

BANK STRESS TEST DISCLOSURES, PRIVATE INFORMATION PRODUCTION, AND PRICE INFORMATIVENESS

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Views and opinions expressed in this presentation reflect those of the authors and do not necessarily reflect those of the FDIC or the United States.

Motivating Question(s)

What are the benefits and costs of bank stress test disclosures? Do stress test disclosures enhance financial system stability?

Research Question

Do bank stress test disclosures increase or decrease the extent of private information production about banks and, ultimately, the informativeness of their stock prices?

Bank opacity was one alleged contributor to the financial crisis

- Market participants (and regulators) didn't understand risk banks were taking
- In response, stress test disclosures were introduced to reduce this opacity

Regulators and policymakers must decide the extent to which these results should be made public

- Disclosure could enhance market discipline and lead to greater stability!
- ... but are there costs?

Regulators use equity prices as a signal about bank health

- “Unlike accounting-based measures, market data are generated on a nearly continuous basis and to a considerable extent anticipates future performance and conditions... Raw market prices are nearly free to supervisors. This characteristic seems particularly important given that supervisory resources are limited and are diminishing in comparison to the complexity of large banking organizations.”

Gary Stern (former President of the FRB of Minneapolis), 2009

This paper highlights potential consequence of increased regulatory disclosures

We find that the disclosure of bank-run stress tests are associated with:

- 1 New information being conveyed to the market
- 2 Decrease in private information production
- 3 Decrease in price informativeness

WHAT IS A STRESS TEST?

Goal: For the banking sector, stress tests are simulation exercises conducted to assess the resilience to a hypothetical scenario of either a single bank or the system as a whole (BIS, 2018)

- Capital?
- Profitability?
- Loan Losses?

Initially conducted on the largest banks in the wake of the financial crisis, stress tests have become a more prominent risk management tool post-crisis.

STRESS TEST BACKGROUND: SEVERELY ADVERSE SCENARIO

From 2015-2017, banks with assets of \$10-\$50 billion were required to disclose the results under their severely adverse scenario

Trajectories for 26 variables:

- Fourteen variables that capture economic activity, asset prices, and interest rates in the U.S. economy and financial markets
- Three variables in each of four countries or country blocks:
 - Real GDP growth, inflation and the U.S./foreign currency exchange rate are reported for the Euro area, the United Kingdom, developing Asia, and Japan.

BENEFITS AND COSTS OF STRESS TEST DISCLOSURES

Potential benefits:

- 1 Enhanced market discipline through better stakeholder monitoring (Healy and Palepu, 2001)
- 2 Decreased information asymmetry, leading to lower cost of capital and higher liquidity (Healy and Palepu, 2001)
- 3 Increased production of private information

Potential costs (Goldstein and Sapra, 2013)

- 1 Release of proprietary information
- 2 Reduction in risk-sharing or “Hirshleifer Effect” (Hirshleifer, 1971)
- 3 Coordination failures and runs
- 4 Decreased production of private information
- 5 Reduced price informativeness

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Disclosure of company-run stress tests could...

- Incent private information production by attracting analysts who believe they can profit from superior information processing (McNichols and Trueman, 1994; Healy and Palepu, 2001), or
- Discourage private information production by
 - Preempting analysts/traders' information advantage (Gao and Liang, 2013; Bond and Goldstein, 2015)
 - Causing traders to become more reliant on public information (Morris and Shin, 2002; Angeletos and Pavan, 2007)

H2 (null): Company-run stress test disclosures do not affect price informativeness.

Recent theory models suggest that mandatory disclosure can affect private information production and ultimately the informativeness of prices.

- Gao and Liang (2013): Mandatory disclosures result in a decrease in private information production and to a decrease in price informativeness.
- Goldstein and Yang (2019): The effect of mandatory disclosure on private information production and ultimately price informativeness depends on the type of information disclosed:
 - Public disclosure of information already known to the regulator could lead to an increase in the production of private information of other, unknown information, increasing the informativeness of prices.
 - Public disclosure of information unknown to the regulator could decrease private information production on this dimension and harm price informativeness.

