Crowding Out—Final Draft

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1 Intro

This project investigates the effect of privately-held US federal government debt through the asset crowder out channel, which operates through increased interest rates and altered financial asset portfolios. These higher rates are suggested to consequently affect private investment. The project will look at the effect of an increase in US Treasury Securities (USTs) [1] held by the private sector on various interest rate spreads, the non-UST financial asset holdings of particular entities, and on gross private investment. The effects on the proportion of privately-held government debt in the form of short-term marketable instruments (bills) and a measure of money creation through Treasury operations will also be examined

2 Crowding out specifications

Crowding out is supposed to operate through the interest rate channel: if there's an increase in the supply of financial assets competing with a fixed supply of funds, this will cause asset prices to fall and their interest rates (yield) to rise. If the Fed is targetting an overnight interest rate (fedfunds), such as was the case since August 1971 (excepting the period of reserve targetting from October 1979 - October 1983), this shouldn't affect the yields on short term USTs since misalignment would offer an arbitrage opportunity to investors and, prior to its ability to pay interest on reserves in October 2008, the main tool the Fed used to target fedfunds was purchasing short term USTs, which pushes their yield to fedfunds. Figure 8 shows that the rate on 1-month USTs closely tracks the overnight fedfunds rate, whereas 10- and 30-year yields are much more variable

2.1 Interest differentials

As such, the mechanism by which crowding out increases rates is to increase risk and term premia, which can be measured by the interest rate differential between longer-dated USTs (coupons) and short-term USTs (bills), and the spread between private sector rates and the yield on USTs with equivalent maturities. This project will look at spreads for 10 and 30-year USTs (over 1-month, and 10-year USTs, respectively), 10-year corporate bonds (over 10-year USTs), 30-year mortgages (over 30-year USTs), and the prime rate minus fedfunds

2.2 Portfolio effects

An increase in USTs may affect the asset compositions of entities in the economy. For example, a common strategy for financial firms, such as private insurance companies and pension funds, is to purchase financial assets that match the maturities of their liabilities (Stigum and Crescenzi 2007). If risk premia rise, USTs may become more attractive than private financial assets, and firms' holdings of private assets may decrease. This project will investigate the effects of privately-held USTs on non-UST financial assets for US insurance companies, pension funds, households, and banks

[1] To simplify and harmonize the data, non-marketable debt is included in this analysis. Disaggregated data on non-marketable holdings for the entities under study was not available. A chart of total debt, marketable debt, non-marketable debt, and private debt can be found in Figure 1

2.3 Investment effects

Because higher interest rates increase borrowing costs, an increase in USTs may decrease investment by making it more expensive to borrow money to finance investments. By looking at debt-to-GDP ratios in the period Q2 1970 to Q2 1982, Carrasco (1998) finds a small negative effect on investment when controlling for inflation rate, ratio of corporate profits to stockholding equity, and the S&P composite index, although this confirming result was sensitive to which time period was chosen, and the adjusted R^2 was relatively low at 0.236

2.4 UST maturity composition effects

Long-term (coupons) and short-term USTs (bills) are expected to each have different crowding out effects due to different degrees of liquidity and 'moneyness'. Miran and Roubini (2024) describe how bills are much more liquid than coupons because their prices are much more stable. Investers have a much greater ability to predict movements in fedfunds over short periods than long periods, and since the risk of price changes are low, investors are able to borrow using bills as a collateral with a low or zero haircut. Miran and Roubini (2024) write: "Because bills and reserves are close substitutes but coupons and cash are not, swapping bills for reserves causes a much smaller reduction in effective money supply than swapping coupons for reserves", and their paper "Activist Treasury Issuance and the Tug-of-War Over Monetary Policy" argues that an increase in the ratio of bills issued relative to coupons has the effect of reducing long term rates by reducing the supply of coupons, which investors then bid up the prices on and reduce their yields. Hartley and Rigon (2024) find that longer-maturity UST issuance leads to larger increases in the term premia compared to short-term USTs: "We estimate a response of 0.9% in the 10-year yield per year of unexpected duration/[weighted average maturity (WAM)] increase in the Treasury term structure over the next 3 months [...] In contrast, we estimate a response of 0.36% in the 3-month yield per year of unexpected duration/WAM increase in the Treasury term structure over the next 3 months". So, we should expect that increases in coupons relative to bills cause a greater effect through the crowding out channel. This project will investigate possible crowding out effects caused by the ratio of bills to total privately-held USTs, which tends to increase during recessions (see Figure 9)

3 Potential confounding factor: Treasury deposit creation channel

Taylor (1995) argues that in countries with well-developed credit markets, government need not finance budget deficits with monetization (central bank purchasing of government bonds or direct financing of the treasury) and can issue debt to the private sector instead: "In the United States, where the fraction of government expenditures that is financed by [monetary base (M0)] growth is very small, neither [M0] growth nor inflation have shown much tendency to vary with the size of the budget deficit". Taylor also notes "The early 1980s provide an excellent historical example: when the budget deficit rose sharply in the United States, the rate of inflation declined sharply". In other words, because US credit markets have a great ability to absorb USTs, the government need not finance deficits through monetization and thus deficits don't directly cause money growth which, according to economic theories such as the quantity theory of money, is associated with inflation (at least in the long term)

Figure 2 shows the period from 1980 to 1990 with the quarterly deficit in blue and monetization (quarterly change in Federal Reserve UST holdings) in red (y-axis is in millions of dollars). Because Fed UST holdings are relatively stable, low, and often negative, Taylor would argue that the

government deficits in this period did not significantly increase inflation because the Fed wasn't increasing the monetary base by purchasing USTs

The problem with this reasoning common to Friedman (1978), Ball and Mankiw (1995), Carrasco (1998), Balcerzak and Rogalska (2014), and Taylor (1995) is that it neglects the effects of government deficits on the supply of commercial bank deposits (a primary component of the M2 money supply), which are inarguably more important to the economy than central bank deposits (referred to here as 'reserves') because a near entirety of aggregate expenditure accounted for in the domestic economy is conducted with transactions involving bank deposits—the only exceptions are where *both* the sender and receiver of the transaction are either a bank, foreigner without a domestic deposit account (referred to here as 'ROW'), or the federal government. In other words, we should not only be looking at the red line in the previous graph, but the sum of the red, green, and yellow lines: Figure 3. If government deficits increase the quantity of deposits and thus the money supply in the economy, then this may affect the degree of crowding out

If a household purchases a UST directly from the Treasury, deposits are debited from their bank account, and their bank sends reserves to the Treasury. This leads to a reduction in deposits and reserves equal to the original price of the UST—if we were to measure M0 and M2 at this point, both are reduced by that amount. When the Treasury spends the proceeds of the sale to another household, the same quantity of reserves and deposits are added (M0 and M2 increase). If the Fed purchased the UST and the Treasury spends the proceeds to a household, then there's an increase in both reserves and deposits (this increase will, in fact, be slightly larger than the original auction value of the UST because the Fed must purchase the UST from a private entity, such as a primary dealer and, in the process, pay the dealer a small premium). These two scenarios seem to be what the authors are imagining with the effects of government borrowing on the economy. However, it leaves out the effects of banks and ROW purchasing USTs: the Treasury receives reserves from the sale to a bank, and if it spends the proceeds to a household, then there's a net increase in deposits equal to the original auction value of the UST—measuring M0 and M2 would reveal no change in M0 but an increase in M2. Together, banks, foreigners, and the government will be referred to here as 'reserve users' (RUs), and all other entities are 'deposit users' (DUs)

