One Slope, Three Mechanisms: Interpreting Near-Money Liquidity Premia

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Abstract

Liquidity premia on near-money assets (e.g., Treasury bills) rise with monetary policy rates. The standard interpretation is that premia track the opportunity cost of money. We show two observationally equivalent explanations: (i) a common-response channel in which monetary policy and debt management react to liquidity-demand shocks, and (ii) a policy-driven issuance channel (rate cuts tilt issuance to bills). A minimal model nests the three mechanisms and yields tests to quantify them, leveraging recent monetary policy regime changes in the US. The results inform the pricing of near-money assets debate and the interaction between monetary operations and debt management.

JEL codes: E43, E52, G12.

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1 Introduction

Liquidity premia on "near-money" assets—short-dated Treasuries, on-the-run issues, and similar instruments—rise when monetary policy rates rise and fall when policy rates fall. A natural interpretation is that the premium paid for liquidity services is proportional to the opportunity cost of holding money, set by the central bank's monetary policy: when the policy rate is high, investors value the ability to rapidly transform positions into means of payment and are willing to pay more for assets that deliver those services. This view has strong empirical appeal[1]. The implication is that government issuance and debt supply play no significant role in determining the liquidity premium.

This paper shows that, once we allow for government borrowing decisions to respond endogenously to the stance of monetary policy or to liquidity demand, then three distinct novel mechanisms can generate the same positive slope of the liquidity premium with respect to the policy rate. Importantly, in these alternative mechanisms, debt issuance by the government does play a role in determining the liquidity premium.

The policy implications are immediate. Liquidity premia (also referred to as "convenience yields") lower short-term equilibrium interest rates (Del Negro et al., 2019; Lenel et al., 2019), are at the center of unconventional monetary policy transmission in Krishnamurthy and Vissing-Jorgensen (2011) and Del Negro et al. (2017), expand the government's fiscal capacity (Reis, 2022; Jiang et al., 2022; Mian et al., 2025), and can explain exchange rate puzzles (Jiang et al., 2025). If the opportunity-cost channel dominates, asset-supply changes are second order for premia outside of stress periods, and the price tool—the policy rate—remains primary for near-money pricing. If issuance-mediated channels or common-response effects are material, then the policy mix matters: rate cuts that lower premia may be amplified (or confounded) by issuance tilts, calling for greater awareness between monetary operations and debt management.

The paper formalizes the three channels and develops empirical tests that can tell them apart. The first mechanism—opportunity cost (OC)—is the standard one: the liquidity premium is proportional to the policy rate, up to slow-moving or stress-related shifts in the usefulness of near-money assets. The second mechanism—common response (CR)—recognizes that liquidity-demand shocks often elicit joint policy reactions: the central bank expands reserves and (if consistent with its macro objectives) lowers the policy rate, while the Treasury increases the share of bill financing for cash-management or cost reasons. Both actions compress premia: the rate cut reduces the opportunity cost; the higher bill supply reduces

[1] See Nagel (2016) and Drechsler et al. (2018a).

scarcity. Even if the direct OC link were weak, an OLS regression of the liquidity premium on the policy rate would exhibit a positive slope because both variables co-move with the same underlying shock.

The third mechanism—policy-driven issuance (PI)—operates even in the absence of a common shock. A policy rate cut lowers the marginal cost of bill finance relative to longer maturities. A cost-minimizing Treasury then tilts issuance toward bills. Because near-money services are subject to scarcity/dilution, greater bill supply reduces the liquidity premium, amplifying the decline in premia that comes from the rate cut itself. The observed positive premia–rate slope thus partly reflects an issuance-mediated channel.

We formalize these ideas in a minimal unified framework with three ingredients: (i) a pricing relation in which the liquidity premium is captured by a scarcity factor that falls with bill supply and rises with liquidity-demand shocks; (ii) a simple debt-management problem in which the Treasury chooses the bill share to minimize interest costs subject to price impact; and (iii) a policy instrument chosen by the central bank, with reserves adjusting to deliver the operating target in the chosen regime. This framework nests the OC, CR, and PI mechanisms and yields discriminating predictions about (a) the causal effect of the policy rate on premia holding issuance fixed, (b) the causal effect of issuance holding the policy rate fixed, and (c) how the estimated effect of policy rates changes once issuance is controlled for or instrumented.

The paper's empirical strategy leverages recent regime shifts in the implementation of monetary policy in the US. In particular, we study liquidity premia of near-money assets under the corridor system of scarce reserves away from the ZLB (normal times); the "floor" system of abundant reserves at the ZLB (floor system), and QE announcements at the ZLB (QE). In normal times, we instrument the policy rate and T-bill issuance. Through a simple mediation test, we show that T-bill issuance accounts for more than a quarter of the effect of the policy rate on the liquidity premium of T-bills. Then we show that under the ZLB, the three mechanisms operate through quantities rather than prices. The PI channel accounts for most of the variation in the liquidity premium, and QE event studies show that the OC channel operating through newly issued central bank reserves crowd out T-bill issuance and still lower the liquidity premium of T-bills. Overall, there is little evidence of the CR channel outside crisis periods.

Literature review. The papers that introduced the notions of convenience yields of short-term government debt either ignore the role of monetary policy (Krishnamurthy and Vissing-Jorgensen, 2012) or, if they don't ignore it, assume an exogenous debt issuance

(Nagel, 2016; Drechsler et al., 2017, 2018b). Greenwood et al. (2015) account for the role of liquidity premia in the debt maturity decisions of the government, but, as mentioned, they do not consider the central bank's influence. Our results do not contradict the conclusions of these papers; instead, they show how they extend to different institutional settings.

