Hegemon, What Hegemon?

The Elusive Spillovers of British and American Monetary Policies until WWII

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Motivation

United States has special status (hegemony) in international finance:

1. **US monetary policy has large effect on rest of the world** (Miranda-Aggrippino and Rey, 2020)
2. Safe haven: dollar appreciates in bad times (Lustig et al., 2014)
3. Exorbitant privilege/duty (Gourinchas and Rey, 2007, Atkeson et al., 2025)
4. Dominant reserve currency (Eichengreen et al., 2017)
5. Disproportionate share of trade invoiced in dollars (Gopinath et al., 2020)

Common interpretation: before the United States, there was the United Kingdom (Kindleberger, 1996, Eichengreen, 2011)

This paper: really?

Limited Interest Rate Spillovers

Construct new shocks for British monetary policy (1885–1914, 1919–38):

- Betting shocks: use betting odds to measure expectations
- Bill shocks: 1-day change in 3-month money market interest rates
- Narrative shocks: change in policy rate purged from committee's information
  $\hookrightarrow$ extension of Lennard (2018)

Study the effect of British monetary policy:

- Expected effect at home: $\xi^{GB} > 0 \Rightarrow \uparrow i^{GB}, \downarrow Y^{GB}, \downarrow P^{GB}$
- Muted interest rate spillovers to other developed economies: $\uparrow i^{GB} \not\Rightarrow \uparrow i^{-GB}$
- Attracts capital flow: $\uparrow i^{GB} \Rightarrow \uparrow$ gold reserve

Surprising for two reasons:

1. Findings contrast with modern United States
2. Gold standard is a system of quasi-fixed exchange rates

Model: Imperfect Capital Mobility

Empirical facts point toward imperfect capital mobility:

- Currency arbitrageurs have limited financial capacity
- Monetary shock opens an interest rate spread and draws capital in/out
- Gold must flow to prevent exchange rate movement

Main insights:

- Britain: higher i.r. pass-through implies lower ability to attract reserves (hegemon paradox)
- Rest of the world: choice between domestic and reserve stabilization

Quantitative counter-factual (w.i.p.):

- Can estimate semi-elasticity of capital flows w.r.t. return differential
- How much insulation can imperfect capital mobility provide?

Theory Validation: Interwar

Construct new monetary shocks for US monetary policy (1919–38):

- Bill shocks: 1-day change in 3-month money market interest rates

Interest rate spillovers depend on the country:

- High pass-through to Britain/Germany: $\uparrow i^{US} \Rightarrow \uparrow i^{GB}, i^{DE}$
- No pass-through to France: $\uparrow i^{US} \not\Rightarrow \uparrow i^{FR}$

$\hookrightarrow$ BoE and Reichsbank cannot afford to lose their thin gold reserves

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Historical Background

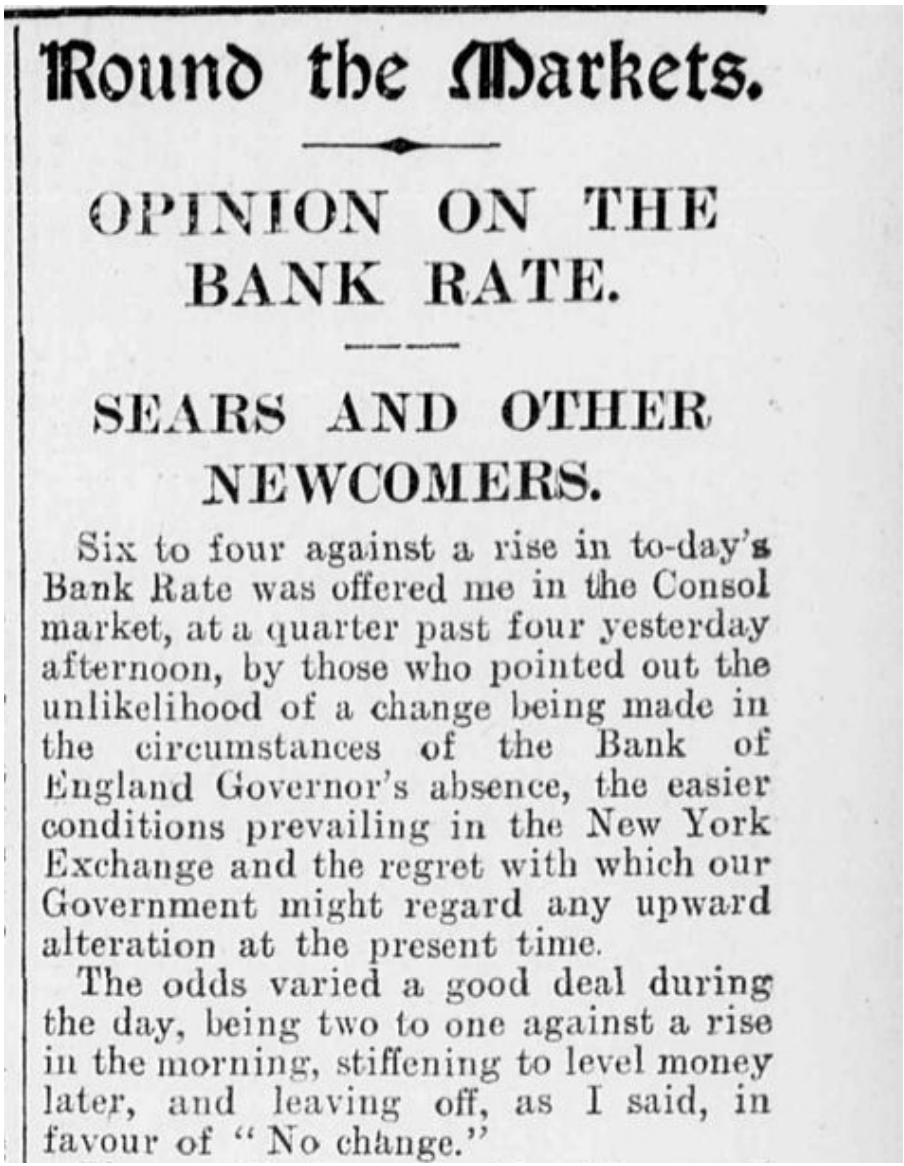
Gold standard:

- 1873–1914: classical gold standard
- 1914–18: European countries suspend gold convertibility
- Interwar gold standard:
  - 1924–31: Germany rejoins with new currency
  - 1925–31: Britain rejoins at pre-WWI parity
  - 1926–36: France rejoins at 80% depreciated parity
  - 1933: US dollar devalued

Central banks:

- Central bank creations: England (1694), France (1800), Reichsbank (1876), Federal Reserve (1913–14)
- Policy rate: discount rate — "Bank rate" in England
- Money market instrument: banker's acceptance

Betting Odds



Round the Markets.

OPINION ON THE BANK RATE.

SEARS AND OTHER NEWCOMERS.

