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# Opaqueness of Financial Institutions

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*Opaqueness of Financial Institutions*

by

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## **Abstract**

Spectators and professionals have targeted financial institutions as being at the epicenter of recent market crises. The opaqueness of bank holding companies' assets has been assumed to have created additional volatility and inefficiency within the market. It appears that the capital structure of a bank is the actual driving force behind the inefficiency. I conduct multiple empirical analyses to measure whether the lack of financial institutions asset transparency negatively impacts the ability of the firm's price to respond to informational innovations in a timely manner. Through additional econometric tests, I explore several economic theories to narrow in on the root cause behind the market inefficiencies created by bank firms. Market efficiency can be measured by characterizing the delay with which prices respond to information. This paper examines price delay which captures the unexpected return premium for stocks trading on Nasdaq and NYSE for the period 1996 through 2008. The results argue that when delay is the measure of market efficiency, banks are relatively less efficient than similarly-sized nonfinancial institutions. The empirical evidence suggests that banks tend to project positive and significant delay coefficients; however, the assets side of the balance sheet does not seem to explain the inefficiency. In contrast, the leverage effect on delay is 75 to 100 times greater for financial institutions relative to similarly matched nonbank firms.

## **I. Introduction/ Motivation**

In this paper, I test whether or not the limited information of bank holding companies (BHC) being revealed to outside investors adversely affects the efficiency of market pricing. The inability for outsiders to observe the risks involved within the market sector of financial institutions, could lead investors to misjudge the actual efficiency of existing prices. Asymmetric information exists within the banking industry and provides an intensely studied topic for financial professionals worldwide.

I initially hypothesize that the lack of transparency in the assets side of the financial firm's balance sheet leads to disconnection between the investor's view of large institutional riskiness and actual reality. The uncertainty of investors could generate inefficient prices that do not reflect all the information circulating within the financial sector following a market-wide shock. Even if the opacity of bank assets is involuntary, the amount of information being withheld from outsiders could negatively affect market efficiency. Flannery, Kwan, and Nimalendran (2010) measured, and compared, market evidence of the opaqueness of banking firms' assets during and after a financial crisis. They found that during the period 1990 through 2009, bank share trading exhibited extremely different features before relative to trading during the crisis. They propose that banking firms tended to become more opaque during the financial crisis which could have led to additional price inefficiencies. Opaque variables such as the book value of bank premises and fixed assets, investments in unconsolidated subsidiaries, intangible assets, and "other assets" on the balance sheet provide the underlying measurement for the asset opaqueness analysis. Using a cross-sectional regression of the delay of prices on liquidity variables, I develop a factor which measures price efficiency (Hou & Moskowitz, 2005).

If prices are efficient, they should essentially reveal all the available information circulating through the market. The delay measure captures the speed of price discovery, or how quickly the price of a particular stock converges to the true value following a market shock. If some firms are able to withhold information while others are required to make similar information available to the public, potential imbalances could be created in the market. The inability for outsiders to view BHC's assets could result in a misevaluation of a banking firm's equity, which in return could make it more expensive for a bank to raise capital. Using the idea of delay measure to capture market efficiency, developed by Hou and Moskowitz, I examine discrepancies between a group of BHC's and other non-financial firms' delay measures while controlling for numerous other variables.

When the global market is experiencing a financial crisis there seems to be a universal reaction of a flight to quality. Investors trade out of financial industry stocks and into treasuries. This causes bank holding companies to experience a drastic and immediate change in liquidity. Financial institutions are historically more illiquid than similarly matched non-bank firms, but this is exacerbated during bearish markets. I examine to see if liquidity is a driving force behind the inefficiency of bank firms.

Financial firms' capital structures during the most recent 2007 recession have been accused as being a major contributor to the downward economic spiral. AIG was said to have had a leverage of over 30 to 1 when the financial crisis began. The amount of debt to a firm's equity could be a leading indicator of market stability. The overly aggressive debt accumulators in the banking industry could be generating additional market inefficiencies (Froot & Stein, 1998). This could cause investors to misestimate the optimal debt to equity level of a financial

firm leading to an overvaluation or an undervaluation of the stock (Michaelas, Chittenden & Poutziouris, 1999).

Government regulations provide additional difficulty for outsiders to access banking firms' equity information. It is essential that investors have reliable information which can provide them with the opportunity to make timely and informed decisions. The inability for banks to provide the necessary information to outsiders presents a controversial issue. If banks were able to display all of their financial records to public viewers, outsiders could become better informed and make more strategic decisions. Possible decentralization of the banking system would force institutions to be more self-reliant and disclose more inside information.

## **II. Data**

To carry out my analysis, I gather every listed security on the Center for Research in Security Prices (CRSP) data files for the period between January of 1996 and December of 2008. First, I navigate through the data and extract all financial firms (SIC code 6000-6999) and disregard regulated utilities (SIC code 4800-4900). Then to compare BHC's assets to non-financial firms, I match firms whose market value is closest to each particular financial firm, whose share price is within 25% of the bank's share price, and whose stock is traded on the same venue. I then match each BHC with a control firm which is re-selected at the start of each fiscal year, readjusted according to the criteria listed above. The final sample includes approximately 600 financial firms and 1500 matched nonbank firms. Because the amount of bank firms trading in the market is exceedingly less than the number of nonfinancial firms, I allow for multiple matched control firms per bank observation.

The delay measure of each firm is calculated separately using CRSP pricing data on all

matched stocks and is defined as follows:

*Delay measure*

$$ret_{i,t} = \alpha_i + \beta_i R_{m,t} + \sum \delta_i(-n) R_{m,t-n} + \varepsilon_{i,t} \quad (1)$$

$$Delay = 1 - (R^2_R / R^2_U) \quad (2)$$

$ret_{i,t}$  is the contemporaneous return on stock  $i$  at time  $t$  with  $R_{m,t}$  representing the corresponding CRSP value-weighted market index retrieved from WRDS. I begin by restricting  $\delta_i^{(-n)}$ , which is the number of lagged returns allowed within the model, to zero and calculating  $R^2$  values. The restricted model is equivalent to the commonly used Capital Asset Pricing Model in modern finance. When  $\delta_i^{(-n)}$  is not restricted to zero, the price of the  $i^{th}$  stock is permitted to respond with a lag. The unrestricted  $R^2$ 's are then generated and stored. In the unrestricted multiple regression, the monthly returns of each stock are regressed on the market risk premium and prior return values. I estimate a delay test that is similar to an F-test using the  $R^2$ 's received from the observed returns. The unadjusted  $R^2$ 's generated from the unrestricted model are inherently greater than the restricted model because more independent variables are introduced into the regression. The greater the delay measure, the more return variation is captured by lagged returns, thus the more volatile the returns are to informational changes.

The delay measure for a portfolio is defined as:

*Portfolio Delay Measure*

$$DelayP = \sum_{n=1}^4 n \delta(-n) / \beta + \sum_{n=1}^4 \delta(-n) \quad (3)$$

The delay portfolio factor mitigates issues of volatile weekly stock returns for which the simple delay measure fails to adjust. I categorize stocks according to market capitalization by taking the end of June stock caps and sorting the firms into deciles. Within those deciles I assign the individual delay measure to create the portfolio factors.

In order to verify that the results are not compromised by cross-sectional idiosyncratic market fluctuations, I create 12 dummy variables for each year of observation excluding the final year 2008, to avoid the dummy variable trap. Each dummy variable, when regressed on the delay measure of the firm, explains the amount of variation in market efficiency that is explained by yearly fluctuations.

To capture the idiosyncratic volatility of each firm, I follow earlier literature from Bali and Cakici, and assume that each firm's returns, within the sample, are estimated by a similar firm-related shock  $\varepsilon$ .

$$R_{i,t} - r_{f,t} = \beta_{i,t} (R_{m,t} - r_{f,t}) + \varepsilon_{i,t} \quad (4)$$

$R_{i,t}$  is the return on stock  $i$  at time  $t$ ,  $R_{m,t}$  is the market return at time  $t$ ,  $r_{f,t}$  is the risk-free rate, and  $\varepsilon_{i,t}$  captures the idiosyncratic return. I then compare this to the commonly used CAPM model.

$$R_{i,t} = \alpha_{i,t} + \beta_{i,t} R_{m,t} + \varepsilon_{i,t} \quad (5)$$

The idiosyncratic volatility is then calculated for each firm using the residuals.

$$idiovolt_{i,t} = \sqrt{[var(\varepsilon_{i,t})]} \quad (6)$$

The Fama-French three factor model can be used in place of equation (4) to estimate the idiosyncratic volatility of a firm, and is commonly preferred within the financial industry.

I use additional CRSP data on stock prices, volume, market capitalization, and volatility measures for each matched firm. To create the dummy variable which distinguishes bank firms from non-banks, I label the security with a one if it is a financial firm and 0 otherwise. The dummy variable *bank* is the most valuable explanatory variable in the efficiency analysis, because it indicates how quickly a BHC responds to informational innovations. If the bank coefficient is positive and significant when regressed on delay, the data suggests that banks generate less efficient prices than matched non-financial control firms.