3.1 Treasury deposit creation channel equations

The equation to identify the quantity of deposits created by Treasury operations in the current period, which I call the Treasury deposit creation channel (TDC), is $(G_d - T_d) + (D_{sales} - D_{purch}) + D_{yield}$, where $(G - T)$ is government spending (except interest payments) net of taxation and other receipts *in the form of deposits*, $(D_s - D_p)$ is the net sale of USTs from DUs to RUs, and D_y is payments that the Treasury makes to DUs' UST holdings (i.e. interest and principle). To estimate this, I use federal government expenditures minus receipts and interest payments, minus DU UST holdings, plus interest payments multiplied by the ratio of DU holdings to total private UST holdings. This is imprecise because total federal expenditures and receipts includes payments to and from RUs, which may not be in the same proportion (if spending to RUs is higher than receipts from RUs, the equation will overestimate deposit creation). In general, I expect this to underestimate deposit creation in normal times and overestimate it in periods with low inflation and banking crises (such as spending to banks under TARP beginning in 2008)

A second, identically equal equation is $T_{AV} + D_{sales} + F_{PY} + M_{MT} - R_{yield} - D_{purch} - F_{OE} - T_{RX} - TGA$, where T_{AV} is the original auction value of all USTs, F_{PY} is income earned by the Fed from the private sector, M_{MT} includes seniorage profits on minting coins and any transfer payments

from the reserve system (including taxes owed by RUs), F_{OE} is Fed operating expenses, T_{RX} is any Treasury spending that doesn't involve deposits, and TGA is the change of surplus in the Treasury General Account since the previous period. If the sum of interest payments by the Treasury to the Fed's UST holdings (F_{TY}) and F_{PY} is less than F_{OE}, then $F_{OE} = F_{TY} + F_{PY}$ in that period (i.e. the Fed only remits net income to the Treasury—it doesn't charge losses). This version of the equation is more difficult to estimate using data, but we can derive a simple approximation with it: RU UST holdings plus remittances from the Fed to the Treasury minus the change in the surplus of the TGA multiplied by the ratio of DU USTs to the total market value of the debt. I call this the UST distributional monetary creation estimate or DMC, and I expect it to be less accurate during periods with large TGA surpluses and an unstable ratio of DU USTs to total debt (note this is a different ratio than the one used in the TDC estimate)

3.2 TDC estimate discrepancies

Figure 4 shows the estimates for TDC and DMC in blue and red with the y-axis in millions of dollars. There's a significant discrepancy between the two estimates, likely involving different types of specification problems in each. For the TDC estimate, we assume all government spending is in the form of deposits and that interest payments to DUs are directly proportional to the ratio of DU holdings to private holdings. For the DMC estimate, we assume that the DU UST to total debt ratio directly reflects the proportion of funds in the TGA from DU UST purchases. In both, we assume that the current market value of USTs is the same as the original auction value—this may cause discrepancies during crises when unexpected monetary policy changes affect asset prices. The inclusion of non-marketable debt may also cause a significant discrepency since its value does not change except through time

The largest discrepency comes from the fact that, while the change in the market value of total federal debt should be equal to federal expenditures minus federal receipts minus federal interest payments, these data are not equal. Because of this discprepancy and since the project is specifically focused on the market value of federal debt, I will replace the $(G - T)$ estimate with total USTs. Figure 5 shows that this alternate estimate (in green) is much closer to the DMC estimate. The average of the alternate estimate and DMC will be used in the results section

3.3 TDC contribution to money supply growth

Looking back at the 1980 - 1990 period, with the quarterly deficit in blue and monetization in red, we can add a green line for the TDC estimates' average: Figure 6. Now, we see that contrary to the idea that there was minimal money creation in this period (i.e. the red line), the lowest of the estimates (DMC) reveals that a mean of $17.0 billion was added to M2 per quarter. Over the same period, the M2 money supply increased with a mean of $43.5 billion. Figure 7 shows DMC in blue and the difference between the change in M2 and DMC in red, indicating that deposit creation from Treasury operations often dominated private sector money growth

3.4 TDC's effect on loanable funds

Ball and Mankiw (1995) describe how changes in government deficits lead to a less than one-for-one change in private savings since a household that receives a government payment or a tax cut will likely spend only a portion of that income, with the rest contributing to national saving. In other words, private saving desires cause a portion of government spending to leak back into private saving, so US deficits financed by sales of debt to the private sector will lead to a less that

one-for-one decrease in the supply of loanable funds (which is a function of global USD savings). When combined with the Treasury's deposit creation channel, government deficits may not reduce loanable funds and, in certain cases, may actually increase the supply

3.5 TDC's effect bank balance sheet expansion

When banks purchase USTs, the aggregate size of both sides of bank balance sheets expand after the Treasury spends. While this increases bank profits, it can introduce interest rate risk, such as via the Fed unexpectedly increasing rates, which reduces asset prices. This risk may be partially reflected in higher rates, however, I don't expect it to be very significant

Bank balance sheets are also subject to regulations, and while USTs have a 0% risk weight and therefore don't count against the risk-adjusted capital ratio, they are included in the denominator of the supplemental leverage ratio, and thus there's a regulatory limit on how many USTs banks can absorb—at which point, they'd be forced to sell assets to non-banks, which could increase interest rates. This may be partially reflected in the portfolio effects discussed later, but I don't think the TDC specifically has had much effect through this chanel, historically, but it may be more relevant in other countries or hypothetical future conditions

4 Confounding factor: inflation channel

While I don't expect the crowding out effect to directly increase short-term rates due to the Fed targetting fedfunds, government deficits may affect inflation or inflation expectations and cause the Fed to change its monetary policy. If an increased deficit doesn't cause the Fed to react in the current period, markets may expect it to react in future periods, which increases longer rates. While technically different from an increase in term premia, an analysis of UST spreads would show an equivalent effect. Thus, higher deficits could decrease investment independent from the crowding out channel. Still, while the focus of this project is on crowding out, identifying any effects of deficits on spreads, portfolios, and investment is useful information

It may be reasonable to believe that any evidence of an increase in deficits positively affecting spreads or negatively affecting investment can be at least partially explained through crowding out since the inflation and crowding out effects are expected to move in the same direction, but if it were the case that the TDC offsets the crowding out channel, then any apparent effects of USTs on the study variables could entirely be caused by the inflation channel