Six to four against a rise in to-day's Bank Rate was offered me in the Consol market, at a quarter past four yesterday afternoon, by those who pointed out the unlikelihood of a change being made in the circumstances of the Bank of England Governor's absence, the easier conditions prevailing in the New York Exchange and the regret with which our Government might regard any upward alteration at the present time.

The odds varied a good deal during the day, being two to one against a rise in the morning, stiffening to level money later, and leaving off, as I said, in favour of "No change."

Source: *Financial Times*, February 7, 1929

Betting odds on the "Bank rate:"

- Not an organized market: seems recreational, but established enough that newspapers often report the odds
- First quote in 1855, become more frequent in 1890s, systematic in the interwar
- Sample:
  - 1885–1914: 60 quotes
  - 1919–1938: 75 quotes
- Sources: *Financial Times*, *Financial News*, *Manchester Guardian*, *Times of London*

Betting Shock Construction

- Consider rate-change ternary variable D_t:

$$D_t = \begin{cases} 1, & \text{if rate hike} \\ 0, & \text{if no change} \\ -1, & \text{if rate cut} \end{cases}$$

- The expected value of D_t is:

$$E_{t-}[D_t] = \begin{cases} p_t, & \text{if rate hike is expected} \\ 0, & \text{if no change is expected} \\ -p_t, & \text{if rate cut is expected} \end{cases}$$

- If direction is correctly anticipated, the shock is:

$$\xi_t^{bet} \equiv D_t - E_{t-}[D_t] = \begin{cases} 1 - p_t, & \text{if rate hike} \\ p_t, & \text{if no change and expected cut} \\ -p_t, & \text{if no change and expected hike} \\ -(1 - p_t), & \text{if rate cut} \end{cases}$$

- Examples:
  - Rate hike expected with probability of 50% happens: $\xi_t^{bet} = 1 - 0.5 = 0.5$
  - Rate cut expected with probability of 25% doesn't happen: $\xi_t^{bet} = 0.25$

BoE Shocks

1. Betting shocks

   ↪ cleanest but less frequent

2. Bill shocks: daily change in 3-month money market rate
   - Committee ("Court of Directors") meets every Thursday
   - Financial instruments: bank or Treasury bill

   ↪ more exhaustive but potentially contaminated by background noise

3. Narrative shocks (Lennard, 2018):

$$\Delta i_m = \phi_0 + \phi_1 i_{m-1} + x'_m \Phi + \xi_m^{nar}$$

   where:
   - i_m is the Bank rate
   - x_m are variables in internal documents prepared by the staff (gold reserve, exchange rates, prices...)

   ↪ more power but potentially contaminated by anticipations

BoE Shocks: Statistics

	1885–1914		1919–1938	
	N	S.d.	*N*	S.d.
Betting	60	0.50	75	0.51
Bank bill	1,257	0.12	1,053	0.09
Treasury bill	.	.	702	0.09
Narrative	1,261	0.21	828	0.08

Note: number of observations (N) and standard deviations (s.d.) of betting, bill, and narrative shocks. Betting shocks are probability changes, other shocks are expressed in percentage points.

BoE Shock Correlations

	Betting	Bank bill	Treasury bill	Narrative
		1885–1914		
Betting	1.00	.	.	.
Bank bill	0.54	1.00	.	.
Treasury bill	.	.	.	.
Narrative	0.70	0.66	0.66	1.00
		1919–1938		
Betting	1.00	.	.	.
Bank bill	0.47	1.00	.	.
Treasury bill	0.47	0.99	1.00	.
Narrative	0.67	0.66	0.66	1.00

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Specification

2SLS regression:

$$\Delta y_t = \alpha + \beta \Delta i_t + e_t$$

where:

- y_t: interest rate or log of stock market index
- i_t: Bank rate/money market rate
- instrument: betting or bill shocks

First Stages

	Classical		Interwar		1925–31	
	(1) Betting	(2) B-bill	(3) Betting	(4) B-bill	(5) Betting	(6) B-bill
			Bank rate			
Shock	0.77***	0.95***	0.54***	0.99***	0.51***	1.27***
	(0.12)	(0.09)	(0.07)	(0.20)	(0.08)	(0.10)
Observations	60	1,257	75	1,053	42	335
F-statistic	41	124	57	25	37	151
			Bank bill rate			
Shock	0.26***	1.00***	0.25***	1.00***	0.23***	1.00***
	(0.05)	(0.00)	(0.06)	(0.00)	(0.06)	(0.00)
Observations	51	1,257	75	1,053	42	335
F-statistic	21	∞	17	∞	12	∞

Note: betting shock coefficients and standard errors are multiplied by 100 for visual convenience.

FTSE30

	Classical		Interwar		1925–31	
	(1) Betting	(2) B-bill	(3) Betting	(4) B-bill	(5) Betting	(6) B-bill
			1-day window			
Bill rate	-1.19*	-0.28**	-1.46**	-0.88***	-1.56***	-1.25***
	(0.70)	(0.13)	(0.60)	(0.24)	(0.57)	(0.26)
Observations	38	786	75	2,060	42	665
			2-day window			
Bill rate	-0.54	-0.19	-1.67*	-0.99***	-1.43	-1.68***
	(0.95)	(0.23)	(1.00)	(0.32)	(1.12)	(0.33)
Observations	38	786	75	2,060	42	665

Monthly VAR: Specification

- Macroeconomic variables should not be expected to respond within a day
- Endogenous variables:
  - Bank rate
  - London money market rate
  - Wholesale prices
  - Unemployment
- Specification:
  - 12 lags (1 year)
  - Shock as external IV for Bank rate
  - Minnesota prior

VAR: Macroeconomic Effect (1885–1914)

