53	1.33	1.34	2.7	1.33	1.74	1.38	1.17	1.41	1.72		36.57
Australia_SSR	17.18	5.71	59.2	3.94	3.59	4.33	2.33	2.15	1.58	1.19	2.39	1.59	1.1	1.02	1	1.41	4.55		40.8
ENERGY	1.78	5.61	2.1	1.07	1.3	1.49	1.08	1.29	0.81	0.73	1.32	1.04	0.83	0.7	0.99	0.96	1.5		40.09
MATERIALS	1.39	6.16	2.1	0.68	3.33	2.83	5.87	4.54	3.16	3.01	4.58	2.64	2.63	1.92	3.44	3.26	3.26		96.69
INDUS	1.39	6.16	1.15	0.81	4.84	5.16	26	7.81	6.3	5.44	7.8	4.89	4.69	3.03	4.77	5.07	4.12		71.04
CONSDESC	2.1	9.98	1.04	1	4.02	4.38	8.22	27.56	6.03	5.05	6.95	3.81	4.83	3.26	3.8	4.38	3.59		72.44
CONSTAPLES	0.92	3.88	0.95	0.6	4.31	4.15	7.85	7.28	31.51	36.48	8.05	4.1	4.22	3.71	4.73	4.63	3.34		68.49
HEALTH	1.26	5.1	0.82	0.63	3.57	2.83	7.42	6.83	6.64	4.21	5.84	3.63	5.09	3.17	4.3	4.21	2.16		63.52
FINEXAREIT	1.32	3.52	1.15	0.89	2.69	2.03	5.72	4.32	3.98	3.03	27.07	29.22	5.2	2.46	4.04	2.6	1.03		72.38
REIT	0.86	3.2	0.81	0.88	3.28	3.82	6.97	6.58	5.12	5.19	5.45	24.88	37.79	3.13	3.29	3.1	3.14		72.38
IT	0.98	3.67	0.68	0.68	2.6	2.74	5.04	4.96	5.07	3.62	5.08	3.3	3.63	48.42	3.75	3.63	2.36		62.21
UTILITIES	0.95	3.43	0.62	0.93	4.43	3.15	7.16	5.44	5.7	4.44	5.97	5.2	3.26	2.92	38.1	5.7	2.61		61.9
REALESTATE	0.91	3.44	0.87	0.78	2.99	2.31	6.26	4.77	4.16	3.31	6.55	25.35	2.61	2.61	4.19	2.31	1.82		72.64
METALS	1.38	6.83	2.34	1	8.23	26.78	4.36	3.65	2.87	1.6	4.22	1.47	2.21	1.96	1.9	1.08	27.31		72.48
Spillovers TO Others	45.15	91.47	20.86	29.03	62.67	81.95	85.16	74.59	64.58	50.76	80.41	68.87	46.18	36.66	47.93	76.59	72.48		
Net Spillover/Spillover	11.58	54.90	-19.94	-11.06	-4.02	7.37	11.16	2.14	-3.90	-12.76	7.48	-1.92	-16.03	-14.92	-13.97	3.95	-0.01		TISI = 60.90%
Sectoral equity analysis																			
Spillovers to Sectoral Indices	17.81	71.34	15.38	11.14	54.38	72.22	78.51	67.44	60.31	46.80	72.38	64.08	41.34	32.69	44.14	71.61	63.70		
Spillovers from Sectoral Indices	33.63	23.38	28.54	31.64	36.24	67.3	64.46	38.32	62.15	38.69	63.36	64.38	51.75	43.68	35.48	66.93	60.75		
Net Spillover/Spillover	4.18	47.96	-13.16	-2.80	-1.94	9.49	14.09	9.12	-1.94	-8.89	9.22	-6.90	-10.41	-12.89	-11.84	4.38	1.97		
to Sectoral Indices																			

Note: All Variables are as defined in the main text.