The independent variables extracted from firms' balance sheets and income statements include: log of assets, debt-to-equity, and book-to-market. Debt-to-equity is captured by taking the firm's total liabilities and dividing by its total equity. The balance sheet and income statement data is retrieved from Compustat and each control variable aids in obtaining robust statistical results. Because of incomplete reports on Compustat, missing values exist within the liabilities and asset measures. In order to retain a complete and untarnished sample, I assign each missing value with the median over the entire data sample of that measure, obtained from univariate tests.

I gather additional CRSP data on all bank firms' assets to conduct opaqueness tests. I categorize transparent assets as cash, federal funds sold, securities purchased under agreement to resell, guaranteed AFS and HTM securities (Jones, Lee & Yager, 2011). Opaque assets are then sorted by taking the total assets of each firm minus the transparent assets summated above. The opaque ratio can be calculated by taking opaque assets divided by total assets for each company. This dataset enables me to calculate how much of the efficiency measure, delay, is being explained by the opaqueness of financial institutions' assets.

### **III. Results**

This section reports the results of the analysis and discusses the tables in the appendix in sequence. I will first examine the relationships between delay measures and other variables approximating informational price response which are included in the analysis. Next, I test the amount of correlation which exists between variable measures in a univariate and multivariate setting. Finally, I investigate the robustness of the variation of price delay that is explained by the opaqueness of bank holding companies' assets and liabilities.

### III.1. Relationships Between Variables

Table 1 reports the means and standard deviations of the variables included in the efficiency analysis, sorted by BHCs and non-financial firms (Panels A & B). Financial institutions have a mean delay of .4541 which is approximately .0442 greater than non-bank firms' mean delay of .4099, with a t-statistic of 7.13, implying that banks' prices respond to informational changes slower than non-BHCs. Similarly, the average portfolio delay measure for bank firms is a positive .1097, which is larger than the non-bank firms' mean of .1048 with a marginal significance t-value of 1.84, displaying a lag in response time of banks' prices to market innovations.

Column 6 reports that the idiosyncratic volatility for bank firms (.0245) is less than non-financial firms (.0338) on average, with a t-stat of 27.22. The mean log of assets for bank firms' is 7.151 with a standard deviation of 1.871. In comparison, the mean log of assets for nonfinancial firms is roughly 6.1079 with a 1.943 standard deviation, which implies larger variation in the amount of assets financial firms report on their balance sheets in comparison to non-banks. BHCs' debt-to-equity ratio of 6.735 appears to be higher on average than similarly sized non-bank companies' ratio of 1.1147, with a significance level of 14.24. The control firms seem to have less debt accumulation and higher equity values which is to be expected.

The market capitalization mean for banks is 4,266,992.67 which is slightly lower than non-bank firms of 4,431,789.66. The test-statistic of 1.16 proposes that the mean book-to-market ratio for the control firms of approximately .0115 is not significantly different than financial firms' b/m ratio of .0612. Column 11 records a mean of .07397 for the inverse of prices of BHCs and .1034 for matched non-bank firms. Lastly, the average value for the sample banks' turnover ratio of .7161 is 1.1409 times less than the non-financial firms' mean ratio of

1.857, with a t-stat of 38.04.

### III.2. Correlation Tests

The statistics in tables 2 and 3 are sorted by non-bank and bank firms. I conduct a comparison analysis of each variable included within the regression to verify that multicollinearity does not exist between any two measures. The correlation matrices report that autocorrelation does not seem to be an issue within this data sample. Each variable is included on the x and y axis, with a one 1 suggesting 100 percent correlation between the two measures and a 0 representing complete dissociation. There does not appear to be significant discrepancies in correlated variables between the control firms and the bank holding companies.

### III.3. Delay

Using the approximation of price efficiency (delay) as the dependent variable and the corresponding independent bank opaqueness measure (banks), I perform a multiple regression analysis to explore whether BHC's tend to have larger delay measures than non-financial firms. The regression equation is constructed as follows:

#### *Multiple Regression Analysis*

$$\text{delay}_{it} = \alpha_{it} + \beta_1 \text{banks}_{it} + \beta_2 \text{beta}_{it} + \beta_3 \text{priceinv}_{it} + \beta_4 \text{idiovolt}_{it} + \beta_5 \text{size}_{it} + \beta_6 \text{turn}_{it} + \beta_7 \text{logassets}_{it} + \beta_8 \text{bm}_{it} + \beta_9 \text{de}_{it} + \sum XyDy + \varepsilon_{it} \quad (7)$$

- banks is the dummy variable equal to 1 for BHCs and 0 for nonfinancial firms.
- beta is the systematic risk captured by the Capital Asset Pricing Model on all firms.
- priceinv is the inverse of stock prices for all matched firms.
- idiovolt is the idiosyncratic volatility which is included to control for investor uncertainty
- size is the market cap of the firm (share price times number of shares) rescaled in billions
- turn is the turnover estimation for firm i at time t.

- $\log_{assets}$  is the lognormal function of assets.
- $bm$  is the book-to-market ratio which is a comparison of a security's book value to its current market value.
- $de$  is the ratio that calculates the debt of the firm over to its total equity.
- $Dy$  is a dummy variable equal to 1 in year  $y$ , otherwise zero. I include dummy variables for all years in the sample period except 2008.

Table (3) begins by showing that delay variation is statistically explained by the dummy variable banks, when no other independent measures are included. The assigned beta coefficient equals .04417 with a test statistic of 7.49 which is significantly different from zero. The positive bank coefficient is consistent with my initial hypothesis that the opacity of financial firms' assets creates inefficient prices, relative to similarly matched control companies.

I then include additional CRSP control measures that aid in determining the misallocation of the amount of variation in delay that is captured by bank opacity. These results are located in column [3] of table 3. By introducing the inverse of prices, size, turnover, and idiosyncratic volatility into the regression, I maintain a positive coefficient of .05125 for banks, which remains statistically significant (9.13 t-test). I note that the idiosyncratic volatility of a firm is positively related to its price delay measure which coincides with my intuition. The more volatility a firm faces, the riskier the security is assumed to become, which explains the lag in informational responses. There exists negative correlation between delay and the size of a firm, which implicates larger-sized firms respond to information quicker than small cap companies; however, the size effect only holds when delay is regressed on CRSP measures alone. The size coefficient becomes statistically insignificant when additional balance sheet and income statement measures are included in the regression.

Column [5] in table 3 examines the regression of delay on the previously discussed variables in addition with several other measures retrieved from the companies' balance sheets and income statements. With the inclusion of the log of assets, book-to-market and debt-to-equity, the results of bank opaqueness remain positively related to delay and become increasingly significant with a t-test of 16.44. The higher a firm's accumulated debt is, in comparison to its equity, the more time it takes for its prices to respond to new information. A firm's book-to-market valuation, according to the results, is anticipated to move in the opposite direction of price delay (-0.01926). This implies that the higher the b/m ratio, the lower the delay measure and vice versa. The logarithmic function of a company's assets is also negatively correlated to the efficiency measure. With a test-statistic of approximately -37, I can confidently say that the more assets a company holds, the lower the delay is to information news.

The final regression on the approximated price efficiency measure (delay) is displayed in column [7] of table 3. I include beta, a measure of systematic risk, and 12 dummy variables that represent each year within the data set, excluding the final year 2008 which is captured by the intercept term. I find that beta is negatively correlated with delay with a value of -0.00206 and statistically significant. The results suggest that stocks that are more exposed to systematic risk are more efficient at responding to market-wide information following a shock. I do not dwell on the economic implications surrounding this negative correlation as it is not applicable to the current study. It would be intriguing to run additional tests to validate the sign and significance of these findings in a follow-up study.

I hypothesize that the measure of delay could be influenced by yearly idiosyncratic market fluctuations. There are a couple of years (1999-2000) in which the year-coefficients appear to be both abnormal and strongly significant. The US economy was experiencing the

height of the dot-com bubble in late 2000. Earlier in the introduction I discussed the scholarly article written by Flannery, Kwan, and Nimalendran and concluded that banks tend to become more opaque during bearish markets. My results are consistent with this theory, and rows (23) & (25) display strongly significant and positively correlated dummy coefficients. With prices of securities falling during the late nineties and early twentieth century, banks seem to have lessened their asset transparency and inflated the inefficiency of their prices.

The final column in table 3 indicates the variance inflation factor which is a scope of the correlation between variables by measuring how much larger the standard error of a variable is, when compared to what the standard error would be if the variable were completely mutually exclusive. With zero independent variables with a VIF of over 5, I am not concerned with autocorrelation amongst the explanatory measures.

#### **III.4. *Portfolio Delay***

Table 4 reports similar results to table 3, but with portfolio delay measure as the dependent variable. It should be noted that the market capitalization measure (size) is simply rescaled because the portfolio delay variable is already sorted based on the size of the firm. If I was to use the market cap of the firm in the regression, I would skew the results and receive unreliable coefficient measures.

Columns [1] and [3] display almost identical results as in the first few columns of table 3. The opaqueness of banks' assets seems to be both positively correlated, and statistically significant in the one-tailed test, with the portfolio delay measure as the regressand. The economic implications are the same for both the delay and portfolio delay regressions.

