Liquidity in Foreign Exchange and Government Securities Markets
(Extended Abstract)

Wentong Chen* Eswar Prasad†

November 2024

Abstract

This research investigates the interconnected liquidity dynamics between the US Treasury securities market and the foreign exchange (FX) market, focusing on the effects of market stress events and central bank liquidity policies. Using high-frequency trading data for Treasury securities and the ten most traded currencies against the USD, the study employs an event study methodology to analyze liquidity changes during market stress events and central bank interventions. We find a significant pass-through of liquidity shocks from the Treasury market to the FX market, evidenced by declines in currency pair liquidity following Treasury market disruptions. This research underscores the importance of understanding liquidity interactions and provides guidance for policymakers to manage liquidity crises effectively.

JEL Classification: F31, F40, G12, G15, G18
Keywords: liquidity pass-through, market stress events, central bank intervention, foreign exchange market, US treasury securities

*Departament of Economics, Cornell univeristy, Ithaca, NY, 14853, USA, E-mail: wc422@cornell.edu
†Dyson School of Applied Economics and Management and Department of Economics, Cornell University, Ithaca, NY, 14853, USA, Brookings Institution, and NBER, E-mail: eswar.prasad@cornell.edu.

1 Motivation and Research Questions

The US Treasury securities market, the most liquid government securities market, has drawn international funding and exerted significant spillover effects on global markets. This often occurs through the transmission of impacts to foreign exchange spot and derivative markets. Recent years have seen instances of sudden liquidity evaporation in the Treasury securities market due to various market frictions, including Treasury flash events, COVID-19, the Brexit Referendum, and VIX turmoil. Consequently, it is important to investigate how these stress episodes affect liquidity in the foreign exchange market and impact global financial markets through the liquidity channel. Additionally, foreign exchange policies, such as central bank cross-border liquidity lines, have influenced liquidity in foreign exchange markets. Investigating how these policies impact the Treasury securities market is also worthwhile. This research seeks to elucidate these complex relationships, offering guidance for coordinated policy responses that consider the intertwined nature of the two markets.

Table 1: Episodes of Market Stress

Event	**Date**	**Type**
Equity Flash Crash	2010-05-07	
Treasury Flash Rally	2014-10-15	Quick Depth Recovery
Brexit Referendum	2016-06-24	
Taper Tantrum	2013-06-19	
VIX Turmoil	2018-02-06	Medium-Paced Depth Recovery
Global Growth Fears	2019-08-02	
Flash Event	2021-02-25	
Global Financial Crisis	2008-09-15	
Sovereign Debt Crisis	2011-08-05	Slow Depth Recovery
Coronavirus	2020-02-28	

Note: The event list is from Aronovich et al. (2021). Market depth is computed as the average of the cumulative sum of the posted quote sizes at the first five bid and ask levels of the order book for the 10-year on-the-run Treasury note. The event date is taken to be the largest initial drop in depth surrounding well-known episodes of market stress. Quick, medium-paced, and slow depth recovery lines are cut off at one business week, one business month, and three business months, respectively, to show the different nature of these events.

We use high-frequency Treasury and foreign exchange trading data to examine the connection between liquidity changes in Treasury securities and foreign exchange markets. Specifically, we analyze a list of Treasury market stress events, as summarized by Aronovich et al. (2021), presented in Table 1, and a list of central bank swap lines, as documented by Bahaj et al. (2024). This paper studies the following research questions: (1) Are there any pass-through effects between liquidity changes in the government securities market and the foreign exchange market? (2) If there are, how large are the pass-through effects, and are they beneficial or detrimental? Do these pass-through effects bring any policy constraints?

(3) Which policies can be implemented to impact the pass-through, reduce market friction, and restore market efficiency?

2 Results

2.1 Data

The paper uses high-frequency trading data for Treasury securities with various tenors, including 2-Year, 3-Year, 5-Year, 7-Year, 10-Year, 20-Year, and 30-Year notes and bonds. The data sources are Refinitiv's Tick History data and BrokerTec/CME Group. These combined datasets provide information on dealers' bid and ask quote submissions and trading volume, timed to the millisecond.