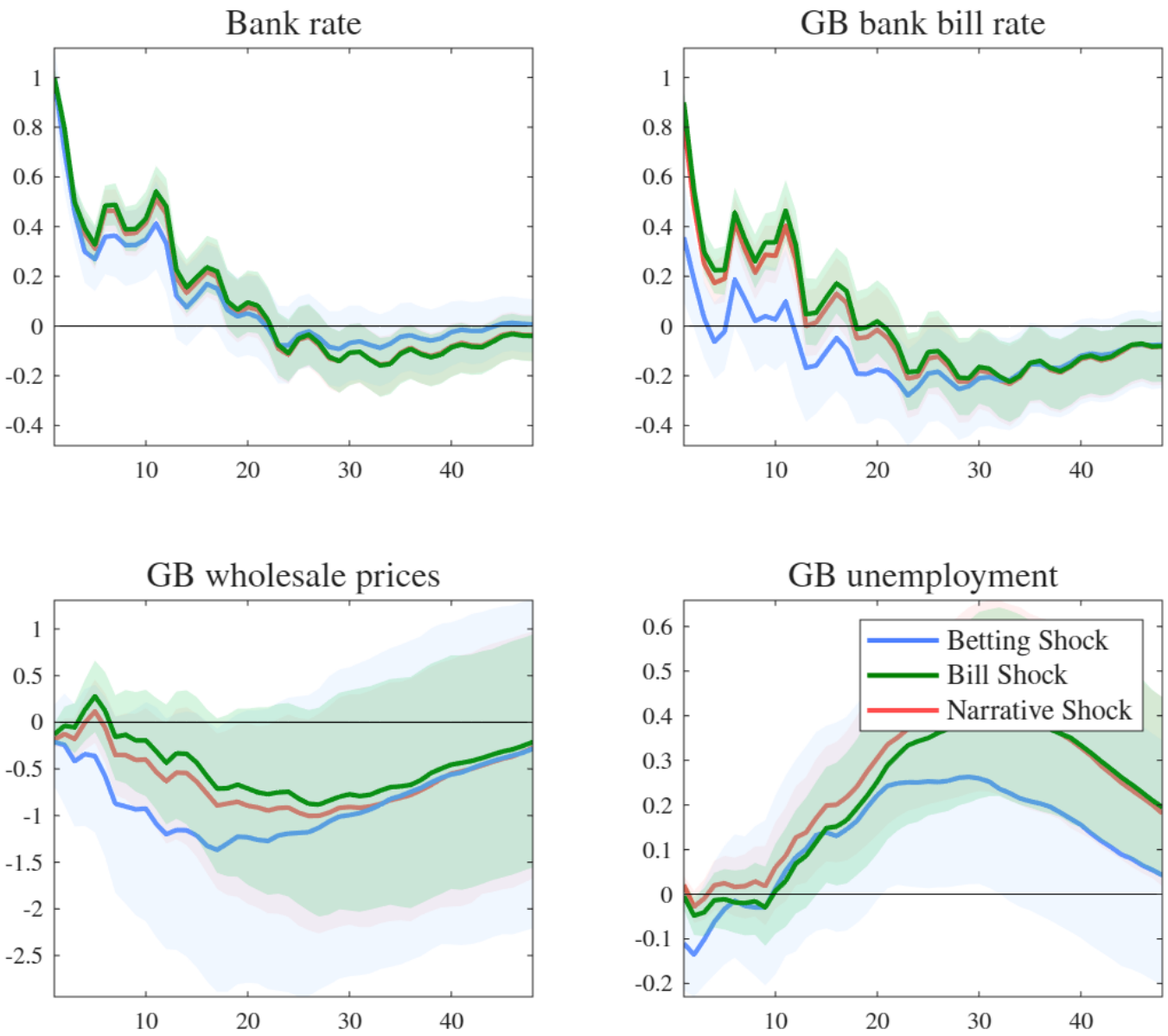


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GB Spillovers: United States

	1885–1914		1919–38		1925–31	
	(1) Betting	(2) B-bill	(3) Betting	(4) B-bill	(5) Betting	(6) B-bill
			Commercial paper			
Bill rate	0.00	0.00	-0.01	0.01	-0.03	0.07**
	(0.15)	(0.05)	(0.06)	(0.03)	(0.08)	(0.03)
Observations	44	1,023	72	1,820	41	620
			Call loan			
Bill rate	-0.14	-0.33	0.35	0.02	0.12	-0.21
	(0.67)	(0.42)	(0.57)	(0.14)	(0.96)	(0.25)
Observations	49	1,174	74	1,924	41	620
			Banker's acceptance			
Bill rate			0.14*	0.03	0.14	0.05**
			(0.09)	(0.03)	(0.11)	(0.02)
Observations			73	1,923	41	622
			Dow Jones			
Bill rate	1.69	0.10	-0.81	-1.02**	2.34	-0.71
	(1.03)	(0.27)	(2.30)	(0.47)	(3.02)	(0.82)
Observations	49	1,189	73	1,930	41	625

GB Spillovers: France and Germany (classical)

	Betting		B-bill	
	(1) Paris	(2) Berlin	(3) Paris	(4) Berlin
1-day window (Wednesday–Thursday)				
Pass-through	0.07	-0.05	0.06**	0.07**
	(0.13)	(0.12)	(0.03)	(0.03)
Observations	29	44	755	1,021
7-day window (Wednesday–Wednesday)				
Pass-through	0.06	-0.31	0.10**	0.27***
	(0.18)	(0.33)	(0.04)	(0.05)
Observations	32	41	743	1,000

