

# U.S. Treasury Auctions: A High Frequency Identification of Supply Shocks

[R&R, AEJ:Macro]

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## Abstract

I identify Treasury supply shocks using auction data, interpreting changes in futures prices around announcements as shocks to expected supply. I isolate the component of futures price variations pertaining to U.S. Treasury announcements between 1998 and 2020. I study how supply affects financial markets through local projections, using shocks as instruments. I show that increases in Treasury supply cause an upward shift of the yield curve fueled partly by a higher term premium. Stock prices climb, volatility declines and corporate bond yields increase. The equity premium rises, the risk premium falls, inflation expectations soar and the liquidity premium decreases.

## Introduction

Following the outbreak of the COVID-19 crisis, OECD governments borrowed 18 trillion dollars from the markets in 2020. This unprecedented 6.8 trillion dollar increase in debt securities with respect to 2019 has propelled debt-to-GDP ratios to record highs in many countries, including the United States.

At the same time, ultra loose monetary policy combined with the general flight to safety have kept yields on these securities extremely low. Still, amidst rising inflation expectations fueled by rapid economic recovery, fears of monetary policy tightening have caused substantial financial market volatility. At the core of investors concerns lies the uncertainty as to how the debt burden will eventually affect financial markets.

There exists a body of empirical literature that relates changes in the supply of Treasury securities to several macro-financial outcomes. Although it is believed to crowd out private investment by raising real interest rates, Treasury supply is thought to provide liquidity services to firms and households thereby crowding in investment via better credit conditions. Yet, estimating the relationship between the supply of Treasuries and the economy is a challenging task. Reduced-form coefficients from the regressions of interest rates onto debt at quarterly frequencies are, at best, correlations.

In this paper, I present a novel identification strategy of U.S. Treasury supply shocks based on Treasury auction data.

## Methodology and Data

Let  $P_t^{TS,k}$  be the price of a  $k$ -year Treasury at the end of day  $t$  and let  $F_t^{TS,k}$  be its associated futures price for  $k = 2, 5, 10, 30$ .  $F_t^{TS,k}$  is a bet on  $P_{\tau(t)}^{TS,k}$  where  $\tau(t)$  is the future settlement date closest to  $t$ . I postulate that on announcement day  $t$ ,

$$F_t^{TS,k} - F_{t-1}^{TS,k} = -\sigma^k \xi_t^k + u_t^k,$$

where  $\xi_t^k$  is the debt supply shock and  $u_t^k$  are changes in futures prices orthogonal to  $\xi_t^k$  modeled as a function of observables (e.g., day-of-week dummies and changes in Fed Funds futures).

The supply shock is  $\xi_t^k \propto Q_{\tau(t)}^k - E[Q_{\tau(t)}^k]$  with  $Q_{\tau(t)}^k$  the stock of  $k$ -year Treasuries at time  $t$ . The scaling factor  $\sigma^k$ , in turn, involves the unconditional standard deviation of changes in futures and the price elasticity of debt demand.

In words, changes in front-month Treasury futures prices around public announcements by the Treasury can be interpreted as shocks to the expected supply of debt securities by the U.S. government. This hypothesis assumes that on announcement days (1) demand for public debt instruments is fixed and (2) markets are fed with no systematic innovation other than the announcement.

To investigate the financial consequences of surprise increases in the supply of U.S. debt securities, I then use  $z_t = (\xi_t^2, \xi_t^5, \xi_t^{10}, \xi_t^{30})'$  to instrument the stock of Treasuries  $y_{1t}$  in the local projections,

$$y_{i,t+h} = \alpha_i + \phi_{i,1,h} y_{1t} + v_{i,t+h},$$

with the purpose of estimating the IRFs  $\phi_{i,1,h}$  for a set of financial variables.