5 Results

OLS time series regressions using robust standard errors were used to assess the crowding out effect. The controls used are the percent changes in GDP and fedfunds, and the year-over-year percent change in PCEPI. For each regression, lags for the three predictor variables (percent change in private USTs, bill ratio, and TDC average) were chosen based on the minimum BIC value when testing between zero and four lags for each. Regressions on the study variables were performed in the entire date range (Q2 2006 through Q3 2024), between Q4 1983 and Q3 2008, and after Q4 2008. The first time period restriction was chosen since it represented a relatively stable period with no significant changes to how monetary policy was conducted. In conjunction with the significant crises in 2008 and 2020, second period involved substantial changes to how monetary policy was conducted, including the introduction of paying interest on reserves, the transition from a limited

reserve regime to a regime of ample or abundant reserves, and the introduction of money market intervention facilities including CPFF, FIMA, and the SRF

5.1 Interest differentials

Statistically significant correlations between percent changes in private USTs and corporate bond and mortgage rate spreads (over 10-year and 30-year USTs, respectively), with coefficients of 0.0595 and 0.0465 and R^2s of 0.291 and 0.348 (see Table 1). There was a small positive coefficient of the bill ratio on the mortgage spread and a small negative coefficient on the 10-year and 30-year UST spreads

In the first period (Table 2), only the 30-year UST spread over 10-year USTs had a significant coefficient for private USTs, with an elasticity of 0.0261 and R^2 of 0.407. Small positive and negative coefficients were found for the TDC average on mortgage and 30-year UST spreads, respectively. In the second period (Table 3), private USTs had a positive coefficient for corporate bond and mortgage spreads (0.0973 and 0.0898) and negative coefficients on 10-year, 30-year, and prime rate spreads (-0.0775, -0.0326, and -0.00583) with R^2s of 0.563, 0.708, 0.809, 0.667, and 0.241

The crowding out hypothesis expects positive coefficients in each of these study variables through the risk and term premia channels. The risk premia effects on financial assets were supported in the entire date range and second period. The opposite was observed for the term premium in the second period, where UST spreads were negatively correlated. This may be due to the confounding effect of 'unconventional' monetary policies such as QE, which had the purpose of lowering long term yields on USTs as well as private assets during a period of steeply rising risk premia. Due to confounding factors from poor economic performance in the second period, we may be unable to make a conclusion about the effect of USTs on risk premia in this period. The bill ratio was expected to lower spreads, but this was only found in the entire date range and only for UST. Larger mortgage were associated with higher bill ratios, but this is difficult to interpret and may be confounded. Because the TDC represents an increase in M2, it may increase the quantity of money available for investments, but the results are difficult to interpret

5.2 Portfolio effects

A positive correlation was found between private USTs and bank non-UST financial assets (0.318), and bill ratio also had a statistically-significant relationship with bank non-UST financial assets (0.0599), but all of these regressions have a very low R^2, with a maximum of 0.157 for banks, so it's unlikely that crowding out explains much of the variation in portfolio holdings over the entire date range (see Table 1)

In the first period (Table 5), the R^2 for banks increased to 0.256, and a statistically significant coefficient of 0.236 was found for private UST holdings. Positive coefficients for private USTs were also found for households and pension funds, with bill ratio having a negative coefficient, but the R^2 values are low. In the second period (Table 6), R^2 values increased, but only banks had a statistically significant coefficient for private USTs (0.284) and the TDC estimate (-0.00256)

Overall, the variables seem to be poor predictors of portfolio holdings, but this may be due to a weak underlying model. Contrary to the crowding out hypothesis, all statistically significant results had positive coefficients for an increase in private USTs

5.3 Investment

As shown in Table 7, statistically significant effects were found from the second lag of private USTs (0.285) and the bill ratio (-0.128) in the entire date range. In the first period, the third lag of private USTs was significant at 0.455, and in the second period, the bill ratio and lag of TDC estimate were significant at -0.129 and 0.00365

The crowding out hypothesis suggests increased USTs should decrease private investment due to higher interest rates and a lower preference of holding private debt. The results do not support this since in the entire range and first period, the coefficient of private USTs on gross private investment is positive, not negative. In the second period, the bill ratio is unexpectedly negative. However, this may be due to a confounding factor of the bill ratio increasing during economic downturns where firms' expectations are depressed. The TDC shows an expected positive correlation, which may be from an increased money supply available for investment, but because this is limited to the second period, there may be confounding factors

6 Conclusion

In conclusion, the results show some support for the effect of privately-held USTs on the risk premia, but the effects on term premia are inconclusive and tend in the opposite of the expected direction. Portfolio effects, while observable in some cases, were generally weak and contradicted the crowding out hypothesis, possibly due to confounding factors and a weak underlying model. Similarly, the relationship between UST holdings and gross private investment was unexpectedly positive in certain periods, indicating that additional factors, such as economic conditions and liquidity effects from the Treasury deposit creation channel, may offset crowding-out effects

