

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

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Three Channels

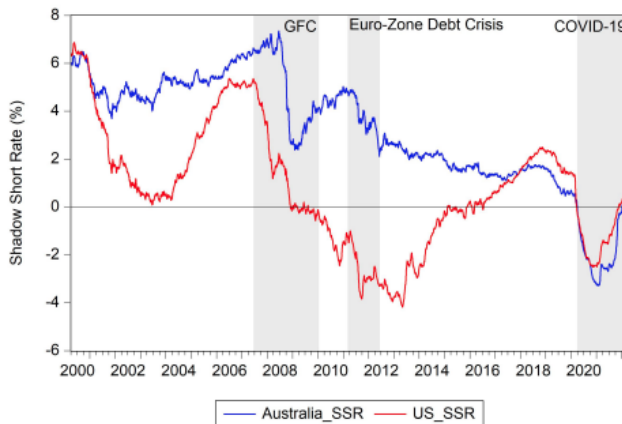
- Three channels of monetary policy shocks transmission:
 - ▶ interest rate (Antonakakis *et al.* 2019; Nsafoah & Serletis 2019)
 - ▶ asset price (Albagli *et al.* 2019; Chiang 2021)
 - ▶ exchange rate (Craine & Martin 2008; Ha 2021)

Gaps in Literature

- most studies use a single framework
- mainly focus on uni-directional spillovers
- for equity price channel
 - ▶ tend to use aggregate stock market index
- Australia's price puzzle is still not removed

Why choose Australia?

Figure 1: Time series plot of shadow short rate (SSR)



Contributions

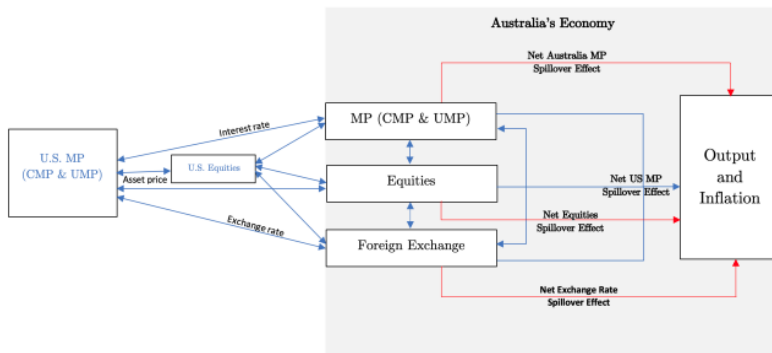
- sectoral equities instead of the aggregate equity indices
- examines all three channels in a unified framework
- remove the “prize puzzle” for Australia

Data

- SSR series for US and Australia (Krippner, 2020)
- daily data (31st March 2000 to 31st March 2022)
- 13 sectoral indices from the ASX
 - ▶ Thomson Reuters Datastream Database
- MSCI-US index
 - ▶ Thomson Reuters Datastream Database
- Exchange rate (USD/ADU)
 - ▶ Thomson Reuters Datastream Database

Flowchart

Figure 2: Flowchart of monetary policy spillovers



Empirical Methods (Spillover)

- VAR based technique of Diebold and Yilmaz (2012, 2014)
- Total Spillover Index (TSI)
- Directional spillovers index (DSI)
 - ▶ made up of 'From' and 'To' DSI
- Net spillovers index (NSI)
 - ▶ $DSI(To) - DSI(From)$
- Net pairwise spillover index (NPSI)
- Robustness
 - ▶ time-varying parameter VAR (TVP-VAR)
 - ▶ frequency domain analysis

Empirical Methods (Output and Inflation) (1 of 2)

$$\mathbf{A}(L)\mathbf{Y}_t = \varepsilon_t, \quad (1)$$

- $A(L) = I - A_0 - A_1L - \dots - A_pL^p$: lag polynomial
- ε_t : vector of orthogonalized disturbances

Empirical Methods (Output and Inflation) (2 of 2)

Vector Y_t :

$$Y_t = \begin{bmatrix} RealOutput_t \\ Inflation_t \\ Policy_t \end{bmatrix} \quad (2)$$

matrix A :

$$A = \begin{bmatrix} a_{11} & 0 & 0 \\ a_{21} & a_{22} & 0 \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \quad (3)$$

Empirical Methods (IV, Gertler & Karadi (2015)) (1 of 2)

$$\mathbf{A}\mathbf{Y}_t = \sum_{k=1}^p \mathbf{B}_k \mathbf{Y}_{t-k} + \epsilon_t, \quad (4)$$

