Economic Consequences of Bias in Fair Value Accounting: Evidence from the Korean Bond Markets

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September 2024

Abstract

We study the effect of competition between bond pricing agencies (BPAs) on bias in fair value prices, and whether there is an effect on liquidity in the corporate bond markets. BPAs are agencies in Korea which provide fair value estimates of all OTC-traded products to financial institutions. We use the entry of a new BPA into the Korean market as a shock to the competition between BPAs and employ a difference-in-differences analysis to investigate changes in BPAs' reporting behavior. We find that the increased competition between BPAs leads to an increased upward bias in bond prices, and we document that this effect is higher for securities that are not traded, less liquid, and have higher credit ratings. Moreover, our results provide new insights on the real effects of accounting by showing that this bias in fair value estimates decreases liquidity in the corporate bond market.

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1 Introduction

The shift to fair value accounting is well underway worldwide, but there is much debate among academics and practitioners regarding the tradeoffs between fair value and historical cost accounting methods. Fair value accounting, or mark-to-market, records assets and liabilities at the *current* market value, and it provides a timelier and more accurate picture of a company's financial position than methods relying on stale, outdated, information. However, despite the significance of the shift to fair value accounting, whether it comes with economic consequences, especially unintended real effects, has been little addressed compared to its importance in accounting. In this study, we answer the call from Barth and Taylor (2010) and investigate the role of discretion over fair value estimates. We use a shock to the incentives affecting recorded asset prices in the Korean corporate bond market to examine the economic consequences of bias in fair value accounting.

The debate about implementation policies, as well as the relevant costs and benefits, at least partially explains the different speeds of fair value adoption between the Financial Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB). Nevertheless, recent standard changes by the FASB, such as SFAS 123R and SFAS 159, have extended the use of the fair value methods in globally used financial statements and signal a broad acceptance of fair value accounting. However, critics argue that fair value estimates may be unreliable in cases where an asset is not traded. Historical cost accounting records values at the price at which assets are acquired, and it could be more reliable when assets trade infrequently because it represents the actual price at which an asset was last traded. Nevertheless, the conspicuous weakness of historical cost values is that they lack

relevance when the market values of assets and liabilities change over time.

A key source of the debate around fair value accounting relates to the amount of discretion involved in assessing fair value estimates. The summary of Statement No. 157 by the FASB states that "a fair value measurement should be determined based on the assumptions that market participants would use in pricing the asset or liability."[1] Benston (2008) and Kothari et al. (2010) raise the possibility of managers using their discretion to report opportunistically when allowed to use fair value accounting. This is not surprising considering the vast accounting literature documenting managers using their discretion to manage earnings as well as analysts' expectations.

To address our main motivating research question, does discretion in fair value accounting have economic consequences, we exploit a novel setting and data in South Korea. To improve public trust in Korea's capital market infrastructure following the Asian financial crisis, the Korean government established three bond pricing agencies (BPAs) in the early 2000s.[2] The mandated role of these BPAs is to provide transparency and increase liquidity to the financial markets by assessing all the over-the-counter (OTC) products traded in the Korean capital markets using mark-to-market methods on a daily basis. Requiring an independent organization to value financial institutions' individual securities aims to add objectivity and accuracy to the reported values of firms' assets. Part of the Korean government's stated objective was to mitigate concerns that discretion could lead to biased fair value estimates. This system of having third-party verifiers to provide daily fair value estimates is unique

[1] https://www.fasb.org/summary/stsum157.shtml

[2] Korea was one of the countries heavily hit by the Asian financial crisis in 1997. In response to the ensuing credit crisis, the Korean government established three BPAs in 2000 - Korea Investors Service - Pricing, NICE Pricing Services, and Korea Bond Pricing. We provide further institutional details related to our setting in Section 2.

to the Korean market. Consequently, this system provides a unique setting to investigate a change to the incentives to bias fair value estimates.

Despite being independent entities, BPAs still have incentives to use the discretion provided within fair value accounting methods to their advantage. BPAs have an "investor-pays" business model, where investors pay the BPAs to assess their assets at fair value daily. This investor-pays model faces similar conflicts of interest as the issuer-pays model that the credit rating agencies and public audit firms have (Tang et al., 2020). Moreover, this business model's agency problems are uniquely exacerbated in this setting because financial institutions in Korea have an internal policy of compensating their employees for their monthly performance based on the fair value prices provided by BPAs. This unique regulatory environment provides a setting with rich data to investigate whether discretion used in fair value accounting has economic consequences.

In this study, we consider two specific research questions previously unaddressed regarding fair value accounting. First, we investigate whether an increase in competition between BPAs creates a systematic bias in reported fair value security prices. Second, we examine whether any bias in fair value prices leads to a decrease in liquidity in the corporate bond market, evidence of a serious capital market consequence. In our setting, we predict that the incentive to bias reported values will result in BPAs providing more "favorable" prices, thus, higher prices or lower bond yields. In 2012, a fourth BPA, FN Pricing, entered the Korean market and began providing estimates of fair value prices. We use this entry as a shock to the competition among BPAs. If the increase in competition intensifies the existing agency problems, then BPAs may respond by providing more favorable prices to their clients. For example, Becker and Milbourn (2011) notably document that the quality of corporate

bond credit ratings issued by Moody's and S&P falls following an increase in competition from Fitch. However, it is possible that BPAs could compete by attempting to provide more accurate prices to their clients.

Related to our second question, the stated purpose of BPAs is to increase transparency in the financial markets by providing daily mark-to-market prices for all financial securities, including those that did not trade on a given day. This transparency should increase liquidity because investors will be well-informed of an asset's value in a timely manner. Nonetheless, if the fair value prices are biased, and the presence of this bias is known to market participants, then investors may have a harder time reaching an agreement on a transaction price, leading to lower liquidity in the bond market.

We use three years of term structure data from the beginning of October 2010 to the end of September 2013 and employ the entry of a fourth BPA to conduct a difference-in-differences analysis as our main identification strategy. We offer two main findings. First, we find that BPAs bias reported bond prices, consistent with competition between BPAs increasing the conflict of interest, and thus the incentive to bias, for BPAs. Interestingly, we document that the effect of this bias intensifies at the end of each month when reported prices are used to determine financial institution managers' (i.e., BPAs' clients) compensation. Thus, our results are consistent with an adverse selection issue at play at the end of each month when agency problems are most severe. We also find that BPAs bias prices through the bonds that are less traded, less liquid, and have higher credit ratings. This finding is worrying because this result is consistent with BPAs taking advantage of the discretion provided under fair value accounting, exactly the concern expressed by critics of fair value accounting rules. Moreover, we detect that this bias is largest in the prices of precisely the bonds that are

supposed to benefit most from fair value prices – bonds that are less-frequently traded and less liquid. This is the opposite of what standard-setters intended.