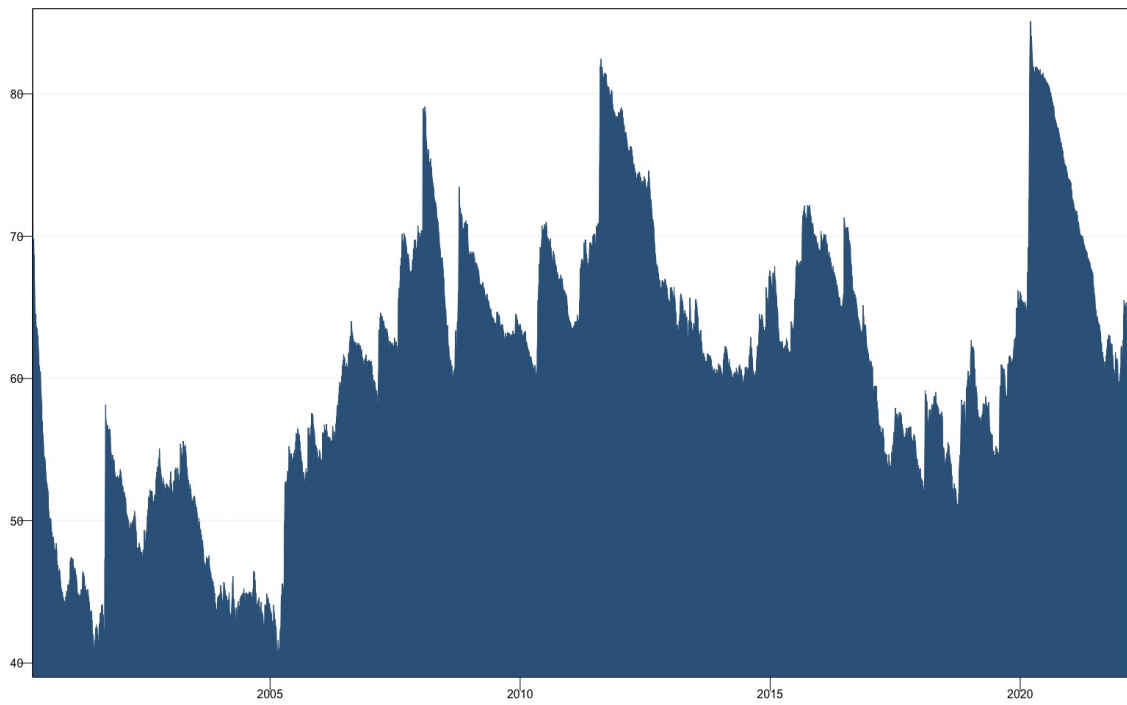


Figure A1: Dynamic total spillovers (TSI)

Note: Results are based on TVP-VAR technique with lag length of order one (Bayesian information criterion, BIC) and a 10-step-ahead generalized forecast error variance decomposition.