7 Figures

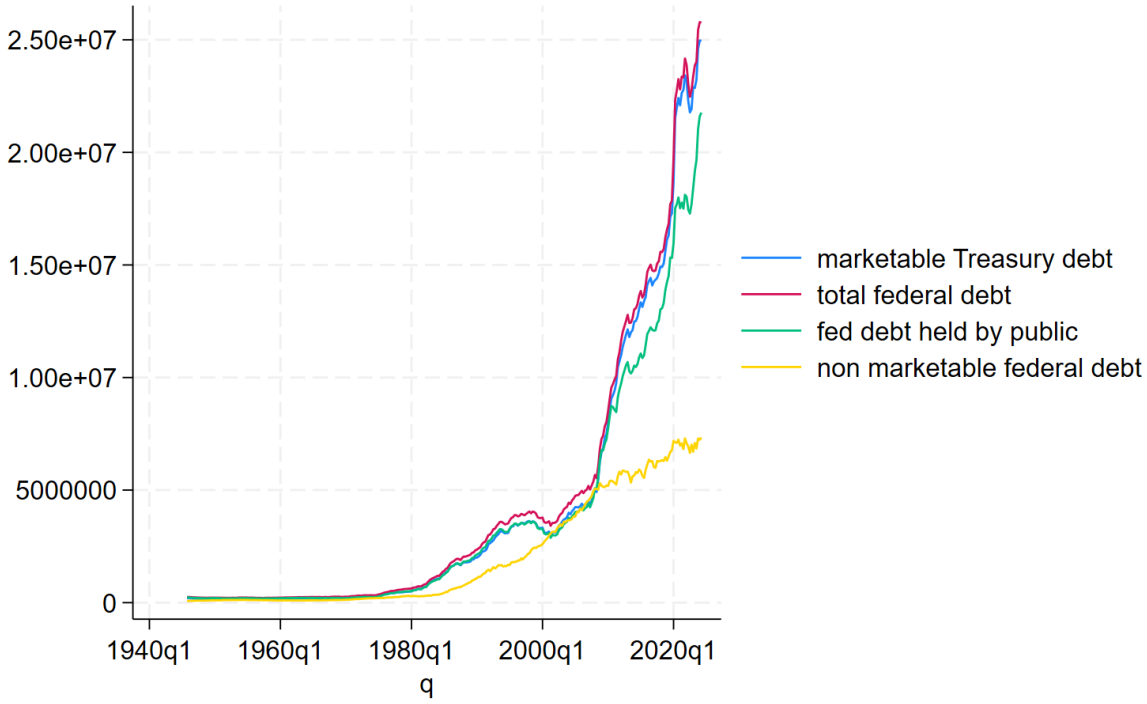

Figure 1

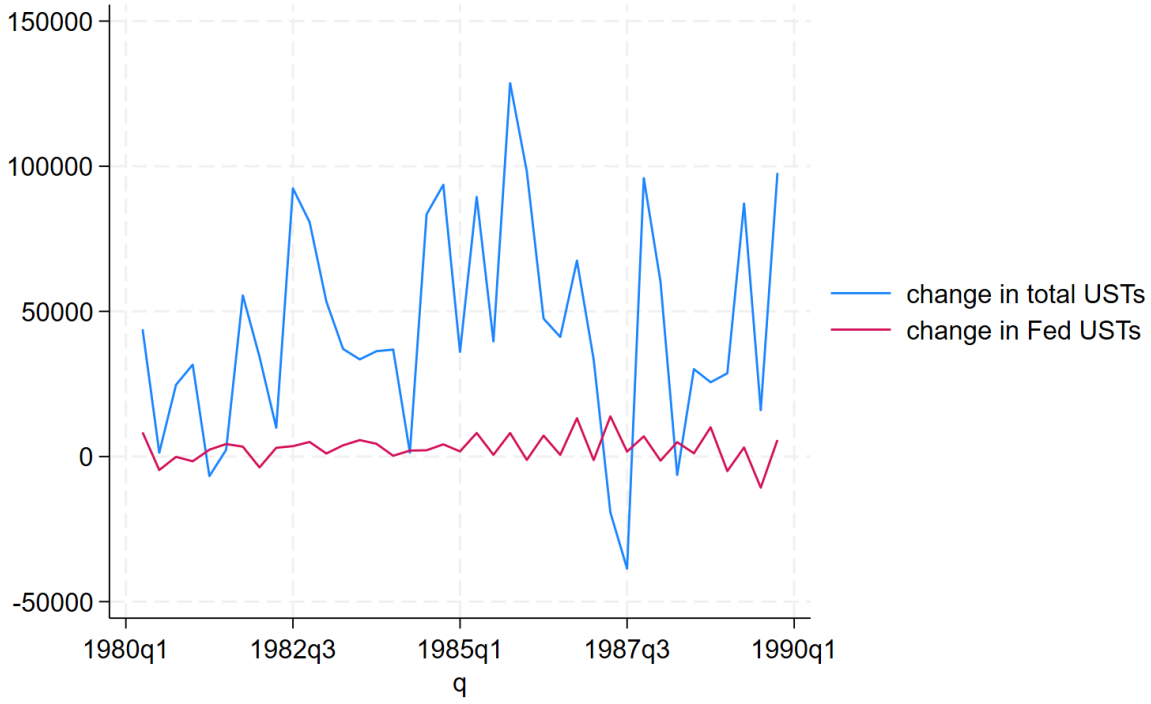

Figure 2

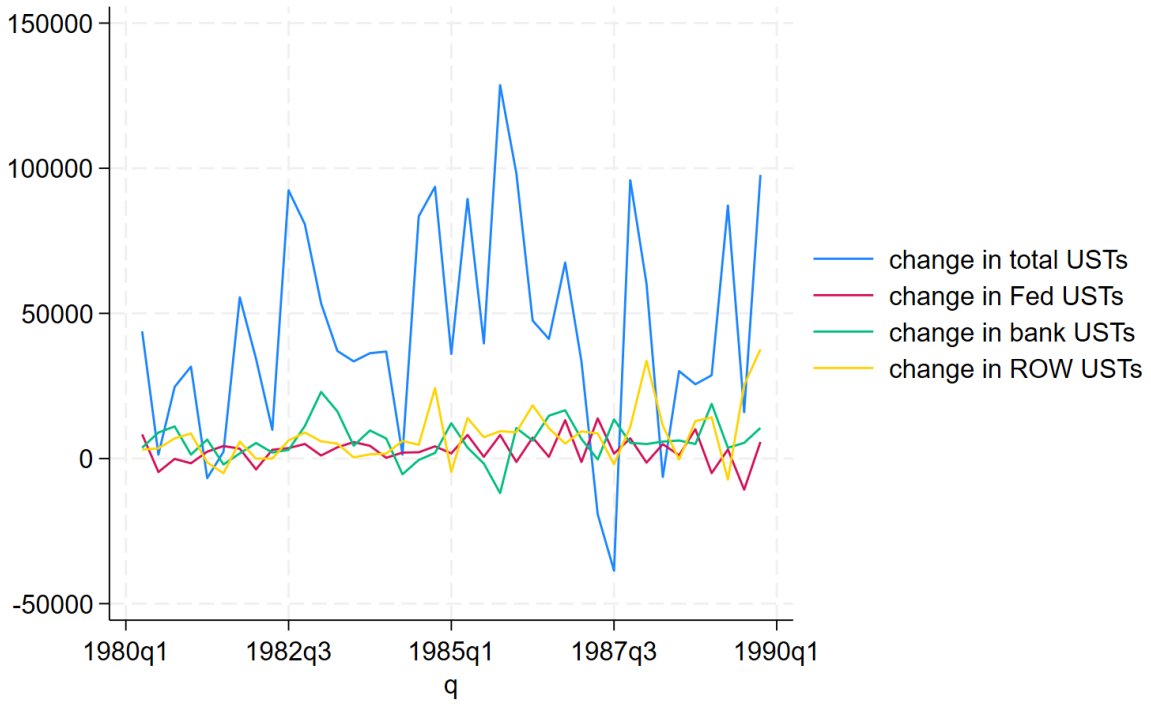

Figure 3

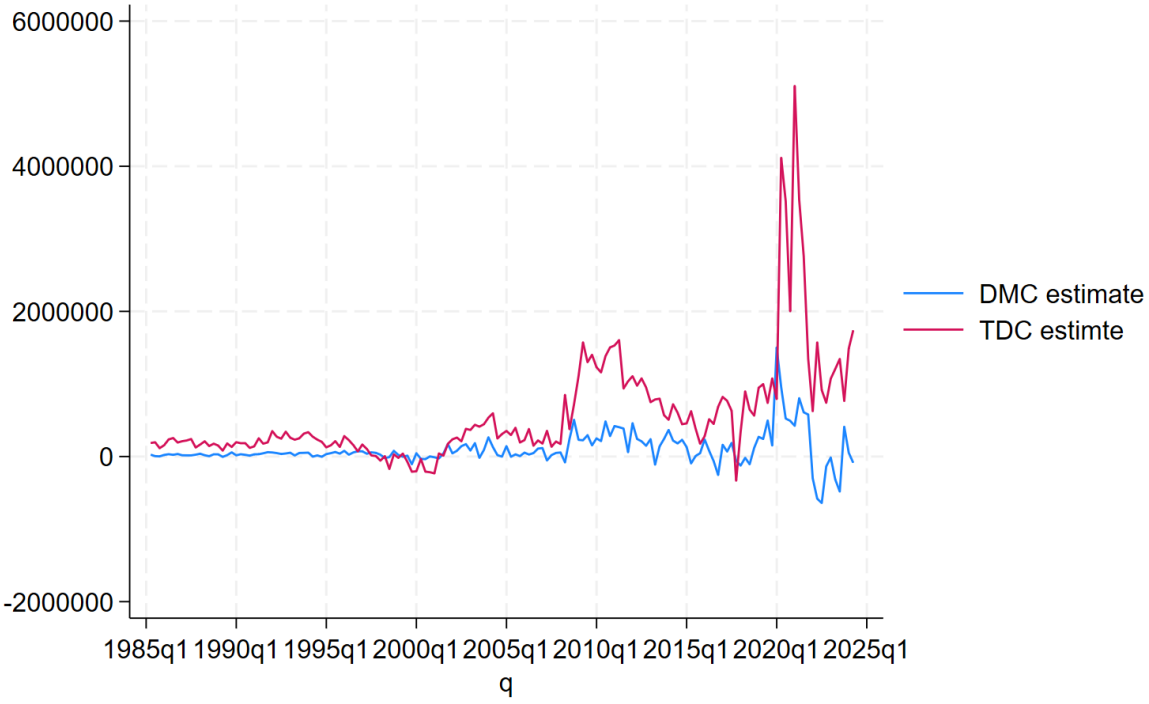

Figure 4

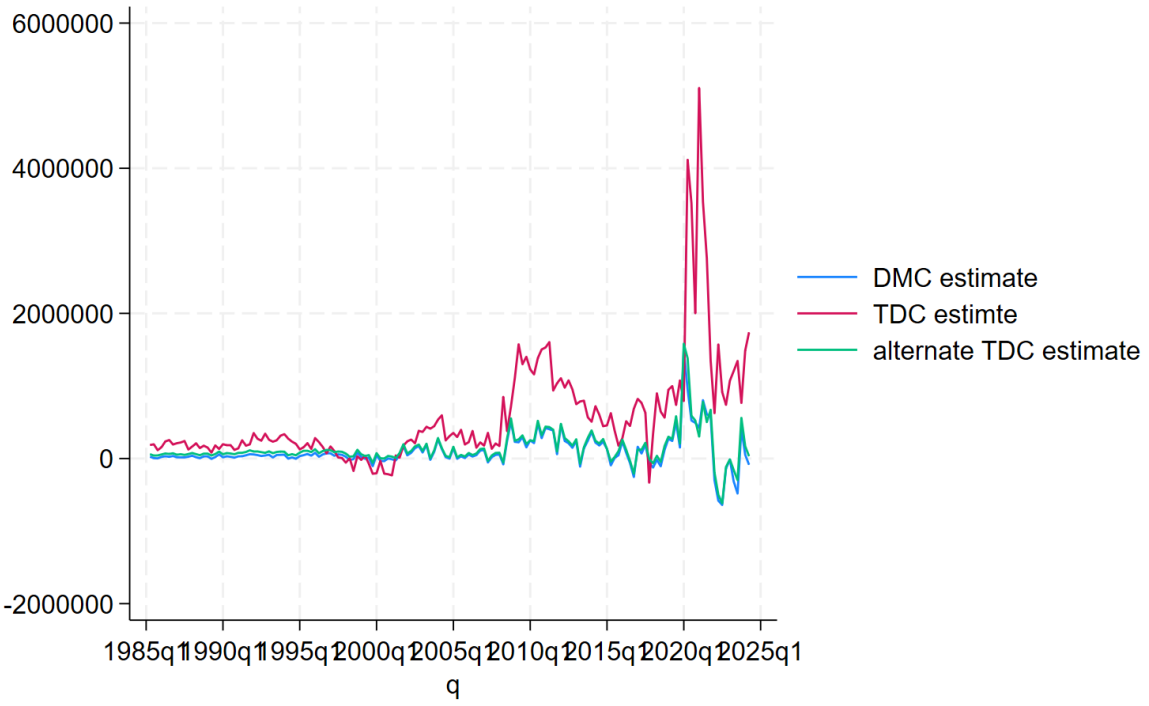

Figure 5

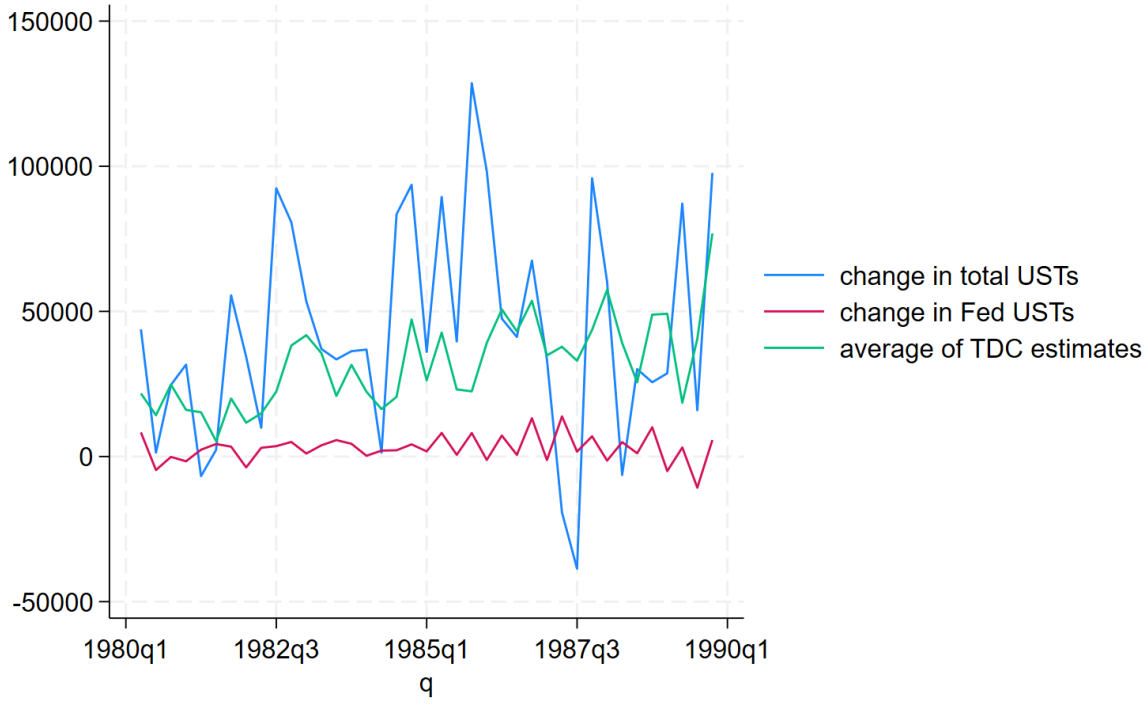

Figure 6

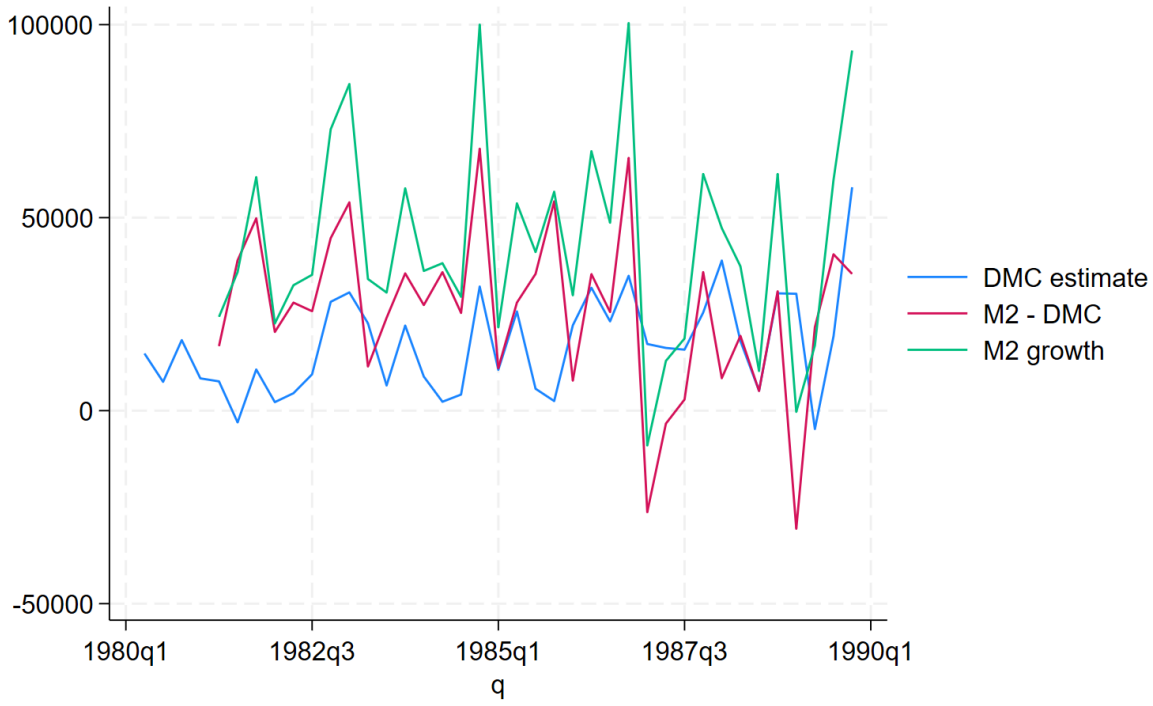

Figure 7

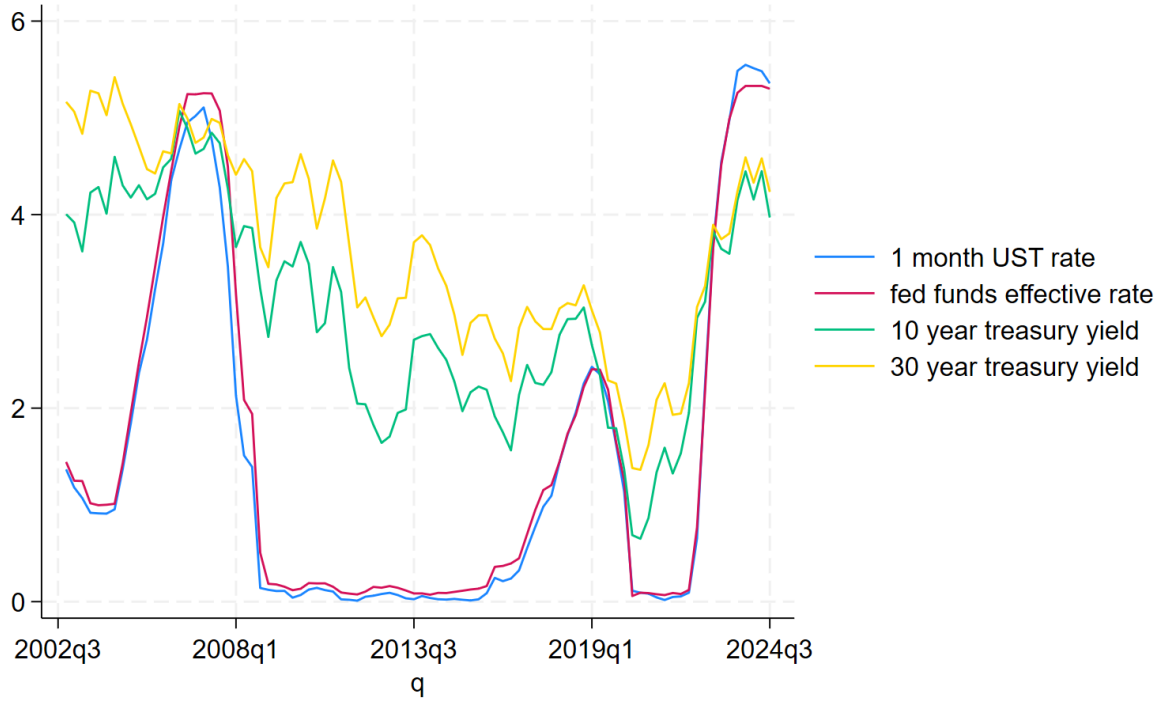

Figure 8

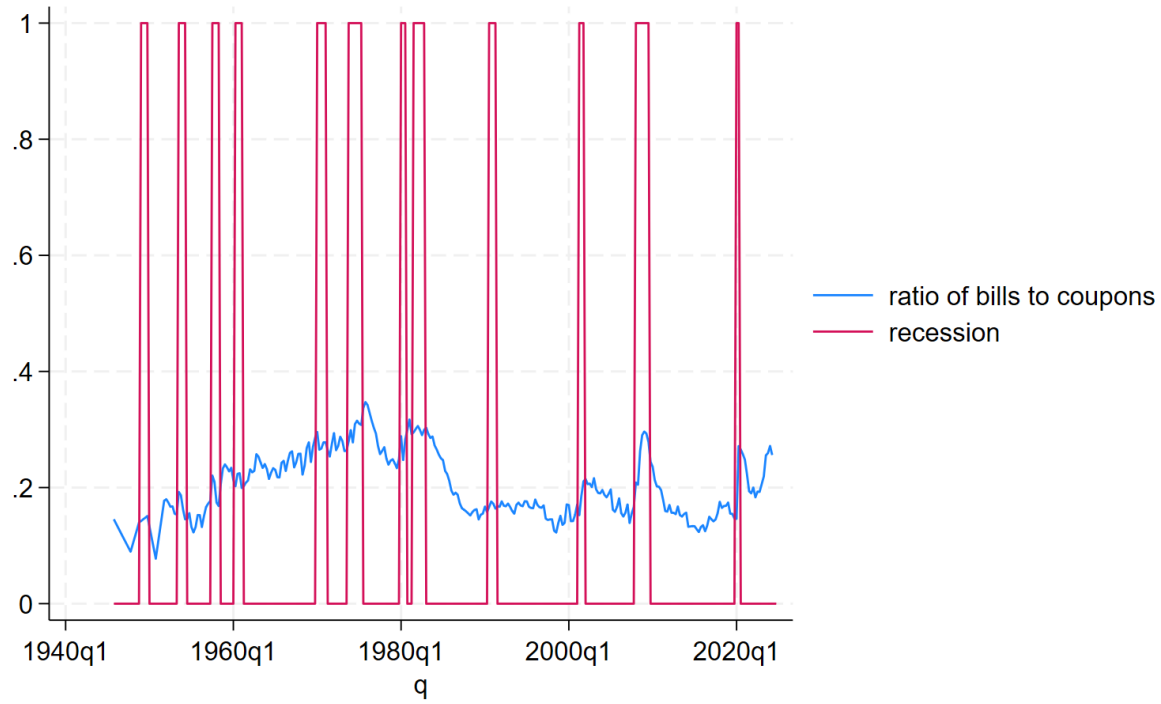

Figure 9

8 Tables

Table 1: Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	cb_gap	mort_gap	tsy10_gap	tsy30_gap	prime_gap
d_pri_tsy	0.0595**	0.0465***			
	(0.0233)	(0.0164)			
L.d_bill_ratio	0.00987	0.0123***	-0.0133*	-0.00451*	0.00595
	(0.00699)	(0.00411)	(0.00794)	(0.00233)	(0.00403)
L.d_tdc_avg	-0.000111	0.000209		-0.0000884	
	(0.000140)	(0.000161)		(0.0000862)	
L3.d_tdc_avg			-0.000605**		
			(0.000243)		
L4.d_tdc_avg					-0.0000207
					(0.0000664)
d_ffr	-0.000165	0.0000988	0.00449***	-0.000459	-0.00133
	(0.00125)	(0.000824)	(0.00147)	(0.000316)	(0.00105)
d_gdp	-0.0119	0.000719	0.00178	0.00310	-0.00993
	(0.0133)	(0.0148)	(0.0420)	(0.00673)	(0.0103)