When assets from the balance sheet and income statement are included in the regression, the firm's size coefficient flips to positive and becomes strongly significant. This occurs because

of the measuring process of the portfolio delay variable. Altering the scale of market capitalization enables us to eliminate the perfect collinearity between the delay measure and the size of the company within the regression; however, the variables remain tightly correlated which causes the reversal in the sign of the size coefficient. This needs to be noted but does not compromise the robustness of the regression analysis.

The final column in table 4, similar to the last column in table 3, represents the regression of delay portfolio adjusting for potential time fluctuations. Results are both consistent and robust with my hypothesis that opaque bank assets indicate price inefficiencies.

### **III.5. *Opaqueness Measures***

The following section isolates bank holding companies. Tables 6 and 7 display the effects of assets opaqueness on the first-stage delay measure developed by Hou and Moskowitz. First in table 6, I run the regression from equation (7) with transparent and opaque assets included as independent variables. The results argue that transparent assets are positively correlated with market efficiency with an estimate of 0.00253 but not statistically significant with a t-statistic of 0.39. Alternatively, opaque assets appear to be adversely related to market efficiency with an estimated value of -0.09268 and significant with a t-value of -12.92. This result contradicts my initial hypothesis that opaqueness in financial institutions' assets leads to market inefficiency. The data suggests that more opaque assets actually cause the delay measure to decrease. Economically this means that institutions are better off withholding asset information from public viewing.

Second, table 7 reports the results from running the regression from equation (7) with the opaque ratio coefficient included as an explanatory variable. The ratio provides an additional

test of asset transparency on the delay measure. Similarly, I find that opaqueness is negatively correlated with delay at the 90% significance level.

The results from tables 8 and 9 are similar to that found in the previous two tables but differ in the fact that the regressions are run using the second-stage portfolio delay measure as the dependent variable. I find analogous results to those in tables 6 and 7, validating that opaqueness is negatively related to price delay. The opaque asset coefficient in table 8 is negative with a value of -0.04616 and soundly significant with a t-stat of -19.26. The opaque ratio variable in table 9 is once again negative (-0.05568) and more statistically significant than in table 7 with a test statistic of -1.89.

I run univariate tests on the opaque ratio and organize bank stocks into quartiles, with quartile I including stocks with the lowest opaque ratio and IV the highest. The opaque ratio does not significantly affect delay, or portfolio delay, when moving across quartiles as displayed in table 10. These robust tests allow me to confidently conclude that opaqueness does not seem to be a factor driving the inefficiency of bank firms found in previous sections. In fact, if anything, opaque assets appear to improve market efficiency.

### **III.6. *Bank Interactions***

The results found in the previous section inspired me to examine the relationships between all of the control variables in equation (7) and both first-stage and second-stage delay measures. I interact each independent variable with the bank dummy coefficient which is equal to 1 for financial institutions and 0 otherwise. I calculate the product of the bank variable with each control coefficient, and include the interactions as additional measures into the regression on delay and portfolio delay. Both tables 10 and 11 are sectioned into four factors; risk,



liquidity, size, and capital structure. I examine each category separately to disentangle the actual driving factors behind delay fluctuation from less significant components.

Table 10 reports the results of the interaction regression on the first-stage market efficiency measure. Panel (a) shows the relationships between delay and both systematic and idiosyncratic volatility. The results argue that banks firms that face lower systematic risk and higher firm specific risk are only 5 times more susceptible to a delayed response to informational innovation than similarly categorized nonbank firms. The minimal difference in risk between bank firms and nonfinancial firms provides insignificant evidence to conclude that risk is the key ingredient in banks' pricing inefficiency.

Panel (b) measures the amount of delay that is being captured by liquidity measures on all bank holding companies. Prices do not seem to be statistically significant, as the interaction term generated a t-stat of only 1.41; however, turnover does seem to be statistically significant, but again not economically different between bank firms and nonbank firms.

Panel (c) reports the results of both book-to-market and market capitalization when interacted with the dummy bank coefficient. Once again, the difference between the matched firms is only marginal and does not seem to explain the overwhelmingly significant inefficiency that bank firms' prices are displaying.

The final panel displays the capital structure effects on the delay coefficient. I initially assumed that the assets side of the balance sheet was driving the inefficiency of bank's stocks; however, the results in panel (d) argue that liabilities are the real cornerstones. Both the asset and debt-to-equity interactions are statistically significant with T-stats of -7.14 and 8.05. The focal point is on the coefficient factors on debt-to-equity (0.000118) and banks\*d/e (0.00686). By taking the second derivative of the regression equation with respect to debt-to-equity, I can

find the amount of variation in delay that is being explained by financial firms' Debt/Equity. The leverage effect on delay is over 50 times greater for bank holding companies, with the assets effect only being only 1.5 times greater. Bank firms that balance their debt to equity seem to be more efficient at gravitating back to true values following an unexpected market shock.

Table 11 reconstructs table 10 using portfolio delay as the regressand. The results remain consistent and significant. Panel (a) disproves the notion that idiosyncratic volatility is explaining the bank inefficiency, as the interaction term flips signs and becomes insignificant. The results from both panels (b) and (c) are comparable to the findings in the previous section. It should be noted that bank's book-to-market ratio is contributing to more of the variation in the efficiency measure than previously documented; however, it remains fairly economically insignificant.

The results in panel (d) not only validate the findings in table 10, but the leverage effect is even more pronounced when portfolio delay is the measure for market efficiency. The debt-to-equity (0.00005332) and interaction debt-to-equity (0.00474) variables are resoundingly different and both statistically significant.

#### **IV. Conclusion**

This study explores the underlying hypothesis that the lack of transparency in bank holding companies generates inefficiency in their stock prices. Not only do financial institutions appear to become more opaque during bearish markets (Flannery, Kwan and Nimalendran, 2010), but their prices appear to be lagging to informational news on a consistent basis. Using the price efficiency measure delay, developed by Hou and Moskowitz, I contend that bank

opaqueness, on the liabilities side of the balance sheet, influences the response time to informational innovation in a positive relation.

The risk of uncertainty appears to be higher for investors looking to build a portfolio around bank holding companies as opposed to similarly-sized nonfinancial firms. There is no premium required by investors to hold securities in stocks owned by banks, but the risk associated with those stocks seems to be undervalued in the market and argue that some type of compensation may need to be demanded. The delay with which BHCs respond to new information is resoundingly slower than comparable non-bank firms. Market participants may be unaware of this phenomenon and are not being compensated for holding the additional risk.

I can confidently conclude for the period between 1996 and 2008, the positive delay measure of banks is not being produced by the opaqueness of their assets. The results of this paper are consistent with Flannery, Kwan, and Nimalendrans' findings that banks do tend to be more opaque during recessionary times; thus, portraying higher price delay in bearish markets. However, the evidence argues that not only does asset opaqueness not contribute to bank pricing inefficiency (table 9), but it may actually be improving efficiency. I do not disprove the hypothesis that opaqueness is not a contributing factor to the higher delay measure for financial firms, because the capital structure clearly provides ample evidence explaining delay.

The inability for banks' prices to timely react to informational changes is creating inefficiencies in the market. Investors may have a hard time evaluating the optimal ratio of debt-to-equity that a financial firms should have, resulting in a misinterpretation of the firm's true stock price. The causation of bank holding companies' inefficiencies remains debatable, but the fact of their existence is conclusive. It appears that overall market efficiency could be improved, if banks disclosed all of their financial information for public viewing.