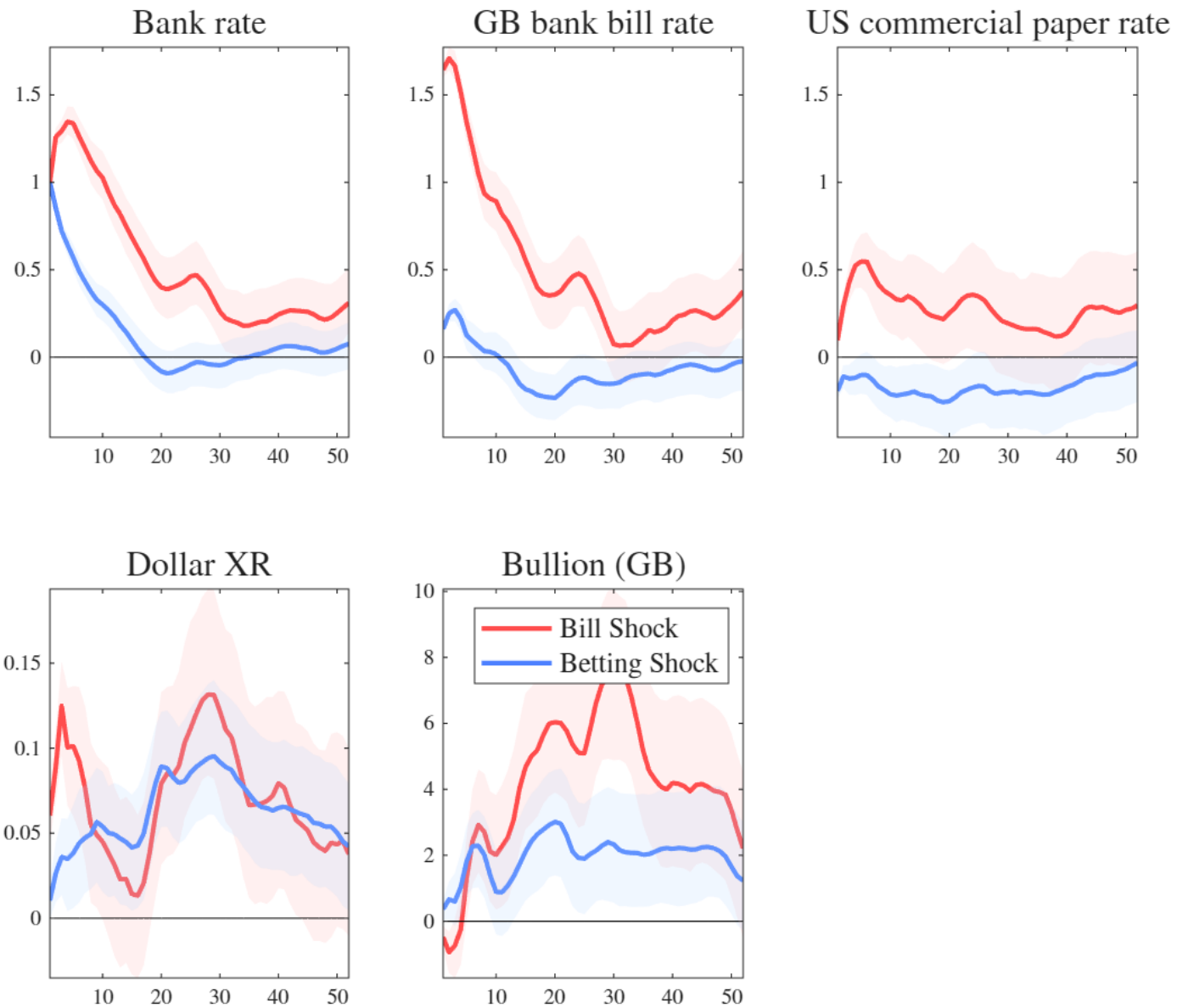
GB Spillovers: Interwar

	Betting			B-bill		
	(1) NYC	(2) Paris	(3) Berlin	(4) NYC	(5) Paris	(6) Berlin
1-day window (Wednesday–Thursday)						
Pass-through	0.14	0.03	0.44	0.05**	-0.01	0.11**
	(0.11)	(0.18)	(0.29)	(0.02)	(0.03)	(0.05)
Observations	41	31	28	622	408	382
2-day window (Wednesday–Friday)						
Pass-through	0.09	-0.18	0.23	0.04	-0.13	0.08
	(0.09)	(0.19)	(0.16)	(0.02)	(0.08)	(0.07)
Observations	40	33	30	309	217	200
7-day window (Wednesday–Wednesday)						
Pass-through	0.05	-0.03	0.19	0.06**	-0.04	0.07
	(0.15)	(0.15)	(0.24)	(0.03)	(0.08)	(0.09)
Observations	40	33	30	318	215	189

Weekly VAR: Specification

- Gold stock should not be expected to respond within a day
- Endogenous variables:
  - Bank rate
  - London money market rate
  - NYC commercial paper rate
  - Sterling-dollar exchange rate
  - BoE's gold stock
- Specification:
  - 52 lags (1 year)
  - Betting/bill shock as external IV
  - Minnesota prior

Weekly VAR: Gold Stock (1885–1914)



Takeaway

- Monetary policy shock at the BoE triggered:
  - Strong response of domestic interest rates and other variables
  - No response of international interest rates or stock markets
- Runs against conventional narratives:
  - Keynes (1930): "conductor of the international orchestra"
  - Jordà et al. (2020): pass-through of 0.40 (0.09), 1870–1938
  - Bazot et al. (2022, 2024):
    - Central banks in continental Europe smoothed shocks $\Rightarrow$ p.t. $\in (0.1, 0.3)$
    - No central banks in the US $\Rightarrow$ p.t. $\in (0.2, 0.6)$
- Probable resolution: higher frequency and cleaner identification

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Model: Core Mechanism

- Contractionary monetary policy opens a return differential that draws capital
- Gold flows to prevent exchange rate appreciation
- Imperfect capital mobility prevents full closure of the spread
  (Gabaix and Maggiori, 2015, Fanelli and Straub, 2021, Itskhoki and Mukhin, 2021)

Environment

- Time is continuous—time index is omitted: $X(t)$ is denoted X
- Many countries:
  - Indexed by j
  - Country size is its relative output: $S^j = \bar{Y}^j / \sum_k \bar{Y}^k$
  - Central bank:
    - sets nominal interest rate i^j
    - commits to buy and sell gold at nominal price $\mathcal{E}^j$
  - Exchange rate between country j and k: XR^{jk}
- 4 types of agents (in each country):
  - Gold arbitrageurs: arbitrage gold price differences across countries
  - Financial arbitrageurs: arbitrage return differences across currencies
  - Representative household: can only buy domestic currency bonds
  - Representative firm: linear production in labor

Gold Arbitrageurs

- Arbitrageurs ship SH^{jk} of gold from k to j at a cost (Canjels et al., 2004):

$$\Pi_G^{jk} = \left(\mathcal{E}^j - \mathcal{E}^k XR^{jk}\right) SH^{jk} - \mathcal{E}^j \left(c_1 \left|SH^{jk}\right| + \tfrac{c_2}{2}(SH^{jk})^2\right)$$

- Optimal gold flow has an inaction band around gold parity $\mathcal{E}^j/\mathcal{E}^k$:

$$SH^{jk} = \begin{cases} \dfrac{1}{c_2}\left(1 - \dfrac{XR^{jk}}{\mathcal{E}^j/\mathcal{E}^k} - c_1\right) & \text{if} \quad 1 - \dfrac{XR^{jk}}{\mathcal{E}^j/\mathcal{E}^k} > c_1, \\ 0 & \text{if} \quad \left|1 - \dfrac{XR^{jk}}{\mathcal{E}^j/\mathcal{E}^k}\right| \leq c_1, \\ -\dfrac{1}{c_2}\left(\dfrac{XR^{jk}}{\mathcal{E}^j/\mathcal{E}^k} - 1 - c_1\right) & \text{if} \quad \dfrac{XR^{jk}}{\mathcal{E}^j/\mathcal{E}^k} - 1 > c_1. \end{cases}$$

- Free arbitrage ($c_1, c_2 \to 0$) pins the exchange rate to parity:

$$XR^{jk} = \frac{\mathcal{E}^j}{\mathcal{E}^k}$$

Financial Arbitrageurs

- Intermediaries with participation cost f choose $x^{jk}(f)$ to maximize profit:

$$\left(i^j - i^k - E_t\dot{xr}^{jk}\right) x^{jk}(f) - f\left|x^{jk}(f)\right| \quad \text{subject to:} \quad x^{jk}(f) \in [-\bar{x}^{jk}, \bar{x}^{jk}]$$

  where $E_t\dot{xr}^{jk}$ is the expected depreciation rate of the exchange rate

- For $\bar{x}^{jk}$, we assume:

$$\bar{x}^{jk} \propto \bar{P}^j(\mathcal{E}^j)\frac{S^j S^k}{\Gamma}$$

  where $\bar{P}^j(\mathcal{E}^j)$ is the steady state price level for nominal gold price $\mathcal{E}^j$

- Summing across markets, total demand for currency-j bonds:

$$\frac{B^j}{\bar{P}^j\bar{Y}^j} \approx \frac{1}{\Gamma}\left(i^j - i^* - E_t\dot{xr}^{j*}\right)$$

  where i^* and xr^{j*} are the world interest/exchange rate

Interpretation

Γ^{-1} is the semi-elasticity of bond demand with respect to return differentials.