Second, we find that the bias in fair value prices leads to economic consequences in the capital markets. We provide evidence that distorted fair value prices decrease overall liquidity in the bond market. We argue that this decrease in liquidity results from reported prices being less informative, making it more difficult for institutional investors to agree on a trading price. Furthermore, the bias also increases information asymmetry between institutional investors and their clients. Institutional investors may be scrutinized by their clients if assets are sold for a lower price than what is indicated by the BPAs. Additionally, institutional investors might be hesitant to buy assets with biased prices, as they would need to account for the extra amount an asset has to increase in value before they can realize additional profits in fair value terms. Consequently, institutional investors are reluctant to trade if there is a large discrepancy between the perceived price of an asset and its reported fair value. Together, biased fair value prices lead to a drop in liquidity.

Our study contributes to two strands of literature. First, we contribute to the literature on fair value accounting. Barth (1994) examines whether fair value prices, capturing the gains and losses in banks' financial statements, are more relevant for stock prices compared to historical cost prices, and she finds that fair value prices are indeed more value-relevant than historical cost. Laux and Leuz (2009, 2010) study fair value accounting in the context of the global financial crisis and, despite the common claim that fair value accounting contributed to the financial crisis, find that the claim is not credible. Moreover, they suggest that more research is needed to understand the effects of fair value accounting, not only during a crisis but also on "normal days." We partially answer this call to study fair value accounting in

a "normal day" setting as suggested by Laux and Leuz (2010), and we also respond to the call of Barth and Taylor (2010) to investigate the role of discretion over fair value estimates. Specifically, we provide empirical evidence that economic agents use their discretion to bias fair value prices, a possibility conjectured in Benston (2008) and Kothari et al. (2010) but not empirically tested. Our results have regulatory implications given our finding that third parties are not always able to prevent discretion in fair value accounting. Our evidence is informative for the Korean setting but has broader implications, such as the auditing and credit rating agency context in the U.S.

Moreover, within the context of fair value accounting, we add to the evidence related to the existence of Akerlof's lemons problem in a variety of settings. Dye (2017) states that "those who advocate fair value accounting have never explained how fair value accounting remains the superior measurement method in the face of this lemons/adverse selection problem." While our study cannot speak to whether historical cost accounting is a better method than fair value accounting, our results are consistent with fair value accounting contributing to a "lemons" problem, further highlighting that the use of fair value accounting may have unintended consequences.

Second, we also contribute to the literature on competition and bias. Two especially relevant studies are Hong and Kacperczyk (2010) who use the shock of analyst brokerage mergers to show that a decrease in competition leads to an increase in analysts' forecasting bias and Becker and Milbourn (2011) who find that the increasing market share of Fitch in the corporate bond credit ratings market decreases the quality and timeliness of credit ratings. Similarly, we show that competition among BPAs in Korea is associated with a bias in reported fair value bond prices. However, we extend our inferences by documenting the

real effects of this competition and bias by showing an effect on liquidity in the corporate bond market in Korea, highlighting a new setting where agency problems lead to significant market consequences. Our results have implications for standard-setters by shedding light on the unintended and significant economic consequences, namely decreases in bond market liquidity, of the allowed discretion in current fair value accounting standards.

2 Institutional Background

2.1 Bond Pricing Agencies

Korea was one of the countries hit heavily by the Asian financial crisis in 1997. Much of the crisis had to do with Korea relying on banks and short-term borrowing from foreign countries for investments. When foreign capital was withdrawn and as banks became insolvent during the crisis, corporations failed due to a credit crunch. As a result, the need for a developed bond market with a strong infrastructure to complement the loan market emerged. The Korean government took several measures to build the infrastructure such as issuing a great number of treasury bonds, adopting a bidding system via the Bank of Korea, and establishing a bond derivatives market. To enhance the transparency of the valuation of financial instruments and protect the solvency of financial institutions, BPAs were introduced to provide daily mark-to-market prices of all the over-the-counter (OTC) traded securities for valuation and bookkeeping purposes. In 2000, three BPAs, Korea Investors Service - Pricing, NICE Pricing Services (now NICE Pricing & Information), and Korea Bond Pricing (now Korea Asset Pricing) were established as subsidiaries of the three

existing credit rating agencies.[3] A fourth bond pricing agency, FN Pricing, was established in June 2011 as a subsidiary of FN Guide. FN Pricing started to provide fair value prices starting in 2012.

Similar to auditing firms' and credit rating agencies' issuer-pays business model, BPAs have an "investor-pays" business model where they enter into annual contracts with their clients. These contracts can be with any financial institution that holds OTC-traded financial assets. In exchange for a commission, BPAs provide their clients with mark-to-market prices each day after the market closes. The commission may differ depending on the type of client but is usually in the form of a fixed amount or for a fixed percentage of assets under management. For example, most securities firms and brokerages pay BPAs a fixed amount while most asset management firms pay a commission that is a proportion of their assets under management.

In 2017, the three BPAs had an average revenue of approximately 14 billion Korean Won (KRW) and an average income from continuing operations of 3.34 billion KRW.[4] In contrast, FN Pricing reported 5 billion KRW in revenue in 2017, less than half the sales of the other BPAs that year. In addition, FN Pricing only started having positive income from continuing operations starting in 2015, recording 180 million KRW in income from continuing operations.

[3]The three parent companies were Korea Investors Service, NICE Investors Service, and Korea Ratings, respectively.

[4]This is equivalent to approximately USD$13 million for the average revenue and USD$3 million for the average income from continuing operations, respectively, using the exchange rate on 12/29/2018.

2.2 Regulatory Dependence on Fair Value Prices

BPAs serve an important role in the Korean financial markets, with their primary role being to provide fair value prices of financial securities. Most OTC-traded products in the Korean market do not trade on a given day, apart from the most liquid securities such as government treasury bonds. Thus, investors face difficulties in estimating market values for securities when there are no trades. This problem is intensified when the period of no trading is prolonged. Therefore, the intent of BPAs is to alleviate this problem by providing fair value assessments on a daily basis, which is especially valuable in the absence of trades. This not only provides benefits in facilitating the trading of securities but also for the risk management of financial institutions. By being able to track the value of their assets daily, financial institutions can predict and prevent potential financial risks. Thus, the Financial Services Commission (FSC) in Korea has made it mandatory under the Capital Market Act for all financial institutions to receive fair value prices on a daily basis from at least two different bond pricing agencies.[5] There are no further restrictions, however, on how the financial institutions use these fair value prices. Some institutions use the average of the prices they receive while some use the highest price. Financial institutions are also allowed to receive prices from more than two BPAs. For example, the National Pension Services of Korea, the third largest pension fund in the world, receives prices from three BPAs.

The fair value prices provided by the BPAs are also used to calculate the performance of funds and other securities, for example, certificate of deposits (CDs). All the individual securities in collective funds such as mutual funds, pension funds, and money market funds are priced daily using the BPAs' stated prices. Thus, the profits and losses of a fund for

[5] https://www.fsc.go.kr/downManager?bbsid=BBS0087no=106392

a given security are primarily determined by the BPAs. Banks also use BPAs' prices when pricing offered CDs. Together, the prices produced by BPAs have a large influence on all participants, retail and institutional investors, of the capital markets.