## Appendix 1: References

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## Appendix 2: Tables

| <b>Table 1. Univariate tests on all analyzed variables</b> |           |           |          |            |          |            |            |            |            |             |           |          |
|--|-----------|-----------|----------|------------|----------|------------|------------|------------|------------|-------------|-----------|----------|
| <b>Panel A. Banks</b>                                      |           |           |          |            |          |            |            |            |            |             |           |          |
|  | volume    | return    | mktret   | delay      | delayP   | idiovolt   | logassets  | de         | cap        | bm          | priceinv  | turn     |
| <i>Mean</i>  | 1254271   | 0.080367  | 0.060854 | 0.454092   | 0.109732 | 0.024502   | 7.150799   | 6.7354219  | 4266992.67 | 0.0612176   | 0.073966  | 0.716083 |
| <i>Std Dev</i>   | 8730626.9 | 0.401805  | 0.202438 | 0.33356    | 0.134660 | 0.017958   | 1.871098   | 5.6634519  | 17832256.2 | 0.5501744   | 0.225639  | 1.261838 |
| <i>Minimum</i>   | 43        | -2.770273 | -0.8911  | 0          | 0.000213 | 0.003784   | 1.751458   | -8.9231537 | 511.536458 | -0.0441241  | 0.002016  | 0.00106  |
| <i>Maximum</i>   | 334437391 | 2.196501  | 0.334299 | 0.999999   | 0.930202 | 0.233292   | 14.935738  | 68.011186  | 248975440  | 27.0208203  | 9.90099   | 35.67784 |
| <b>Panel B. Nonbanks</b>                                   |           |           |          |            |          |            |            |            |            |             |           |          |
|  | volume    | return    | mktret   | delay      | delayP   | idiovolt   | logassets  | de         | cap        | bm          | priceinv  | turn     |
| <i>Mean</i>  | 2022389.1 | 0.153216  | 0.061949 | 0.409927   | 0.104878 | 0.033836   | 6.107911   | 1.1147231  | 4431789.66 | 0.0497383   | 0.103385  | 1.856949 |
| <i>Std Dev</i>   | 6376193.1 | 0.595979  | 0.205796 | 0.31564    | 0.150750 | 0.022378   | 1.943046   | 50.544544  | 16806273.9 | 0.5005237   | 0.266032  | 2.832252 |
| <i>Minimum</i>   | 13        | -3.416871 | -0.8911  | 0          | 0.000212 | 0.003052   | -3.912023  | -5847      | 33.45875   | -51.6451879 | 0.001099  | 8.06E-06 |
| <i>Maximum</i>   | 137202702 | 8.238732  | 0.886551 | 1          | 0.930202 | 0.73239    | 12.6884    | 3117       | 469519475  | 8.2031558   | 16        | 152.3148 |
| <b>Panel C. Difference</b>                                 |           |           |          |            |          |            |            |            |            |             |           |          |
|  | volume    | return    | mktret   | delay      | delayP   | idiovolt   | logassets  | de         | cap        | bm          | priceinv  | turn     |
| <i>Difference</i>  | 768118*** | 0.0728*** | 0.00109  | -0.0442*** | -0.00485 | 0.00933*** | -1.0429*** | -5.6207*** | 164797     | -0.0115     | 0.0294*** | 1.1409   |
| <i>Std Dev</i>   | 6841060   | 0.5673    | 0.2052   | 0.3188     | 0.1481   | 0.0217     | 1.9308     | 46.0322    | 16987937   | 0.5094      | 0.2595    | 2.6289   |
| <i>T-value</i>   | 5.03      | 9.02      | 0.3      | -7.32      | -1.84    | 27.22      | -30.35     | -14.24     | 0.51       | -1.16       | 6.92      | 38.04    |

This table displays test statistics with \*, \*\*, \*\*\* indicating statistical significance at the .05, .02, and .01 levels for a 2-tailed test and 0.025, 0.01, and 0.005 levels for the 1-tailed test. The table presents univariate tests for all matched banks and non-bank firms within the data sample. Each panel displays statistics that describe the sample stock used in the analysis. Compustat assets, debt to equity, book to market, and turnover are included as well as CRSP market return, price, and market cap. Also, CAPM returns, two measures of price delay and idiosyncratic volatility are calculated and added to the analysis. Delay is defined by the amount of lag prices exhibit when new information is announced in the market. Delay Portfolio is measured by sorting stocks into deciles according to descending market capitalizations. The idiosyncratic volatility variable captures investor uncertainty and evaluates volatility risk. After matching stocks based on size, price, and venue, I obtain a sample of financial firms and similarly-characterized non-bank firms.

**Table 2. Correlations between non-financial firms' variables**

| <b>Nonbanks</b>  |               |               |               |              |               |                 |                  |             |             |             |                 |             |
|------------------|---------------|---------------|---------------|--------------|---------------|-----------------|------------------|-------------|-------------|-------------|-----------------|-------------|
|                  | <b>volume</b> | <b>return</b> | <b>mktret</b> | <b>delay</b> | <b>delayP</b> | <b>idiovolt</b> | <b>logassets</b> | <b>de</b>   | <b>cap</b>  | <b>bm</b>   | <b>priceinv</b> | <b>turn</b> |
| <b>volume</b>    | 1             | -0.06724***   | -0.10513***   | -0.18368***  | 0.0408***     | -0.08042***     | 0.39159***       | 0.00377     | 0.5378***   | 0.07558***  | -0.04983***     | 0.17628***  |
| <i>(p-value)</i> |               | (.0001)       | (.0001)       | (.0001)      | (.0001)       | (.0001)         | (.0001)          | (0.6189)    | (.0001)     | (.0001)     | (.0001)         | (.0001)     |
| <b>return</b>    |               | 1             | 0.29759***    | 0.02223**    | 0.16769***    | 0.02626***      | -0.07852***      | 0.00977     | -0.01904*   | 0.00203     | -0.05107***     | 0.0725***   |
|                  |               |               | (.0001)       | (0.0034)     | (.0001)       | (0.0005)        | (.0001)          | (0.1983)    | (0.0121)    | (0.7896)    | (.0001)         | (.0001)     |
| <b>mktret</b>    |               |               | 1             | 0.07766***   | 0.34018***    | -0.15679***     | -0.07***         | -0.00333    | -0.02558*** | 0.00105     | -0.03187***     | -0.06698*** |
|                  |               |               |               | (.0001)      | (.0001)       | (.0001)         | (.0001)          | (0.6607)    | (0.0007)    | (0.8894)    | (.0001)         | (.0001)     |
| <b>delay</b>     |               |               |               | 1            | -0.03825***   | 0.2521***       | -0.34852***      | -0.00639    | -0.13587*** | -0.02283**  | 0.171***        | -0.15898*** |
|                  |               |               |               |              | (.0001)       | (.0001)         | (.0001)          | (0.3993)    | (.0001)     | (0.0026)    | (.0001)         | (.0001)     |
| <b>delayP</b>    |               |               |               |              | 1             | -0.14561***     | 0.10715***       | 0.00023     | 0.06221***  | 0.01523*    | -0.05056***     | -0.00657    |
|                  |               |               |               |              |               | (.0001)         | (.0001)          | (0.9755)    | (.0001)     | (0.0446)    | (.0001)         | (0.3864)    |
| <b>idiovolt</b>  |               |               |               |              |               | 1               | -0.41807***      | -0.03589*** | -0.16129*** | -0.04113*** | 0.54472***      | 0.16156***  |
|                  |               |               |               |              |               |                 | (.0001)          | (.0001)     | (.0001)     | (.0001)     | (.0001)         | (.0001)     |
| <b>logassets</b> |               |               |               |              |               |                 | 1                | 0.02579***  | 0.42449***  | 0.02972***  | -0.20428***     | 0.048***    |
|                  |               |               |               |              |               |                 |                  | (0.0007)    | (.0001)     | (.0001)     | (.0001)         | (.0001)     |
| <b>de</b>        |               |               |               |              |               |                 |                  | 1           | 0.00169     | 0.35754***  | -0.01962**      | 0.00425     |
|                  |               |               |               |              |               |                 |                  |             | (0.8239)    | (.0001)     | (0.0097)        | (0.5749)    |
| <b>cap</b>       |               |               |               |              |               |                 |                  |             | 1           | 0.11278***  | -0.07641***     | -0.02402**  |
|                  |               |               |               |              |               |                 |                  |             |             | (.0001)     | (.0001)         | (0.0015)    |
| <b>bm</b>        |               |               |               |              |               |                 |                  |             |             | 1           | -0.03151***     | -0.00006    |
|                  |               |               |               |              |               |                 |                  |             |             |             | (.0001)         | (0.9934)    |
| <b>priceinv</b>  |               |               |               |              |               |                 |                  |             |             |             | 1               | -0.05274*** |
|                  |               |               |               |              |               |                 |                  |             |             |             |                 | (.0001)     |
| <b>turn</b>      |               |               |               |              |               |                 |                  |             |             |             |                 | 1           |

I calculate the difference between variables in the regression and report p-values from t-tests testing for equality with \*, \*\*, and \*\*\* indicating statistical significance at the 0.05, 0.01, and 0.1 levels. The table evaluates the correlation between each variable within the non-bank sample. As the value between two variables approaches 1, the amount of correlation between the two measures becomes perfect. The number of observations within the non-financial firm sample is greater than the bank sample because there are several firms that satisfy the matching criteria (similar market cap, price, and venue) for each bank firm.