Net Foreign Assets (NFA)

- Net foreign asset positions are held as gold reserves net of bond liabilities:

$$NFA^j = \mathcal{E}^j G^j - B^j$$

- Substituting bond demand, gold reserves reflect NFA and return differential:

$$\frac{\mathcal{E}^j G^j}{\bar{P}^j \bar{Y}^j} \approx \frac{NFA^j}{\bar{P}^j \bar{Y}^j} + \frac{1}{\Gamma}\left(i^j - i^* - E_t \dot{x}r^{j*}\right)$$

- Given NFA^j, UIP deviation in favor of currency j attracts gold:

$$\uparrow \left(i^j - i^* - E_t \dot{x}r^{j*}\right) \Rightarrow \uparrow G^j$$

▸ Identification

Central Bank

- Bank rate responded to gold reserves, exchange rate, and coverage ratio (Lennard, 2018)
- Central bank follows a Taylor rule:

$$i^j = \rho - \psi_g^j \left(g^j - \bar{g}^j\right) + \psi_x^j \left(xr^{j*} - \left(\epsilon^j - \epsilon^*\right)\right) + \psi_m^j \left(\lambda^j + m^j - \left(\epsilon^j + g^j\right)\right) + \xi^j$$

  where lower case letters denote logarithms and λ^j is the target gold to liability ratio: $\lambda^j = \log\left(\mathcal{E}^j \bar{G}^j / \bar{M}^j\right)$

- For analytical convenience, we assume:

$$c_1, c_2 \to 0 \quad \Rightarrow \quad xr^{j*} = \epsilon^j - \epsilon^*$$

Rest of Model

- In each country, the representative household maximizes:

$$\int_0^\infty e^{-\rho t}\left[\frac{(C^j)^{1-\theta}-1}{1-\theta}+\bar{m}\frac{(M^j/P^j)^{1-\chi}-1}{1-\chi}-\bar{n}\frac{(N^j)^{1+\varphi}}{1+\varphi}\right]\mathrm{d}t$$

- Nested CES over domestic foreign goods:

$$\text{domestic/foreign bundle:}\quad C^j=\left[(1-\iota)^{\frac{1}{\zeta}}(C_H^j)^{\frac{\zeta-1}{\zeta}}+\iota^{\frac{1}{\zeta}}(C_F^j)^{\frac{\zeta-1}{\zeta}}\right]^{\frac{\zeta}{\zeta-1}}$$

$$\text{import bundle:}\quad C_F^j=\left[\sum_k(\nu^{jk})^{\frac{1}{\eta}}(C_F^{jk})^{\frac{\eta-1}{\eta}}\right]^{\frac{\eta}{\eta-1}}$$

- Production function is linear in labor: $Y^j=A^jN^j$
- Prices are flexible, but wages are rigid *à la* Calvo

▸ FOCs

Experiment

- World economy starts in symmetric steady state
  - Wages are completely rigid, so all relative prices are 1 throughout
- AR(1) contractionary monetary shock in Britain: $\xi^{GB} > 0$
- Two polar cases:
  1. Full interest rate pass-through: $i^k = i^{GB}$ for all k
  2. No interest rate pass-through: $i^k = \rho$ for $k \neq GB$

	$i^k = i^{GB}$	$i^k = \rho$
Consumption	$\downarrow C^{GB} = \downarrow C^k$	$\downarrow C^{GB}$, $\mathrm{d}C^k = 0$
Output	$\downarrow Y^{GB} = \downarrow Y^k$	$\downarrow Y^{GB}$, $\downarrow Y^k$
Gold	$\mathrm{d}G^{GB} = \mathrm{d}G^k = 0$	$\uparrow G^{GB}$, $\downarrow G^k$

Reserves or Hegemony

City of London proverb (1907?):

> *7% brings gold from the moon.*

Keynes (1930):

> *During the latter half of the nineteenth century, the influence of London on credit conditions throughout the world was so predominant that the Bank of England could almost have claimed to be the conductor of the international orchestra.*

Model highlights the tension between these views:

- "Gold from the moon" view requires incomplete pass-through ($\mathrm{d}i^k/\mathrm{d}i^{GB} < 1$)
- "Conductor" view ($\mathrm{d}i^k/\mathrm{d}i^{GB} = 1$) implies that no gold flows

$\hookrightarrow$ Hegemony comes at the expense of reserve accumulation
$\hookrightarrow$ Empirical results are consistent with the "gold from the moon" view

Running Out of Gold

We have assumed that foreign central bank always had enough gold to service gold loss, what if does not?

- Can capture this with a constraint of the form:

$$\underline{\Lambda}^j M^j \leq \mathcal{E}^j G^j$$

- Using the money demand equation to substitute out the money supply:

$$i^j \geq \bar{m} \left(\frac{\underline{\Lambda}^j P^j}{\mathcal{E}^j G^j} \right)^{\chi} (C^j)^{\theta}$$

- Seems to describe British experience in interwar era

▸ US spillovers

Conclusion

Main findings:

- Pass-through of the British rate to the rest of the world was low
- But capital flows responded to the British monetary policy
- Pass-through of American rate to London was high in the interwar era
- Can be explained by model of gold standard as a combination:
  - a semi-independent interest rate rule
  - automatic foreign exchange intervention through the gold window

Challenges two conventional narratives:

- Monetary policy had a hegemon before the US
- Fixed exchange rate system necessarily implies high interest rate pass-through abroad

Appendix

London-NYC Exchange Rate

	Classical		Interwar		1925–31	
	(1) Betting	(2) B-bill	(3) Betting	(4) B-bill	(5) Betting	(6) B-bill
			Spot (1-day window)			
Bill rate	0.06	0.01	0.17	-0.21	0.16***	0.05
	(0.06)	(0.01)	(0.20)	(0.18)	(0.05)	(0.03)
Observations	49	1,189	75	2,042	42	658
			Spot (2-day window)			
Bill rate	0.05	0.02	0.20	-2.14	0.14***	0.08***
	(0.07)	(0.02)	(0.27)	(1.91)	(0.04)	(0.02)
Observations	51	1,187	74	2,030	42	653
			Appreciation (90 days)			
Bank rate	0.24	0.21	-13.12	-30.63**	-1.34	0.74
	(0.51)	(0.37)	(9.98)	(12.66)	(0.84)	(0.53)
Observations	57	1,168	75	1,028	38	319

London-Paris Exchange Rate

	Classical		Interwar		1926–31	
	(1) Betting	(2) B-bill	(3) Betting	(4) B-bill	(5) Betting	(6) B-bill
	Spot (1-day window)					
Bill rate	0.06	0.02	1.97***	-0.20	0.81	-0.08
	(0.06)	(0.02)	(0.75)	(0.38)	(0.64)	(0.17)
Observations	49	1,189	75	2,047	42	661
	Spot (2-day window)					
Bill rate	0.04	0.02	1.70**	-0.81	0.40	-0.52
	(0.07)	(0.02)	(0.84)	(0.80)	(0.85)	(0.45)
Observations	51	1,187	74	2,035	42	656
	Appreciation (90 days)					
Bank rate	-0.31	-0.15	-38.77**	-37.77**	0.28	0.36
	(0.41)	(0.34)	(15.38)	(15.33)	(0.63)	(0.51)
Observations	57	1,168	75	1,030	31	234

GB Spillovers: Other Europe (1885–1914)

