Pacific-Basin Finance Journal 48 (2018) 84–98

Contents lists available at ScienceDirect

Pacific-Basin Finance Journal

journal homepage: www.elsevier.com/locate/pacfin

Price discovery in China's inter-bank bond market

Lei Wu[c], Chunlin Liu[a], Qingbin Meng[b,*], Hongchao Zeng[a]

[a] College of Business, University of Nevada, Reno, Reno, NV 89557, United States
[b] College of Business, Renmin University of China, Beijing 100872, China
[c] School of Economics and Management, Beihang University, Beijing 100191, China

ARTICLE INFO

JEL classification:
C32
G14
G15

Keywords:
Price discovery
Dealership market
Dealers' quotations
Price efficiency
Quoting activity
China's inter-bank bond market

ABSTRACT

This paper examines the contributions of individual banks to price discovery in China's inter-bank bond market. In this market, large state commercial banks, city commercial banks, and approved foreign banks act as dealers to facilitate the trading process. We propose a structural model to capture the dynamic relationships among the quotes of these dealers. Our empirical results show that while large state commercial banks have advantages over other dealers in obtaining new information, they take longer to adjust their quotes to the new equilibrium. Meanwhile, foreign banks can incorporate new information into their quotes quickly and efficiently, thus contributing more to price discovery than most Chinese banks and sometimes even large state commercial banks.

1. Introduction

In the last decade, China's bond market has grown from almost nothing to one of the largest in the world.[1] From a trading perspective, China has two bond markets: the inter-bank bond market, which is regulated by the People's Bank of China (PBC), and the exchange bond market, which is regulated by the China Securities Regulatory Commission (CSRC). The inter-bank market is much larger than the exchange market, accounting for more than 95% of the total trading volume. As China steps up the pace of financial liberalization, its inter-bank bond market has played an important role in determining market interest rates as well as providing a building block for the pricing of financial assets.

The purpose of this paper is to investigate price discovery in China's inter-bank bond market where banks act as dealers to facilitate the trading process through continuous quoting of bid and ask prices for each bond. The dealers include not only large state commercial banks and city commercial banks but also approved foreign banks. These banks have various sources of information and possess different skills in collecting and interpreting information for subsequent trading. Compared with domestic banks, foreign banks may be disadvantaged by various barriers including differences in culture, language, regulatory and supervisory structures, and market-specific features (Berger et al., 2001). These barriers can make it difficult for foreign banks to access, collect, and interpret new information about China's macroeconomic factors, leading to less information being acquired. Hence, we hypothesize that there exists heterogeneity in the dealers' private information and Chinese dealers have an information advantage over foreign dealers. On the other hand, prior banking research on developing nations has documented evidence suggesting that foreign banks are more efficient than domestic banks. Sources of this efficiency include foreign banks' superior expertise and technology (Berger et al., 2009),

* Corresponding author.
E-mail addresses: L.Wu@buaa.edu.cn (L. Wu), liuc@unr.edu (C. Liu), mengqingbin@rbs.org.cn (Q. Meng), hzeng@unr.edu (H. Zeng).

[1] According to Bank for International Settlements, as of June 2014, China's bond market is the third largest in the world at about RMB 35.89 trillion, or approximately 5.79 trillion in US dollars. As of December 2014, one US dollar was exchanged for RMB 6.20.

https://doi.org/10.1016/j.pacfin.2017.12.010
Received 21 January 2017; Received in revised form 25 September 2017; Accepted 29 December 2017
Available online 11 January 2018
0927-538X/

advanced managerial skills and best-practice policies and procedures (Berger et al., 2001), and a transfer of human capital and banking know-how from their parent banks (Weill, 2003; Bonin et al., 2005). Efficiently managed foreign banks have higher learning capacity which allows them to quickly adjust to new information. We next hypothesize that an interactive learning process existing among dealers allows foreign dealers to contribute more in price discovering through quickly and efficiently incorporating new information into their quotes. Though there is a rich body of literature on the efficiency of price discovery in China's stock markets, no paper has addressed the issue of efficiency in China's inter-bank bond market. Thus, an investigation into the above proposed hypotheses may shed new light on the efficiency of price discovery in this market.