- \mathbf{Y}_t : vector of economic variables
- \mathbf{A} and \mathbf{B}_k : vectors of conformable coefficient matrices
- ϵ_t : vector of structural shocks

Empirical Methods (IV, Gertler & Karadi (2015)) (2 of 2)

Reduced form of structural VAR:

$$\mathbf{Y}_t = \sum_{k=1}^p \Phi_k \mathbf{Y}_{t-k} + \mu_t, \quad (5)$$

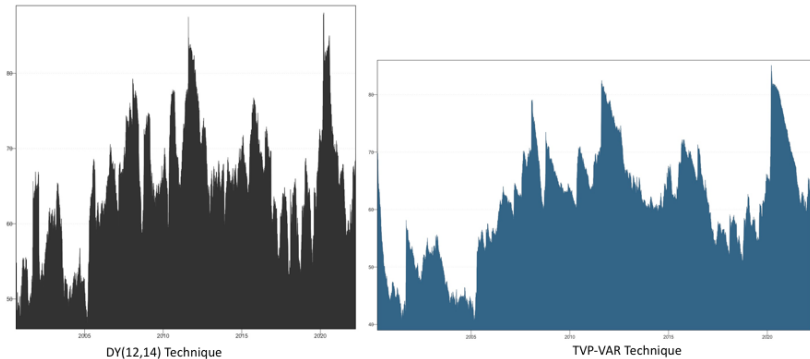
Impulse responses:

$$\mathbf{Y}_t = \sum_{k=1}^p \Phi_k \mathbf{Y}_{t-k} + \mathbf{s} \epsilon_t^p. \quad (6)$$

$$\begin{aligned} E \left[\mathbf{Z}_t \epsilon^{p'} \right] &= \phi \\ E \left[\mathbf{Z}_t \epsilon^{q'} \right] &= \mathbf{0}. \end{aligned} \quad (7)$$

Total Spillover

Figure 3: : Dynamic total spillover index (TSI)



Average dynamic total spillovers – DY (2012, 2014)

Table 1: Average dynamic total spillovers - DY (2012, 2014)