Recently, many papers have introduced the role of convenience yields in New-Keynesian models and studied their implications for monetary policy and banking (see Piazzesi et al., 2021; Benigno and Benigno, 2021; and Bianchi and Bigio, 2022). However, they do not delve into the question of the determination of the liquidity premium and give no role to government decisions.

The literature on convenience yields has flourished since the influential papers of Krishnamurthy and Vissing-Jorgensen (2012), Greenwood et al. (2015), and Nagel (2016), making it impossible to fully summarize it here. We are aware that in recent years the financial literature has moved away from the aggregate time-series regressions of these papers and has gotten into the microfoundations of convenience yields and the empirical analysis at the financial institution level[2]. However, this paper speaks directly to those original papers, seeks to clarify the interpretation of those aggregate time-series regressions, and highlight their policy implications.

Section 2 presents the motivating evidence for the three channels, the unified framework, and the discriminating predictions. Section 3 lays out the formal empirical exercise, describing the identification strategy, instruments, and event designs. Section 4 concludes.

2 Preliminary Evidence and a Simple Framework

In this section, we use 3-month T-bills as a proxy for near-money assets. The dependent variable in my empirical exercises is the spread between T-bills and other assets of similar maturity and credit risk. The intuition here is that, since the maturity and risk are the same, the remaining spread must be due only to their liquidity. The spread, then, is a measure of the extra price investors are willing to pay for the liquidity of the T-bills (Krishnamurthy and Vissing-Jorgensen, 2012; Nagel, 2016). A description of the variables as well as data sources can be found in the Appendix.

The first measure of the liquidity premium corresponds to the 3-month AA Financial commercial paper/3-month T-bill spread. Since AA corresponds to very high credit quality, the spread likely captures a liquidity premium. The second measure is the spread between

[2]See, for example, He et al. (2022), Acharya and Laarits (2023), Corell et al. (2025)

the 3-month general collateral (GC) repo rate and the 3-month T-bill. This repo rate is the interest rate for a three-month term interbank loan that is collateralized with a portfolio of US Treasury securities. Due to this backing with safe collateral, the repo rate is virtually free of any credit risk component. However, an investment into a repo term loan is illiquid because the investment is locked in during the term of the loan. In contrast, a T-bill investment can be resold easily with a tiny bid-ask spread in a highly liquid market.

Summary statistics show that these spreads remain non-negligible even after the unprecedented supply of liquidity provided by governments and central banks to fight the financial crisis in 2008. While from 2001 and 2005 the AA Financial commercial paper/T-bill spread averaged 18.1 basis points, in the period after 2009 it has averaged 17.1 basis points, with similar standard deviations (11.1 vs. 9.2). The GC repo/T-bill spread had an average of 11.7 bp between 2001 and 2005, and 15.8 bp between 2009 and 2019, with similar standard deviations (11 vs 10.3).

2.1 Debt Issuance and Monetary Variables

We present suggestive evidence that the short-term debt supply responds endogenously to the stance of monetary policy and liquidity demand. Formal econometric evidence is addressed in Section 3.

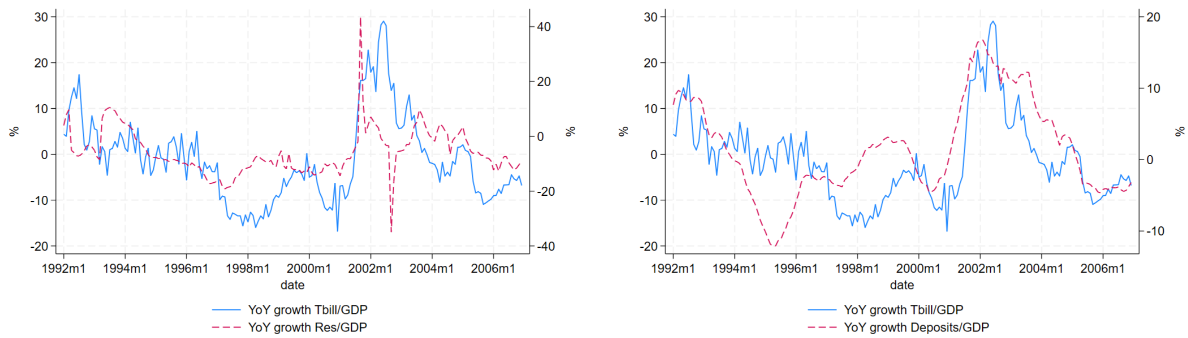
In Figure 1a, we collect data from January 1992 to December 2006 -the period before the financial crisis- and show the correlation between the 12-month growth rate of T-bills-to-GDP and Reserves-to-GDP. Panel (b) shows the same correlation for "liquid deposits" (the sum of checking and savings deposits) to GDP. Between T-bill/GDP growth and Reserve/GDP growth, the correlation is 0.46, and with Dep/GDP, the correlation is 0.62 [3]. In both cases, the correlation is significant at the 1% level.

Figure 1 suggests that the Treasury and the central bank respond to demand for liquidity (the "common response" channel), or that T-bill issuance responds endogenously to monetary policy (the "policy-driven issuance" channel). Of course, as this is an unconditional correlation, there is a third explanation where macroeconomic shocks or long-term stochastic trends drive both (we account for these in the next Section). The common response channel relies on the plumbing of the corridor system. Under a corridor system of scarce reserves, there is a one-to-one relationship between the federal funds rate (the policy rate) and the supply of reserves. The central bank issues reserves to lower the federal funds rate (the rate

[3] Adding time deposits -which are less liquid but are part of what is known as "core deposits"- does not change this result. In this case, the correlation is 0.46 and still significant at the 1% level.