**Table 3. Correlations between financial firms' variables**

| <b>Banks</b>     |               |               |               |              |               |                 |                  |             |             |             |                 |             |
|------------------|---------------|---------------|---------------|--------------|---------------|-----------------|------------------|-------------|-------------|-------------|-----------------|-------------|
|                  | <b>volume</b> | <b>return</b> | <b>mktret</b> | <b>delay</b> | <b>delayP</b> | <b>idiovolt</b> | <b>logassets</b> | <b>de</b>   | <b>cap</b>  | <b>bm</b>   | <b>priceinv</b> | <b>turn</b> |
| <b>volume</b>    | 1             | -0.1072***    | -0.12057***   | -0.10346***  | 0.03546*      | 0.07073***      | 0.29519***       | 0.04188*    | 0.50773***  | 0.04623**   | -0.01779        | 0.2535***   |
| <i>(p-value)</i> |               | (.0001)       | (.0001)       | (.0001)      | (0.0326)      | (.0001)         | (.0001)          | (0.0116)    | (.0001)     | (0.0053)    | (0.2836)        | (.0001)     |
| <b>return</b>    |               | 1             | 0.42367***    | -0.05961***  | 0.30539***    | -0.37221***     | -0.02386         | -0.06591*** | -0.00289    | 0.02992     | -0.09884***     | -0.13462*** |
|                  |               |               | (.0001)       | (0.0003)     | (.0001)       | (.0001)         | (0.1517)         | (.0001)     | (0.862)     | (0.0722)    | (.0001)         | (.0001)     |
| <b>mktret</b>    |               |               | 1             | -0.0069      | 0.51575***    | -0.41065***     | -0.07258***      | -0.11294*** | -0.00517    | 0.03489*    | -0.07351***     | -0.16197*** |
|                  |               |               |               | (0.6776)     | (.0001)       | (.0001)         | (.0001)          | (.0001)     | (0.7552)    | (0.0355)    | (.0001)         | (.0001)     |
| <b>delay</b>     |               |               |               | 1            | -0.06957***   | 0.19984***      | -0.38977***      | -0.0195     | -0.22388*** | -0.08314*** | 0.12488***      | -0.18999*** |
|                  |               |               |               |              | (.0001)       | (.0001)         | (.0001)          | (0.2399)    | (.0001)     | (.0001)     | (.0001)         | (.0001)     |
| <b>delayP</b>    |               |               |               |              | 1             | -0.39113***     | 0.10073***       | -0.0655***  | 0.07411***  | 0.02991     | -0.07376***     | -0.00539    |
|                  |               |               |               |              |               | (.0001)         | (.0001)          | (.0001)     | (.0001)     | (0.0715)    | (.0001)         | (0.7455)    |
| <b>idiovolt</b>  |               |               |               |              |               | 1               | -0.19545***      | -0.03754*   | -0.10253*** | -0.03707*   | 0.45296***      | 0.12962***  |
|                  |               |               |               |              |               |                 | (.0001)          | (0.0237)    | (.0001)     | (0.0255)    | (.0001)         | (.0001)     |
| <b>logassets</b> |               |               |               |              |               |                 | 1                | 0.47821***  | 0.5331***   | -0.07729*** | -0.14063***     | 0.14964***  |
|                  |               |               |               |              |               |                 |                  | (.0001)     | (.0001)     | (.0001)     | (.0001)         | (.0001)     |
| <b>de</b>        |               |               |               |              |               |                 |                  | 1           | 0.17245***  | -0.07731*** | -0.07397***     | -0.10657*** |
|                  |               |               |               |              |               |                 |                  |             | (.0001)     | (.0001)     | (.0001)         | (.0001)     |
| <b>cap</b>       |               |               |               |              |               |                 |                  |             | 1           | 0.11583***  | -0.05294**      | 0.06331***  |
|                  |               |               |               |              |               |                 |                  |             |             | (.0001)     | (0.0014)        | (0.0001)    |
| <b>bm</b>        |               |               |               |              |               |                 |                  |             |             | 1           | -0.02314        | 0.01677     |
|                  |               |               |               |              |               |                 |                  |             |             |             | (0.1631)        | (0.3122)    |
| <b>priceinv</b>  |               |               |               |              |               |                 |                  |             |             |             | 1               | -0.00076    |
|                  |               |               |               |              |               |                 |                  |             |             |             |                 | (0.9634)    |
| <b>turn</b>      |               |               |               |              |               |                 |                  |             |             |             |                 | 1           |

I calculate the difference between variables in the regression and report p-values from t-tests testing for equality with \*, \*\*, and \*\*\* indicating statistical significance at the 0.05, 0.01, and 0.1 levels. The table reports similar results to table 2 but differs in that it contains the values for all of the variables included within the sample of bank holding companies.



**Table 4.****Regressions on Delay**

|                          | (1)             | (2)              | (3)             | (4)               | Variance Inflation |
|--------------------------|-----------------|------------------|-----------------|-------------------|--------------------|
| <b>Banks</b>             | <b>0.0442**</b> | <b>0.05125**</b> | <b>0.0911**</b> | <b>0.09821**</b>  | 1.10074            |
| <i>t-stat</i>            | <b>(7.59)</b>   | <b>(9.13)</b>    | <b>(16.44)</b>  | <b>(18.20)</b>    |                    |
| <b>Beta</b>              |                 |                  |                 | <b>-0.00206**</b> | 1.01658            |
|                          |                 |                  |                 | <b>(-6.85)</b>    |                    |
| <b>priceinv</b>          |                 | 0.01455          | 0.02576*        | 0.03771**         | 1.5229             |
|                          |                 | <i>(1.52)</i>    | <i>(2.78)</i>   | <i>(4.10)</i>     |                    |
| <b>size</b>              |                 | -2.19327**       | -0.02659        | -0.07790          | 1.27641            |
|                          |                 | <i>(-17.77)</i>  | <i>(-0.2)</i>   | <i>(-0.60)</i>    |                    |
| <b>turn</b>              |                 | -0.02394**       | -0.01978**      | -0.01819**        | 1.20267            |
|                          |                 | <i>(-29.61)</i>  | <i>(-25.02)</i> | <i>(-23.24)</i>   |                    |
| <b>idiovolt</b>          |                 | 3.67817**        | 2.1535**        | 2.02340**         | 2.20572            |
|                          |                 | <i>(31.49)</i>   | <i>(17.91)</i>  | <i>(15.69)</i>    |                    |
| <b>logassets</b>         |                 |                  | -0.04715**      | -0.04676**        | 1.6289             |
|                          |                 |                  | <i>(-37.46)</i> | <i>(-37.64)</i>   |                    |
| <b>bm</b>                |                 |                  | -0.01926**      | -0.02188**        | 1.13556            |
|                          |                 |                  | <i>(-4.59)</i>  | <i>(-5.38)</i>    |                    |
| <b>de</b>                |                 |                  | 0.0001321**     | 0.00014008**      | 1.11866            |
|                          |                 |                  | <i>(2.87)</i>   | <i>(3.14)</i>     |                    |
| <b>dummy1</b>            |                 |                  |                 | 0.10829**         | 1.93072            |
|                          |                 |                  |                 | <i>(10.48)</i>    |                    |
| <b>dummy2</b>            |                 |                  |                 | 0.08210**         | 1.97304            |
|                          |                 |                  |                 | <i>(8.06)</i>     |                    |
| <b>dummy3</b>            |                 |                  |                 | -0.00733          | 1.92582            |
|                          |                 |                  |                 | <i>(-0.72)</i>    |                    |
| <b>dummy4</b>            |                 |                  |                 | <b>0.24812**</b>  | 1.90090            |
|                          |                 |                  |                 | <b>(24.53)</b>    |                    |
| <b>dummy5</b>            |                 |                  |                 | 0.18852**         | 1.89676            |
|                          |                 |                  |                 | <i>(18.75)</i>    |                    |
| <b>dummy6</b>            |                 |                  |                 | 0.10293**         | 1.88046            |
|                          |                 |                  |                 | <i>(10.16)</i>    |                    |
| <b>dummy7</b>            |                 |                  |                 | 0.01646           | 1.92228            |
|                          |                 |                  |                 | <i>(1.63)</i>     |                    |
| <b>dummy8</b>            |                 |                  |                 | 0.07403**         | 1.95589            |
|                          |                 |                  |                 | <i>(7.21)</i>     |                    |
| <b>dummy9</b>            |                 |                  |                 | 0.07134**         | 1.98569            |
|                          |                 |                  |                 | <i>(6.95)</i>     |                    |
| <b>dummy10</b>           |                 |                  |                 | 0.09715**         | 2.02095            |
|                          |                 |                  |                 | <i>(9.46)</i>     |                    |
| <b>dummy11</b>           |                 |                  |                 | 0.09826**         | 2.02919            |
|                          |                 |                  |                 | <i>(9.57)</i>     |                    |
| <b>dummy12</b>           |                 |                  |                 | <b>0.10481**</b>  | 1.98849            |
|                          |                 |                  |                 | <b>(10.24)</b>    |                    |
| <b>Adj-R<sup>2</sup></b> | 0.0027          | 0.114            | 0.169           | 0.2169            |                    |

This table reports t-statistics with 20 degrees of freedom and \*, \*\* indicate statistical significance with a 1 tail test at the 0.01, and 0.005 levels and 2 tail test at the 0.02 and 0.01 levels.

