Stock Price Synchronicity and Price Informativeness: Evidence from a regulatory change in the U.S. Banking Industry

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Abstract. Whether return synchronicity is associated with higher or lower stock price informativeness is still an ongoing debate in the academic literature. This paper contributes to this debate by exploiting an exogenous shock, provided by a regulatory change introduced by the Federal Reserve in 2015, and examining its impact on return synchronicity using a sample of U.S. listed bank holding companies (BHCs) operating during the period of 2014: Q3 – 2016: Q2. Applying a regression discontinuity design, we find that return synchronicity of treated BHCs decreases after the regulatory change. This finding suggests that lower return synchronicity represents lower stock price informativeness.

JEL Classifications: G14, G21, G28

Keywords: Price Informativeness; Stock Return Synchronicity; Financial Regulation; Bank Opacity

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1. Introduction

Banks are inherently more opaque than companies in other industries (Morgan, 2002; Blau, Brough and Griffith, 2017). Existing empirical research has shown that it is difficult for outsiders to valuate banks (Jones, Lee and Yeager, 2012; Flannery, Kwan and Nimalendran, 2013). As a consequence, market discipline presumes to be less effective for banks (Morgan and Stiroh, 2001).

Stock price informativeness is a key concept to better understand the role played by market discipline. The most famous measure of stock price informativeness in literature is stock return synchronicity, which is the co-movement of an individual stock return with the market (e.g., Gul, Kim and Qiu, 2010; An and Zhang, 2013; Jones, Lee and Yeager, 2013). However, whether higher return synchronicity is associated with higher or lower informativeness has been a subject of debate in recent years (e.g., Jin and Myers, 2006; Dasgupta, Gan and Gao, 2010; Xing and Anderson, 2011).

The first theory argues that lower synchronicity represents higher stock price informativeness. Roll (1988) suggests that low stock price synchronicity could be caused by either the incorporation of private information or occasional frenzy (i.e., noise). Inspired by Roll's work, Morck, Yeung and Yu (2000) and Durnev et al. (2003) find that stocks have lower return synchronicity because more firm-specific information is incorporated into stock prices thanks to active informed arbitrageurs. Morck, Yeung and Yu (2000) and Jin and Myers (2006) further find that more difficulties in understanding a firm (e.g., higher opacity) could discourage informed trading by increasing the cost of informed arbitrage, and consequently, prevent the incorporation of firm-specific information into stock prices. Based on the findings, they conclude that price synchronicity is higher when firms are more difficult to be understood, and stock prices are less informative.

However, the second theory advocates a positive relationship between synchronicity and stock price informativeness. Dasgupta, Gan and Gao (2010) propose a theoretical model predicting that price synchronicity increases when a firm is less opaque. They explain that lower opacity can accelerate the incorporation of firm-specific information and reduce idiosyncratic variation. Chan and Chan (2014) find a negative relationship between return synchronicity and the discount of seasoned equity offerings (SEOs). Given that SEO discount is lower when investors face less information asymmetry, they conclude that higher synchronicity indicates higher informativeness.

We examine whether more opaque banks have lower or higher stock return synchronicity. Banks are usually excluded from the empirical research discussing the relationship between synchronicity and informativeness, because banks are different from non-financial firms in many aspects. However, opacity is more compelling and prevalent in the banking industry and regulations attempt to improve the disclosure quality to alleviate information asymmetry in banking industry (Akhigbe and Martin, 2006; Jirasakuldech et al., 2011). Therefore, we argue that the banking industry and regulatory change that targets information disclosure is an ideal setting for investigating this debate.

To reduce the regulatory burden for small banks, the Fed issued a new Small Bank Holding Company (BHC) Policy Statement in May 2015. With this regulation, the asset threshold for identifying small BHCs was increased from $500 million to $1 billion. Newly qualified small BHCs can enjoy relatively loose capital and regulatory reporting requirements (The Federal Reserve, 2015). In this paper, we test whether this regulatory change could affect bank synchronicity using a sample of U.S. listed BHCs operating during the period of 2014: Q3 – 2016: Q2. As robustness checks, we use the illiquidity ratio of Amihud (2002) as an alternative trade-based measures of price impact (Kyle, 1985). We find that the synchronicity of treated BHCs is significantly lower than control BHCs after the implementation of the 2015 policy statement, and the illiquidity ratio of treated banks is significantly lower than control BHCs.