pcepi_yoy	-0.0757*	0.153***	-0.233**	-0.0718***	-0.0466*
	(0.0396)	(0.0267)	(0.0903)	(0.0105)	(0.0266)
q	0.00358***	0.0000172	-0.0251***	0.00269***	0.00808***
	(0.000681)	(0.00113)	(0.00455)	(0.000501)	(0.000632)
L.d_pri_tsy			0.0131	0.0155**	-0.0158
			(0.0380)	(0.00733)	(0.0128)
_cons	0.635***	0.834***	7.399***	0.132	1.560***
	(0.188)	(0.248)	(1.025)	(0.102)	(0.160)
R-squared	0.291	0.348	0.412	0.461	0.623

Table 2: Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	cb_gap	mort_gap	tsy10_gap	tsy30_gap	prime_gap
L.d_pri_tsy	-0.0191	-0.0289			-0.0290
	(0.0142)	(0.0213)			(0.0216)
L3.d_pri_tsy			0.0580		
			(0.0731)		
d_pri_tsy				0.0261**	
				(0.0101)	
L.d_bill_ratio	0.00426	0.000181		0.00130	0.00159
	(0.00425)	(0.00722)		(0.00469)	(0.00474)
d_bill_ratio			0.00929		
			(0.0216)		
L.d_tdc_avg	0.00000580	0.000232*		-0.0000806	0.0000850
	(0.0000800)	(0.000119)		(0.0000897)	(0.0000668)
L3.d_tdc_avg			-0.000844***		
			(0.000243)		

	cb_gap	mort_gap	tsy10_gap	tsy30_gap	prime_gap
d_ffr	-0.0164***	-0.0112***	-0.0162	-0.00358	-0.0110**
	(0.00281)	(0.00384)	(0.0107)	(0.00281)	(0.00488)
d_gdp	-0.00150	0.00225	0.0199	0.00472	0.00397