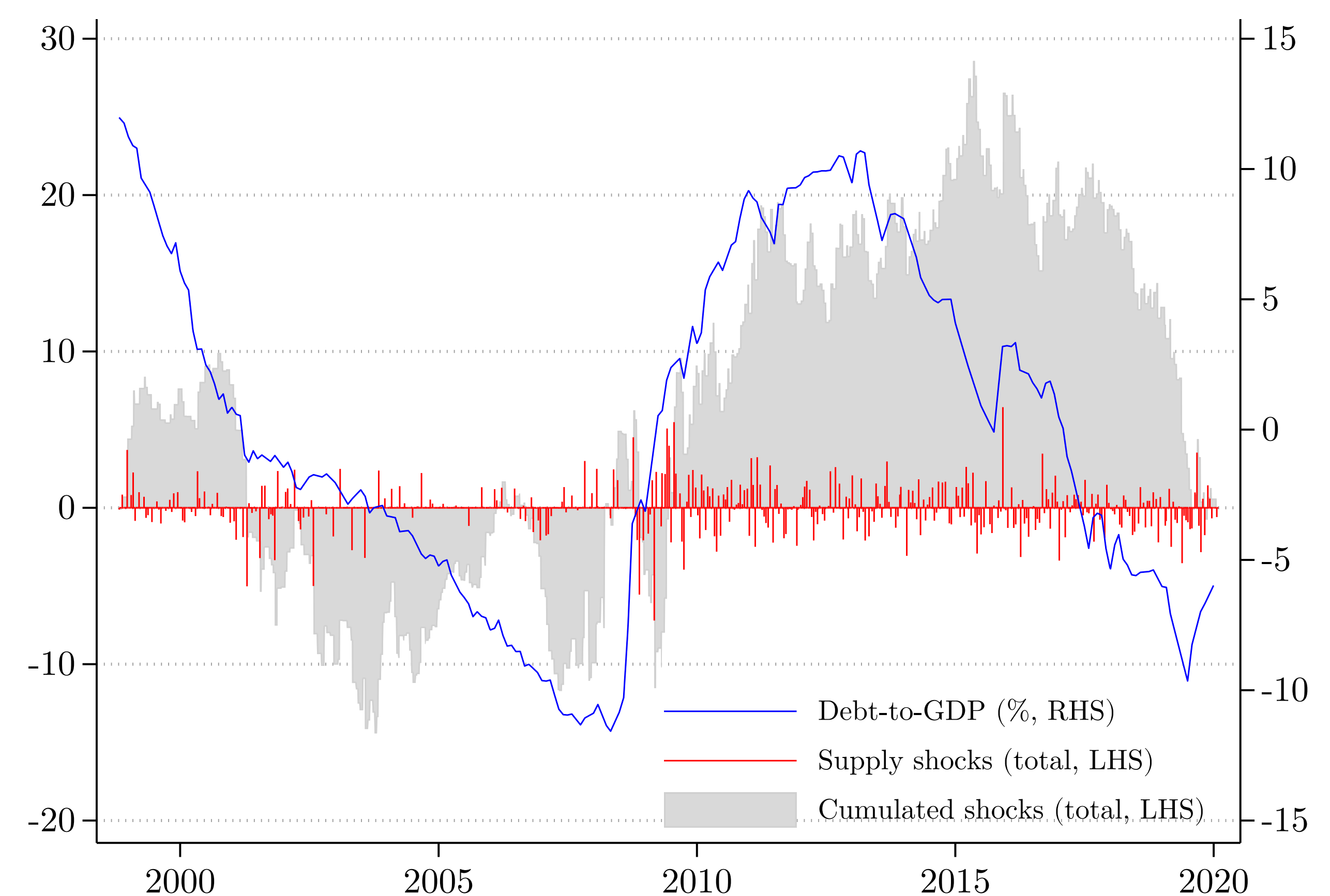
The argument that  $z_t$  ought to serve as reasonable instruments hinges upon the claim that my series are relevant (i.e., they explain a substantial share of the variance in the net amount of securities tendered by the U.S. Treasury on announcement days) and exogenous (i.e., they are orthogonal to innovations to the other variables in the system on announcement days).

Data on announcement dates come from TreasuryDirect.com while those on futures prices come from Eikon Datasream. The financial variables of interest were retrieved from the Federal Reserve Economic Data (FRED), from Yahoo Finance or from Bloomberg. My baseline sample starts on October 28, 1998, and ends on January 31, 2020, providing 5343 observations.

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Figure 1. Debt-to-GDP & Supply Shocks