This paper contributes to the existing literature. To the best of our knowledge, we test the relationship between stock price synchronicity and informativeness for the first time in the banking industry. Most previous studies examined samples including only non-financial firms (e.g., Dasgupta, Gan and Gao, 2010; Kelly, 2014; Chan and Chan, 2014). Our findings provide further evidence in support of a positive relationship between return synchronicity and price informativeness.

The rest of the paper is organised as follows. Section 2 presents our hypothesis. Section 3 presents the methodology and econometric specifications. Section 4 discusses the data and descriptive statistics. The empirical results are presented in section 5. Section 6 concludes.

2. Hypothesis

Stock prices and information flows have symbiotic relationship and are inseparable in financial markets. An informative stock price is expected to reflect fundamental value and firm-specific information of the company (Jones, Lee and Yeager, 2012; Flannery, Kwan and Nimalendran, 2013). Stock price informativeness is usually measured by stock return synchronicity, however, there is no consensus to date about whether higher return synchronicity is associated with higher or lower informativeness (e.g., Jin and Myers, 2006; Dasgupta, Gan and Gao, 2010). One theory supports the negative relationship between synchronicity and informativeness (e.g., Roll, 1988; Morck, Yeung and Yu, 2000; Durnev et al., 2003; Banerjee, Davis and Gondhi, 2018), while the other theory predicts the positive relationship (e.g., Dasgupta, Gan and Gao, 2010; Chan, Hameed and Kang, 2013; Chan and Chan, 2014; Kan and Gong, 2018; Watanabe, Imhof and Tartaroglu, 2019). Both theories are supported empirically. However, banks are excluded from previous studies.

To examine the relationship between synchronicity and informativeness, we test the impact of the 2015 Small BHC Policy Statement on synchronicity. If higher return synchronicity implies higher (lower) price informativeness, then return synchronicity and bank opacity are negatively (positively) related. This implies that stock return synchronicity of treated banks decreases (increases) after the introduction of the 2015 policy statement. This leads to our hypothesis, stated in its alternative form:

H_1: *The introduction of the 2015 Small BHC Policy Statement decreases (or increases) stock return synchronicity of treated banks*.

3. Methodology and Econometric Specifications

3.1. Institutional Background

Drawing lessons from the 2007-2008 financial crisis, the Fed strengthened the supervision on the banking sector. However, concerns about the potential impacts of post-Dodd-Frank rules and regulations have been arisen in recent years, particularly for small banks (Conference of State Bank Supervisors and Federal Reserve, 2013 and 2017). To relieve regulatory burden for small banks, a new Small Bank Holding Company (BHC) Policy Statement was signed into Public Law 113-250 in December 2014 (The Congress, 2014) and

was effective in May 2015 (The Federal Reserve, 2015)[2]. With this new regulatory change, the asset threshold for identifying small BHCs increased from $500 million (valid from 2006) to $1 billion. Newly classified small BHCs are exempt from strict capital and reporting requirements.

The BHCs newly classified as small BHCs are exempt from risk-based and leverage capital rules under Basel III, although their affiliated banks are still subjected to the Basel III capital requirements. In addition to the less restrict capital requirement, small BHCs under the Policy Statement enjoy the reduced form of reporting requirement. Medium and large BHCs are required to submit FR Y-9C report quarterly and FR Y-9LP semi-annually. With a length of 60 pages, FR Y-9C is a regulatory report covering financial data of parent companies and their subsidiaries. FR Y-9LP is a parent only regulatory report with a length of 9 pages. However, the qualifying small BHCs are only required to submit FR Y-9SP report semi-annually. FR Y-9SP is an 8-page parent company only financial statement and contains less information than FR Y-9C.