The table displays the results from estimating the following equation:

$$delay_{it} = \alpha_{it} + \beta_1 banks_{it} + \beta_2 beta_{it} + \beta_3 priceinv_{it} + \beta_4 idiovolt_{it} + \beta_5 size_{it} + \beta_6 turn_{it} + \beta_7 logassets_{it} + \beta_8 bm_{it} + \beta_9 de_{it} + \sum XyDy + \varepsilon_{it}$$

The dependent variable is the price efficiency measure delay regressed on the bank coefficient, inverse prices, idiosyncratic volatility, market cap, turnover, the lognormal function of assets, book-to-market, debt-to-equity, and 12 time dummy variables. The sample includes 21,027 matched bank and non-bank firms. The bank coefficient measures the delay with which prices of bank holding companies respond to informational changes in the market. The bank beta coefficient is positive and significant when regressed on delay alone, and remains both economically and statistically significant when additional control measures are included in the regression.

| <b>Table 5.</b>                       |                |                  |                 |                      |                    |
|---------------------------------------|----------------|------------------|-----------------|----------------------|--------------------|
| <b>Regressions on Portfolio Delay</b> |                |                  |                 |                      |                    |
|                                       | (1)            | (2)              | (3)             | (4)                  | Variance Inflation |
| <b>Banks</b>                          | <b>0.0049*</b> | <b>0.02487**</b> | <b>0.0484**</b> | <b>0.05307**</b>     | 1.09912            |
| <i>t-stat</i>                         | <b>(1.71)</b>  | <b>(9.8)</b>     | <b>(20.23)</b>  | <b>(25.75)</b>       |                    |
| <b>Beta</b>                           |                |                  |                 | <b>-0.00031398**</b> | 1.01277            |
|                                       |                |                  |                 | <b>(-2.54)</b>       |                    |
| <b>priceinv</b>                       |                | 0.03077**        | 0.04131**       | 0.05543**            | 1.52413            |
|                                       |                | (6.96)           | (10.06)         | (15.31)              |                    |
| <b>Size</b>                           |                | -0.94742**       | 0.40596**       | 0.38030**            | 1.27572            |
|                                       |                | (-17.88)         | (7.4)           | (8.05)               |                    |
| <b>Turn</b>                           |                | -0.01236**       | -0.00908**      | -0.00769**           | 1.20439            |
|                                       |                | (-30.98)         | (-24.25)        | (-23.36)             |                    |
| <b>Idiovolt</b>                       |                | 3.09784**        | 2.01312**       | 1.52072**            | 2.21298            |
|                                       |                | (55.86)          | (36.62)         | (29.15)              |                    |
| <b>Logassets</b>                      |                |                  | -0.02985**      | -0.03114**           | 1.62771            |
|                                       |                |                  | (-55.97)        | (-66.09)             |                    |
| <b>Bm</b>                             |                |                  | -0.01458**      | -0.01581**           | 1.13558            |
|                                       |                |                  | (-8.47)         | (-10.65)             |                    |
| <b>De</b>                             |                |                  | 6.542E-05**     | 0.00006748**         | 1.11864            |
|                                       |                |                  | (3.46)          | (4.15)               |                    |
| <b>dummy1</b>                         |                |                  |                 | -0.01575**           | 3.51776            |
|                                       |                |                  |                 | (-3.04)              |                    |
| <b>dummy2</b>                         |                |                  |                 | -0.02546**           | 3.64421            |
|                                       |                |                  |                 | (-4.97)              |                    |
| <b>dummy3</b>                         |                |                  |                 | -0.03173**           | 3.61593            |
|                                       |                |                  |                 | (-6.22)              |                    |
| <b>dummy4</b>                         |                |                  |                 | <b>0.20999**</b>     | 3.55624            |
|                                       |                |                  |                 | <b>(41.25)</b>       |                    |
| <b>dummy5</b>                         |                |                  |                 | 0.03555**            | 3.57772            |
|                                       |                |                  |                 | (7.00)               |                    |
| <b>dummy6</b>                         |                |                  |                 | -0.0000091           | 3.51602            |
|                                       |                |                  |                 | (-0.00)              |                    |
| <b>dummy7</b>                         |                |                  |                 | 0.03154**            | 3.53643            |
|                                       |                |                  |                 | (6.20)               |                    |
| <b>dummy8</b>                         |                |                  |                 | 0.03947**            | 3.52619            |
|                                       |                |                  |                 | (7.71)               |                    |
| <b>dummy9</b>                         |                |                  |                 | 0.00560              | 3.59015            |
|                                       |                |                  |                 | (1.10)               |                    |
| <b>dummy10</b>                        |                |                  |                 | -0.00096383          | 3.65273            |
|                                       |                |                  |                 | (-0.19)              |                    |
| <b>dummy11</b>                        |                |                  |                 | -0.01811**           | 3.67224            |
|                                       |                |                  |                 | (-3.55)              |                    |
| <b>dummy12</b>                        |                |                  |                 | 0.01618**            | 3.59769            |
|                                       |                |                  |                 | (3.19)               |                    |
| <b>Adj-R<sup>2</sup></b>              | 0.0001         | 0.247            | 0.352           | 0.2169               |                    |

This table reports t-statistics and \*, \*\* indicate statistical significance with a 1 tail test at the 0.01, and 0.005 levels and 2 tail test at the 0.02 and 0.01 levels.

The table displays the results from estimating regression:

$$delayP_{it} = \alpha_{it} + \beta_1 banks_{it} + \beta_2 beta_{it} + \beta_3 priceinv_{it} + \beta_4 idiovolt_{it} + \beta_5 size_{it} + \beta_6 turn_{it} + \beta_7 logassets_{it} + \beta_8 bm_{it} + \beta_9 de_{it} + \sum XyDy + \varepsilon_{it}$$

The dependent variable is the price efficiency measure delay after being sorted into portfolios based on stocks' end of June market capitalizations. The independent variables are identical to those found in table 4 which include: bank coefficient, inverse prices, idiosyncratic volatility, market cap, turnover, lognormal function of assets, book-to-market, debt-to-equity, and 12 dummy variables for each year between 1996 and 2007 inclusive. The sample includes 19,351 financial firms and similar-sized non-bank firms. The bank coefficient measures the delay with which prices of bank holding companies respond to informational innovations as in table 4. The bank beta coefficient is positive and significant when regressed on the delay portfolio measure of price efficiency which implies that bank prices experience an abnormal lag to informational innovations in the market.

| Table 6: Transparent & Opaque Assets on Delay |                             |          |         |
|---|-----------------------------|----------|---------|
| Dependant Variable: Delay                     | Adj-R <sup>2</sup> = 0.3620 | 2222     |         |
| Independent Variable                          |                             | T-stat   | VIF     |
| beta  | -0.00278*                   | (-2.08)  | 1.01571 |
| transassets                                   | 0.00253                     | (0.39)   | 7.30909 |
| opaqueassets                                  | -0.09268***                 | (-12.92) | 7.5139  |
| price   | -0.00699                    | (-0.28)  | 1.36956 |
| size  | 1.06176***                  | (3.32)   | 1.56711 |
| turn  | -0.01866***                 | (-2.89)  | 1.3427  |
| idiovolt                                      | 1.41332***                  | (2.84)   | 2.31786 |
| B/M   | -0.03617***                 | (-4.18)  | 1.03521 |
| D/E   | 0.00885***                  | (6.4)    | 1.23564 |
| dummy1  | 0.07304*                    | (2.4)    | 1.94655 |
| dummy2  | -0.01051                    | (-0.32)  | 1.72897 |
| dummy3  | -0.11558***                 | (-3.42)  | 1.5509  |
| dummy4  | 0.17613***                  | (5.06)   | 1.51143 |
| dummy5  | 0.12982***                  | (4.09)   | 1.52303 |
| dummy6  | 0.14698***                  | (4.79)   | 1.71228 |
| dummy7  | 0.00635                     | (0.21)   | 1.92506 |
| dummy8  | 0.04981                     | (1.66)   | 2.17607 |
| dummy9  | 0.06122*                    | (2.05)   | 2.22179 |
| dummy10                                       | 0.04821                     | (1.65)   | 2.43888 |
| dummy11                                       | 0.15171***                  | (5.16)   | 2.56168 |
| dummy12                                       | 0.11868***                  | (4.3)    | 2.33829 |

This table reports test statistics with \*, \*\*, \*\*\* indicating statistical significance at the .05, .02, and .01 levels for a 2-tailed test and 0.025, 0.01, and 0.005 levels for the 1-tailed test.

$$delay_{it} = \alpha_{it} + \beta_1 banks_{it} + \beta_2 beta_{it} + \beta_3 transassets_{it} + \beta_4 opaqueassets_{it} + \beta_5 priceinv_{it} + \beta_6 idiovolt_{it} + \beta_7 size_{it} + \beta_8 turn_{it} + \beta_9 logassets_{it} + \beta_{10} bm_{it} + \beta_{11} de_{it} + \sum XyDy + \varepsilon_{it}$$

This table reports the results from running the regression above, with transparent assets and opaque assets included as explanatory variables. The analysis controls for several variables including cross-sectional variation, and encompasses 2,222 observations on all financial institutions.

| Table 7: Opaque Ratio on Delay |                             |         |         |
|--------------------------------|-----------------------------|---------|---------|
| Dependant Variable: Delay      | Adj-R <sup>2</sup> = 0.1962 | 2222    |         |
| Independent Variable           |                             | T-stat  | VIF     |
| beta                           | 0.00511***                  | (-3.41) | 1.01022 |
| opaqueratio                    | -0.12436                    | (-1.59) | 1.09188 |
| price                          | -0.03847                    | (-1.38) | 1.37818 |
| size                           | -2.94773***                 | (-9.79) | 1.09999 |
| turn                           | 0.07892***                  | (11.81) | 1.14327 |
| idiovolt                       | 5.54681***                  | (10.6)  | 2.04014 |
| B/M                            | -0.01172                    | (-1.22) | 1.02102 |
| D/E                            | -0.00139                    | (-0.94) | 1.11613 |
| dummy1                         | 0.17899***                  | (5.34)  | 1.87777 |
| dummy2                         | 0.06912                     | (1.91)  | 1.69751 |
| dummy3                         | -0.08476*                   | (-2.25) | 1.53304 |
| dummy4                         | 0.20594***                  | (5.3)   | 1.49345 |
| dummy5                         | 0.15093***                  | (4.26)  | 1.50725 |
| dummy6                         | 0.20153***                  | (5.9)   | 1.68088 |
| dummy7                         | 0.08224*                    | (2.48)  | 1.88107 |
| dummy8                         | 0.15133***                  | (4.54)  | 2.11792 |
| dummy9                         | 0.15448***                  | (4.66)  | 2.18064 |
| dummy10                        | 0.15413***                  | (4.76)  | 2.37055 |
| dummy11                        | 0.26077***                  | (8.02)  | 2.48724 |
| dummy12                        | 0.21179***                  | (6.9)   | 2.29141 |