Figure 1: Correlation of Growth Rates, 1991-2006

(a) T-bill/GDP and Reserves/GDP (b) T-bill/GDP and Deps/GDP



at which banks lend/borrow reserves to each other).[4].

Regarding the "policy-driven issuance" channel, in Figure 2a we plot the correlation between the 12-month change in T-bill/GDP and the 12-month change in the federal funds rate, for the period January 1992-December 2006. As can be seen, the correlation is significantly negative (-0.56). In Figure 2b, we reproduce the correlation between the federal funds rate and the T-bill liquidity premium. From these two graphs, monetary policy appears to shift the **supply** of T-bills rather than the investors **demand** for T-bills. This follows from the fact that prices (the liquidity premium) and quantities (T-bill/GDP) move in opposite directions. By contrast, a shift in demand would cause prices and quantities to move in the same direction[5].

According to the 'policy-driven issuance" channel, whenever the central bank raises the policy rate, the government endogenously decides to issue fewer T-bills, and this shift in

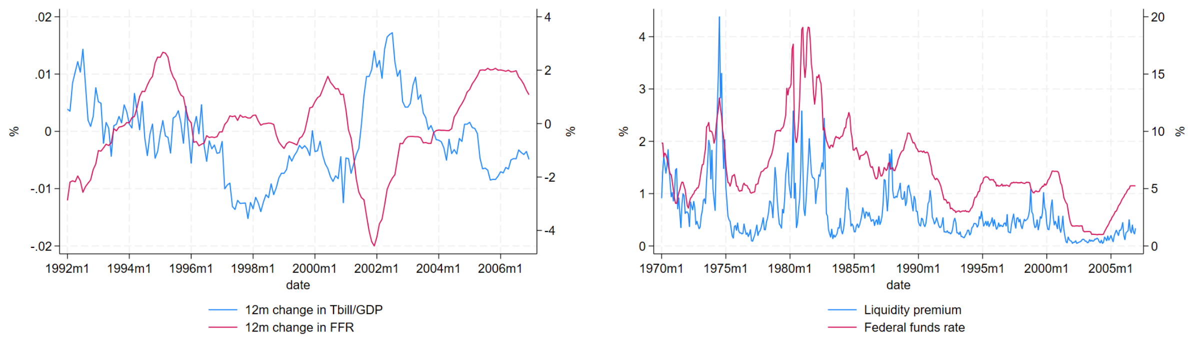
[4]The results in Krishnamurthy and Vissing-Jorgensen (2015) confirm this insight. The authors estimate the extent to which Treasury debt crowds out short-term liabilities by the financial sector. They find an economically significant crowding out, but it works through Treasury supply crowding out non-checkable short-term debt (time and savings deposits) and on the asset side through a substitution from lending towards Treasuries. Their results also show Treasury debt crowding in very liquid deposits like checking accounts.

[5]Replicating Figures 1 and 2 with the supply of long-term debt instead of T-bills shows no meaningful correlations. As evidence that T-bills provide more money-like services than longer-term Treasuries, one can think of the "dash for cash" episode in March 2020. While yields on T-bills dropped as usual, yields on longer-term Treasuries actually increased, prompting the Fed to buy a considerable amount of them in mid-March. In addition, Du et al. (2018) find that while longer-term Treasuries have lost their convenience yield differentials with respect to foreign sovereign bonds since 2008, shorter-term Treasuries still enjoy a sizable differential compared to foreign equivalent bonds.

Figure 2: Federal funds rate and T-bills, 1991-2006

(a) Federal fund rate and quantities

(b) Federal fund rate and prices



supply in turn increases the liquidity premium on T-bills. In such a case, the supply of T-bills would still be a significant determinant of the liquidity premium -and the "opportunity cost" channel would not be the full story[6].

Importantly, this policy-driven issuance does not disappear during a zero lower bound episode. Figure 3a displays the data for T-bill and reserves supply for the US for the period between January 2010 and February 2020. Interestingly, Panel 3a shows that the correlation between T-bill supply and reserves became significantly negative (-0.73), in a complete reversal from the pre-Crisis pattern. It is important to note that Figure 3a includes both the QE period and the period where the Fed ran something close to a floor system[7].

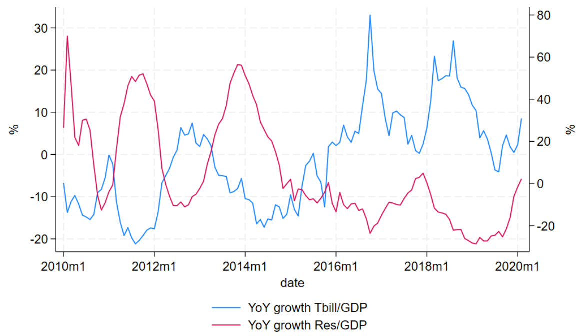
This negative correlation is consistent with the policy-driven issuance working through quantities rather than prices. Even though short-term rates are at near-zero levels, as the central bank buys long-term debt, an interest-cost-minimizing government would tilt its borrowing toward longer horizons to lock in this extra demand. Therefore, at every round of QE, we would expect the government to reduce the quantity of T-bills and increase the quantity of long-term debt. Figure 3b provides suggestive evidence supporting this intuition. It shows a strong positive correlation between the supply of long-term debt (TIPS, in this

[6]This also seems to conflict with the intuition put forth by Greenwood et al. (2015). In their model of government's optimal debt maturity, they stress that the fiscal authority should enjoy the money premium by issuing more T-bills rather than issuing long. Of course, this should be compared to the added cost of a rise in rollover concerns. However, Figure 2a suggests that the Treasury is actually doing the opposite: it issues more near-money debt when the premium is lowest, which would make no sense. This is further suggestive evidence that the causation seems to go in reverse: the Treasury decides to issue fewer T-bills, and this supply shift makes the liquidity premium rise.