3.2 Empirical Strategy

We follow Dechezleprêtre et al., (2016) and use a simple reduced-form regression discontinuity (RD)[3] equation of the form:

$$INF_{i,t} = \alpha_{1,t} + \alpha_2 Treatment_{i,2014} + f_{1,t}(Size_{i,2014}) + \varphi X_{it} + \varepsilon_{1i,t} \quad (1)$$

[2] The Policy Statement has been revised three times since 1980. The asset threshold to identify small BHCs was initially set to $150 million in 1980. It was increased to $500 million in 2006 to address the effects of inflation, bank safety and soundness, and normal asset growth of BHCs (The Federal Reserve, 2006). In 2015, the asset limit was raised to $1 billion, and all saving and loan holding companies (SLHCs) with total assets less than $1 billion had been covered by the Policy Statement since then (The Federal Reserve, 2015). The most recent adjustment was in 2018. In the spirit of the Economic Growth, Regulatory Relief, and Consumer Protection Act (EGRRCPA), the Fed increased the asset threshold to $3 billion to further reduce regulatory burden (The Federal Reserve, 2018).

[3] The RD design is valid when banks or their parent companies cannot "precisely manipulate" the running variable (Imbens and Lemieux, 2008; Lee and Lemieux, 2010). The newly qualifying small BHCs (i.e., those becoming small BHCs only under the new asset threshold) could only get benefits from the regulatory change after May 2015 (The Federal Reserve, 2015). However, the capital and reporting exemptions were based on the BHC assets in June 2014, and the Fed first announced the change of asset threshold in December 2014 (The Congress, 2014). That prevented banks' strategic behaviour around the new threshold. Hence, 2015Q3 and afterwards are treated as full policy-on periods. Meanwhile, the small BHC status of a BHC in 2015Q3 and afterwards was based on its financial and operational status in 2014Q2. Using assets in 2014Q2 as the primary running variable could mitigate the concern that there might be endogenous sorting of the affiliated banks across the threshold. An RD design assumes that the distribution of all predetermined variables should not change discontinuously around the threshold (Lee and Lemieux, 2010), therefore, eligibility of small BHC status is as good as randomly assigned it at the cut-off point.

Where i and t subscripts represent individual BHC and time, respectively. $INF_{i,t}$ is a measure of stock price informativeness. We use polynomials of the running variable, parent-BHC asset in 2014Q2 $f_{1,t}(Size_{i,2014})$, which can be fallen on either side of the new asset threshold ($\widetilde{Size}$). $Treatment_{i,2014}$ is a binary dummy taking the value of one if 2014Q2 assets of the parent company of bank i are less than or equal to the asset threshold ($1 billion), and zero otherwise, and it represents the eligibility of the bank i's parent company for the Small BHC Policy Statement. The coefficient α_2 captures the effect of being below the asset threshold on price informativeness. X_{it} is a set of control variables which are the determinates of synchronicity highlighted in the literature, and $\varepsilon_{1i,t}$ is an error term. Standard errors are clustered at the BHC level.

Based on equation (1), we estimate regressions for quarter-by-quarter outcomes. Following Dechezleprêtre et al., (2016), we also run analogous regressions in the pre-policy quarters to assess the validity of the RD design.

3.3 Measures of Stock Price Informativeness

3.3.1 Stock Return Synchronicity

Stock price synchronicity is measured as the logit transformation of the R-squared statistic from a regression of individual stock return on market return. It is measured for each bank-quarter in the sample. Following the method proposed by Morck, Yeung and Yu (2000), we regress banks' daily returns on daily market returns as follows:

$$RET_{it} = \alpha_0 + \alpha_1 MKTRET_t + \varepsilon_{it} \quad (2)$$

where $MKTRET_t$ is the day t value-weighted return on NYSE/AMEX/NASDAQ, and RET_{it} is the daily stock return of bank *i*.