	(0.0102)	(0.0179)	(0.114)	(0.00837)	(0.0142)
pcepi_yoy	0.0492	0.256***	0.604*	-0.116***	0.000292
	(0.0369)	(0.0649)	(0.338)	(0.0220)	(0.0707)
q	0.00459***	-0.00432**	-0.157***	0.00390***	0.0133***
	(0.00141)	(0.00193)	(0.0292)	(0.00112)	(0.00168)
_cons	0.224	1.378***	28.58***	0.00824	0.756**
	(0.284)	(0.411)	(4.790)	(0.191)	(0.361)
R-squared	0.385	0.395	0.708	0.407	0.546

Table 3: Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	cb_gap	mort_gap	tsy10_gap	tsy30_gap	prime_gap
d_pri_tsy	0.0973***	0.0898***	-0.0775***	-0.0326***	
	(0.0311)	(0.0174)	(0.0287)	(0.0104)	
L3.d_bill_ratio	0.0123				
	(0.00759)				
L.d_bill_ratio		0.0104	-0.00323	-0.00113	0.00157
		(0.00630)	(0.00510)	(0.00334)	(0.00144)
L.d_tdc_avg	0.000126	0.000103	-0.000266		-0.0000103
	(0.000135)	(0.000212)	(0.000272)		(0.0000363)
d_tdc_avg				0.000164	
				(0.000108)	
d_ffr	0.00156**	0.00107	0.00244**	-0.000758***	-0.000191
	(0.000636)	(0.000703)	(0.000991)	(0.000252)	(0.000170)
d_gdp	-0.0108	-0.0136	-0.00900	0.00403	-0.00151
	(0.0245)	(0.0199)	(0.0327)	(0.00862)	(0.00220)
pcepi_yoy	0.0375	0.0582	0.0845	-0.00447	0.0113*
	(0.0383)	(0.0456)	(0.0749)	(0.0190)	(0.00672)