We introduce a dynamic structural model for dealers' quotes in tick time. Our model is an extension of the structural models in the literature (Madhavan and Smidt, 1991; Yan and Zivot, 2010; Caporalea and Girardid, 2013) and draws heavily on Frijns and Schotman (2009). Our model takes into account the interaction among dealers and the dynamic process of how dealers correct their pricing errors through learning. The price discovery in our model is an impulse response function rather than a traditional static measure that only accounts for contemporaneous quote responses to shocks. As emphasized by Gonzalo and Ng (2001), even though no economic theory is used, impulse response functions can be constructed to trace the propagating mechanism of shocks distinguished by their degree of persistence. Thus, an impulse response is a more suitable form to describe price discovery.

Our empirical analysis is based on quote data of individual banks for a sample of government bonds that are traded actively in China's inter-bank bond market over the period from September 11, 2011, to May 24, 2013. The empirical results are consistent with our hypotheses. Specifically, we find evidence suggesting that dealers possess heterogeneous levels of private information. We also find significant evidence that price discovery is a dynamic process that depends on the interaction among dealers. Using the dynamic structural model, we are able to examine the contributions of different types of dealers to price discovery. We find that foreign banks, although having no advantages in gathering private information, can post quotes that converge to the new equilibrium quickly because of their higher learning capacity. Chinese banks, which can easily access new information about China's macroeconomic factors, do not significantly outperform foreign banks due to their slow convergence to the new equilibrium and the relatively large noise in their quotes.

Our study is closely linked to the literature on price formation in bond markets. For instance, Brandt and Kavajecz (2004) investigate price discovery in the U.S. Treasury market using the order flows of both customers and individual dealers. They separate days with macroeconomic news from days with no news and find that up to a third of the daily yield changes on no-news days can be attributed to inter-dealer trades. Menkveld et al. (2012) study the Treasury futures market and find that customer order flow is crucial for price discovery since it conveys information about customers' risk preferences and endowments. Valseth (2013) investigates price discovery in Norwegian government bond markets and finds that while aggregate inter-dealer order flow explains one-fourth of daily yield changes, the customers' aggregate order flow has little explanatory power.

Our paper is also related to studies on the role of dealers in price discovery. Peiers (1997) and Sapp (2002) investigate the role of different quoting behavior among individual dealers in the foreign exchange market. They find that some dealers do a better job than others in incorporating new information into their quotes and thus become leaders in price formation. Examining the behavior of dealers in futures contracts traded on the Chicago Mercantile Exchange, Manaster and Mann (1996) conclude that dealers possess heterogeneous levels of information and trading skills. Osler et al. (2011) show that the process of price discovery in currency markets takes place in the inter-dealer market rather than in the customer market. Anand and Subrahmanyam (2008) study price formation in equity markets and find that dealers are better informed than their clients because of their information advantage and superior skills in trading. Valseth (2013) finds that dealers are heterogeneously informed and appear to have different sources of information. While some dealers rely on their customer trades, others appear to rely on skills in acquiring and interpreting relevant information, evidence suggesting that dealers play an independent role in price discovery.

The paper is structured as follows. Section 2 describes the framework used to construct the dynamic structural model. Section 3 presents the data and sample. Section 4 reports and discusses the empirical results on the contributions of different types of dealers to price discovery and the dynamic feature of price discovery. Section 5 concludes.

2. A dynamic structural model for quotes in tick time

This section introduces a dynamic structural model that captures the interactive learning process among dealers and the dynamic process of price discovery. Based on this model, we design a measure of price discovery that is applicable to a wider range of settings than traditional measures.

Formally, we use a dealer market where M dealers issue bid and ask quotes that arrive at times t_ℓ ($\ell = 1, \ldots, L$). If q_ℓ is a $M \times 1$ vector of dealers' midpoints of standing bid-ask quotes at time t_ℓ, then the observed q_ℓ is described as the sum of two components. One component is the market maker's expectation of the bond's value conditional on the public information at time t_ℓ, denoted as f_ℓ. In Madhavan and Smidt (1991), f_ℓ is called a “prior mean.” The other component is a $M \times 1$ vector s_ℓ that measures the difference between the dealer's quote and the prior mean. That is,

$$q_\ell = \iota f_\ell + s_\ell \tag{1}$$

where ι is a $M \times 1$ vector of ones.

According to Madhavan and Smidt (1991), because the market makers use Bayesian rules to update their beliefs, the prior mean f_ℓ should have a moving average: