

Central Banker to the World: Foreign Reserve Management and U.S. Money Market Liquidity

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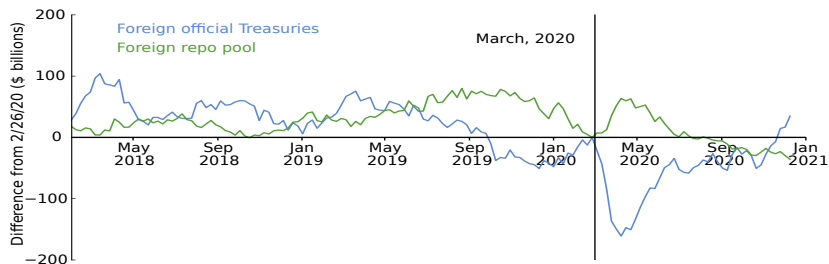
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Motivation: The use of the dollar as a reserve currency



- ▶ Dollar's status permits United States to invest in equity and FDI abroad and supply liquidity to foreign asset holders (Gourichas and Rey 2007).
- ▶ But shifts in foreign liquidity demand can spillover to U.S. liquidity.
 - ▶ In March 2020, foreign official accounts sold \$147 billion in Treasuries.
 - ▶ How large an effect do such sales have on U.S. money market liquidity?

How does the use of the dollar as a reserve currency affect U.S. liquidity?

Main finding

- ▶ *Use of dollar as reserves exposes U.S. money markets to export price volatility of foreign countries through portfolio decisions of reserve managers.*

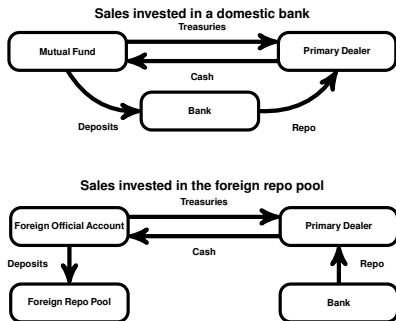
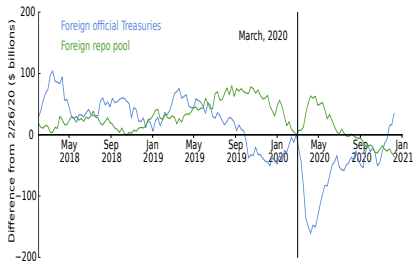
Make this point in two ways:

1. Develop model of reserve management for pegged exchange rates.
 - ▶ Two-economy model with financial frictions.
 - ▶ Central bank desires liquid settlement balances, leading to hoarding liquidity.
2. Examine empirical effects of FX management on U.S. repo market.
 - ▶ Analyze relation between foreign official Treasury holdings and repo spreads.
 - ▶ **Identification challenge:** Need to isolate variation in reserve demand.
 - ▶ Focus on oil-exporting countries with a dollar peg.
 - ▶ Use oil price volatility as an instrument.
 - ▶ **Evidence points to significant and sizeable effects on U.S. repo spreads.**

Focus is on oil producers with dollar pegs for three reasons:

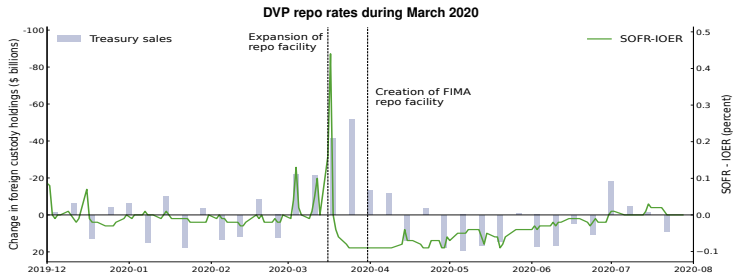
1. Reserve demand is relatively easy to characterize as a function of export prices and volatility.
2. Treasury holdings data are almost exclusively government.
3. Oil exporters played an outsized role in recent episodes of money market stress.

How do foreign reserve sales affect U.S. money market domestic liquidity?



- ▶ Foreign official accounts sold \$147 billion in Treasuries.
- ▶ In theory, sales had both direct and indirect effects on repo markets:
 - ▶ **Direct:** More Treasuries needed to be funded.
 - ▶ **Indirect:** Fewer reserves to fund them.
- ▶ Unclear what role these sales played in repo market and Treasury stress.

How do foreign reserve sales affect U.S. money market liquidity?



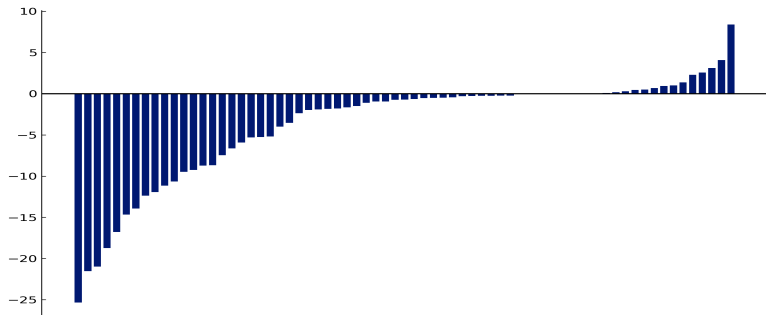
Reserve manager sales associated with money market illiquidity.

- ▶ Repo rates rose relative to IOER several times during March.
 - ▶ Coincident with decreases in foreign official holdings of Treasuries.
- ▶ However, there were many sellers of Treasuries during March.
 - ▶ There were also policy actions by the Federal Reserve and Treasury.

To isolate the effects of foreign central bank actions, we need:

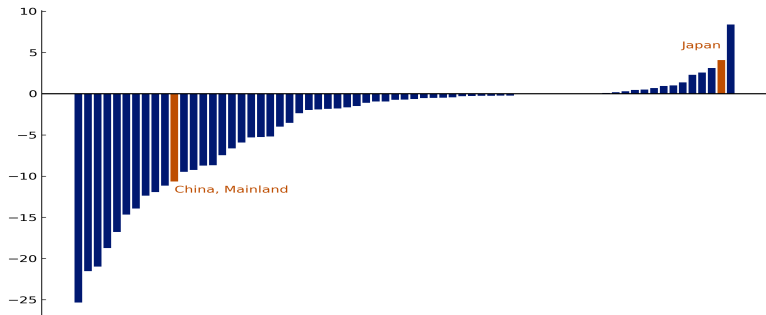
1. To understand what drives these sales.
2. A longer span of data for analysis.

Who were the major foreign sellers during March 2020?



TIC data allows us to look across countries.

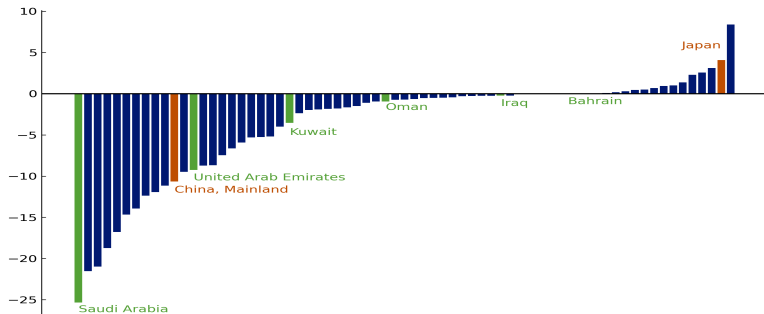
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- ▶ China and Japan: -6.6B.

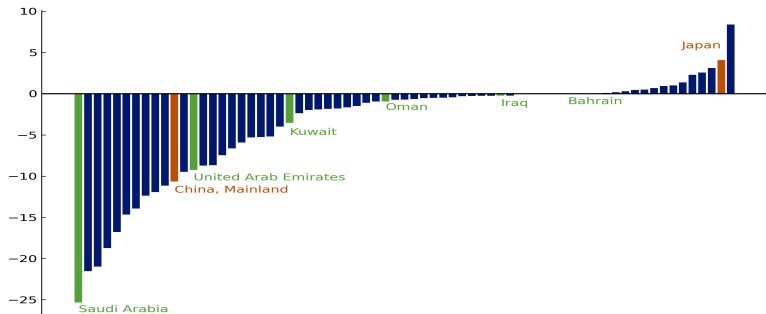
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TIC data allows us to look across countries.