2.3 Entry of a Fourth Bond Pricing Agency

The first BPAs required licenses approved by the FSC. However, the regulations were later changed so that BPAs could be established upon approval of the registry by the Financial Services Commission (FSC). The process takes less than 30 days to receive a decision, and the major requirements are having sufficient funds and a pricing system.[6] In 2011, FN Guide received approval from the FSC to establish a BPA named FN Pricing. After approval, they started providing fair value assessments to financial institutions in 2012. FN Guide is one of the largest financial data providers in Korea. However, FN Guide focuses primarily on firm fundamental data and equity trading information. As an attempt to expand their business into the bond markets, FN Guide founded FN Pricing as a subsidiary with a total capital stock of 5 billion KRW.

3 Empirical Predictions

3.1 Hypothesis Development

BPAs have a similar business model as credit rating agencies and auditing firms. In this model, clients select two or more BPAs and pay them to price the securities that they hold. An agency problem arises because BPAs have a financial incentive to provide favorable

[6] http://www.fcsc.kr/B/fu b 01 01.jsp?business type=B&boundary type=12&auth reg seq=206

prices to their clients. For example, UBS Hana Asset Management and the BPAs received an official warning from the FSC of Korea in September 2013 for colluding earlier that year. In this case, although a fund managed by UBS Hana Asset Management was losing money, the BPAs had distorted prices so that the fund appeared profitable. The warning restricted UBS Hana Asset Management from initiating new business in the following three years.

One aspect of the Korean financial industry that may increase BPAs' incentive to bias prices is that fund managers, dealers, and traders who trade financial securities are evaluated based on these fair value prices on a monthly basis. This means that these institutional investors' compensation depends on the BPAs' prices. Just as in the case with UBS Hana Asset Management, institutional investors may still receive compensation at the end of a given month, even if the true value of the assets they are holding decreased, if BPAs have biased asset values upwards. For compensation purposes, only the book value of the assets matters. Therefore, whether institutional investors are concerned about their funds' performance or their personal compensation, both avenues provide reasons for BPAs to consider the effect of their pricing decisions on their clients.

BPAs may face financial, legal, and reputational costs from mispricing. There is anecdotal evidence of a BPA having to reimburse a fund that paid out an investor based on an incorrect price. However, in this case, there was a systematic error: a mistake in the credit rating threw off the calculation of the asset's price. Incidents like these, where BPAs reimburse the financial losses they caused to their clients are rare because it is hard to prove that the provided prices deviate from an unknown true value. This is why even though the BPAs are audited regularly by the FSC, there have been very few instances of legal prosecutions.

In addition, BPAs may face reputational costs. The case of Daewoo Shipbuilding &

Marine Engineering (DSME) in 2015 is an example. In this situation, the market realized that fundamentals of DSME were deteriorating, and rates rose as much as 20 basis points in a day and subsequently continued to rise. Before managers locked in a trade, they called pricing agencies and asked how much of the recent trading prices were going to be reflected in the posted price. However, pricing agencies were pressured to raise the stated rates by only 5 basis points. Pricing agencies were reluctant to raise rates, especially in the absence of a change in a credit rating. BPAs generally act, perhaps wishfully, as if sudden price movements are "noise" and prices will quickly revert back to previous levels. However, in this case, it was not long before DSME was caught in an accounting fraud for delaying to report a net loss of approximately $1.27 billion, and their credit rating consequently dropped to a C rating (i.e., junk). The bonds became worth much less than everyone had expected given the stated prices of the BPAs. The managers who had been holding DSME's bonds initially benefited from the over-valued pricing the agencies provided, but once the bond lost value, the importance of true "fair value" was highlighted to other market participants.

Just as credit rating agencies were blamed for not properly evaluating the debt instruments during the financial crisis of 2008, BPAs are continuously being criticized for failing to provide proper assessments, such as in the case above. However, the literature has yet to directly examine this issue. We address this gap in the literature and investigate whether a systematic bias in the fair value prices provided by BPAs exists. We argue that if the agency problem is exacerbated with the entry of FN Pricing, then any systematic bias in fair value prices would increase. However, the increase in competition may have no effect on BPAs' pricing behavior if BPAs are sufficiently concerned about the related financial, legal, and reputational costs. Thus, whether there is an increase in bias following the entry of a new

competitor into the market is an empirical question.

In Korea, there is no restriction on the number of BPAs that can be established, though the number of credit rating agencies is restricted to three. Thus, the entry of a new BPA could have a significant effect on the incentives of the existing BPAs. In fact, the effect of increased competition among BPAs may be intensified due to lower revenues and profit compared to credit rating agencies. We argue, therefore, that our results can be generalized to other settings and have implications for other industries with similar business models, such as credit rating agencies and auditing firms located in jurisdictions that do not explicitly limit the entrance of competitors (e.g., the U.S.).

If a systematic bias in fair value prices exists, then we predict that this bias will be associated with real effects in the capital markets. Specifically, we predict that a fair value price bias will lead to a decrease in the liquidity of corporate bonds. We argue that the difficulty of institutional investors trading corporate bonds will be increasing in the distortion of the stated fair value bond prices. Biased fair value prices increase the information asymmetry between institutional investors and their clients. Clients may believe that institutional investors are more sophisticated, but if they also believe they are at an informational disadvantage compared to institutional investors or asset managers, then clients may use prices from BPAs as the relevant benchmarks to evaluate their performance.

We hypothesize that the bias in fair value prices will decrease liquidity in the bond markets by decreasing the willingness of buyers and sellers to trade. To fix intuition, consider the case of a mutual fund or money market fund. Retail investors only have fair value prices provided by BPAs for reference. The provided values are used in part to determine whether institutional investors or asset managers are outperforming their respective benchmarks.

Therefore, if the provided fair value price of a security is biased upwards, then the asset manager holding the security would not want to engage in a trade and sell the security for less than the stated fair value price. If asset managers trade at a lower price than the price indicated by the BPAs, investors will question asset managers' ability to make good trading decisions. Sophisticated asset managers know more about assets' true fundamental values and prices, and asset managers will also be reluctant to buy overpriced assets. An asset manager selling an overpriced asset at a biased price would realize a "profit" instantly. However, if the asset buyer believes that the true value of the asset is the traded price, then the value of the asset would need to rise above the BPAs' price in order for the buyer to realize a profit. Thus, the bias would burden the buying asset manager down the road. Managers knowing the potential for bias in stated prices may be unwilling to trade, in turn decreasing the liquidity in the bond markets.

3.2 Identification Strategy

We exploit the entry of the FN Pricing and conduct a difference-in-differences analysis to study the effect of competition on the bias in fair value prices. For securities such as treasuries, corporate bonds, municipal bonds, and bank debentures, BPAs are required to price all the public offering bonds. Private placement bonds are only priced by request. FN Pricing started to simultaneously price all bonds from the year 2011. This does not allow us to compare the effect of competition on bias for different groups of issuers.

Instead, our measure of bias is based on the idea that BPAs may have different incentives when pricing bonds at the middle of the month compared to the end of the month.

Financial institutions in Korea have an internal policy to compensate their employees at the end of the month using the mark-to-market prices provided by the BPAs. If BPAs have financial incentives to bias the prices to provide favorable prices, then the incentives should be exacerbated at the end of the month. Thus, our control group is a bond's own yield at the middle of the month, and the treatment group is a bond's yield at the end of the month.