We run regressions for each bank on a quarterly basis and obtain R-squared statistics (R_{it}^2) from each estimation. The stock price synchronicity for bank *i* in quarter *t* then can be calculated as the log ratio of explained return variance to unexplained return variance:

$$SYN_{it} = \ln[R_{it}^2/(1 - R_{it}^2)] \quad (3)$$

3.3.2 Stock Illiquidity

As robustness checks, we use the illiquidity ratio of Amihud (2002)[4] as an alternative measure of price informativeness (Ferreira, Ferreira and Raposo, 2011; Fresard, 2012). The illiquidity ratio (*Illiq*) is the average of the daily stock's absolute return and its dollar volume (multiplied by 10^6) (Fresard, 2012). The variable is calculated as:

$$Illiq_{it} = \frac{1}{D_{it}} \sum_{\tau=1}^{D_{it}} \frac{|RET_{i\tau}|}{VolD_{i\tau}}, \qquad (4)$$

where D_{it} is the number of trading days for bank *i* with valid observations in quarter t, $RET_{i\tau}$ is the daily stock return, and $VolD_{i\tau}$ is the dollar volume of bank *i* on day τ.

3.4 Control Variables

We first control for bank size ($Size_{it}$) which is measured as the logarithm of bank assets (Hughes, Mester and Moon, 2001). The loan to asset ratio ($LoanToAsset_{it}$) is included because it is difficult for outsiders to value the banks' assets, especially loans (Flannery, Kwan and Nimalendran, 2004; Francis et al., 2015). Bank capitalisation is controlled by the ratio of equity to assets ($EquityRatio_{it}$). A better capitalised bank receives more monitoring from shareholders, and they suffer less from moral hazard problems (Berger and DeYoung, 1997). Following Thomas (2002) and Bai et al. (2017), we use the market-to-book ratio MTB_{it} to control for a bank's growth opportunities, since banks with better growth opportunities could reveal more firm-specific information. Non-performing loans (NPL_{it}) are regarded as bank-specific signals of information asymmetry the banking literature (Sarkisyan et al., 2009; Jones, Lee and Yeager, 2013). The return on asset (ROA_{it}) is included to control for profitability (Stiroh and Rumble, 2006).

4. Data and Descriptive Statistics

The empirical analysis is conducted on a sample of U.S. listed BHCs operating during the period 2014: Q3 – 2016: Q2. Banks' quarterly financial data and daily market data are extracted from S&P Global Market Intelligence. Daily market returns are calculated based

[4] Stock prices are assumed to efficiently aggregate information from various market participants and hence improve the allocation of resources (Hayek, 1945). The aggregation of information is enabled by the trading activity of diverse speculators who incorporate their private information into market prices via their trades (Kyle, 1985). As in Kyle (1985) and Fresard (2012), the degree to which the price is affected should be positively related to the perceived amount of informed trading on a stock. Therefore, the illiquidity ratio is positively related to the amount of private information incorporated into stock prices (Fernandes and Ferreira, 2008; Fresard, 2012). Thus, higher illiquidity ratio indicates higher stock price informativeness.

on the daily market risk premium from Kenneth R. French's Website[5]. There are 229 BHCs and 2,971 quarter-BHC observations in the final sample[6].

Table 1B displays the descriptive statistics of bank-level data for the whole sample. The average stock return synchronicity is -3.99, while the average illiquidity ratio is 0.02. Compared to stock return synchronicity, the illiquidity ratio shows a lower variation. In addition, the mean book value of assets is $1.01 billion, while the maximum of total assets is $2.00 billion. On average, the loan-to-asset ratio is 69%, and the equity-to-asset ratio is 11%. The average ratio of non-performing loans to total assets is 2%. The correlations among all independent variables are presented in Table 2 in the Appendix. All correlation coefficients are at an acceptable level suggesting that there is no multicollinearity problem in our regressions.

5. Empirical Results

Based on Eq. (1), we examined the impact of the 2015 Small BHC Policy Statement on stock return synchronicity using regression discontinuity (RD) design. $Treatment_{i,2014}$ is a dummy variable indicating whether the parent BHCs' total assets are below $1 billion in 2014:Q2. The running variable is the total assets of BHCs in 2014:Q2. Fig. 1 displays the visible discontinuity in stock return synchronicity at the asset threshold. There is clear evidence of a sudden decrease in stock return synchronicity for treated BHCs at the threshold showing the effect of the regulatory change.