	Betting			B-bill		
	(1) Amst.	(2) Frankfurt	(3) Vienna	(4) Amst.	(5) Frankfurt	(6) Vienna
1-day window (Wednesday–Thursday)						
Pass-through	0.10	0.03	0.08	0.11***	0.02	0.02
	(0.08)	(0.20)	(0.15)	(0.04)	(0.03)	(0.03)
Observations	29	17	41	591	577	900
7-day window (Wednesday–Wednesday)						
Pass-through	0.16	-0.15	0.09	0.21***	0.15**	0.21***
	(0.28)	(0.50)	(0.28)	(0.07)	(0.07)	(0.05)
Observations	30	18	42	583	569	905

GB Spillovers: Other Europe (1919–38)

	Betting			B-bill			
	(1) Amst.	(2) Brussels	(3) Switz.	(4) Amst.	(5) Brussels	(6) Switz.	(7) Milan
1-day window (Wednesday–Thursday)							
Pass-through	-0.03	-0.01	-0.03	0.09**	0.04	0.02	0.00
	(0.12)	(0.02)	(0.06)	(0.04)	(0.03)	(0.02)	(0.01)
Observations	19	16	20	340	335	346	279
2-day window (Wednesday–Friday)							
Pass-through	-0.00	0.01	0.21**	0.08**	0.08	0.22	-0.01
	(0.11)	(0.01)	(0.11)	(0.04)	(0.08)	(0.14)	(0.03)
Observations	19	16	20	174	169	176	142
7-day window (Wednesday–Wednesday)							
Pass-through	0.38*	0.27	0.26***	0.07	0.18	0.26*	-0.00
	(0.20)	(0.18)	(0.10)	(0.13)	(0.11)	(0.14)	(0.03)
Observations	16	13	17	167	164	171	137

US Shocks

- Fed created in 1913, so we can only study its influence in the interwar period
- New York Fed meets every Thursday
- Bill shocks: change in rate on banker's acceptances from Wednesday to Thursday

	Classical	Interwar
Betting	X	X
Bank bill	X	✓
Treasury bill	X	X
Narrative	X	X

◀ Model

US Shocks

	Interwar		1918–33	
	(1) 1-day	(2) 2-day	(3) 1-day	(4) 2-day
Commercial paper				
NY Fed d.r.	1.01***	1.11***	1.00***	1.10***
	(0.35)	(0.29)	(0.35)	(0.29)
Observations	927	887	645	614
Call loan				
NY Fed d.r.	0.05	0.77	0.03	0.76
	(0.55)	(0.97)	(0.55)	(0.97)
Observations	982	940	700	668
Banker's acceptance				
NY Fed d.r.	1.75***	1.86***	1.68***	1.78***
	(0.42)	(0.47)	(0.38)	(0.43)
Observations	984	945	700	669

◀ Model

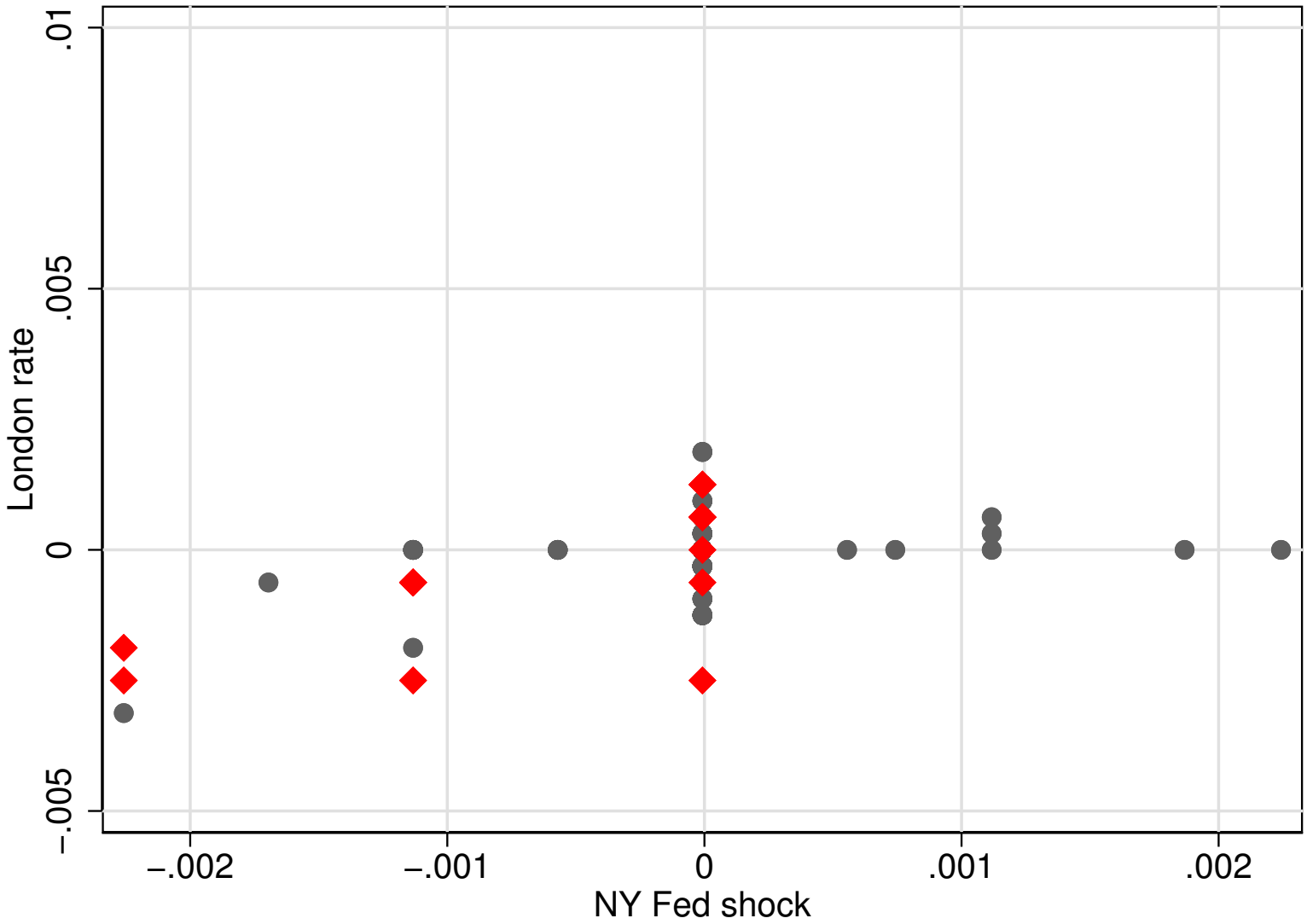
US Shocks: Stock Market

	(1)	(2)	(3)	(4)
	Interwar			
NY Fed d.r.	-0.80	-5.71**	-0.79	-0.87
	(1.07)	(2.26)	(1.36)	(1.06)
N	982	981	980	981
Htskd. s.e.	2.36	3.69	2.86	2.36
Htskd. p-value	0.24	0.12	0.21	0.00
	1918–33			
NY Fed d.r.	-0.39	-4.59**	-0.37	-0.51
	(1.02)	(2.06)	(1.28)	(1.00)
N	699	698	697	698
Htskd. s.e.	2.13	3.40	2.58	2.11
Htskd. p-value	0.30	0.14	0.27	0.01

Note: (1) no controls, (2) no controls omitting March 2, 1933, (3) controlling for previous week's change in bill rate, (4) controlling for previous week's change in stock index.