The strength of using this within-month variation is that it allows us to identify the systematic bias, which is the treatment effect of increased competition. Because the barrier to entry in the bond pricing industry is low, the establishment of FN Pricing is possibly endogenous. Nevertheless, the entry of the fourth BPA serves as a plausible shock as long as it does not affect what is happening in the middle of the month or at least has the same effect at the end of the month. Moreover, the parallel trends assumption should be satisfied because only the end-of-month yields would vary from the differential of incentives at the end of the month after the entry of FN Pricing. This also mitigates the concern that the adoption of Korean IFRS in 2011 or other potential concurrent economic events, which do not have differential effects on the yields *within* the month, could be driving our results. Together, our identification strategy makes our inferences less subject to endogeneity concerns.

3.3 Data and Sample Selection

3.3.1 Corporate Bond Term Structures

Each bond pricing agency constructs a term structure, or yield curve, for every corporate bond that they price. If a bond does not have an issuance in a certain maturity range, then BPAs will determine a comparable maturity price using treasuries or trades for similar

bonds as benchmarks. For example, if the bond with the longest maturity for Samsung Electronics is only two years but LG Electronics has an outstanding bond with a maturity of three years, the bond pricing agencies will use trades of LG Electronics' three-year bond to estimate the price of Samsung's three-year yield under the assumption that Samsung and LG have comparable credit risk. Thus, BPAs provide fair value prices for all bonds for all maturities on a daily basis.

These yield curves are not only sent directly to the BPAs' clients but also to data vendors such as Infomax and Bondweb. Many of these data vendors are heavily subscribed by the institutional investors. If a bond is listed on an exchange, it is called a public offering, with private placements being issued bonds that are not listed on an exchange. While all BPAs price public offerings, private placements may not be priced by a given BPA if there is no request from their clients. Hence, we focus our analyses on public offerings and the issuers disclosed by the vendors. In particular, we manually collect that yield curves from Infomax.[7] For consistency, we only use the three-year term of each issuer. We focus our tests using three-year bond yields because they are the most liquid term traded in Korea and have the most accurate pricing. Furthermore, it allows us to overcome the challenge of comparing bonds from different issuers and with different maturities.

We further restrict the sample to the yield curves of the three preexisting bond pricing agencies, excluding bonds covered by FN Pricing. We do this to isolate the effect of how the three existing BPAs react to the increased competition from the fourth BPA entering the market. Furthermore, data vendors such as Infomax provide the average yield curves

[7]Infomax also has a terminal similar to that of Bloomberg. One of the datasets that Infomax provides is the term structure for corporate bonds for all the companies that the BPAs price. The term structure for each company, as provided by the individual BPAs, is available for collection for subscribers.

from the three existing BPAs as well as that of all four BPAs, in addition to providing each BPA's yield curve separately. The average of the original three BPAs is still considered the "benchmark" by most institutional investors.

3.3.2 Corporate Bond Trades and Issuances

Corporate bond trades are also collected from Infomax. Koscom[8], an IT firm jointly founded by the Korean Ministry of Finance and the Korea Exchange in 1977, assigns a unique identifier to each issuer. The bond trades are matched with its yield curve using this identifier. We obtain both the daily traded amount and the turnover rate. The turnover rate is calculated as the amount traded divided by the issuance amount. Hence, turnover can be used as a reasonable, albeit coarse, measure of liquidity. A higher turnover ratio indicates a more liquidity security and vice versa.

Corporate bond issuance data provided by Infomax does not provide bond issuer identifiers. Ideally, we would match the issuances of each individual bond with its yield curve using a unique name. However, many bonds of different issuers have similar names, making this approach noisy. Instead, we gather issuance data from KIS Pricing. KIS Pricing also collects issuance data from Koscom once there is a new issuance but includes unique identifiers, significantly improving the accuracy of the matching process.

[8] https://english.koscom.co.kr/eng/main/contents.do?menuNo=300039

4 Empirical Results

4.1 Competition and Bias

Utilizing the variation in the incentives to bias prices during different periods of the month, we estimate the following regression:

$$Y_{i,j,t} = \beta_0 + \beta_1 EndMonth_{i,j,t} + \beta_2 Post_t \times EndMonth_{i,j,t} + \gamma X_{i,t} + \delta_t + \lambda_i + \epsilon_{i,j,t}, \quad (1)$$

where δ_t and λ_i are year-month and issuer fixed effects, respectively. The dependent variable, $Y_{i,j,t}$, is the three-year yield for issuer i at month t. For each issuer, there would be two observations for month t. Subscript j indicates whether the yield is for the middle of the month or the end of the month. The $Post_t$ variable is an indicator variable that equals one from April of 2012, which is when FN Pricing first started to provide their prices to data vendors for all subscribers, such as institutions and other bond pricing agencies, to see. This variable is omitted as an independent variable in this specification and throughout our tests because it is subsumed by year-month fixed effects. $EndMonth_{i,j,t}$ is equal to one for the last trading day of the month and zero for the middle day of the month.

We include firm characteristics provided by KIS Pricing as control variables were. KIS Pricing receives the financial statements and stock price of firms regularly from KOSCOM. Korea adopted IFRS, called the K-IFRS, from 2011. Before the K-IFRS, companies reported non-consolidated financial statements. Because our sample includes observations preceding IFRS adoption, we use accounting numbers only from the separate financial statements

to calculate our control variables for consistency. $X_{i,t}$ indicates control variables such as $Size$, $EBIDTA$, $Tangibility$, $Leverage$, $Current$, $log\,(Outstanding)$, $CreditRating$, and $log\,(TradedVolume)$. All variables are defined in Appendix A. Standard errors are clustered at the issuer level.

Table 1 reports the summary statistics of our sample. There are a total of 260 issuers in the full sample and 229 issuers in the sample when all control variables are added. On average, the issuers have a three-year yield of 4.48% and an A+ rating. Furthermore, there are 346 billion KRW outstanding on average for each issuer, which is equivalent to approximately 315 million USD. The average daily volume traded is approximately one million USD, but the majority of the bonds do not trade on a given day.

The results of estimating equation (1) are shown in Table 3. The coefficient of interest is β_2, which is negative and statistically significant at the 0.01% level for all three columns. The economic magnitude of the coefficient in column (1) is -0.049 and becomes more negative with values of -0.057 and -0.069 in columns (2) and (3) as we include control variables and rating fixed effects, respectively. These results indicate that the yields at the end of the month are approximately 4.9 to 6.9 basis points lower than those at the middle of the month *after* the entry of FN Pricing. This suggests that yields at the end of the month became lower relative to the middle of the month following the introduction of FN Pricing, providing evidence that the entry of FN Pricing biased BPA yields downward at month-end.