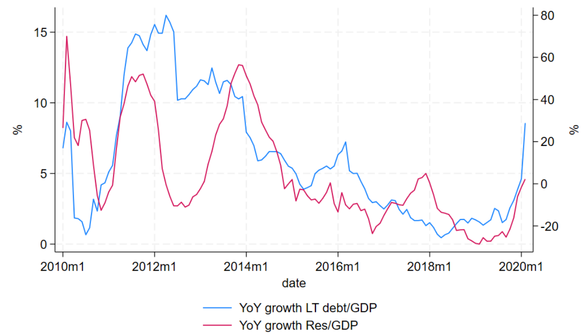
[7]The plot of the correlation between the supply of T-bills and demand deposits shows the same pattern (not shown): correlation of -0.56, significant at the 1% level.

Figure 3: Correlations for US, 2010-2020

(a) T-bills and Reserve supply



(b) Long-term Debt and Reserve supply



case) and the supply of reserves (correlation 0.59, significant at the 1% level)[8].

2.2 A Unified Framework

Let $\pi_t \equiv i_t - i_t^b$ be the liquidity premium on T-bills, where i_t represents the rate on illiquid assets and i_t^b the rate on near-money assets such as T-bills. Let's summarize it by the following function:

$$\pi_t = \kappa(B_t, R_t, \xi_t) \tag{1}$$

where B_t is the supply of outstanding T-bills, R_t is the supply of central bank reserves (which are an alternative liquid asset and can be understood as "money"), and ξ_t is an exogenous shock to liquidity demand by households and firms.

In addition, we assume $\kappa_B < 0$, $\kappa_R < 0$ and $\kappa_\xi > 0$. Function $\kappa(\cdot)$ is a standard reduced-form expression for the marginal value of liquid assets (money and near-money). It captures the same forces as in any model used by the convenience yield literature (Krishnamurthy and Vissing-Jorgensen, 2012; Greenwood et al., 2015; Nagel, 2016; Benigno and Benigno, 2021; Mian et al., 2025): a larger supply of liquid assets diminishes its marginal value and thus the liquidity premium, and an increase in demand for liquidity increases its marginal value.

Two important notes. First, we assume that the monetary policy rate tracks i_t, and is set according to a Taylor-type rule targeting inflation or the price level (similar to Nagel, 2016; Drechsler et al, 2017, 2018b). The relationship between i_t and the supply of reserves,

[8] The pattern is very similar if we use the supply of bonds instead of TIPS (correlation of 0.56, significant at the 1% level), and the supply of demand deposits instead of reserves (correlation of 0.74, significant at the 1% level)

R_t, will depend on the central bank framework. Under a corridor system of scarce reserves, the central bank needs to lower (increase) reserves to increase (lower) the interbank rate, which works as the policy rate. Under a floor system of abundant reserves, the supply of reserves disconnects from the interest on reserves (IOR), which works as the policy rate. As will be explained in the next Section, the central bank can set the IOR without a one-to-one change in the supply of reserves[9].

Second, we could also use the supply of demand deposits as an input in $\kappa(\cdot)$ instead of reserves. While reserves are a liquid asset for banks, deposits, D_t, are also very liquid instruments that provide marginal services to households. In most models of banking and liquidity premia, the amount of deposits that banks can create is constrained by the amount of reserves they hold, according to $D_t^s \leq \phi R_t$ (coming from regulatory requirements or precautionary holdings)[10]. Therefore, the empirical exercise will be carried out using either reserves or demand deposits as the "money" asset.

Every period, the fiscal authority faces a funding need F_t. Given the monetary policy stance (given i_t), it minimizes interest expenses:

$$\min_{B_t} i_t^b B_t + i_t^n (F_t - B_t) \tag{2}$$

where i_t^n is the rate on long-term notes or bonds. Let $i_t^n \approx i_t + \tau_t$ where τ_t (term premium) follows an exogenous path with shocks independent of liquidity demand.

Notice that combining π_t with (3) yields $i_t^b = i_t[1 - \kappa(B_t, \xi_t)]$. Substituting this into (2) yields the following first order condition:

$$1 - \kappa(B_t, \xi_t) - B_t \kappa_B(B_t, \xi_t) = \frac{i_t^n}{i_t} \tag{3}$$

Intuitively, the government trades off the cheaper funding cost of T-bills (the term on the right-hand side) against the fact that excessive T-bill issuance can dilute the liquidity premium (the term on the left-hand side).

It is easy to show that increases in i_t drive B_t down. For intuition, take $i_t^n \approx i_t + \tau_t$. Then the right-hand side (RHS) falls when i_t is raised. To re-match a lower RHS, the Treasury must lower the left-hand side, which (given $\kappa_B < 0$) is achieved by reducing B_t. Thus, holding ξ_t fixed, a higher rate reduces B_t.

Similarly, the government responds to liquidity shocks. A positive shock decreases the left-hand side (via larger $\kappa(\cdot)$). The government responds by increasing B_t, which restores the equality in (3) by increasing $-B_t \kappa_B(B_t, \xi_t)$.

[9]See, for example, Keister et al. (2008) or recent models by Afonso et al. (2020)

[10]See, for example, Benigno and Benigno (2021) and Piazzesi et al. (2021)

Endogenizing B_t yields a reaction function $B_t^*(i_t, \xi_t)$ given by (3); the liquidity premium remains $\pi_t^* = \kappa(B_t^*(i_t, \xi_t), \xi_t)i_t$.

3 Empirical Analysis

The baseline regression (estimated at the monthly frequency) is:

$$\pi_t = \beta i_t + \gamma B_t + \Lambda' X_t + \varepsilon_t \tag{4}$$

where X_t is a set of controls.

How can we empirically discriminate between channels? We estimate (4) under different policy regimes: corridor system of scarce reserves away from the ZLB (normal times); floor system of abundant reserves (floor system), and QE announcements at the ZLB (QE).

The coefficient β captures the effect of the monetary policy rate on the liquidity premium of T-bills. In the framework, the relationship between the liquidity premium and the policy rate is given by:

$$\frac{d\pi}{di} = \kappa_R \frac{dR}{di} + \kappa_B \frac{dB}{di} \tag{5}$$

The first term on the right-hand side corresponds to the opportunity cost of money (OC channel): the direct effect of the policy rate on the supply of reserves. In a corridor system away from the ZLB, $\frac{dR}{di} < 0$ and thus the first term is positive. The second term on the right-hand side corresponds to the policy-driven issuance (PI) channel, and since $dB/di < 0$ for a cost-minimizing Treasury (see (3)) -rate cuts increase bill issuance-, it amplifies the positive relationship between the liquidity premium and the policy rate (since $\kappa_B < 0$).

The coefficient γ in the regression captures the effect of debt supply on the liquidity premium of T-bills. This might capture any issuance unrelated to cost-minimizing debt management. In the model, the response of the liquidity premium to debt supply is:

$$\frac{d\pi}{dB} = \kappa_B + \kappa_R \frac{dR}{dB} \tag{6}$$

The first term on the right-hand side corresponds to the direct effect of a higher debt supply on the liquidity premium: a larger number of bonds reduces the marginal value of all bonds outstanding and reduces the liquidity premium ($\kappa_B < 0$). The second term on the right-hand side captures the central bank's reaction to new debt issuance. In a corridor system, the model implies that $dR/dB < 0$ (the central bank needs to offset new debt issuance to keep the rate on target). Therefore, the second term dampens the effect of debt supply on the liquidity premium (since $\kappa_R < 0$).

Regression (4) has been widely estimated in the literature. A well-known result for US data shows that $\hat{\beta} > 0$ and $\hat{\gamma} \approx 0$. This leads many authors to conclude that the main driver of liquidity premia of near-money assets is the opportunity cost of money (Nagel, 2016; Drechsler et al., 2017, 2018). That conclusion ignores the PI channel (assumes $dB/di = 0$ by not considering the endogeneity of debt management). Furthermore, they imply that $\hat{\gamma} \approx 0$ suggests that $\kappa_B \approx 0$, without taking into account that in a corridor system $\hat{\gamma} \approx 0$ implies that $\kappa_B \approx |\kappa_D \frac{dR}{dB}|$.

Column 1 in Table 1 replicates the result in Nagel (2016), who estimates (4) for a sample ending in December 2011. As can be seen, the coefficient $\hat{\beta}$ is positive and significant, and the coefficient γ is not statistically different from zero. Assuming $dB/di \approx 0$, the policy rate determines the opportunity cost of money, and thus also the liquidity premium of all near-money assets.

Even if a cost-minimizing Treasury implies $dB/di < 0$, the PI channel can still be irrelevant if it's true that $\kappa_B \approx 0$.

To check this possibility, the rest of Table 1 estimates (4) in levels over the full sample (extended to December 2019), using OLS, and interacting i_t and B_t with a Floor dummy (0 through 2008m11, 1 from 2008m12 onward). The floor system is one where the central bank issues abundant reserves, beyond the point where banks' demand for reserves becomes flat. The interbank rate falls to equal the interest on reserves (IOR), which becomes the main policy rate. Importantly, the supply of reserves is disconnected from the IOR and ceases to be relevant for the central bank's mandate[11].

In this context, it is fair to assume that $dR/dB \approx 0$ (the central bank no longer needs to monitor the total supply of liquidity to pin down the policy rate)[12]. Thus, coefficient γ in the regression (4) collapses to $\frac{d\pi}{dB} = \kappa_B$. If $\kappa_B < 0$, the coefficient γ should capture its magnitude during a floor system.

Dependent variables are the AA Commercial paper/T-bills spread and the spread between the 3-month general collateral (GC) repo rate and the 3-month T-bill. Two facts emerge.

First, the partial effect of bill supply, conditional on the policy rate, γ, is statistically insignificant during the corridor era, but its interaction with the Floor is negative and statistically significant. This indicates that, under the floor system, when abundant reserves delink the operating target from reserve scarcity, a scarcity/dilution margin in near-money services becomes economically relevant, and the variation in premia reflects asset-supply

[11]It can still be relevant for other central banks' objectives (see Piazzesi et al., 2022).

[12]See Poole (1968), Keister et al. (2008), Lenel et al. (2019), Afonso et al. (2020), Arce et al. (2020), Cúrdia and Woodford (2011), Piazzesi et al. (2021)

Table 1: Determinants of the Liquidity Premium

	Variables in levels			Variables in 1st diff.		
	(1)	(2)	(3)	(4)	(5)	(6)
Dep. var.:	GCrepo/Tbill	AACP/Tbill	GCrepo/Tbill	ΔGCrepo/Tbill	ΔGCrepo/Tbill	ΔAACP/Tbill
fedfundsrate	6.184***	7.189***	7.192***	12.55***	9.200*	22.54
	(0.792)	(1.323)	(0.928)	(4.844)	(4.923)	(21.35)
fedfundsrate$\times I_{\text{floor}}$		1.048	2.323			
		(3.572)	(2.713)			
vix	0.961***	1.331**	0.703***	0.669***	1.112***	0.375
	(0.185)	(0.571)	(0.240)	(0.228)	(0.253)	(0.323)
$\log(\frac{Tbill}{GDP})$	-5.786	11.86	-11.54		-105.9***	-94.98***
	(9.265)	(14.63)	(9.828)		(25.68)	(36.86)
$\log(\frac{Tbill}{GDP}) \times I_{\text{floor}}$		-63.21**	-35.24**			
		(27.07)	(15.07)			
I_{floor}		-161.8	-64.42			
		(64.45)	(36.05)			
$\log(\frac{Tbill}{GDP})_{t-1}$						27.46
						(36.55)
Constant	-31.54	30.85	-46.45	0.277	0.519	-1.871*
	(22.77)	(36.89)	(23.81)	(0.829)	(0.871)	(1.103)
Control for:						
Fed's Programs	N	Y	Y	N	N	N
Instruments for:						
MP rate	N	N	N	Y	Y	Y
Tbill/Debt supply	N	N	N	Y	Y	Y
Weak instruments test						
CD stat				38.20	13.35	6.21
SY critical value				[6.53]	[6.22]	[5.9]
Observations	248	876	344	211	211	136
Adj. R^2	0.524	0.412	0.538	0.062	0.057	0.023
Sample:	5/1991-12/2011	5/1991-12/2019	5/1991-12/2019	5/1991-12/2008	5/1991-12/2008	11/2008-2/2020

Notes: Data are at a monthly frequency. Units are in basis points. A CD stat greater than the Stock and Yogo critical value rejects weak instruments (with bias greater than 20% of OLS bias). Newey-West standard errors in parentheses (12 lags).

conditions.

Second, the coefficient on the policy rate, β, is positive and statistically significant, and its interaction with Floor is small and not statistically different from zero. Under a floor system, the pure OC channel would predict that the causal effect of i_t on premia weakens once the short rate is technologically delinked from reserves (as in a floor system). Instead, the rate effect survives intact. The stability of β across regimes can be explained by the fact that, in the US, the implementation of the floor system coincided with the ZLB. The policy rate shows little to no variation until the end of 2015. Another reason might be that in the floor system, the effect of the policy rate captures the full PI channel. This is hard to tell from US data, as the floor system also coincided with the implementation of QE programs, which also affect T-bill issuance (as suggested in the previous Section). In our final exercise below, we slightly modify the framework to account for the OC channel during the ZLB plus QE period[13].

These results hold against some simple robustness checks. In columns 2 and 3, we add a dummy variable for those months when the Fed extended extraordinary liquidity programs to help distressed financial institutions during the height of the financial crisis. Lastly, we also run these regressions with the dummy variable taking the value of one at other dates, to check if we are picking up some unrelated shock. Although the results in Table 1 also hold for other dates between August 2007 and October 2008 (the height of the financial crisis), the effect disappears for dates outside of the crisis and far from October 2008.

Taken together, these results support a hybrid view: the direct opportunity-cost channel is structural and might be regime-invariant; an asset supply channel is latent in the corridor but becomes first-order under the floor.

In Columns 4 to 6, we use instruments for the policy rate and T-bill supply. We also run (4) with all variables in first differences to account for possible stochastic trends that generate spurious correlation between the levels of these variables. To instrument the supply variable, we follow Greenwood et al. (2015) and use month dummies to exploit the strong seasonality in T-bill supply. This seasonality arises from seasonal fluctuations in tax receipts that are plausibly exogenous and immune to the reverse causality problem here. To instrument the federal funds rate, we use federal funds futures in the same way as in Piazzesi and Swanson (2008). These are futures contracts that settle at the end of each month based on the average federal funds rate that prevails during that month. The futures price before expiration is a risk-adjusted forecast of the average federal funds rate that prevails during the expiration month. Used as an instrument, the futures price in months prior to the expiration month should therefore be highly correlated with the average federal funds rate during the expiration month. Tests for weak instruments are shown for each Column.

Column 4 runs (4) in normal times (May 1991 to December 2008) with only the policy rate, and Column 5 adds the T-bill supply. This is a direct mediation test for the role of the PI channel in normal times. The inclusion of B_t in the regression reduces the estimated coefficient $\hat{\beta}$, suggesting that the PI channel amplifies the effect of β in Column 4. Notably, the magnitude of the drop suggests that, in normal times, the PI channel accounts for more

[13] In addition, see Cuevas (2025) for the study of the liquidity premium under floor systems that did not involve ZLB or QE programs.

than a quarter of the overall effect of the policy rate on the liquidity premium.

Regarding the CR channel during normal times, the use of instruments for both the policy rate and T-bill supply likely rules out a significant role for this mechanism[14].

Column 6 restricts the sample to the period November 2008-February 2020[15]. The IV coefficient on the change in T-bill supply is negative and statistically significant, which confirms the result shown in levels: the supply variable "wakes up" during the floor system.

We also consider the possibility that the coefficient on the supply variable is only capturing a transitory effect on the liquidity premium. This is especially relevant in this case, where we are using 1-month differences. It can be the case that new debt issuance by the government has a short-lived impact that fades away soon after. To address this issue, we include the lagged change in T-bill supply (also instrumented with monthly dummies). Temporary impacts would show up as a statistically significant positive sign in this coefficient, and in a roughly equal magnitude compared to the current supply variable. Column 6 shows that this coefficient is not significant. This is inconsistent with "OC only" in this window and is consistent with a direct supply effect (scarcity/dilution) in which quantity interventions dominate pricing when the short rate is stuck.