◂ Model

US to UK Spillovers



Note: red diamonds are observations where the NY Fed discount rate was changed. Shocks are scaled such that they move the discount rate one-for-one.

◂ Model

London-NYC Exchange Rate

	(1) 1919–25	(2) 1925–31	(3) 1931–33	(4) 1933–38
		Exchange rate		
NY Fed d.r.	-2.79	-0.02	-1.48	-1673.25
	(2.62)	(0.04)	(1.63)	(7301.78)
Observations	307	312	75	282
		Exchange rate depreciation		
NY Fed d.r.	11.41	-0.45	-84.57	-6307.42
	(88.44)	(0.89)	(99.85)	(31930.01)
Observations	291	300	64	273

◀ Model

US to UK Spillovers: Stock Market

	(1) 1919–25	(2) 1925–31	(3) 1931–33	(4) 1933–38
1-day window (Thursday–Friday)				
NY Fed d.r.	1.88	-1.99**	-0.55	-186.88
	(2.55)	(0.88)	(0.79)	(5467.65)
N	310	315	75	284
Htskd. s.e.	2.36	1.67	0.58	591.37
Htskd. p-value	0.66	0.01	0.43	0.97
2-day window (Wednesday–Friday)				
NY Fed d.r.	2.49	-2.99**	0.14	-291.82
	(3.81)	(1.40)	(1.36)	(8540.90)
N	310	315	75	284
Htskd. s.e.	3.91	2.42	1.51	937.05
Htskd. p-value	0.89	0.07	0.75	0.97

◀ Model

Net Foreign Assets (NFA)

- Net foreign asset positions are held as gold reserves net of bond liabilities:

$$NFA^j = \mathcal{E}^j G^j - B^j$$

- Substituting bond demand, gold reserves reflect NFA and UIP deviations:

$$\frac{\mathcal{E}^j G^j}{\bar{P}^j \bar{Y}^j} = \frac{NFA^j}{\bar{P}^j \bar{Y}^j} + \frac{1}{\Gamma}\left(i^j - i^* - E_t \dot{x}r^{j*}\right)$$

- NFA moves according to:

$$\mathrm{d}NFA^j = \underbrace{\left(TB^j - i^j B^j\right)\mathrm{d}t}_{\text{current account}} + \underbrace{\omega_G^j \Pi_G^j + \omega_B^j \Pi_B^j}_{\text{arbitrageurs' profits}}$$

  where $\Pi_G^j = \sum_k \Pi_G^{jk}$ and $\Pi_B^j = \sum_k \int \Pi_B^{jk}(f)\,\mathrm{d}f$ are total arbitrage profits and ω_G^j, ω_B^j the shares accruing to country j

- With perfectly-fixed exchange rate, NFA is predetermined at time 0:

$$c_1, c_2 \to 0 \quad \Rightarrow \quad XR^{jk} = \frac{\mathcal{E}^j}{\mathcal{E}^k} \quad \Rightarrow \quad \mathrm{d}NFA^j(0) = 0$$

Back

Identification Result

- Remember expression for gold reserves:

$$\frac{\mathcal{E}^j G^j}{\bar{P}^j \bar{Y}^j} = \frac{NFA^j}{\bar{P}^j \bar{Y}^j} + \frac{1}{\Gamma}\left(i^j - i^* - E_t \dot{x} r^{j*}\right)$$

- With perfectly-fixed exchange rate, NFA is predetermined so:

$$c_1, c_2 \to 0 \quad \Rightarrow \quad \frac{\mathcal{E}^j}{\bar{P}^j \bar{Y}^j} \frac{\mathrm{d}G^j(0)}{\mathrm{d}\xi^j(0)} = \frac{1}{\Gamma} \frac{\mathrm{d}\left(i^j(0) - i^*(0)\right)}{\mathrm{d}\xi^j(0)}$$

  where ξ is a monetary shock

Identification

The gold-flow response to a monetary shock identifies the slope of bond demand:

$$\frac{\mathrm{d}g^j(0)}{\mathrm{d}\left(i^j(0) - i^*(0)\right)} = \frac{1}{\tilde{g}^j} \frac{1}{\Gamma}$$

where $g^j = \log(G^j)$ and $\tilde{g}^j = \mathcal{E}^j \bar{G}^j / (\bar{P}^j \bar{Y}^j)$ is steady-state gold to output.

Households and Production

- Representative agent values consumption and real money balances:

$$\text{Euler equation:} \quad \frac{\dot{C}^j}{C^j} = \frac{1}{\theta}\left(i^j - \pi^j - \rho\right)$$

$$\text{money demand:} \quad i^j \left(\frac{M^j}{P^j}\right)^{\chi} = \bar{m}(C^j)^{\theta}$$

- Consumption is a bundle of home and foreign goods:

$$\text{domestic: } C_H^j = (1-\iota)\left(\frac{P_H^j}{P^j}\right)^{-\zeta} C^j \qquad \text{foreign: } C_F^j = \iota\left(\frac{P_F^j}{P^j}\right)^{-\zeta} C^j$$

$$\text{foreign from country } k\text{: } C_F^{jk} = \nu^{jk}\left(\frac{P_F^{jk}}{P_F^j}\right)^{-\eta} C_F^j$$

- Production is linear in labor: $P_H^j = P_F^{kj}/XR^{kj} = W^j/A^j$
- Wages follow a Phillips curve with slope κ_w:

$$\frac{\dot{W}^j}{W^j} = \kappa_w\left(\bar{n}(N^j)^{\phi}(C^j)^{\theta} - \frac{W^j}{P^j}\right)$$