4.2 Cross-sectional Analyses

Next, we examine the cross-sectional variation among different bond issuers. The regressions above are useful for understanding whether the increase in competition has any effect on the fair value prices provided by the BPAs. However, it is also important to determine the mechanism through *which* bonds the BPAs are more likely to upwardly bias the price. We first investigate whether the impact of competition is weaker for bonds that actually traded on a given day. Transaction prices from actual bond trades provide a reference to BPAs, decreasing the ability to bias stated prices. Consequently, issuers that did not have traded bonds are more likely to be biased. In order to test this prediction, we estimate the following regression:

$$\begin{aligned} Y_{i,j,t} = \beta_0 &+ \beta_1 EndMonth_{i,j,t} + \beta_2 NotTraded_{i,j,t} + \beta_3 Post_t \times EndMonth_{i,j,t} \\ &+ \beta_4 Post_t \times NotTraded_{i,j,t} + \beta_5 EndMonth_{i,j,t} \times NotTraded_{i,j,t} \\ &+ \beta_6 Post_t \times EndMonth_{i,j,t} \times NotTraded_{i,j,t} + \gamma X_{i,t} + \delta_t + \lambda_i + \epsilon_{i,j,t}, \end{aligned} \tag{2}$$

where $NotTraded_{i,j,t}$ indicates whether the issuer i did not have a bond traded during the middle or end of the month t. All other variables are defined as before and also included in the regression specifications.

The results of this regression are displayed in Table 4. The coefficient of interest is β_6, the coefficient of the triple interaction term $Post_t \times EndMonth_{i,j,t} \times NotTraded_{i,j,t}$. The coefficient is negative and statistically significant for all three columns. The magnitude of -0.112 in column (1) changes to -0.098 and -0.039 in columns (2) and (3) as we include control variables and rating fixed effects. These results suggest that non-traded bonds have

yields that are approximately four to 11 basis points lower at the end of the month than at the middle of the month after an increase in competition, relative to traded bonds. This is consistent with our conjecture that BPAs are more likely to upwardly bias the price of bonds that did not trade, pricing non-traded bonds relatively higher compared to their own prices at the middle of the month.

Second, we differentiate the issuers based on bond turnover. We calculate turnover as the *log* value of the ratio of volume traded to the outstanding issuance amount. This measure is also widely used in the financial industry as a proxy for liquidity, with higher turnover representing more liquidity. We predict that issuers that are more liquid will be harder to bias due to having more transaction prices as an observable reference. The following regression is estimated to test this hypothesis:

$$\begin{aligned} Y_{i,j,t} = \beta_0 &+ \beta_1 EndMonth_{i,j,t} + \beta_2 LowTurnover_{i,j,t} + \beta_3 Post_t \times EndMonth_{i,j,t} \\ &+ \beta_4 Post_t \times LowTurnover_{i,j,t} + \beta_5 EndMonth_{i,j,t} \times LowTurnover_{i,j,t} \\ &+ \beta_6 Post_t \times EndMonth_{i,j,t} \times LowTurnover_{i,j,t} + \gamma X_{i,t} + \delta_t + \lambda_i + \epsilon_{i,j,t}, \end{aligned} \tag{3}$$

where $LowTurnover_{i,j,t}$ is an indicator for having low turnover for issuer i on day j of month t.

Table 5 presents the results of equation (3). Column (1) shows the results for the specification without control variables. We are again interested in the coefficient of the triple interaction term $Post_t \times EndMonth_{i,j,t} \times LowTurnover_{i,j,t}$. The coefficient is negative and statistically significant at the 1% level with a magnitude of -0.174. This magnitude remains similar at -0.186 when control variables are included in column (2) and decreases to -0.116

when rating fixed effects are added in column (3), while remaining statistically significant at the 1% level. We find that bonds with a lower turnover or less liquidity have relatively lower yields at the end of the month compared to the middle of the month, evidence suggesting that BPAs are biasing bonds that are more illiquid.

Lastly, we partition bond issuers based on credit ratings and test whether issuers with higher credit ratings are less affected by increased competition. We find that the more traded and liquid issuers are less affected by the increase in competition. Similarly, we expect issuers with higher credit ratings to be less biased and have higher yields. We test this prediction using the following regression:

$$\begin{aligned} Y_{i,j,t} = \beta_0 &+ \beta_1 EndMonth_{i,j,t} + \beta_2 Rating_{i,j,t} + \beta_3 Post_t \times EndMonth_{i,j,t} \\ &+ \beta_4 Post_t \times Rating_{i,j,t} + \beta_5 EndMonth_{i,j,t} \times Rating_{i,j,t} \\ &+ \beta_6 Post_t \times EndMonth_{i,j,t} \times Rating_{i,j,t} + \gamma X_{i,t} + \delta_t + \lambda_i + \epsilon_{i,j,t}, \end{aligned} \tag{4}$$

where $Rating_{i,j,t}$ is a dummy variable equal to one if the issuer has a credit rating higher than an A0 rating.

Table 6 shows the results of estimating equation (4). Contrary to our expectation, the coefficient of the triple interaction term, β_6, is negative and statistically significant. These results indicate that yields for higher-rating issuers are lower than lower-rating issuers at the end of the month compared to the middle of the month. One explanation for this finding is that the majority of financial institutions hold bonds with high ratings, and many funds have restrictions that limit the ownership of lower-rating corporate bonds. Moreover, the better-performing issuers during the month are more likely to have higher ratings, and financial

institutions are likely to hold on to these bonds from higher-rating issuers to collect higher compensation for their performance. Thus, the trading of these bonds at the end of the month may occur due to insurance companies, banks, or asset management firms having capital requirements or because of their external demand for cash. Together, we argue that these results are consistent with BPAs' incentives to bias the term structure of the issuers that most of their clients hold.

4.3 Capital Market Consequences

It is possible that market participants are likely to identify the systematic bias in the end of month prices by BPAs. Therefore, we next investigate whether there are any capital market consequences. Specifically, we explore the effect of biased prices on market liquidity. If prices are biased at the end of the month, then trading on the following day should suffer the most from the distorted prices. Thus, we expect there to be a decrease in liquidity on the first trading day of the month compared to the middle of the month. This effect is estimated using the following regression:

$$\begin{aligned} Turnover_{i,j,t} = \beta_0 + \beta_1 FirstMonth_{i,j,t} + \beta_2 Post_t \times FirstMonth_{i,j,t} \\ + \gamma X_{i,t} + \delta_t + \lambda_i + \epsilon_{i,j,t}, \end{aligned} \tag{5}$$

where $FirstMonth_{i,j,t}$ indicates whether a given day is the first trading day of the month t for issuer i or a trading day in the middle of the month. The variable $Turnover_{i,j,t}$ is used as a measure for liquidity and is defined as before. All other variables are the same as in previous specifications.

The results of equation 5 are shown in Table 7. Column (1) reports the results without including control variables, column (2) shows results with control variables, and column (3) includes both control variables and rating fixed effects. The coefficient of interest, β_2, is negative and statistically significant at the 0.01% level across all three specifications. These results suggest that the increase in competition affects liquidity in the bond markets through distorted prices. Institutional investors and traders use the previous trading day's posted BPA prices as a reference to trade. If these prices are biased, then traders have a harder time agreeing on a transaction price, decreasing trading. Overall, our results indicate that while attempts to provide timely fair value estimates of public securities provide transparency to the capital markets, there may be unintended consequences of a decrease in liquidity if these prices are biased.