- ▶ China and Japan: -6.6B.
- ▶ Middle East oil exporters: -39.3B
 - ▶ **Increase** of \$12.7B in holdings of short-term, non-Treasury U.S. assets.
 - ▶ **Increase** of \$7.8B in "other" ST U.S. assets (includes foreign repo pool).
 - ▶ **Amounts to a shift from less liquid to more liquid dollar holdings.**

Stylized fact 1: Substantial variation in implied interest rate differentials

Specifically, construct:

$$x_{i,t} = \frac{F_{i,t}}{e_{i,t}} - 1$$

► Under CIP:

$$x_{i,t} \approx r_{i,t} - r_{US,t}$$

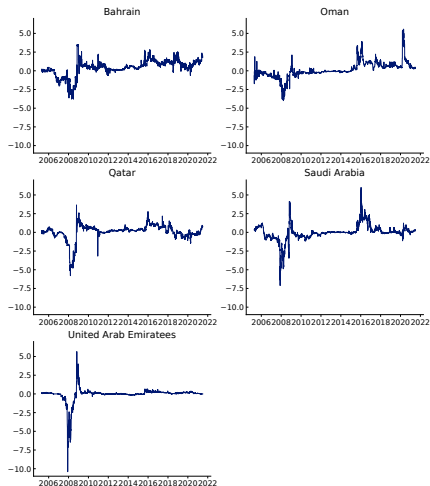
► Under UIP, no revaluations:

$$x_{i,t} = E \left[\frac{e_{i,t+1}}{e_{i,t}} \right] - 1 = 0$$

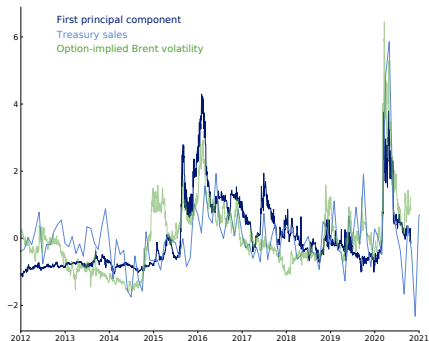
► Range from -2.38% to 3.64% after excluding crises.

We work with first PC:

► Explains 69% of daily variance.



Stylized fact 2: Relation with oil-price volatility and Treasury sales



Establish series on LT Treasuries held by sample countries.

Combine with data on option implied Brent oil-price volatility.

Correlation with IR factor:

- ▶ Oil-price volatility = 72%
- ▶ Treasury sales = 52%

▶ **Interpreting these relationships requires a structural framework.**

International macro model with financial frictions provides our framework

Two-country, two-period model:

1. **Oil-producing economy:** oil endowment, central bank pegs FX rate.
2. **U.S. economy:** consumption good endowment, exogenous monetary policy.

Intermediaries hold reserves in each currency for settlement balances.

- ▶ Poole (1968), d'Avernas and Vandeweyer (2020), Bianchi and Bigio (2022), Bianchi et al. (2021).

Model generates three predictions:

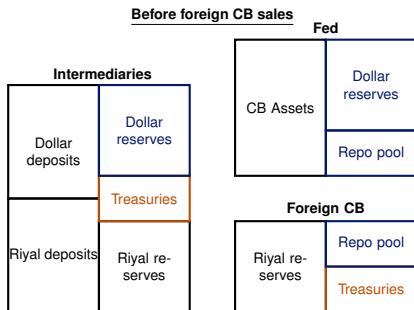
1. Greater foreign central bank dollar liquidity demand leads to less liquid U.S. money markets.
2. Increases in oil-price volatility lead to increased central bank demand for dollar liquidity.
3. Providing liquidity to foreign central bank lowers money market rates and the effect of oil-price volatility.

Basic friction: intermediaries need to maintain sufficient settlement balances

- ▶ Intermediaries need sufficient reserves for end-of-day settlement.

$$\text{Liquidity premium}_{i,t} = F(\theta \times \text{Deposits}_{i,t} - \text{Reserves}_{i,t})$$

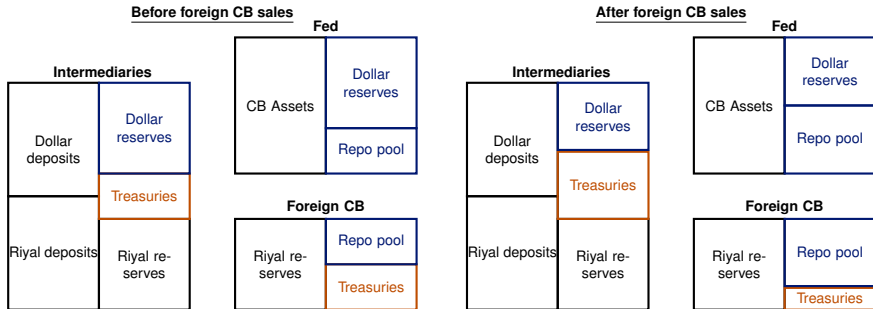
- ▶ Two deposit shocks reallocate (1) among banks within currency; and (2) between currencies.