Regression results are reported in Table 3. Columns 1–4 show the results for four pre-policy quarters. There is no significant discontinuity in synchronicity at the asset threshold, indicating that there is no pre-policy trend. The coefficients in columns 5 and 6 are negative and significant. This implies that BHCs whose total assets are below the threshold had significantly lower stock return synchronicity than BHCs whose total assets are above the threshold. This finding suggests a positive relationship between informativeness and synchronicity.

[5] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html#Research

[6] We exclude several banks based on exclusion criteria applied by the existing literature (Jones, Lee and Yeager, 2013; Fosu et al., 2018). First, we remove banks operating less than three consecutive quarters. Second, we exclude banks with available daily observations fewer than 26 in one quarter when calculating return synchronicity. Finally, considering the comparability of the treated group and control group, BHCs with total consolidated assets more than $2 billion are excluded. Following Jones, Lee and Yeager (2013) and Fosu et al. (2018), all balance sheet items are presented as end-of-quarter amounts. All quarterly data are winsorized at the 1st and 99th percentiles.

As robustness checks, we use the illiquidity ratio (Illiq) of Amihud (2002) as an alternative trade-based measure of price informativeness. .Columns 2 to 4 of Table 4 show no significant discontinuity in Illiq at the asset threshold in the pre-policy period. However, the coefficients in columns 5 to 7 are negative and significant, indicating a significant decrease in Illiq in the post-policy period. Overall, we find that more opaque BHCs, those with total assets below the threshold, had significantly lower stock return synchronicity and Illiq in the post-policy period. This finding implies a positive relationship between price informativeness and return synchronicity.

6. Conclusion

Whether return synchronicity is associated with higher or lower stock price informativeness is still an ongoing debate in the academic literature. In this paper, we explore this relationship in the banking industry. In particular, we examine the link between bank opacity and stock return synchronicity. A positive (negative) link between bank opacity and return synchronicity would support a negative (positive) relationship between return synchronicity and informativeness.

We exploit an exogenous shock provided by a regulatory change. The 2015 Small BHC Policy Statement reduces regulatory burden for small banks by decreasing the quantity and quality of regulatory reporting. We test whether the policy affects stock return synchronicity using a regression discontinuity design.

We find that stock return synchronicity of the treated BHCs decreases after the implementation of the 2015 Small BHC Policy Statement. This finding suggests that lower return synchronicity represents lower stock price informativeness. Our results have important implications for policy makers. Although this regulation helps reduce regulatory burden, those affected BHCs became more opaque for investors, which may impede market discipline.

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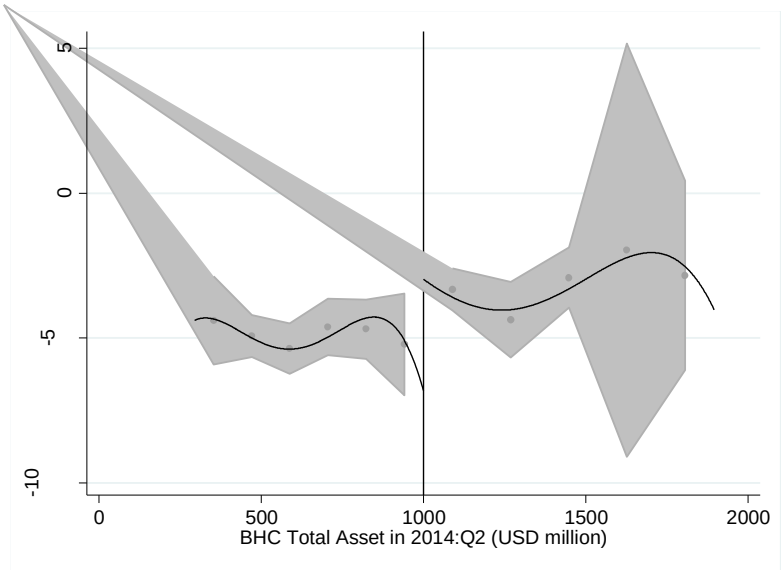
Appendix

Figure 1: Discontinuity in average synchronicity over 2015:Q3-2016:Q4



Note: The figure corresponds to the baseline RD Design regression based on equation (1). The dependent variable is the average synchronicity over 2015:Q3-2016:Q2. The running variable is the total assets of BHCs in 2014:Q2 with an asset threshold of $1 billion. For each side of the threshold, fourth-order polynomials of the running variable are controlled separately.

