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## Journal of Financial Economics

journal homepage: [www.elsevier.com/locate/jfec](http://www.elsevier.com/locate/jfec)Market liquidity, asset prices, and welfare<sup>☆</sup>Jennifer Huang<sup>a,\*</sup>, Jiang Wang<sup>b,c,d</sup><sup>a</sup> McCombs School of Business, University of Texas, Austin, TX 78712, USA<sup>b</sup> Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA 12412, USA<sup>c</sup> National Bureau of Economic Research, USA<sup>d</sup> China Academy of Financial Research, China

## ARTICLE INFO

## Article history:

Received 19 November 2007

Received in revised form

13 May 2008

Accepted 14 August 2008

Available online 4 September 2009

## JEL classification:

D53

G12

E58

D5

## Keywords:

Liquidity

Asset prices

Welfare

Central bank policy

## ABSTRACT

This paper represents an equilibrium model for the demand and supply of liquidity and its impact on asset prices and welfare. We show that, when constant market presence is costly, purely idiosyncratic shocks lead to endogenous demand of liquidity and large price deviations from fundamentals. Moreover, market forces fail to lead to efficient supply of liquidity, which calls for potential policy interventions. However, we demonstrate that different policy tools can yield different efficiency consequences. For example, lowering the cost of supplying liquidity on the spot (e.g., through direct injection of liquidity or relaxation of ex post margin constraints) can decrease welfare while forcing more liquidity supply (e.g., through coordination of market participants) can improve welfare.

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<sup>☆</sup> Part of this work was done during Jiang Wang's visit at the Federal Reserve Bank of New York as a resident scholar. We thank Anat Admati, Tobias Adrian, Franklin Allen, Markus Brunnermeier, Douglas Diamond, Joe Hasbrouck, Nobu Kiyotaki, Arvind Krishnamurthy, Pete Kyle, Arzu Ozoguz, Lasse Pedersen, Paul Pfleiderer, Michel Robe, Jacob Sagi, Suresh Sundaresan, Sheridan Titman, Andrey Ukhov, Dimitri Vayanos, S. "Vish" Viswanathan, Pierre-Olivier Weill, and participants at the FDIC and JFSR seventh annual Bank Research Conference, the third annual IIROC-DeGroot Conference, the 2009 American Finance Association Meeting and seminars at Boston University, Emory University, Columbia University, Federal Reserve Bank of New York, Hong Kong University of Science and Technology, London School of Economics, Nanyang Technological University, National University of Singapore, Princeton University, Stanford University, Stockholm School of Economics, Texas A & M University, University of Chicago, University of Michigan, and the University of Texas at Austin for comments and suggestions. Support from Morgan Stanley (Equity Market Microstructure Grant, 2006) (Huang and Wang), the National Natural Science Foundation of China (Project no. 70440420490, Wang), and JP Morgan Academic Outreach Program (Wang) are gratefully acknowledged.

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## 1. Introduction

Liquidity is of critical importance to the stability and the efficiency of financial markets. The lack of it has often been blamed for exacerbating market crises such as the 1987 stock market crash, the 1998 near collapse of the hedge fund Long Term Capital Management (LTCM), and the current upheaval in the credit market.<sup>1</sup> Yet much less consensus exists about what market liquidity is, what determines it, and how it affects asset prices and welfare. Views become even more divergent when it comes to appropriate policies with respect to liquidity, such as

<sup>1</sup> The Report of the Presidential Task Force on Market Mechanisms, the Review of Financial Market Events in Autumn 1998 by the Committee on the Global Financial System, and the Global Financial Stability Report by the International Monetary Fund provide an overview of events in 1987, 1998, and 2007, respectively.

lowering barriers of entry in securities trading, setting margin and capital requirements for broker-dealers, coordinating market participants, and supplying liquidity during crises. The ongoing debate on the interventions by the central banks and the US Treasury to inject liquidity into the market during the current credit market crisis is an excellent case in point. The purpose of this paper is to present a simple theoretical framework to facilitate the discussions on these issues.

We start with the observation that the lack of full participation in a market is at the heart of illiquidity. Imagine a situation in which all potential buyers and sellers are constantly present in the market and can trade without constraints and frictions, i.e., fully participate. Then all agents face the full demand and supply at all times and security prices depend only on the fundamentals such as payoffs and preferences. To the extent that illiquidity reflects forces beyond these fundamentals, a market with full participation can be considered perfectly liquid. Thus, illiquidity arises only when frictions prevent full participation of all agents.