5 Robustness Tests

As robustness tests, we run the main analyses again using actual trade data instead of the yields provided by the BPAs. We first aggregate the individual trade data to the security level and construct two measures of disagreement: *Spread* and *Difference*. *Spread* is calculated as the difference between the lowest and highest yield of a particular security traded that day, with higher values indicating more disagreement in price or potentially more traders trying to manipulate price. *Difference* is the difference between the average trade price and the fair value price provided by the bond pricing agencies at the end of the day, with higher values indicating lower fair value prices. Table 8 presents the results from estimating this alternative specification.

We also investigate how the number of trades and trade volume changes at the end of the month in comparison with the middle of the month as competition heightens. *Number of Trades* is the number of times a particular bond traded on a given day. *Total Trade Volume* is the total sum of the individual trade volumes. We find that individual bonds tend to trade many more times at the end of the month, but there is no change in the total trade volume. This implies that dealers or portfolio managers are making more trades of less volume. This is consistent with dealers trying to "fake" trades at the end of the month.

Finally, we calculate the expected default frequency (EDF), or the theoretical credit risk, using the KMV model based on Merton (1974).[9] This theoretical credit risk is equivalent to the credit spread, i.e., bond yields. We construct the control group using the theoretical credit risk and use the bond yields provided by the BPAs as the treatment group. This allows us to construct treatment and control groups without having to exploit the within-month variation in yields provided by the BPAs. Consistent with our previous results, Table 10 shows that the credit risk indicated by the yields provided by the BPAs decrease relative to the theoretical credit risk calculated by the KMV model once there is increased competition.

6 Conclusion

Bond pricing agencies (BPAs) in Korea have an incentive to bias daily fair value bond prices upwards in order to placate the firms that pay for their bond pricing services, similar to the model oft criticized in the U.S. relating to credit rating agencies and audit firms. In this paper we examine the effect of BPA competition on the bias in fair value prices

[9]The EDF is calculated based on the methodology in Crosbie and Bohn (2003), consistent with the methods used in Drucker and Puri (2008) and Wang and Xia (2014).

in the Korean bond market. We use novel Korean bond pricing data and the entry of a fourth BPA, FN Pricing, as a shock to competition and conduct a difference-in- differences analysis. Consistent with their incentives to cater to clients' demands to maximize their personal compensation, we find that BPAs tend to bias bond prices upwards more after an increase in competition. Specifically, we find that a bond's price is biased upwards on the last trading of the month, when fund and asset managers' compensation is determined, compared to that bond's own price in the middle of the month.

Our results suggest that BPAs provide favorable prices to their clients to maintain or expand their client base. The impact of competition is higher for bonds that are not traded, more illiquid, and have higher credit ratings. These are the type of bonds that do not trade at the end of the month, and for which biasing bond would be most possible by BPAs. Our findings are consistent with BPAs exploiting their discretion to bias fair value prices rather than provide more accurate assessments of securities that are supposed to benefit the most from daily fair value price updates, the more illiquid and non-traded bonds. Furthermore, we show that these biased prices have real effects on the capital markets. Due to the distorted prices, investors have a harder time agreeing on a trading price. This leads to a decrease in liquidity in the bond markets, which is contrary to what the BPAs were established to do.

Our paper raises several issues relevant to the current discussion surrounding fair value accounting. First, in some settings fair value accounting may lead to *more* systematic bias in security prices. Academics have documented that managers manage earnings, analysts give biased forecasts, and credit rating agencies provide favorable ratings. Therefore, it is not entirely surprising that managers would not use their influence over BPAs to bias the fair value assessment of the financial securities they hold. Second, bias in fair value prices does

have capital market consequences by decreasing the liquidity. This would be a concern to standard-setters and regulators because fair value accounting is usually adopted to increase transparency and liquidity in the markets. As a whole, these results are consistent with fair value accounting increasing the potential for the existence of Akerlof's lemons problem in a variety of settings. While our study cannot speak to whether historical cost accounting is a better method than fair value accounting, our results highlight that the use of fair value accounting may have unintended consequences.

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Appendix A: Variable Definitions

Variable	Definition
Size	Natural logarithm of total assets.
Leverage	Long-term debt divided by total assets.
Current	Current assets divided by current liabilities.
EBIDTA	Earnings before interest and taxes plus depreciation deflated by total assets.
Tangibility	Net property, plant, and equipment (PP&E) divided by total assets.
Log(Outstanding)	Natural logarithm of total outstanding issuance amount.
Rating	Credit rating scaled to numeric values in Table 2.
Log(Traded Volume)	Natural logarithm of daily total traded volume.

Appendix B: Example

Each BPA has its own procedures and methods for producing fair value prices. However, they all have one thing in common: they generate yield curves for companies that issue corporate bonds. Figure A1 shows an example of the term structures created for Samsung Securities by KIS Pricing for different days. These term structures can be as short as 3 months and as long as 30 years. BPAs adjust the term structure to reflect the price at which a given corporate bond was traded during the day. For instance, in Figure A1, the yields for January 7th dropped for bonds with maturities less than two years and rose for those with maturities of two years and above. The term structure was adjusted accordingly so that the individual bond prices calculated based on the term structure could reflect the curve steepening in the fair value prices.

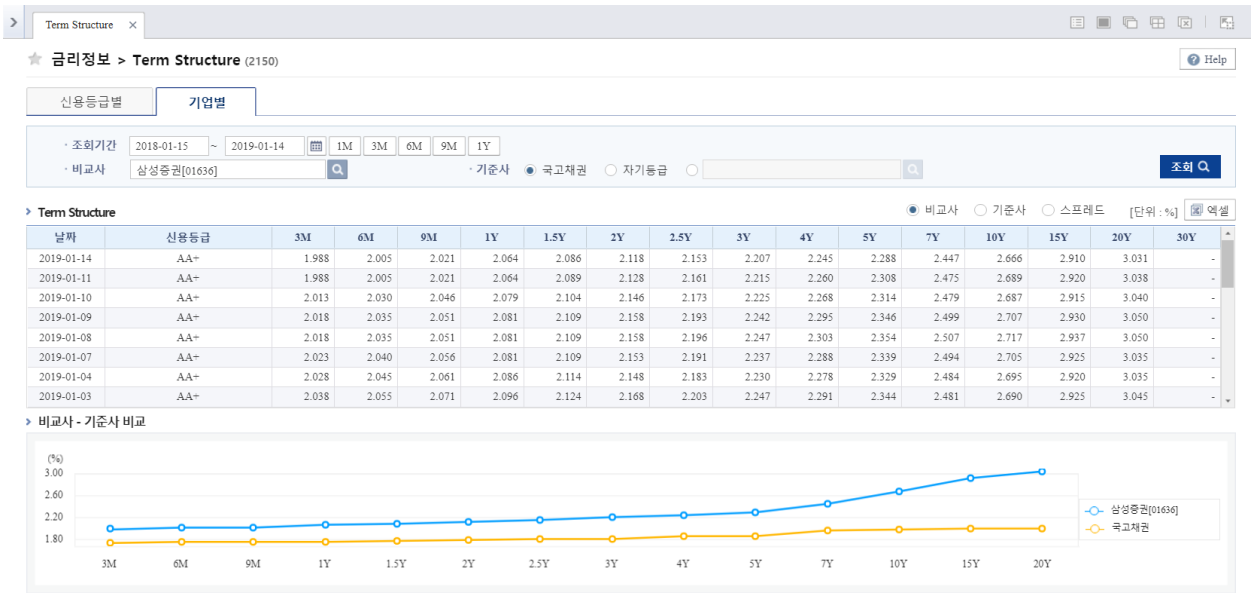

Figure A1: This figure shows the term structures for Samsung Securities provided by KIS Pricing from 1/3/2019 to 1/14/2019 (Source: KIS Pricing).