- ▶ Reserve requirement in each country segment markets.
- ▶ Foreign CB needs sufficient *liquid* FX reserves to meet currency shock (repo pool).
- ▶ CB cannot always sell Treasuries to increase reserves.
 - ▶ Precautionary motive to hold liquid FX reserves.

Basic friction: intermediaries need to maintain sufficient settlement balances

- ▶ **As oil-price volatility increases, precautionary motive become stronger.**
 - ▶ Foreign CB sells Treasuries and increases liquid reserves.
 - ▶ Holding Fed assets constant, intermediaries hold fewer dollar reserves.
 - ▶ As a consequence, liquidity premia in the United States rise.



Two ways U.S. CB can counteract demand by foreign official accounts:

1. Expand reserves when demand is high.
2. Provide a way to secure liquidity from Treasuries (FIMA repo).

Model disciplines the regression analysis

Oil price volatility → foreign CB demand for liquidity → U.S. liquidity; isolate exogenous variation in oil exporters' official demand for Treasuries.

Three concerns:

1. Treasury sales are low frequency.
 - ▶ Use IR factor as a proxy.
2. Deviations may increase *because of* U.S. illiquidity.
 - ▶ Use Brent oil-price volatility as an instrument.
3. Oil prices may be affected by OPEC decisions.
 - ▶ We scrape all OPEC press releases from website.
 - ▶ Construct an announcement control:

$$\text{OPEC control}_t = \mathbf{1}(\text{OPEC announcement}_t) \times \text{Brent vol}_t$$

Include additional controls for factors affecting money markets:

- ▶ Bill issuance, note issuance, bond issuance, T-bill yield, TGA balances, income-tax payments, FOMC dates, VIX, month-end dummy, Saudi CDS, level of Brent prices, among others.

We find evidence of strong effects of reserve management on U.S. liquidity

	SOFR - IOER	GCF - IOER	GCF - TGCR	GCF - EFR
	<i>Second stage</i>			
<i>IR factor</i>	5.49***	6.82***	2.72***	5.49***
<i>N</i>	1,210	1,209	1,209	1,209
1st-stage R^2	0.75	0.75	0.75	0.75
2nd-stage R^2	0.38	0.24	0.16	0.11
IV <i>F</i> -stat	119.6	119.1	119.1	119.1

- ▶ Increase in all money market spreads, largely from inter-dealer secured rates over unsecured rates.
- ▶ Magnitudes for 1 SD increase in IR factor:

	SOFR-IOER	GCF-IOER	GCF-TGCR	GCF-EFR
SD increase	0.30	0.44	0.79	0.28
- ▶ These findings are consistent with effects on liquidity from dealers taking on more Treasuries funded in the repo market.
 - ▶ **But let's inspect this mechanism in more detail.**

Independent evidence is consistent with model's logic

1. Rise in interest-rate differential factor \Rightarrow Treasury sales by countries in sample

January 2010 – May 2020			
	Oil exporter holdings		
	Total	LT	ST
<i>IR factor</i>	-3.84**	-3.28**	-0.66
<i>N</i>	90	90	90
<i>R</i> ²	0.22	0.29	0.16

- ▶ Same signs and larger effect sizes for TIC official holdings, but estimated coefficients statistically insignificant.

2. Rise in interest-rate differential factor \Rightarrow Higher Treasury exposures, lower reserves

January 2015 – May 2020				
	Dealer Treasuries	Custody holdings	Foreign repo pool	Swap lines
<i>IR factor</i>	12.82**	-52.27***	8.26***	-0.10
<i>N</i>	251	251	251	251
<i>R</i> ²	0.18		0.30	0.14

Conclusion

Foreign reserve management can lead to pressure on U.S. money market liquidity.

- ▶ Effects are sizeable relative to money-market spreads.
- ▶ Consistent with Treasury sales by foreign official investors demanding liquidity needed by U.S. intermediaries.
- ▶ Imply meeting foreign liquidity demand is important for ensuring adequate availability of domestic liquidity.