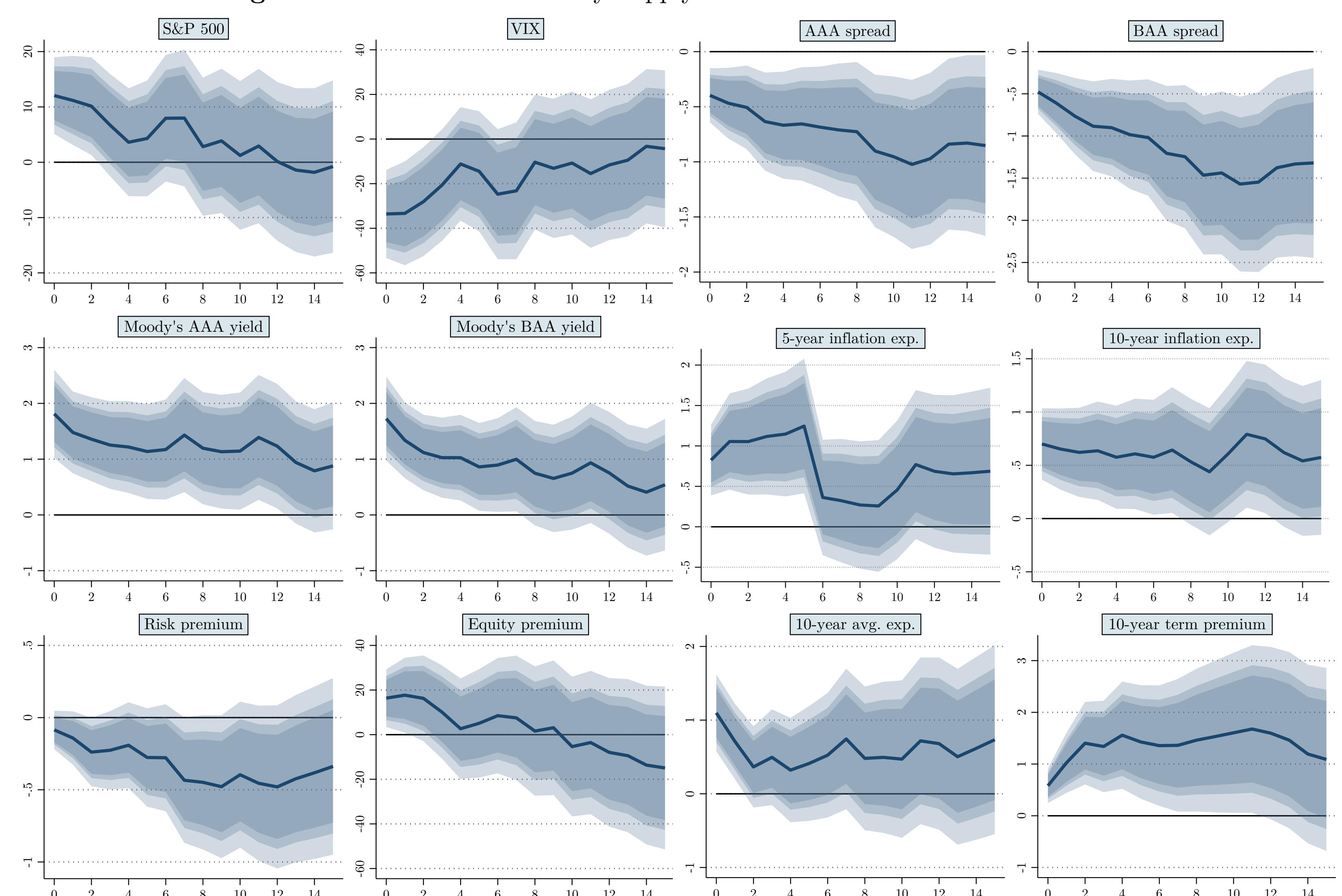
## Results

A one-billion-dollar net increase in supply of U.S. Treasury securities causes an upward shift in the yield curve that ranges from 1 to 2 bp. The latter effect is only partly explained by an increase in the short rates. Instead, investors appear to command a yield in excess of the one predicted by short rates in order to hold the newly issued securities. Hence, the term premium increases by about 1.5 bp.

Furthermore, a one-billion-dollar net increase in Treasury supply is perceived as good news, as it drives stock prices up and leads to a decrease in market volatility. Corporate bonds yields increase by about 2 bp, indicating a worsening in financing conditions for the corporate sector. The equity premium spikes (by 20 bp) as a result of the simultaneous rise in stock prices and the fall in bond yields, and the risk premium falls (by roughly 0.5 bp). Yet, because the sudden increase in the supply of debt instruments may signal an upcoming surge in fiscal deficits, long-term inflation expectations soar by about 1 bp.

Moreover, a positive Treasury supply shock is associated with a significant decrease in the liquidity premium. Looking at AAA as well as BAA spreads, we find that a one-billion-dollar increase in net supply of U.S. Treasury securities brings about a significant drop in these spreads of up to 1.5 bp.

Figure 2. IRFs to U.S. Treasury Supply Shocks of Macro-Financial Variables



## Conclusions

Treasury supply shocks have sizable and significant effects on financial markets. A positive surprise in Treasury supply causes an upward shift in the yield curve, the latter being only partly induced by an increase in the short rates. Rather, investors command a higher term premium to hold the newly issued securities.

At the same time, a positive supply shock is good news for market participants, though it increases borrowing costs of the corporate sector: Stock prices and the equity premium go up, volatility and the risk premium go down, and corporate bond yields increase. Yet, for it might signal higher future fiscal deficits, inflation expectations soar. Finally, the liquidity premium decrease following the shock, confirming previous findings that the liquidity services provided by Treasury securities are a negative function of the supply thereof.