Back

US Spillovers

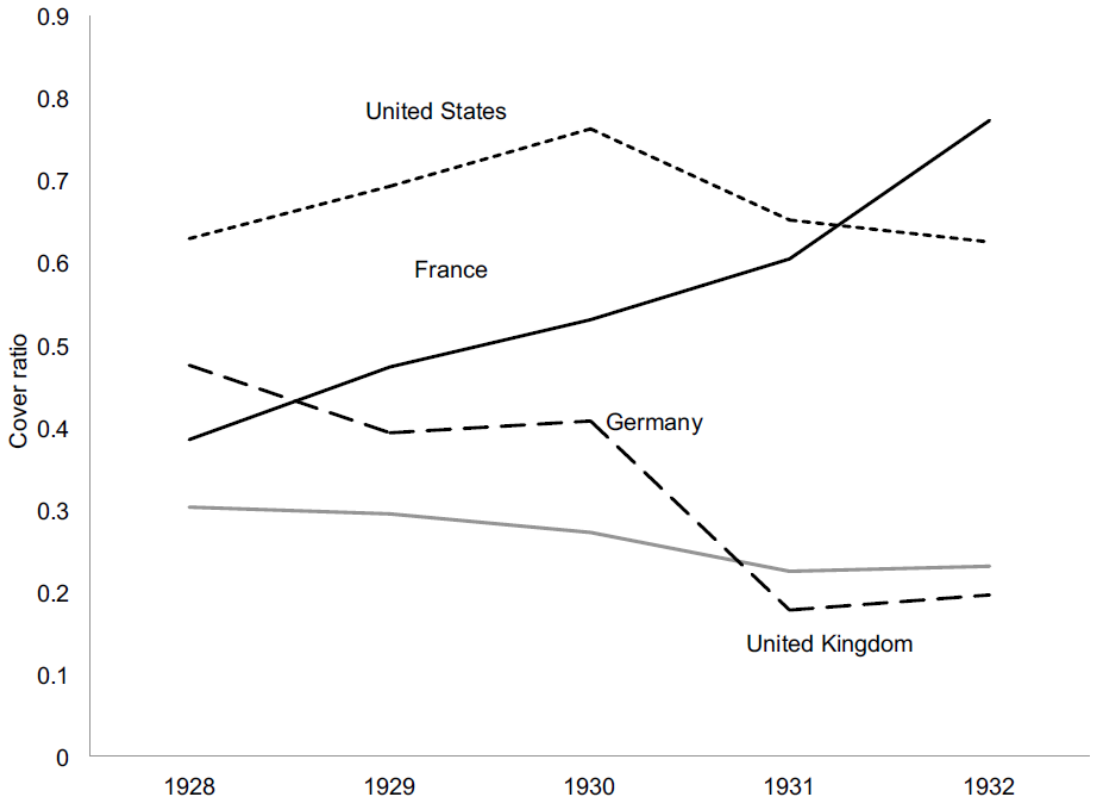
	(1) London	(2) Paris	(3) Berlin
1-day window (Thursday–Friday)			
Pass-through	0.52***	-0.01	0.11
	(0.13)	(0.03)	(0.08)
Observations	312	259	183
2-day window (Wednesday–Friday)			
Pass-through	0.71***	0.02	0.30**
	(0.22)	(0.06)	(0.14)
Observations	300	266	182
7-day window (Wednesday–Wednesday)			
Pass-through	0.79***	0.10	0.44
	(0.25)	(0.19)	(0.33)
Observations	308	266	172

Note: sample is the period when US and outcome country are on the gold standard, 1919–1933 for US, 1925–31 for Britain, 1926–33 for France, 1924–31 for Germany. Paris and Berlin data is missing before 1927.

◂ Model

Not Enough Gold?

Figure 5
Cover Ratios of Major Central Banks, 1928–32



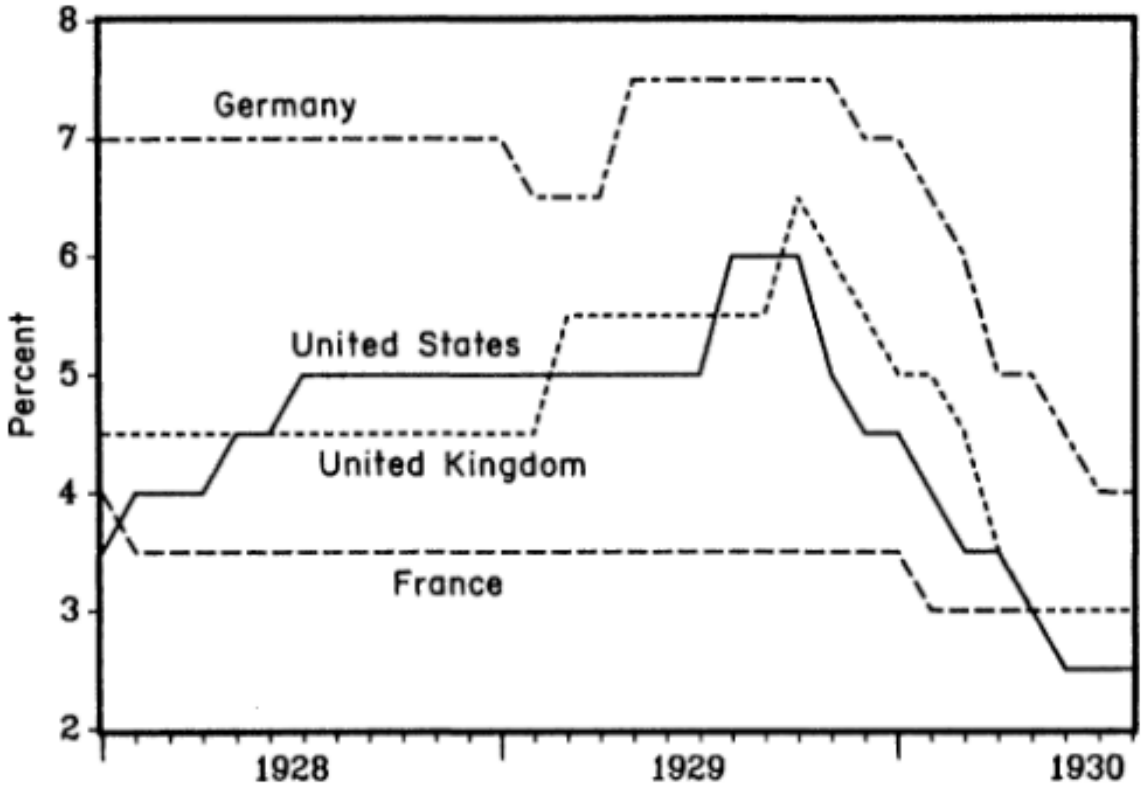
Source: Calculated from the Board of Governors of the Federal Reserve System (1943).
Note: Data are for December of each year.

Source: Irwin (2012)

◂ Model

Forced to Raise Rate?

Fig. 8.6.



Central bank discount rates, January 1928—August 1930.
The Reichsbank was forced to maintain a higher discount rate than those of other major central banks by the recurrent weakness of Germany's balance of payments.
Source: Banking and Monetary Statistics, pp. 439, 656–659.

Source: Eichengreen (1992)

◂ Model

US Spillovers: Other Europe

	(1) Amsterdam	(2) Brussels	(3) Switzerland	(4) Milan
1-day window (Thursday–Friday)†				
Pass-through	0.42***	0.08	-0.02	0.00
	(0.11)	(0.06)	(0.03)	(0.01)
Observations	191	191	196	162
2-day window (Wednesday–Friday)				
Pass-through	0.33***	0.03	-0.01	0.00
	(0.07)	(0.06)	(0.03)	(0.00)
Observations	191	191	196	163
7-day window (Wednesday–Wednesday)				
Pass-through	0.67***	-0.03	0.05	-0.02
	(0.25)	(0.07)	(0.04)	(0.05)
Observations	183	187	192	159

Note: sample is the period when US and outcome country are on the gold standard, 1925–33 for the Netherlands, 1926–33 for Belgium, 1925–33 for Switzerland, 1927–33 for Italy. Data is missing before 1927.

◀ Model

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