The research also uses high-frequency trading data for the ten most traded currencies and their trades with USD, both as base and quote currencies. These top currencies include EUR, JPY, GBP, AUD, CAD, CHF, CNH, CNY, HKD, and NZD, covering major currency pairs such as USD/EUR, USD/JPY, USD/GBP, USD/CNY, USD/CAD, USD/AUD, and USD/CHF, thus capturing most foreign exchange market liquidity conditions. The data sources are Refinitiv's Tick History and Refinitiv FX Matching (RM). The dataset includes price, trading volume, and the name and location of the dealer bank, all timed to the millisecond.

2.2 Methodologies and Results

Empirical tests: The paper uses the event study methodology to conduct empirical assessments of liquidity changes in the foreign exchange market corresponding to each market stress event documented in Table 1, capturing liquidity shocks from the Treasury securities market. Additionally, it investigates changes in Treasury securities market liquidity following selected announcement and initiation dates of central bank cross-border liquidity lines, as discussed in Bahaj et al. (2024). Specifically, we do the following empirical tests: (1) What changes occur in intraday and interday prices and trading volumes in the Treasury and foreign exchange markets during market stress events and the implementation of central bank swap lines? (2) How do intraday and interday market liquidity in the Treasury and foreign exchange markets change around market stress events and central bank swap line implementation events? What is the extent of the spillover effect between these two markets? (3) What role do dealer characteristics play in the liquidity impacts observed during these events? (4) How long does it take for liquidity to recover following these events? (5) What happens to CIP

deviations around the market stress events and central bank swap line implementation events?

Theoretical analysis: The paper delves deeper into the mechanisms of liquidity transmission between the foreign exchange and Treasury securities markets, focusing on the constraints of arbitrage as a potential pathway. It posits that when liquidity diminishes in the Treasury market—which often functions similarly to cash on a high-frequency basis—dollar borrowers face increased financial constraints. This unmet demand spills over into the foreign exchange market as participants purchase dollars in the spot market, leading to an appreciation of the dollar and a corresponding decline in liquidity in the exchange rate market. Conversely, the implementation of central bank swap lines introduces an influx of cheaper US dollar funding, resulting in a depreciation of the dollar. This, in turn, reduces demand in the Treasury securities market, leading to excess supply and an increase in liquidity within that market. This paper will formally model the described mechanism and validate the model by matching its predictions with empirical results. The model will also be utilized to conduct counterfactual analyses, which will be instrumental in evaluating the implications of policy interventions on liquidity transmission between the foreign exchange and Treasury securities markets.

2.3 Preliminary results

Figure 1 shows the liquidity evolution in the USDEUR and USDJPY spot markets during the market stress event on February 25, 2021, using two common liquidity measures: quoting intensity (number of quotes per 5 minutes divided by the total number of active unique dealer banks within each 5 minutes) and spread using equal quote weights. During the event, the price of Treasury securities experienced a sharp drop after 1 pm EST, likely triggered by the 7-year note Treasury auction held at that time. Following the liquidity stress event in the Treasury market, both the USDEUR and USDJPY markets experienced spikes in quoting intensity and spreads, indicative of a reduction in market liquidity.

Figure 1: Quoting intensity and spread on Feb 25, 2021

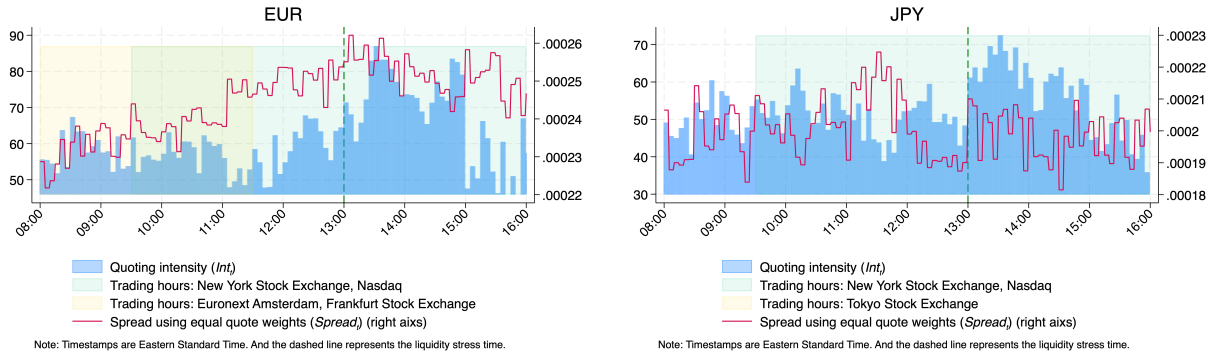
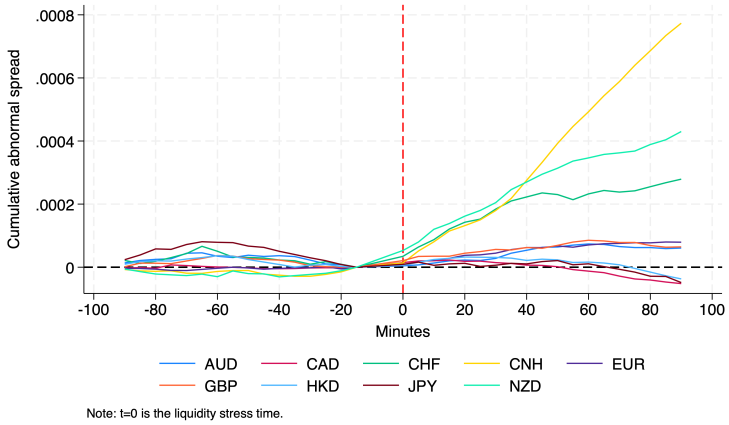