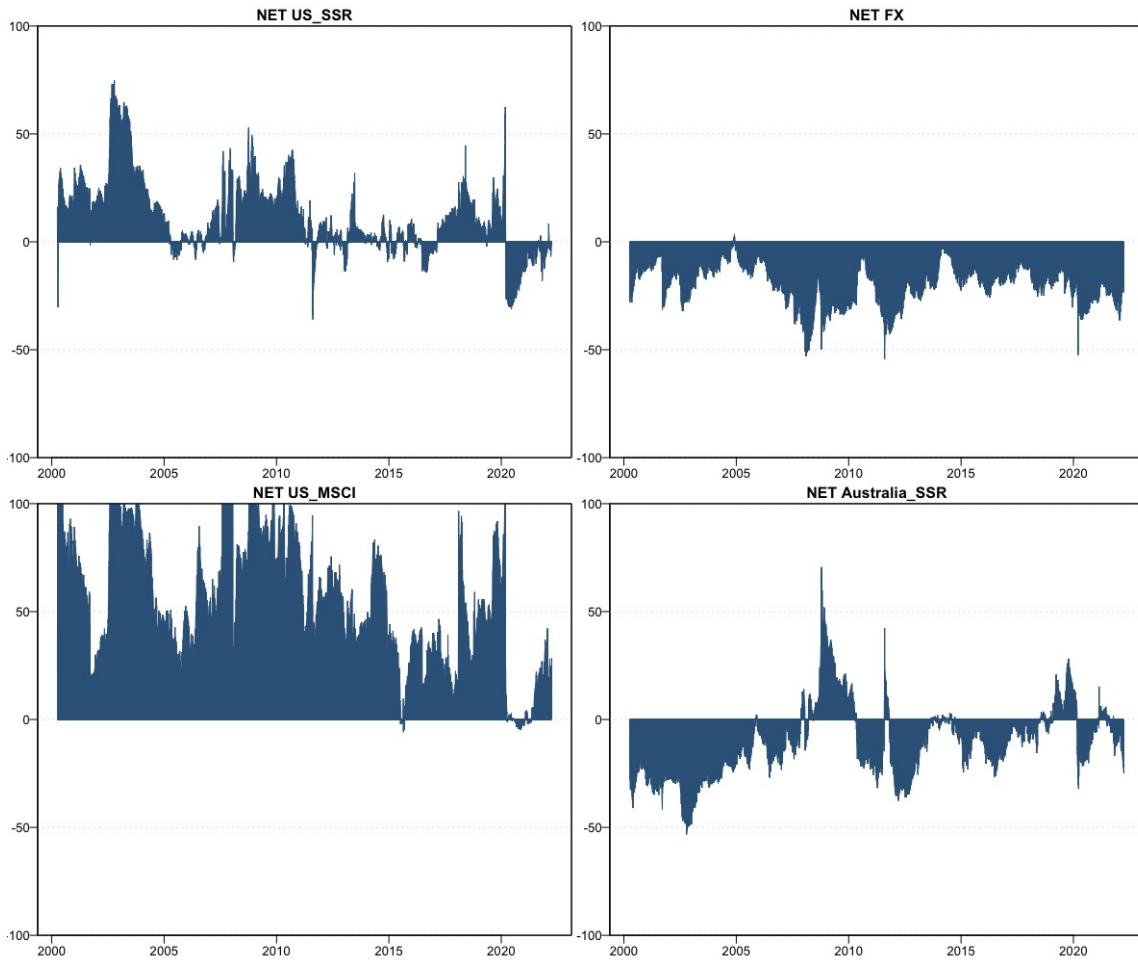


Figure A2: Dynamic net spillovers/spillbacks (NSI) – interest rate, FX and MSCI-US

Note: Results are based on TVP-VAR technique with lag length of order one (Bayesian information criterion, BIC) and a 10-step-ahead generalized forecast error variance decomposition.