Variable	US_SSR	US_MSCI	FX	Australia_SSR	ENERGY	MATERIALS	INDUS	CONSDISC	CONSTAPLES	HEALTH	FINEXAREIT	REIT	IT	COMMSVS	UTILITIES	REALSTATE	METALS	Spillovers FROM Others
US_SSR	55.42	8.65	1.76	11.86	1.99	2.03	1.71	1.89	1.32	1.49	2.06	1.50	1.75	1.71	1.43	1.45	1.99	44.58
US_MSCI	8.32	56.37	2.08	3.97	2.58	2.69	2.55	2.72	1.80	1.92	2.91	1.79	2.02	1.97	1.82	1.92	2.58	43.63
FX	3.79	7.59	49.11	4.41	3.60	4.29	2.74	2.92	2.33	2.11	2.82	1.93	1.97	2.00	1.87	2.05	4.46	50.89
Australia_SSR	17.93	5.82	3.51	50.02	1.82	1.89	1.75	1.92	1.52	1.56	2.00	1.57	1.67	1.61	1.98	1.58	1.84	49.98
ENERGY	2.35	6.18	2.46	1.65	31.77	9.09	5.70	4.72	4.12	3.24	5.53	2.69	2.81	2.30	3.09	3.21	8.46	68.23
MATERIALS	2.27	7.68	2.47	1.49	7.57	23.77	5.14	4.36	3.32	2.32	4.71	2.09	2.74	2.15	2.43	2.33	23.15	76.23
INDUS	1.95	6.71	1.65	1.32	4.84	4.98	24.85	7.56	6.15	5.51	7.40	4.86	4.57	3.43	4.67	5.43	4.14	75.17
CONSDISC	2.69	8.97	1.63	1.53	4.18	4.53	8.00	25.94	6.13	5.13	6.91	3.94	4.79	3.55	3.98	4.40	3.79	74.06
CONSTAPLES	1.58	4.12	1.47	1.17	4.20	3.94	7.50	7.37	30.48	5.72	7.40	4.38	4.25	3.73	4.67	4.78	3.25	69.52
HEALTH	1.86	5.45	1.62	1.28	3.63	3.13	7.19	6.64	6.32	33.62	5.67	3.95	5.05	3.28	4.40	4.36	2.55	66.38
FINEXAREIT	2.47	6.22	1.64	1.45	4.81	4.77	7.82	6.92	6.50	4.46	25.93	5.13	4.12	3.66	4.27	5.94	3.90	74.07
REIT	1.63	3.65	1.23	1.26	2.68	2.37	5.53	4.35	4.11	3.34	5.59	27.35	2.44	2.95	4.12	25.40	1.99	72.65
IT	2.33	7.18	1.59	1.73	3.57	3.93	6.56	6.25	5.09	5.13	5.47	3.11	34.53	3.38	3.37	3.45	3.32	65.47
COMMSVS	1.93	3.85	1.48	1.38	3.00	3.06	5.20	4.89	5.00	3.67	5.24	3.72	3.67	43.45	3.74	4.01	2.71	56.55
UTILITIES	1.72	3.77	1.24	1.59	4.45	3.25	6.65	5.54	5.52	4.55	5.89	5.24	3.29	3.27	35.62	5.63	2.78	64.38
REALSTATE	1.58	3.95	1.24	1.24	2.94	2.54	5.94	4.67	4.28	3.51	6.15	24.13	2.62	2.98	4.25	25.97	2.10	74.13
METALS	2.35	7.31	2.69	1.49	7.59	24.94	4.59	3.89	2.92	2.01	4.14	1.86	2.45	2.00	2.21	2.65	25.60	74.40
Spillovers TO Others	56.59	97.09	29.78	38.84	63.48	81.43	84.58	76.40	66.44	55.66	79.99	71.90	56.22	43.97	52.00	77.98	73.00	1100.32
Spillovers Inc. Own	112.01	153.46	78.87	88.87	95.23	105.20	109.41	102.54	96.93	89.29	105.82	99.24	84.75	87.42	88.52	103.85	98.60	
Net Spillovers/Spillover	12.01	53.40	-21.13	-11.13	-4.77	5.80	8.41	2.54	-3.07	-10.72	5.82	-6.76	-15.85	-12.58	-11.48	3.85	-1.40	
Sectoral equity analysis																		
Spillovers to Sectoral Indices	26.53	75.01	22.41	18.61	52.16	70.53	75.83	67.16	59.16	48.59	70.10	65.10	12.80	36.68	45.80	70.59	62.11	
Spillovers From Sectoral Indices	22.32	29.27	35.09	22.71	55.56	62.31	63.54	59.23	61.19	56.17	62.3	64.87	52.63	17.91	56.06	66.11	60.65	
Net Spillovers/Spillover to Sectoral Indices	4.21	45.77	-12.68	-4.10	-2.10	8.22	12.28	7.83	-1.73	-7.58	7.80	0.23	-8.83	-11.23	-10.26	4.88	1.49	