In this setting, the IV coefficient on the change in the policy rate is statistically insignificant. This, again, might be due to the long ZLB period that dominates this sample. By contrast, changes in the supply of near-money assets move the scarcity factor $\kappa(B_t, \xi_t)$ and therefore premia.

We can slightly modify the framework to account for the OC channel during this period. Since there is no variation in the interest rate during the ZLB, we can account for monetary policy decisions by the variation in the supply of reserves (through QE programs). Recall that QE programs purchased long-term Treasuries (not T-bills) and expanded the supply of reserves. In the simple model, the effect of a change in reserves is given by:

$$\frac{d\pi}{dR} = \kappa_R + \kappa_B \frac{dB}{dR} \tag{7}$$

The first term on the right-hand side is the "new" opportunity cost channel: increasing

[14]The instruments clear any unobserved shock to the liquidity premium not accounted for in the explanatory variables that could be correlated with interest rates or the supply variables. For example, a rise in the liquidity premium due to an unobservable liquidity demand shock may prompt the Fed to lower interest rates in the same month, leading to reverse causality from the liquidity premium to the interest rate and a downward-biased estimate of the interest rate coefficient.

[15]Starting the series when the recession was over (it ended 2009Q2 according to NBER) -to avoid the recession adding an endogenous shock to liquidity demand that can further bias the results- does not change the results significantly.

Table 2: QE Study Event

	(1)	(2)	(3)
	3m AA Fin CP	3m Tbill	Liq. Premium
QE1			
Jan. 28, 2009	17	10	7
Mar. 18, 2009	-21	-4	-17
Aug. 12, 2009	-3	-1	-2
Sep. 23, 2009	2	-1	3
Nov. 4, 2009	1	-2	3
Sum			-6
QE2			
Aug. 10, 2010	-4	0	-4
Sep. 21, 2010	-3	-1	-2
Nov. 3, 2010	0	0	0
Sum			-6***
QE3			
Sep. 21, 2011	-12	-1	-11***

Notes: Daily data. Changes measured in 2-day windows. Units are in basis points. See main text for details on standard errors.

the supply of reserves increases the overall supply of liquidity and lowers the liquidity premium on near-money assets (since $\kappa_R < 0$). The second term on the right-hand side is the "new" policy-driven issuance channel: as shown in the previous Section, there is suggestive evidence that T-bill supply contracts during QE programs. Thus, $dB/dR < 0$ and the second term offsets the first one (since $\kappa_B < 0$).

Which of the two effects dominates is an empirical question. To answer it, Table 2 studies two-day windows around LSAP announcements during 2009–2012, when the policy rate is constant at zero, taking the cumulative changes as a measure of the overall effects. For QE1, we focus on six official communications: the eight considered in Gagnon et al. (2010) from which we exclude three for which there is no reliable data. For QE2 and QE3, we consider the events included in Krishnamurthy and Vissing-Jorgensen (2011). The Appendix describes the events happening on each date.

The liquidity premium on T-bills declines on impact in these windows, except for QE1[16].

[16] To test for the significance of the effect, we regress the daily changes of the liquidity premium on six

The main difference with respect to existing papers that carry these event studies (Gagnon et al., 2010; Krishnamurthy and Vissing-Jorgensen, 2011) is that these papers estimate the effects for long-term assets -which are the assets QE is trying to directly affect-. QE was never intended to alter the prices of short-term assets, and these assets were not purchased[17].

This result is a clean support for the OC channel in the relevant horizons: with each LSAP announcement, π_t still falls. The newly issued reserves more than offset the effect of changes in T-bill supply[18]. Of course, one explanation might be that, over such short windows, Treasury issuance cannot adjust meaningfully within two days. Still, we can interpret it as the extra supply of reserves more than offsets the expectation of a future lower supply of Treasuries of all maturities. Overall, the natural interpretation is a monetary-quantity channel: LSAPs expand central-bank liquidity, compress money-market frictions, and/or signal more abundant safe collateral, which lowers κ and therefore π_t even with no change in i_t. The fact that this effect appears rapidly in event time strengthens the identification relative to monthly regressions.

4 Conclusions

This paper asks why liquidity premia on near-money assets co-move positively with short-term policy rates and shows that the reduced-form slope admits multiple interpretations. A minimal framework nests three mechanisms: a direct opportunity-cost channel, a common-response quantity channel, and a policy-driven issuance channel. Using dual instruments for policy rates and bill supply, regime interactions, and event windows, we separate these forces.

Three findings emerge. First, the causal effect of the policy rate on premia is positive and

dummies: three dummies for whether there was a QE announcement in that day for each QE1, QE2 or QE3, and three other dummies for whether there was a QE announcement on the previous day, again for each QE1, QE2 and QE3.

[17]The usual caveats on the credibility of event studies also apply here. In particular, a series of strong assumptions are made: that QE expectations have not been affected by anything other than these announcements, that we can measure responses in windows wide enough to capture long-run effects but not so wide that information affecting yields through other channels is likely to have arrived, and that markets are efficient in the sense that all the effects on yields occur when market participants update their expectations and not when actual purchases take place. Also, QE programs do not arise in a vacuum, complicating causal attribution.

[18]The null effect during QE1 might be due to the increase in demand for liquidity (an increase in ξ_t) during the height of the crisis (this would be the CR channel)

regime-invariant, consistent with the OC view. Its effect operates through prices in normal times, and through quantities during QE programs. Second, we find a meaningful role for issuance-mediation in our core tests; debt supply is present in normal times through the PI channel, and it becomes the marginal instrument under the floor regime: changes in T-bill supply significantly move premia. Third, we find no necessary role for the common response channel; if present, CR appears modest relative to OC in levels and to quantity effects in the floor era.