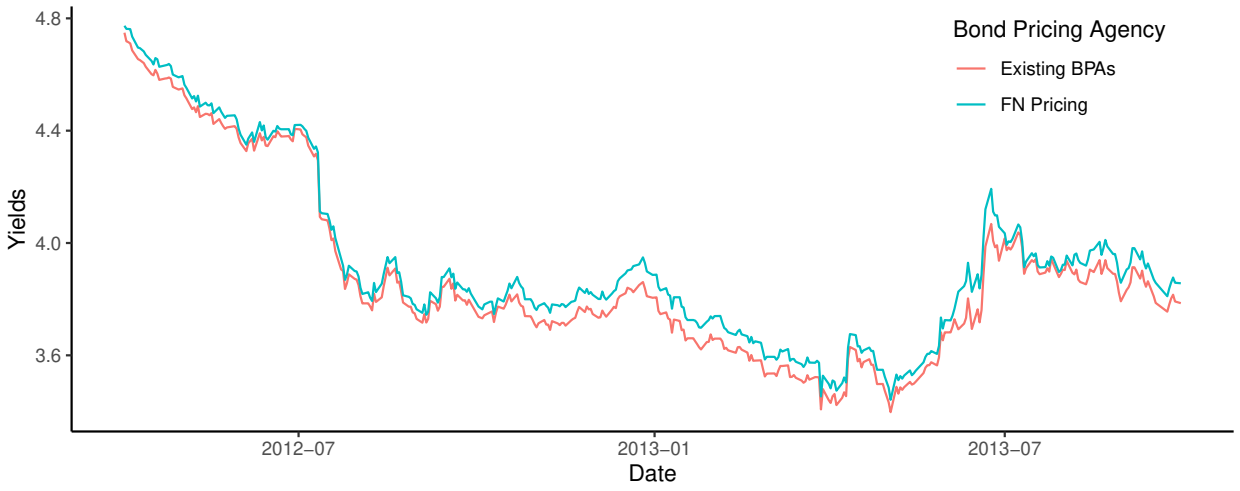

Figure 1: This figure plots the average three-year yields of all corporate bonds priced by FN Pricing and the three incumbents.

Table 1: Descriptive Statistics

	N	Mean	Median	Std Dev
Three-year Yields	21,608	4.48	4.15	1.51
log(Issuance Outstanding)	21,608	26.57	26.58	1.50
Traded Volume (KRW in millions)	21,608	1,192.00	0.00	9,267.78
Turnover	21,608	0.90	0.00	7.23
Rating Scale	19,662	23.37	23.00	2.51
Total Assets	13,668	21.46	21.34	1.22
EBITDA	13,668	0.03	0.03	0.04
Current	13,668	1.24	1.07	1.16
Leverage	13,668	0.56	0.58	0.16
Tangibility	13,668	0.16	0.12	0.22

Table 2: Investment Grade Rating Scale

Rating	Rating Scale	Definition
AAA	28	The strongest capacity for timely repayment.
AA+	26	Very strong capacity for timely repayment. This capacity may, nevertheless, be slightly inferior than is the case for the highest rating category.
AA0	25	
AA-	24	
A+	23	Strong capacity for timely repayment. This capacity may, nevertheless, be more vulnerable to adverse changes in circumstances or in economic conditions than is the case for higher rating categories.
A0	22	
A-	21	
BBB+	20	Capacity for timely repayment is adequate, but adverse changes in circumstances and in economic conditions are more likely to impair this capacity.
BBB0	19	
BBB-	18	

Table 3: Main Model

This table presents evidence that BPAs bias yields at the end of the month more after the entry of FN Pricing. Results from equation (1) are reported without control variables in column (1), with control variables in column (2), and with both control variables and rating fixed effects in column (3). The dependent variable is the average three-year yields of the existing three BPAs and the independent variable of interest is $Post \times EndMonth$. All three regression specifications include issuer and year-month fixed effects, and standard errors are corrected for heteroscedasticity and clustered at the issuer level.

	Dependent variable:		
	Three-Year Yield		
	(1)	(2)	(3)
EndMonth	0.017^{***}	0.025^{***}	0.031^{***}
	(0.002)	(0.004)	(0.003)
EndMonth × Post	-0.049^{***}	-0.057^{***}	-0.069^{***}
	(0.003)	(0.005)	(0.004)
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes
Rating FE	No	No	Yes
Observations	21,608	13,668	13,668
Adjusted R^2	0.932	0.951	0.968
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 4: Cross-sectional Analysis: Traded vs. Not Traded

This table shows that the impact of competition on bias is stronger for issuers with bonds that did not trade. Column (1) reports the results from equation (2) without control variables, column (2) shows the results with control variables, and column (3) includes both control variables and rating fixed effects. The dependent variable is the average three-year yield of the existing three BPAs, and the independent variable of interest is $Post \times EndMonth \times NotTraded$. The variable $NotTraded$ is an indicator equal to one if the issuer's bonds did not trade and zero otherwise. All three regression specifications include issuer and year-month fixed effects, and standard errors are corrected for heteroscedasticity and clustered at the issuer level.

	Dependent variable:		
	Three-Year Yield		
	(1)	(2)	(3)
EndMonth	−0.003	0.006	0.027**
	(0.017)	(0.015)	(0.011)
NotTraded	0.119*	0.080	0.054
	(0.066)	(0.052)	(0.033)
EndMonth × Post	0.060*	0.022	−0.034
	(0.033)	(0.024)	(0.021)
Post × NotTraded	−0.287**	−0.213**	−0.153**
	(0.126)	(0.104)	(0.064)
EndMonth × NotTraded	0.022	0.038**	0.011
	(0.019)	(0.018)	(0.013)
EndMonth × Post × NotTraded	−0.112***	−0.098***	−0.039*
	(0.034)	(0.027)	(0.024)
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes
Rating FE	No	No	Yes
Observations	21,608	13,668	13,668
Adjusted R^2	0.933	0.951	0.968
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 5: Cross-sectional Analysis: Liquid vs. Illiquid

This table shows that the impact of competition on bias is stronger for issuers with less liquid bonds. Columns (1) and (2) report the results from equation (3) without and with control variables, respectively, while column (3) includes both control variables and rating fixed effects. The dependent variable is the average three-year yield of the existing three BPAs, and the independent variable of interest is $Post \times EndMonth \times LowTurnover$. The variable $LowTurnover$ is an indicator equal to one if the issuer's turnover ratio is below the median and zero otherwise. All three regression specifications include issuer and year-month fixed effects, and standard errors are corrected for heteroscedasticity and clustered at the issuer level.