To capture this notion of illiquidity in a simple way, we assume that agents face participation costs that prevent them from constant, active, and unfettered participation in the market. We then develop an equilibrium model of both liquidity demand and supply in the presence of such costs. The endogenous demand for liquidity arises when participation costs prevent potential buyers and sellers with matching trading needs from coordinating their trades. The same costs also hinder the supply of liquidity. As a result, purely idiosyncratic shocks can cause infrequent but large deviations in prices from the fundamentals. Moreover, we show that, in general, market forces fail to achieve efficient supply of liquidity. However, different policy interventions can lead to divergent consequences. For example, direct injection of liquidity when it is in shortage can reduce welfare, while coordinated supply of liquidity by market participants can improve welfare. We also show that different costs of market presence give rise to distinctively different market structures and price and volume behavior, and the welfare consequences of the same policy interventions heavily depend on the structure of the market.

To model the need for and the provision of liquidity in a unified framework, we start with an economy in which agents face both idiosyncratic and aggregate risks. The desire to share the idiosyncratic risks gives rise to their need to trade in the asset market. By definition, idiosyncratic risks sum to zero across all agents. Thus, underlying trading needs are always perfectly matched among agents.

When market presence is costless, all agents stay in the market at all times. The market price adjusts to coordinate all buyers and sellers. Buy and sell orders, driven by idiosyncratic risks, are always in balance. In this case, asset prices are fully determined by the fundamentals, in particular, the level of aggregate risk, and are independent of agents' idiosyncratic trading needs.

When market presence is costly, however, not all agents are in the market at all times. We assume that agents can participate in the market in two ways: either incur an ex ante cost to be a market maker and then trade constantly, or pay a spot cost to trade after learning about their trading

needs. Such a cost structure is motivated by the market structure we observe: A subset of agents (such as dealers, trading desks, and hedge funds) maintain a constant market presence and act as market makers, while most agents (such as the majority of individual and institutional investors, whom we refer to as traders) enter the market only when they need to trade. By the cost of market presence we intend to capture not only the costs of being in the market, but also any costs associated with raising needed capital or adjusting existing positions, in other words, any costs or hurdles that prevent the free flow of capital in the market.

As they trade only infrequently, traders are forced to bear certain idiosyncratic risk. This extra risk makes them less risk tolerant and less willing to hold their share of the aggregate risk. For traders receiving an additional idiosyncratic risk in the same direction as the aggregate risk, they are further away from their desired position and thus are more eager to trade. Consequently, more of them enter the market than those with the opposite idiosyncratic risk (which partially offsets their exposure to the aggregate risk). Thus, despite perfectly matching trading needs, traders fail to coordinate their trades, leading to order imbalances.

The endogenous order imbalances exhibit several distinctive properties. First, they are always in the same direction as the impact of the aggregate risk on asset demand, as traders with higher than average risk are more likely to enter the market. Second, order imbalances are always of significant magnitudes when they occur. This is because, for small idiosyncratic shocks, gains from trading are small and all traders choose to stay out of the market. It is only with sufficiently large idiosyncratic shocks that gains from trading exceed participation costs for some traders, leading to the mismatch in their trades. The resulting order imbalance is also large. Third, the magnitude of possible order imbalances depends on the level of the aggregate risk, which affects the asymmetry in trading gains between different traders.

By endogenizing the order imbalance, we are able to characterize the impact of liquidity on asset prices. In particular, purely idiosyncratic shocks can generate aggregate liquidity needs and cause price to deviate from its fundamental value. Moreover, the impact of liquidity on price is in the same direction as that of the aggregate risk and is of significant magnitude. Consequently, it leads to high price volatility and fat tails.

Under exogenous liquidity demand, Grossman and Miller (1988) find that higher costs of market making lead to lower levels of liquidity in the market and more volatile prices. We show that, when liquidity demand is endogenously determined, it becomes interdependent with liquidity supply and prices are not necessarily more volatile in less liquid markets.

In particular, we obtain two different market structures. Only when the cost of market making is below a threshold do we have the usual market structure in which liquidity is supplied by market makers. When the cost of market making exceeds this threshold, a different market structure emerges: No market makers are in the market, and all liquidity is supplied by traders themselves on the spot.

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