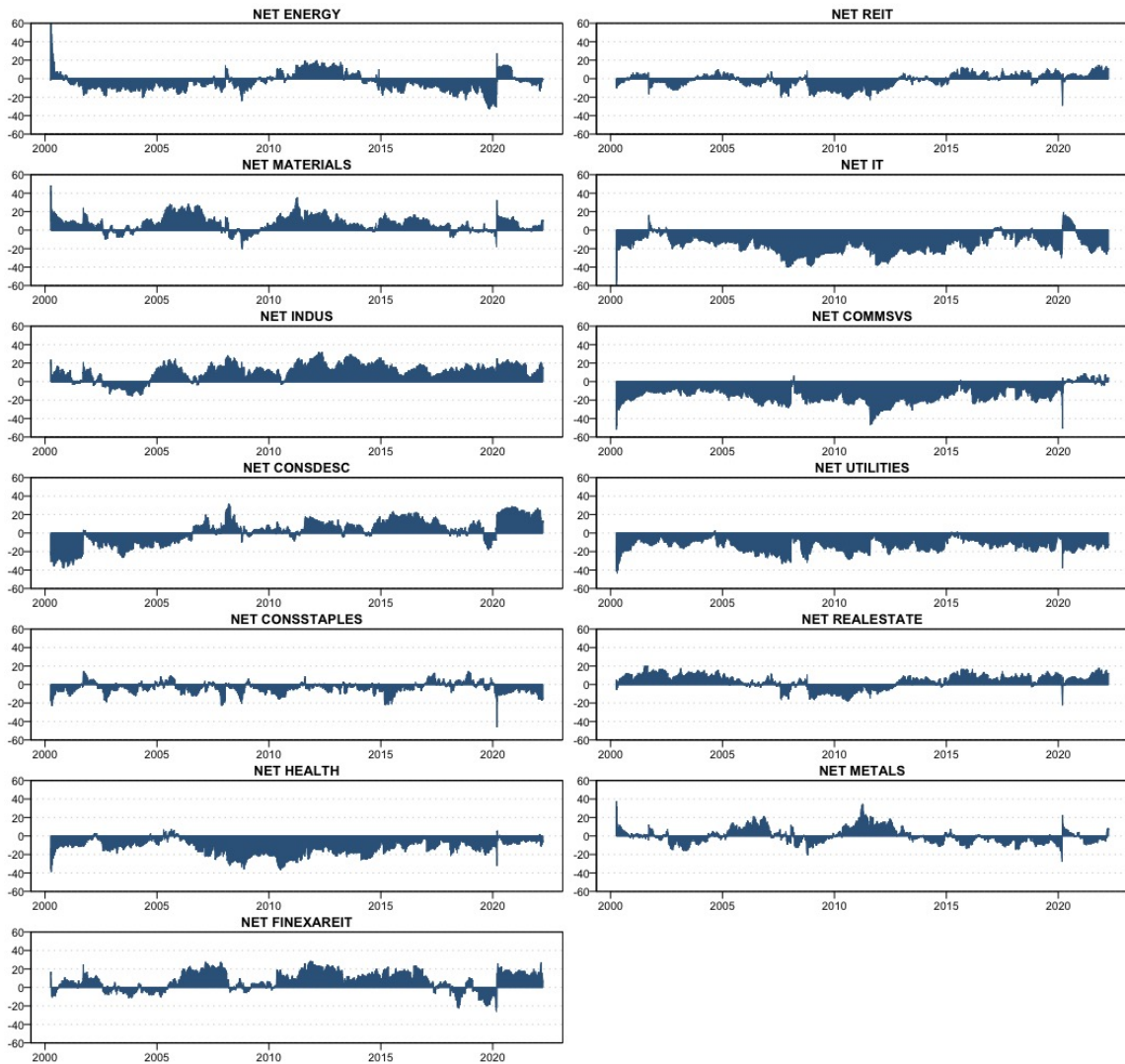


Figure A3: Dynamic net spillovers/spillbacks (NSI) – Australia's sectoral indices

Note: Results are based on TVP-VAR technique with lag length of order one (Bayesian information criterion, BIC) and a 10-step-ahead generalized forecast error variance decomposition.

## References

- Antonakakis, N., Chatziantoniou, I., Gabauer, D., 2020. Refined measures of dynamic connectedness based on time-varying parameter vector autoregressions. *Journal of Risk and Financial Management* 13, 84.
- Diebold, F.X., Yilmaz, K., 2012. Better to give than to receive: Predictive directional measurement of volatility spillovers. *International Journal of Forecasting* 28, 57–66.
- Diebold, F.X., Yilmaz, K., 2014. On the network topology of variance decompositions: Measuring the connectedness of financial firms. *Journal of Econometrics* 182, 119–134.
- Koop, G., Korobilis, D., 2014. A new index of financial conditions. *European Economic Review* 71, 101–116.