q	-0.0207***	0.0233***	-0.0668***	-0.0146***	-0.000131
	(0.00409)	(0.00334)	(0.00562)	(0.00190)	(0.000834)
L2.d_pri_tsy					-0.00583**
					(0.00280)
_cons	5.811***	-4.382***	16.58***	4.042***	3.160***
	(0.934)	(0.730)	(1.217)	(0.408)	(0.187)
R-squared	0.550	0.699	0.808	0.685	0.241

Table 4: Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	d_hh_fa	d_ic_fa	d_pp_fa	d_usb_fa
L.d_pri_tsy	0.0636	0.00960	0.101	

	d_hh_fa	d_ic_fa	d_pp_fa	d_usb_fa
	(0.0623)	(0.0575)	(0.0743)	
d_pri_tsy				0.318***
				(0.0779)
L.d_bill_ratio	-0.00174	0.0198	0.000848	0.0599***
	(0.0195)	(0.0204)	(0.0226)	(0.0203)
L4.d_tdc_avg	0.000540	0.000215		0.0000771
	(0.000515)	(0.000739)		(0.000679)
L2.d_tdc_avg			0.000655	
			(0.000574)	
d_ffr	-0.0124***	-0.00910***	-0.0159***	-0.00873
	(0.00432)	(0.00315)	(0.00492)	(0.00557)
d_gdp	0.0921*	0.0883	0.0665	-0.0202
	(0.0535)	(0.0536)	(0.0632)	(0.0736)
pcepi_yoy	-0.0135	-0.0646	-0.0539	-0.0947
	(0.0770)	(0.106)	(0.102)	(0.136)
q	-0.00302	-0.0134***	-0.00921*	-0.00490
	(0.00390)	(0.00409)	(0.00515)	(0.00586)
_cons	2.055***	4.146***	3.381***	2.445*
	(0.789)	(0.939)	(1.091)	(1.244)
R-squared	0.0995	0.136	0.129	0.157