Figure 2 uses the event study method to calculate the cumulative abnormal spread for all nine currencies, examining 100 minutes before and after the flash event. Liquidity, measured by culmunlative spreads with equal quote weights, has notably deteriorated for CNH, CHF, NZD, GBP, and EUR. This trend is also evident in the short term for HKD, CAD, and JPY. These two results jointly indicate a liquidity decline pass-through from the Treasury securities market to the foreign exchange market.

Figure 2: Abnormal spread on Feb 25, 2021



3 Related Literature

This paper is inspired by the literature on factors affecting covered interest rate parity (CIP) deviations after the global financial crisis. These factors include the zero lower bound (Amador et al., 2020), US Treasury premium (Du et al., 2018a; Avdjiev et al., 2019), bank lending, market instability, risk and policy factors (Cerutti et al., 2021), bank balance sheet constraints (Du et al., 2018b), borrowing cost (Liao, 2020), and local market credit spreads in

emerging markets (Du and Schreger, 2016). This paper identifies a new channel to understand how the consolidated and feedback effects of liquidity in government securities and foreign exchange markets contribute to CIP deviations.

The paper also connects with the literature on liquidity factors in foreign exchange and government securities markets. These factors include the convenience yield of USD (Engel, 2020), monetary policies (Chordia et al., 2005), money market conditions (Baba et al., 2008), trading strategies (Brunnermeier et al., 2008; Mueller et al., 2017; Rime et al., 2022), funding liquidity (Brunnermeier and Pedersen, 2009), etc. Liquidity changes impact foreign exchange market rates through government bond market changes (Engel and Wu, 2023), foreign exchange interventions (Pasquariello, 2010), market microstructure factors (Lester et al., 2012; Evans and Lyons, 2012; Hasbrouck and Levich, 2021; Osler et al., 2011; Holden et al., 2021), noise traders (Jeanne and Rose, 2002), financial intermediaries (Gabaix and Maggiori, 2015; Bruno and Shin, 2015), and risk factors (Lustig et al., 2011, 2014; Verdelhan, 2018). For government securities, liquidity impacts yields through liquidity premiums (Favero et al., 2010; Nagel, 2016) and safe asset features (Krishnamurthy and Vissing-Jorgensen, 2012; Del Negro et al., 2019). This research links the two markets' liquidity, showing how unexpected changes in the Treasury market propagate internationally through foreign exchange trades and affect global financial stability and the US economy.

Finally, the liquidity connection between the two markets has implications for various scenarios of liquidity decline. One recent application is the "reverse flight to liquidity" trend in the US Treasury market after COVID-19, where high selling pressure in liquid and safe asset markets raises doubts about the USD's safe haven status. This trend is analyzed by considering the roles of institutional investors (Ma et al., 2022; Schrimpf et al., 2021), foreign demand changes (Weiss, 2022), and dealer balance sheet constraints (Duffie, 2020; He et al., 2022). Understanding liquidity interactions helps explain the foreign exchange market impact during Treasury market stress and provides policy implications for managing liquidity declines in the Treasury market using foreign exchange policies.

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