Summary of Average net pairwise spillovers of US MP

Interest rate channel : 17.93% - 11.86% = 6%

Asset Price channel : 26.53 - 22.32 = 4%

Exchange rate channel : 3.79% - 1.76% = 2%

Main Channel: Consumer discretionary 0.71%

Average dynamic total spillovers – TVP-VAR

Table 2: Average dynamic total spillovers - TVP-VAR

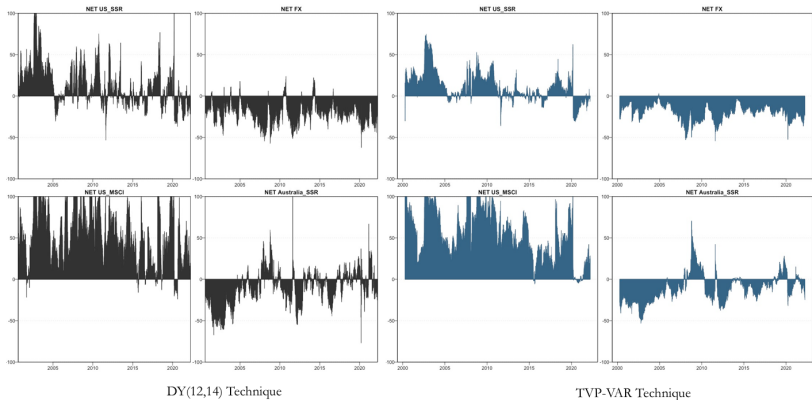
Variable	US_SSR	US_MSCI	FX	Australia_SSR	ENERGY	MATERIALS	INDUS	CONSDISC	CONSSAPLES	HEALTH	FINEXAREIT	REIT	IT	COMMSVS	UTILITIES	REALESTATE	METALS	Spillovers FROM Others
US_SSR	66.44	8.24	0.98	10.71	1.34	1.53	0.95	1.17	0.65	0.71	1.42	0.85	1.16	0.85	0.63	0.89	1.48	33.56
US_MSCI	8.01	63.43	1.35	3.24	2.18	2.36	2.28	2.53	1.33	1.34	2.7	1.3	1.74	1.38	1.17	1.41	2.26	36.57
FX	2.14	6.18	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	1.72	4.55	40.8
Australia_SSR	17.18	5.71	3.15	59.91	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
ENERGY	1.78	5.61	2	1.07	33.31	9.83	5.87	4.54	4.16	3.01	5.8	2.64	2.63	1.92	3.44	3.26	9.12	66.69
MATERIALS	1.6	7.22	2.11	0.98	8.18	25.36	5.23	4.18	3.35	1.99	4.89	1.75	2.55	1.72	2.15	2.02	24.72	74.64
INDUS	1.39	6.16	1.15	0.81	4.84	5.1	26	7.81	6.3	5.44	7.8	4.89	4.69	3.03	4.77	5.67	4.14	74
CONSDISC	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
CONSSAPLES	0.92	3.88	0.95	0.6	4.31	4.15	7.85	7.28	31.51	5.78	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	36.48	5.84	3.63	5.09	3.17	4.3	4.21	2.16	63.32
FINEXAREIT	1.71	5.82	1.14	0.89	5.04	5.03	8.21	7.02	6.88	4.34	27.07	5.36	3.92	3.2	4.1	6.23	4.03	72.93
REIT	0.86	3.2	0.85	0.89	2.69	2.1	5.72	4.38	3.93	3.03	5.98	29.22	2	2.46	4.04	26.98	1.67	70.78
IT	1.77	7	0.81	0.88	3.38	3.82	6.97	6.58	5.12	5.19	5.45	2.58	37.79	3.13	3.29	3.1	3.14	62.21
COMMSVS	0.98	3.67	0.68	0.68	2.6	2.74	5.04	4.96	5.07	3.02	5.08	3.3	3.63	48.42	3.43	3.75	2.36	51.58
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	2.31	2.61	4.19	27.36	1.82	72.64
METALS	1.58	6.83	2.34	1	8.23	26.78	4.56	3.65	2.87	1.6	4.22	1.47	2.21	1.56	1.9	16.68	27.51	72.49
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	
Spillovers Inc. Own	111.38	154.9	80.06	88.94	95.98	107.31	111.16	102.14	96.1	87.24	107.48	98.08	83.97	85.08	86.03	103.95	99.99	
Net Spillover/Spillover	11.58	54.90	-19.94	-11.06	-4.02	7.31	11.16	2.14	-3.90	-12.76	7.48	-1.92	-16.03	-14.92	-13.97	3.95	-0.01	TSI = 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	60.21	46.80	72.58	64.08	41.34	32.69	44.14	71.61	62.70	
Spillovers From Sectoral Indices	13.63	23.98	28.54	14.04	56.22	62.73	64.48	58.32	62.15	55.69	63.36	64.98	51.75	45.58	55.98	66.63	60.73	
Net Spillovers/Spillover to Sectoral Indices	4.18	47.36	-13.16	-2.90	-1.94	9.49	14.03	9.12	-1.94	-8.89	9.22	-0.90	-10.41	-12.89	-11.84	4.98	1.97	

Summary of Average net pairwise spillovers of US MP

To From
 Interest rate channel : 17.18% - 10.71% = 6%
 Asset Price channel : 17.81% - 13.63% = 4% → Main Channel: Consumer discretionary 0.93%
 Exchange rate channel : 2.14% - 0.98% = 1%

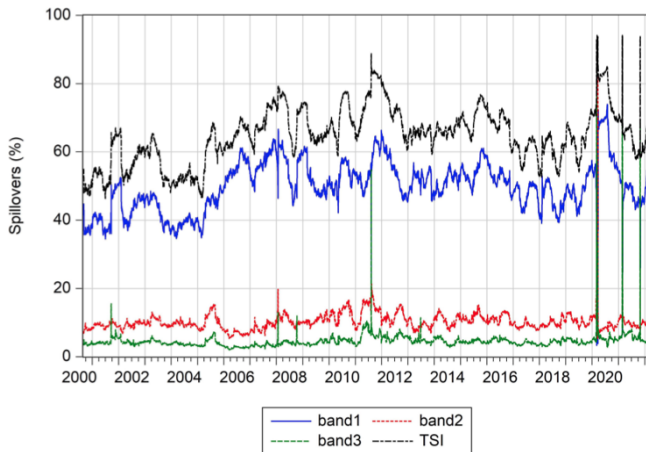
Dynamic net spillovers

Figure 4: Dynamic net spillover index (NSI)