Taken together, the results favor a decomposition: outside the ZLB, premia primarily reflect the opportunity cost of money and issuance decisions by the Treasury; when reserves are abundant or the rate is pinned, asset quantities—central-bank liquidity and the supply of near-money collateral—dominate. Policy implications follow. Monetary authorities should expect premia to respond reliably to the policy rate in normal times, while debt-management choices and balance-sheet policies become first-order at the floor. For future work, quantifying the mediated share via structural estimates of κ_B and dB/di, and exploiting cross-country differences in operating regimes and debt-management flexibility, would sharpen welfare and design conclusions.

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Appendix A Data sources

All interest rates in the empirical analysis are monthly averages of daily annualized effective yields.

Yields: The return on the 3-month Treasury-bill is from FRED, series TB3MS, available from January 1934 onwards.

For 1971-onwards the commercial paper yield is from the FRED database. For 1971-1996 it is the series CP3M (the average of offering rates on three-month commercial paper placed by several leading dealers for firms whose bond rating is AA or equivalent). This series was discontinued in 1996, so for 1997-onwards we use the series CPN3M (the three-month AA nonfinancial commercial paper rate). Prior to 1971 we use the commercial paper series for prime commercial paper, 4-6 month maturity, from Banking and Monetary Statistics (table 12.5 fro 1941-1970 and table 120 for 1920-1940).

The GC repo rate comes from Bloomberg, and the federal funds rate comes from FRED.

The variable on federal funds rates corresponds to the effective federal fund rate (in FRED) from July 1954 onward and the Federal Reserve Bank of New York's discount rate before that date.

Interest on Reserves is also from FRED, series IOER. It is available from October 2008 (when the Fed started paying interest in reserves) onwards.

Supply variables: Data on outstanding T-bills is from the Center for Research in Security Prices (CRSP) monthly Treasury files. The series reports the outstanding face values of Treasury Bills since January 1947. We use this source instead of the Financial Accounts (Table L.210 reports government securities) since the latter only reports quarterly figures. Data on nominal GDP is from the quarterly FRED database, linearly interpolated to monthly values.

The supply of reserves is the total reserves of depository institutions (FRED, series TOTRESNS), available from January 1959 onwards.

The data in Figure **??** is from the Monthly Statement on Public Debt, available at Treasurydirect.

Other variables: VIX index is from FRED, available since 1990. For the period pre-1990, we use Nagel (2016)'s projection, which is based on realized volatility of the S&P 500 index (see that paper's appendix for details).

Appendix B Event study: QE announcements dates

For QE1, we include the dates in the baseline estimation in Gagnon et al. (2010). These events are: -November 25, 2008: the Fed announced it would purchase up to 100$billioninagencydebt, andupt$ billion in agency MBS. However, during these days the market for commercial paper was under severe stress, so it is not possible to reliably estimate the impact on the liquiidty premium.
-The same problem happens for December 1, 2008, when Bernanke's speech stated that in order to infuence financial conditions, the Fed "could purchase longer-term Treasury securities... in substantial quantities".
-The December 2008 and January 2009 FOMC statements, which indicated that the FOMC was considering expanding purchases of agency securities and initiating purchases of longer-term Treasury securities.
-The March 2009 FOMC statement, in which the FOMC announced the decision to purchase "up to" \$300 billion of longer-term Treasury securities, and to increase the size of agency debt and agency MBS purchases to "up to" \$200 billion and \$1.25 trillion, respectively.
-The August 2009 FOMC statement, which dropped the "up to" language qualifying the maximumamount of Treasury purchases, and announced a gradual slowing in the pace of these purchases.
-The September 2009 FOMC statement, which dropped the "up to" language qualifying the maximum amount of agency MBS purchases, and announced a gradual slowing in the pace of agency debt and MBS purchases.
-The November 2009 FOMC statement, which stated that the FOMC would purchase "around \$175 billion of agency debt".

For QE2 and QE3, we consider the events included in Krishnamurthy and Vissing-Jorgensen (2011). For QE2 they are:
-August 10, 2010: the FOMC statement announced that it "will keep the Federal Reserve's holdings of securities at their current level by reinvesting principal payments from agency debt and agency mortgage-backed securities in longer-term Treasury securities". Before this announcements, market expectations were that the Fed would let its MBS portfolio run off. Moreover, it announced the shift towards longer-term Treasuries, and not MBSs as in QE1.
-September 21, 2010: the FOMC announcement reiterates this message: "will maintain its existing policy of reinvesting principal payments from its securities holdings". The fourth paragraph also reveals its intention to expand the purchases of longer-term Treasuries: "will continue to monitor the economic outlook and financial developments and is prepared to

provide additional accommodation if needed to support the economic recovery".
-November 3, 2010: the FOMC statement makes such and intention explicit: "will maintain its existing policy of reinvesting principal payments from its securities holdings. In addition, the Committee intends to purchase a further $600 billion of longer-term Treasury securities by the end of the second quarter of 2011". However, KV 2011 show evidence that this announcement was far more anticipated than the previous ones.

As for QE3, it considers the announcement in September 21, 2011, when the FOMC statement said: "The Committee intends to purchase, by the end of June 2012, $400 billion of Treasury securities with remianing maturities of 6 years to 30 years and to sell an equal amount of Treasury securities with remaining maturities of 3 years or less (...) The Committee will now reinvest principal payments from its holdings of agency debt and agency mortgage-backed securities in agency mortgage-backed securities". There is a key difference with QE1 and QE2: this round of purchases was financed with short-term Treasuries, not reserves. In light of the model, the effect of this extra supply of short-term Treasuries on the liquidity premium will depend on the actual maturity of the instruments actaully sold.