	Dependent variable:		
	Three-Year Yield		
	(1)	(2)	(3)
EndMonth	−0.016	−0.045**	−0.004
	(0.030)	(0.022)	(0.019)
LowTurnover	0.135***	0.041	0.029
	(0.050)	(0.034)	(0.031)
EndMonth × Post	0.120**	0.115***	0.041
	(0.055)	(0.043)	(0.042)
Post × LowTurnover	−0.194**	−0.107	−0.104*
	(0.089)	(0.073)	(0.062)
EndMonth × LowTurnover	0.032	0.079***	0.039*
	(0.034)	(0.025)	(0.021)
EndMonth × Post × LowTurnover	−0.174***	−0.186***	−0.116***
	(0.057)	(0.046)	(0.044)
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes
Rating FE	No	No	Yes
Observations	21,608	13,668	13,668
Adjusted R^2	0.933	0.951	0.968
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 6: Cross-sectional Analysis: Credit Rating

This table shows that the impact of competition on bias is stronger for issuers with higher credit ratings. Equation (4) is used for estimation. Column (1) reports the results without including control variables, and column (2) shows results with control variables. The dependent variable is the average three-year yield of the existing three BPAs, and the independent variable of interest is $Post \times EndMonth \times Rating$. The variable *Rating* is a dummy variable equal to one if the issuer has a credit rating higher than an A0 rating. Both regression specifications include issuer and year-month fixed effects, and standard errors are corrected for heteroscedasticity and clustered at the issuer level.

	Dependent variable:	
	Three-Year Yield	
	(1)	(2)
Rating	-0.645^{***}	-0.759^{***}
	(0.093)	(0.110)
EndMonth × Post	0.043^{*}	0.061^{**}
	(0.022)	(0.027)
Post × Rating	0.006	−0.003
	(0.015)	(0.019)
EndMonth × Rating	0.001^{***}	0.001^{***}
	(0.0001)	(0.0002)
EndMonth × Post × Rating	-0.004^{***}	-0.005^{***}
	(0.001)	(0.001)
Controls	No	Yes
Firm FE	Yes	Yes
Year-Month FE	Yes	Yes
Observations	19,662	13,668
Adjusted R^2	0.949	0.950
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table 7: Economic Consequences

This table reports the estimation of equation (5) and shows the real effects of bias on liquidity. Due to bias in the fair value prices at the end of the month, liquidity on the following day (the first trading day of the month) decreases. Results are reported without control variables in column (1), with control variables in column (2), and with both control variables and rating fixed effects in column (3). The dependent variable is the *log* of turnover, and the independent variable of interest is $Post \times FirstMonth$. The variable $FirstMonth$ is an indicator equal to one for the first trading day of each month and zero otherwise. All three regression specifications include issuer and year-month fixed effects, and standard errors are corrected for heteroscedasticity and clustered at the issuer level.

	Dependent variable:		
	Liquidity		
	(1)	(2)	(3)
FirstMonth	0.011^{***}	0.019^{***}	0.019^{***}
	(0.003)	(0.005)	(0.005)
FirstMonth × Post	-0.013^{***}	-0.028^{***}	-0.028^{***}
	(0.003)	(0.007)	(0.007)
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes
Rating FE	No	No	Yes
Observations	21,599	13,662	13,662
Adjusted R^2	0.006	0.008	0.008
Note:			*p<0.1; **p<0.05; ***p<0.01

Table 8

This table presents the results of an analysis using trade-level data to examine the impact of competition on price disagreement and the difference between actual trade prices and end-of-day fair value prices. Columns (1) and (2) use the difference between the lowest and highest traded yield of the day for a particular bond (Spread) as the dependent variable, which captures the degree of disagreement in prices or potential price manipulation by traders. Columns (3) and (4) use the difference between the average trade price and the price provided by the BPAs at the end of the day (Difference) as the dependent variable, calculated as the average trade price minus the fair value price, such that more positive values indicate lower fair value prices relative to trade prices. Results are reported without and with control variables in odd- and even-numbered columns, respectively. The independent variable of interest is $EndMonth \times Post$. All regression specifications include issuer and year-month fixed effects, and standard errors are corrected for heteroscedasticity and clustered at the issuer level.

	Dependent variable:			
	Spread		Difference	
	(1)	(2)	(3)	(4)
EndMonth	-0.045^{**}	-0.061^{***}	0.018	-0.232
	(0.020)	(0.020)	(0.034)	(0.160)
EndMonth × Post	0.089^{**}	0.077^{**}	0.285^{*}	0.438^{**}
	(0.036)	(0.032)	(0.149)	(0.209)
Controls	No	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes
Observations	5,898	4,905	5,898	4,905
Adjusted R^2	0.897	0.931	0.172	0.234
Note:		*p<0.1; **p<0.05; ***p<0.01		

Table 9

This table examines the effect of competition on trading activity at month-end using trade-level data. The dependent variables are the number of trades in columns (1) and (2), and the total trade volume in columns (3) and (4). The key independent variable is $EndMonth \times Post$. The variable $EndMonth$ is an indicator equal to one for the last trading day of each month and zero otherwise. Results are reported without and with control variables in odd- and even-numbered columns, respectively. All specifications include firm and year-month fixed effects, and standard errors are clustered by firm.

	Dependent variable:			
	Number of Trades		Total Trade Volume	
	(1)	(2)	(3)	(4)
EndMonth	0.061	−1.705	−544,596.800**	−569,395.400*
	(1.040)	(1.506)	(250,832.000)	(299,479.100)
EndMonth × Post	29.271*	36.404*	30,713.580	261,063.100
	(16.424)	(20.611)	(419,203.300)	(410,424.500)
Controls	No	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes	Yes
Observations	5,898	4,905	5,898	4,905
Adjusted R^2	0.111	0.121	0.427	0.483
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 10: Distance to Default

This table examines the relationship between credit risk assessments provided by BPAs and the theoretically calculated distance to default (DD), and how this relationship changes after the entry of a new competitor, FN Pricing. The dependent variable, Credit Risk, is an indicator variable equal to one for credit risk assessments provided by BPAs and zero for the DD calculated using the Merton model. The key independent variable of interest is $BPA \times Post$. Results are reported without control variables in column (1), with control variables in column (2), and with both control variables and rating fixed effects in column (3). All specifications include firm and year-month fixed effects, and standard errors are clustered at the firm level.

	Dependent variable:		
	Credit Risk		
	(1)	(2)	(3)
BPA	1.991***	2.010***	2.010***
	(0.161)	(0.164)	(0.164)
BPA × Post	−1.215***	−1.186***	−1.186***
	(0.100)	(0.109)	(0.109)
Controls	No	Yes	Yes
Firm FE	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes
Rating FE	No	No	Yes
Observations	213,844	184,738	184,738
Adjusted R^2	0.371	0.381	0.386
Note:			*p<0.1; **p<0.05; ***p<0.01