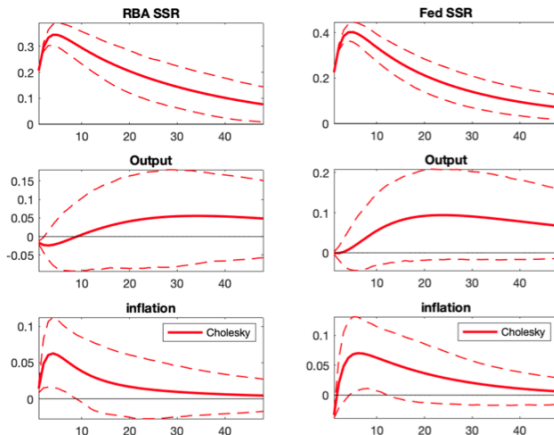
Frequency domain analysis

Figure 5: Dynamic total and frequency spillovers



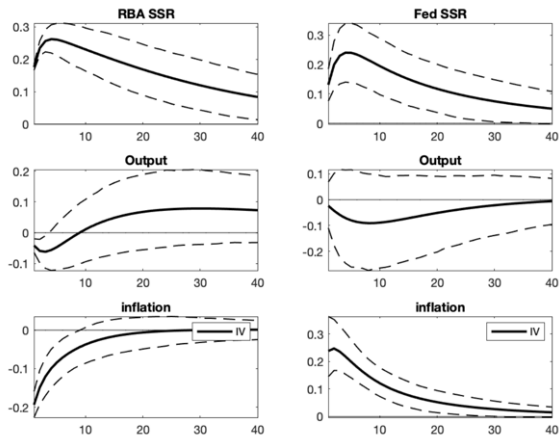
Monetary policy on output and inflation

Figure 6: Impulse response function



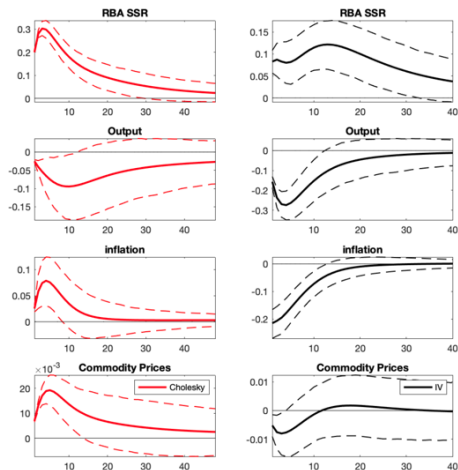
Monetary policy on output and inflation (IV)

Figure 7: Impulse response function



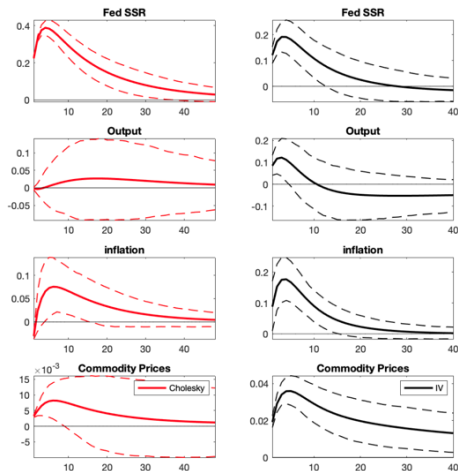
RBA Monetary policy on output and inflation

Figure 8: Impulse response function



FED Monetary policy on output and inflation

Figure 9: Impulse response function



Summary of Findings

- Spillovers are heterogeneous over time.
 - ▶ peak during COVID-19 pandemic
- U.S. MP has a dominant spillover effect on AUS financial markets.
 - ▶ main transmission: interest rate channel
 - ▶ then asset price channel (consumer discretionary)
- Australia's MP is a net receiver of spillovers
- Spillovers can be used as external IV to remove prize puzzle.
- Fed's monetary policy may undermine RBA's monetary policy.

Conclusions and Policy Implications

- High spillovers in periods of crises should be a concern.
 - ▶ monetary authorities
 - ▶ financial market participants
- RBA need to adjust its monetary policy stance.
 - ▶ considering the dominance of US MP on AUS economy