This table reports test statistics with \*, \*\*, \*\*\* indicating statistical significance at the .05, .02, and .01 levels for a 2-tailed test and 0.025, 0.01, and 0.005 levels for the 1-tailed test. The results are generated from running the following regression:

$$delay_{it} = \alpha_{it} + \beta_1 banks_{it} + \beta_2 beta_{it} + \beta_3 opaqueratio_{it} + \beta_4 price_{it} + \beta_5 idiovolt_{it} + \beta_6 size_{it} + \beta_7 turn_{it} + \beta_8 logassets_{it} + \beta_9 bm_{it} + \beta_{10} de_{it} + \sum XyDy + \varepsilon_{it}$$

The opaque ratio is the variable of interest and contributes to examining the underlying hypothesis that banks are less efficient than similarly sized nonbank firms because of the opaqueness of their assets. The analysis controls for several variables including cross-sectional variation, and encompasses 2,222 observations on all financial institutions. Delay is negatively related to the opaque ratio but not statistically significant.

| Table 8: Transparent & Opaque Assets on Portfolio Delay |                             |          |         |
|---|-----------------------------|----------|---------|
| Dependant Variable: DelayP                              | Adj-R <sup>2</sup> = 0.5700 | 1973     |         |
| Independent Variable                                    |                             | T-stat   | VIF     |
| Intercept   | 0.38908***                  | (19.21)  | 0       |
| beta  | -0.00199                    | (-1.37)  | 1.11843 |
| transassets   | 0.00384                     | (1.77)   | 7.86949 |
| opaqueassets  | -0.04616***                 | (-19.26) | 8.03181 |
| price   | 0.02373***                  | (2.87)   | 1.41036 |
| size  | 0.93751***                  | (9.3)    | 1.57942 |
| turn  | -0.00403                    | (-1.74)  | 1.60943 |
| idiovolt  | 0.54583***                  | (2.88)   | 1.96454 |
| B/M   | -0.01447***                 | (-5.34)  | 1.03909 |
| D/E   | 0.00449***                  | (9.92)   | 1.2482  |
| dummy1  | -0.02994*                   | (-2.01)  | 4.64601 |
| dummy2  | -0.0371*                    | (-2.42)  | 3.88516 |
| dummy3  | -0.04609***                 | (-2.95)  | 3.35556 |
| dummy4  | 0.17705***                  | (11.25)  | 3.07418 |
| dummy5  | 0.04363***                  | (2.86)   | 3.36499 |
| dummy6  | -0.00312                    | (-0.21)  | 3.92415 |
| dummy7  | 0.02872                     | (1.95)   | 4.56956 |
| dummy8  | 0.02755                     | (1.86)   | 5.0903  |
| dummy9  | -0.02418                    | (-1.63)  | 5.49925 |
| dummy10   | -0.02758                    | (-1.87)  | 6.14705 |
| dummy11   | -0.04602***                 | (-3.13)  | 6.35469 |
| dummy12   | 0.00684                     | (0.48)   | 6.05428 |

This table reports test statistics with \*, \*\*, \*\*\* indicating statistical significance at the .05, .02, and .01 levels for a 2-tailed test and 0.025, 0.01, and 0.005 levels for the 1-tailed test. The following regression is constructed and the above results are reported:

$$delayP_{it} = \alpha_{it} + \beta_1 banks_{it} + \beta_2 beta_{it} + \beta_3 transassets_{it} + \beta_4 opaqueassets_{it} + \beta_5 price_{it} + \beta_6 idiovolt_{it} + \beta_7 size_{it} + \beta_8 turn_{it} + \beta_9 logassets_{it} + \beta_{10} bm_{it} + \beta_{11} de_{it} + \sum XyDy + \varepsilon_{it}$$

The equation above is identical to the regression found in table 6; except for the dependent variable is now portfolio delay (second-stage delay). Again, the variables of interest are the transparent and opaque assets. All other variables in the regression are used to control for the variation in portfolio delay. There are 1,973 observations in the regression and all bank holding companies are examined. Transparent assets seem to be positively correlated with portfolio delay, with opaque assets being adversely related to market efficiency.

| Table 9: Opaque Ratio on Porfolio Delay |                             |          |         |
|---|-----------------------------|----------|---------|
| Dependant Variable: DelayP              | Adj-R <sup>2</sup> = 0.3082 | 1973     |         |
| Independent Variable                    |                             | T-stat   | VIF     |
| Intercept                               | 0.06984                     | (1.96)   | 0       |
| beta                                    | -0.01042***                 | (-5.74)  | 1.08633 |
| Opaqueratio                             | -0.05568                    | (-1.89)  | 1.07988 |
| price                                   | -0.0027                     | (-0.26)  | 1.40311 |
| size                                    | -0.85349***                 | (-7.97)  | 1.10621 |
| turn                                    | -0.03082***                 | (-11.11) | 1.43509 |
| idiovolt                                | 3.0393***                   | (13.65)  | 1.68274 |
| B/M                                     | -0.00248                    | (-0.73)  | 1.02256 |
| D/E                                     | -0.00030266                 | (-0.55)  | 1.12925 |
| dummy1                                  | 0.0433*                     | (2.31)   | 4.5401  |
| dummy2                                  | 0.02555                     | (1.32)   | 3.82812 |
| dummy3                                  | -0.00199                    | (-0.1)   | 3.32726 |
| dummy4                                  | 0.21139***                  | (10.62)  | 3.05368 |
| dummy5                                  | 0.06618***                  | (3.43)   | 3.3543  |
| dummy6                                  | 0.04409*                    | (2.33)   | 3.88314 |
| dummy7                                  | 0.08477***                  | (4.56)   | 4.50837 |
| dummy8                                  | 0.09804***                  | (5.26)   | 4.99362 |
| dummy9                                  | 0.04711**                   | (2.53)   | 5.39802 |
| dummy10                                 | 0.05114**                   | (2.77)   | 6.00282 |
| dummy11                                 | 0.03104                     | (1.69)   | 6.21271 |
| dummy12                                 | 0.07436***                  | (4.17)   | 5.94161 |

Table 9 reports test statistics with \*, \*\*, \*\*\* indicating statistical significance at the .05, .02, and .01 levels for a 2-tailed test and 0.025, 0.01, and 0.005 levels for the 1-tailed test. The results are obtained from running the following regression:

$$delayP_{it} = \alpha_{it} + \beta_1 banks_{it} + \beta_2 beta_{it} + \beta_3 opaqueratio_{it} + \beta_4 price_{it} + \beta_5 idiovolt_{it} + \beta_6 size_{it} + \beta_7 turn_{it} + \beta_8 logassets_{it} + \beta_9 bm_{it} + \beta_{10} de_{it} + \sum X_j D_j + \varepsilon_{it}$$

Portfolio delay is the dependent variable with opaque ratio being the questionable coefficient. The regression consists of 1,973 observations on all banks firms. The opaque ratio appears to be negatively correlated with portfolio delay and marginally significant.



| Table 10: Opaque Ratio        |                  |           |           |                   |          |
|-------------------------------|------------------|-----------|-----------|-------------------|----------|
| Opaque Ratio Univariate Tests |                  |           |           |                   |          |
| Delay                         | QI               | QII       | QIII      | QIV               | QIV - QI |
|                               | Low Opaque Ratio |           |           | High Opaque Ratio |          |
|                               | [1]              | [2]       | [3]       | [4]               | [5]      |
|                               | 0.4406027        | 0.4445655 | 0.4446564 | 0.444082          | -0.045   |
| T-stat                        |                  |           |           |                   | (-0.16)  |
| DelayP                        | QI               | QII       | QIII      | QIV               | QIV - QI |
|                               | [1]              | [2]       | [3]       | [4]               | [5]      |
|                               | 0.1166864        | 0.1140086 | 0.094085  | 0.0960405         | 0.005**  |
| T-stat                        |                  |           |           |                   | (2.6)    |

This table reports test statistics with \*, \*\*, \*\*\* indicating statistical significance at the .05, .02, and .01 levels for a 2-tailed test and 0.025, 0.01, and 0.005 levels for the 1-tailed test.