Table 1: Variables description and sample statistics: 2009-2018 (Annual)

Panel A: Description of variables

Variables	Description
SYN	Stock return synchronicity, a measure of stock price informativeness estimated from the market model.
Illiq	The illiquidity ratio of Amihud (2002)
ROA	The return on assets.
LnAsset	The logarithm of the book value of bank asset.
LoanToAsset	The ratio of bank loans to total assets.
EquityRatio	The ratio of equity to total assets.
MTB	The ratio of the market value of equity to the book value of equity.
NPL	Non-performing loans scaled by total loans.

Panel B: Sample statistics: 2014:Q3-2016:Q2 (Quarterly)

Variable	Obs	Mean	Median	Std.Dev.	Min	Max
SYN	2,971	-3.99	-3.71	2.32	-11.76	0.48
Illiq	2,971	0.02	0.01	0.07	0.00	0.88
ROA	2,971	0.79	0.83	0.50	-2.50	2.23
Asset (billion dollars)	2,971	1.01	0.97	3.23	0.16	2.00
LoanToAsset	2,971	0.69	0.70	0.11	0.27	0.88
EquityRatio	2,971	0.11	0.10	0.03	0.05	0.21
MTB	2,971	1.18	1.05	0.35	0.30	2.64
NPL	2,971	0.02	0.02	0.02	0.00	0.15

Table 2: Pairwise correlations matrix for all explanatory variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) LnAsset	1.000					
(2) ROA	-0.010	1.000				
(3) LoanToAsset	-0.000	0.016	1.000			
(4) EquityRatio	0.000	0.192*	-0.001	1.000		
(5) MTB	-0.000	0.175	0.091	-0.164	1.000	
(6) NPL	-0.000	-0.207*	-0.131	0.077	-0.274*	1.000

Note: * significant at 1% level.

Table 3: Regression discontinuity of the Small BHC Policy Statement on stock return synchronicity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	**Synchronicity (SYN)**							
	Before (pre-policy)				After (post-policy)			
Quarter	2014Q3	2014Q4	2015Q1	2015Q2	2015Q3	2015Q4	2016Q1	2016Q2
Below-asset-threshold indicator (in 2014Q2)	0.0882	-1.466	-2.071	0.341	-2.816*	-2.235**	1.076	1.085
	(2.711)	(1.477)	(1.301)	(0.986)	(1.663)	(1.002)	(0.917)	(1.417)
BHCs	133	126	134	133	130	120	118	126

Note: *** significant at 1% level, ** 5% level, * 10% level. OLS estimates based on the RD Design. The running variable is total assets in 2014Q2 with a threshold of $1 billion. The sample includes firms with total assets in 2014Q2 below and above the cut-off (i.e. below $2 billion). Controls for first order polynomials of the running variable separately for each side of the threshold are included. Robust standard errors are in brackets.

Table 4: Regression discontinuity of the Small BHC Policy Statement on stock illiquidity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	**Illiquidity (Illiq)**							
	Before (pre-policy)				After (post-policy)			
Quarter	2014Q3	2014Q4	2015Q1	2015Q2	2015Q3	2015Q4	2016Q1	2016Q2
Below-asset-threshold indicator (in 2014Q2)	-0.013***	0.005	0.010	0.0033	-0.011**	-0.011*	-0.016**	-0.004
	(0.004)	(0.008)	(0.007)	(0.007)	(0.005)	(0.006)	(0.008)	(0.004)
BHCs	133	126	134	133	130	120	118	126

Note: *** significant at 1% level, ** 5% level, * 10% level. OLS estimates based on the RD Design. The running variable is total assets in 2014Q2 with a threshold of $1 billion. The sample includes firms with total assets in 2014Q2 below and above the cut-off (i.e. below $2 billion). Controls for first order polynomials of the running variable separately for each side of the threshold are included. Robust standard errors are in brackets.