Table 5: Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	d_hh_fa	d_ic_fa	d_pp_fa	d_usb_fa
L.d_pri_tsy	0.128*	0.0980	0.189**	0.236**
	(0.0716)	(0.0689)	(0.0842)	(0.112)
L2.d_bill_ratio	-0.0810**			
	(0.0360)			
L.d_bill_ratio			0.0309	0.0391
			(0.0337)	(0.0457)
d_bill_ratio		0.103		
		(0.0929)		
L.d_tdc_avg	-0.000582	-0.000692	0.000349	-0.00224
	(0.000712)	(0.00124)	(0.000751)	(0.00138)
d_ffr	0.0238	0.00223	0.0334	-0.0300
	(0.0158)	(0.0267)	(0.0219)	(0.0275)
d_gdp	0.0610	0.184	0.0722	-0.284***
	(0.0565)	(0.131)	(0.0831)	(0.0986)
pcepi_yoy	-0.258	-0.545**	-0.451*	-0.422*
	(0.225)	(0.234)	(0.254)	(0.236)
q	-0.00621	-0.0200**	-0.0290***	-0.0324**
	(0.00787)	(0.00766)	(0.00958)	(0.0136)
_cons	3.100*	6.086***	7.124***	7.473***
	(1.564)	(1.557)	(1.852)	(2.298)
R-squared	0.162	0.136	0.146	0.256

	d_hh_fa	d_ic_fa	d_pp_fa	d_usb_fa

Table 6: Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	d_hh_fa	d_ic_fa	d_pp_fa	d_usb_fa
L.d_pri_tsy	-0.0121	-0.0201	0.0403	0.284**
	(0.141)	(0.0762)	(0.174)	(0.125)
L.d_bill_ratio	-0.0198	0.00553	-0.0287	-0.00612
	(0.0346)	(0.0195)	(0.0393)	(0.0334)
L.d_tdc_avg	0.00107	0.000183	0.00134	-0.00256***
	(0.00228)	(0.00195)	(0.00263)	(0.000733)
d_ffr	-0.0119***	-0.00991***	-0.0150***	-0.00822*
	(0.00344)	(0.00290)	(0.00462)	(0.00480)
d_gdp	0.111	0.0518	0.177	0.124
	(0.165)	(0.136)	(0.197)	(0.135)
pcepi_yoy	-0.530*	-0.154	-0.695*	-0.353
	(0.268)	(0.200)	(0.368)	(0.291)
q	0.0522*	0.0304	0.0510	0.0112
	(0.0282)	(0.0202)	(0.0344)	(0.0223)
_cons	-9.201	-5.513	-8.790	-0.200
	(5.772)	(4.051)	(7.148)	(4.856)
R-squared	0.224	0.154	0.233	0.293

Table 7: Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	entire range	period 1	period 2
L2.d_pri_tsy	0.285**		
	(0.135)		
L3.d_pri_tsy		0.455***	
		(0.122)	
L.d_pri_tsy			-0.297
			(0.357)
d_bill_ratio	-0.128***		-0.129***
	(0.0358)		(0.0441)
L4.d_tdc_avg	0.000813		
	(0.000908)		
L.d_tdc_avg		0.000602	0.00365**
		(0.000730)	(0.00167)
d_ffr	0.0135	0.138***	0.000411
	(0.0158)	(0.0304)	(0.0101)
d_gdp	0.381***	0.0192	0.571
	(0.140)	(0.119)	(0.355)
pcepi_yoy	-0.0166	-0.984**	0.0543
	(0.232)	(0.377)	(0.554)

	entire range	period 1	period 2
q	-0.00220	-0.0211	0.00579
	(0.00844)	(0.0144)	(0.0485)
L2.d_bill_ratio		0.379***	
		(0.0411)	
_cons	0.772	6.487**	0.0375
	(1.864)	(2.781)	(10.78)
R-squared	0.182	0.461	0.245

Table 8: Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	entire range	period 1	period 2
L.d_pri_tsy	-0.0204*	0.0104	-0.0403**
	(0.0120)	(0.0112)	(0.0176)
L.d_bill_ratio	0.00374	0.00409	-0.00561
	(0.00460)	(0.00451)	(0.00588)
L3.d_tdc_avg	0.000218**		
	(0.0000865)		
L.d_tdc_avg		-0.0000358	0.000111
		(0.0000882)	(0.000159)
d_ffr	0.00346***	0.00626**	0.00181***
	(0.000810)	(0.00286)	(0.000444)
d_gdp	0.0115	-0.00567	0.0125
	(0.0126)	(0.00946)	(0.0236)
d_gov	0.00220	0.0576***	-0.00898
	(0.00550)	(0.0162)	(0.00561)
d_gov_in	0.0237**	-0.00697	0.0119
	(0.0109)	(0.0137)	(0.0110)
q	-0.00672***	-0.00468***	0.00937**
	(0.000796)	(0.00120)	(0.00352)
_cons	1.843***	1.264***	-1.550*
	(0.146)	(0.178)	(0.806)
R-squared	0.423	0.293	0.466

Balcerzak, Adam P., and Elzbieta Rogalska. 2014. "Crowding Out and Crowding in Within Keynesian Framework. Do We Need Any New Empirical Research Concerning Them?" *Institute of Economic Research Working Papers*, no. 2/2014.

Ball, Laurence, and N. Gregory Mankiw. 1995. "What Do Budget Deficits Do?"

Carrasco, Marie. 1998. "Crowding Out and Government Spending." *University Avenue Undergraduate Journal of Economics* 2 (1): 1. https://digitalcommons.iwu.edu/uauje/vol2/iss1/1.

Friedman, Benjamin M. 1978. "Crowding Out or Crowding in? Economic Consequences of Financing Government Deficits." *Brookings Papers on Economic Activity* 3.

Hartley, Jonathan S., and Lorenzo Rigon. 2024. "Does Government Debt Management Matter? High Frequency Identification from u.s. Treasury Quarterly Refunding Announcements." https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4772653.

Miran, Stephen, and Nouriel Roubini. 2024. "Activist Treasury Issuance and the Tug-of-War over Monetary Policy." Hudson Bay Capital. https://www.hudsonbaycapital.com/documents/FG/hudsonbay/research/635102_Activist_Treasury_Issuance_-_Hudson_Bay_Capital_Research.pdf.

Stigum, Marcia, and Anthony Crescenzi. 2007. *Stigum's Money Market (Ebook)*. 4th ed. McGraw-Hill.

Taylor, John B. 1995. "Monetary Policy Implications of Greater Fiscal Discipline."