Table 10 displays the robust results on the opaque ratio measure. Each stock is evaluated using opaque assets over total assets and categorized into quartiles. The opaqueness of bank holding companies' assets does not appear to be correlated with either delay measure. The opaque ratio does not exhibit any particular pattern that is significant when moving across quartiles.

| Table 11: Interactions on Delay |             |               |                    |                 |
|---------------------------------|-------------|---------------|--------------------|-----------------|
| Panel a. Risk Factors           |             |               |                    |                 |
|                                 | [1]         | <i>T-stat</i> | [2]                | <i>T-stat</i>   |
| <i>banks</i>                    | 0.10073***  | (18.51)       | 0.0629***          | (7.04)          |
| <i>beta</i>                     | -0.00182*** | (-5.9)        | -0.00203***        | (-6.74)         |
| <i>banks*beta</i>               | -0.00486*** | (-3.53)       |                    |                 |
| <i>idiovolt</i>                 | 2.02367***  | (15.69)       | 1.84344***         | (13.77)         |
| <i>banks*idiovolt</i>           |             |               | 1.40818***         | (4.96)          |
| <i>adj-r<sup>2</sup></i>        | 0.2174      |               | 0.2178             |                 |
| Panel b. Liquidity              |             |               |                    |                 |
|                                 | [3]         |               | [4]                |                 |
| <i>banks</i>                    | 0.09579***  | (16.92)       | 0.1139***          | (18.72)         |
| <i>priceinv</i>                 | 0.03317***  | (3.4)         | 0.03816***         | (4.15)          |
| <i>banks*priceinv</i>           | 0.03173     | (1.41)        |                    |                 |
| <i>turn</i>                     | -0.01822*** | (-23.28)      | <b>-0.01736***</b> | <b>(-21.81)</b> |
| <i>banks*turn</i>               |             |               | <b>-0.02046***</b> | <b>(-5.57)</b>  |
| <i>adj-r<sup>2</sup></i>        | 0.217       |               | 0.218              |                 |
| Panel c. Size Effect            |             |               |                    |                 |
|                                 | [5]         |               | [6]                |                 |
| <i>banks</i>                    | 0.10444***  | (18.85)       | 0.10153***         | (18.69)         |
| <i>size</i>                     | 0.18736     | (1.34)        | -0.07009           | (-0.54)         |
| <i>banks*size</i>               | -1.43726*** | (-4.92)       |                    |                 |
| <i>b/m</i>                      | -0.0218***  | (-5.36)       | <b>-0.01089*</b>   | <b>(-2.36)</b>  |
| <i>banks*b/m</i>                |             |               | <b>-0.04914***</b> | <b>(-5.08)</b>  |
| <i>adj-r<sup>2</sup></i>        | 0.2178      |               | 0.2179             |                 |
| Panel d. Capital Structure      |             |               |                    |                 |
|                                 | [7]         |               | [8]                |                 |
| <i>banks</i>                    | 0.24297***  | (12.05)       | 0.05378***         | (6.97)          |
| <i>logassets</i>                | -0.04331*** | (-32.71)      | -0.04866***        | (38.54)         |
| <i>banks*logassets</i>          | -0.02061*** | (-7.45)       |                    |                 |
| <i>d/e</i>                      | 0.000151*** | (3.38)        | <b>0.000118**</b>  | <b>(2.65)</b>   |
| <i>banks*d/e</i>                |             |               | <b>0.00686***</b>  | <b>(8.05)</b>   |
| <i>adj-r<sup>2</sup></i>        | 0.219       |               | 0.2193             |                 |

This table displays test statistics with \*, \*\*, \*\*\* indicating statistical significance at the .05, .02, and .01 levels for a 2-tailed test and 0.025, 0.01, and 0.005 levels for the 1-tailed test.

$$\begin{aligned}
 \text{delay}_{it} = & \alpha_{it} + \beta_1 \text{banks}_{it} + \beta_2 \text{beta}_{it} + \beta_3 \text{priceinv}_{it} + \beta_4 \text{idiovolt}_{it} + \beta_5 \text{size}_{it} + \beta_6 \text{turn}_{it} + \beta_7 \text{logassets}_{it} + \beta_8 \text{bm}_{it} + \\
 & \beta_9 \text{d/e}_{it} + \beta_{10} \text{banks*beta}_{it} + \beta_{11} \text{banks*priceinv}_{it} + \beta_{12} \text{banks*idiovolt}_{it} + \beta_{13} \text{banks*size}_{it} + \beta_{14} \text{banks*turn}_{it} + \\
 & \beta_{15} \text{banks*logassets}_{it} + \beta_{16} \text{banks*bm}_{it} + \beta_{17} \text{banks*d/e}_{it} + \sum X_j Y_j + \varepsilon_{it}
 \end{aligned}$$

The results in this table are generated from the regression above on delay. The dummy control variables for cross-sectional fluctuations are not reported in the results section but did contribute to improving the validity of the results. The leverage effect on delay is nearly 50 times greater for banks. Delay and debt-to-equity are positively related, suggesting that lower d/e firms are more efficient at incorporating market-wide news.

| Table 12: Interactions on Portfolio Delay |             |               |                      |                 |
|---|-------------|---------------|----------------------|-----------------|
| <b>Panel a. Risk Factors</b>              |             |               |                      |                 |
|   | [1]         | <i>T-stat</i> | [2]                  | <i>T-stat</i>   |
| <i>banks</i>                              | 0.05611***  | (25.5)        | 0.05832***           | (16.42)         |
| <i>beta</i>                               | -0.00027*   | (-2.18)       | -0.0003171**         | (-2.57)         |
| <i>banks*beta</i>                         | -0.00515*** | (-3.93)       |                      |                 |
| <i>idiovolt</i>                           | 1.53211***  | (29.33)       | 1.54164***           | (28.85)         |
| <i>banks*idiovolt</i>                     |             |               | -0.22874             | (-1.82)         |
| <i>adj-r<sup>2</sup></i>                  | 0.5172      |               | 0.5169               |                 |
| <b>Panel b. Liquidity</b>                 |             |               |                      |                 |
|   | [3]         |               | [4]                  |                 |
| <i>banks</i>                              | 0.05533***  | (25.74)       | 0.06205***           | (25.59)         |
| <i>priceinv</i>                           | 0.06043***  | (15.64)       | 0.05531**            | (15.3)          |
| <i>banks*priceinv</i>                     | -0.03186*** | (-3.69)       |                      |                 |
| <i>turn</i>                               | -0.00764*** | (-23.16)      | <b>-0.00735***</b>   | <b>(-22.12)</b> |
| <i>banks*turn</i>                         |             |               | <b>-0.01177***</b>   | <b>(-7.01)</b>  |
| <i>adj-r<sup>2</sup></i>                  | 0.5172      |               | 0.5181               |                 |
| <b>Panel c. Size Effect</b>               |             |               |                      |                 |
|   | [5]         |               | [6]                  |                 |
| <i>banks</i>                              | 0.05227***  | (24.64)       | 0.0539***            | (25.97)         |
| <i>size</i>                               | 0.34951***  | (6.83)        | 0.3822***            | (8.09)          |
| <i>banks*size</i>                         | 0.16724     | (1.57)        |                      |                 |
| <i>b/m</i>                                | -0.01582*** | (-10.66)      | <b>-0.01321***</b>   | <b>(-7.86)</b>  |
| <i>banks*b/m</i>                          |             |               | <b>-0.0116***</b>    | <b>(-3.29)</b>  |
| <i>adj-r<sup>2</sup></i>                  | 0.5169      |               | 0.5171               |                 |
| <b>Panel d. Capital Structure</b>         |             |               |                      |                 |
|   | [7]         |               | [8]                  |                 |
| <i>banks</i>                              | 0.02737***  | (3.61)        | 0.02299***           | (7.94)          |
| <i>logassets</i>                          | -0.03177*** | (-63.07)      | -0.03254***          | (-68.05)        |
| <i>banks*logassets</i>                    | 0.00363***  | (3.52)        |                      |                 |
| <i>d/e</i>                                | 6.55E-05*** | (4.03)        | <b>0.00005332***</b> | <b>(3.29)</b>   |
| <i>banks*d/e</i>                          |             |               | <b>0.00474***</b>    | <b>(14.69)</b>  |
| <i>adj-r<sup>2</sup></i>                  | 0.5172      |               | 0.5221               |                 |

This table reports test statistics with \*, \*\*, \*\*\* indicating statistical significance at the .05, .02, and .01 levels for a 2-tailed test and 0.025, 0.01, and 0.005 levels for the 1-tailed test.

$$\begin{aligned}
 \text{delay}P_{it} = & \alpha_{it} + \beta_1 \text{banks}_{it} + \beta_2 \text{beta}_{it} + \beta_3 \text{priceinv}_{it} + \beta_4 \text{idiovolt}_{it} + \beta_5 \text{size}_{it} + \beta_6 \text{turn}_{it} + \beta_7 \text{logassets}_{it} + \beta_8 \text{bm}_{it} + \\
 & \beta_9 \text{de}_{it} + \beta_{10} \text{banks*beta}_{it} + \beta_{11} \text{banks*priceinv}_{it} + \beta_{12} \text{banks*idiovolt}_{it} + \beta_{13} \text{banks*size}_{it} + \beta_{14} \text{banks*turn}_{it} + \\
 & \beta_{15} \text{banks*logassets}_{it} + \beta_{16} \text{banks*bm}_{it} + \beta_{17} \text{banks*de}_{it} + \sum XyDy + \varepsilon_{it}
 \end{aligned}$$

The results in this table are generated from the regression above on portfolio delay. Again, the dummy control variables for yearly fluctuations are not reported in the results section but did contribute to improving the accuracy of the results. The leverage effect on delay is approximately 100 times greater for financial firms.