Sample consists of banks with assets less than \$50 billion from 2011-2017:

- “Treated” banks (assets \$10-\$50 billion) release bank-run DFAST disclosures
- “Control” banks (assets less than \$10 billion) do not
- “Disclose” indicator variable if year is 2015-2017

Difference-in-differences framework:

$$\text{Dependent_Variable}_{b,q} = \alpha_b + \gamma_q + \beta_1' \text{DISCLOSE}_{b,q} \times \text{TREAT}_{b,q} + \beta_2' \text{BANK_CONTROLS}_{b,q-1} + \epsilon_{b,q} \quad (1)$$

- Include bank (α_b) and year-quarter (γ_q) fixed effects which subsume direct effects of *TREAT* and *POST*.
- Controls include size, NCOs, MVE, MTB, and Capital.

PRIVATE INFORMATION MEASURES

EPS_FCSTNUM : Total number of earnings forecasts

EPS_ANALYSTS: Number of analysts making earnings forecasts

SEASONED_FCST: Number of analysts making earnings forecasts who had previously made four quarterly forecasts

ROOKIE_FCST: Number of new analysts making earnings forecasts for fewer than four quarters

$$\text{EPS_DISPERSION}_{b,q} = \frac{\text{EPS_SD}_{b,q}}{\text{Price}_{qb,-1}}$$

$$\text{EPS_FE}_q = \frac{|\text{EPS_MEAN}_{b,q} - \text{EPS_ACTUAL}_q|}{\text{Price}_{b,q-1}}$$

$$\text{EPS_PRIV_INFO1}_{b,q} = \frac{\text{EPS_SD}_{b,q}}{((1 - 1/\text{EPS_ANALYSTS}_{b,q}) \times \text{EPS_SD}_{b,q} + \text{EPS_SE}_{b,q})^2}$$

$$\text{EPS_PRIV_INFO2}_{b,q} = \frac{|\text{EPS_MEAN}_{b,q} - \text{EPS_ACTUAL}_{b,q-4}|}{\text{Price}_{b,q-1}}$$

PRIVATE INFORMATION MEASURES

Barron, Kim, Lim, and Stevens (1998) use forecast errors and dispersion to decompose analysts' forecasts into common and idiosyncratic information

Intuition: If you observe analyst dispersion and mean forecast error, the dispersion proxies for the amount of idiosyncratic information reflected in the forecasts and the mean forecast error represents the common uncertainty

- They create a measure of analysts' private information that is related to the amount of idiosyncratic information contained within their forecasts.

$$\text{EPS_PRIV_INFO1}_q = \frac{\text{EPS_SD}_q}{((1 - 1/\text{EPS_ANALYSTS}_q) \times \text{EPS_SD}_q + \text{EPS_SE}_q)^2}$$

- Increasing in dispersion (EPS_SD)
- Increasing in number of analysts making forecasts (EPS_ANALYSTS)
- Decreasing in amount of mean forecast error (EPS_SE)

PRICE INFORMATIVENESS PROXIED BY PRICE SYNCHRONICITY

Following, Durnev, Morck, and Yeung (2004), Jin and Myers (2006), Hutton, Marcus, and Tehranian (2009), we measure synchronicity as:

$$r_{b,q} = \alpha + \beta_1 r_{m,q-1} + \beta_2 r_{m,q} + \beta_3 r_{m,q+1} + \gamma_1 r_{i,q-1} + \gamma_2 r_{i,q} + \gamma_3 r_{i,q+1} + \epsilon_{b,q} \quad (2)$$

$r_{b,q}$, $r_{m,q}$, and $r_{i,q}$ are excess returns of the stock, market, and stock's industry

Idiosyncratic information in price obtained using a logistic transformation of the quarterly R^2 measure :

$$IDIOSYN_{b,q} = \ln\left(\frac{1 - \text{QuarterlyRSQ}_{b,q}}{\text{QuarterlyRSQ}_{b,q}}\right)$$

higher values of *IDIOSYN* indicates a greater amount of stock price informativeness.

- Federal Reserve's quarterly Consolidated Financial Statements (FR Y-9C)
- Bank-run stress test disclosures: SNL, 8-K filings, bank websites
- Disclosure release dates: SNL, 8-K filings, bank websites, and press releases
- Analyst data: IBES
- Stock price data: CRSP

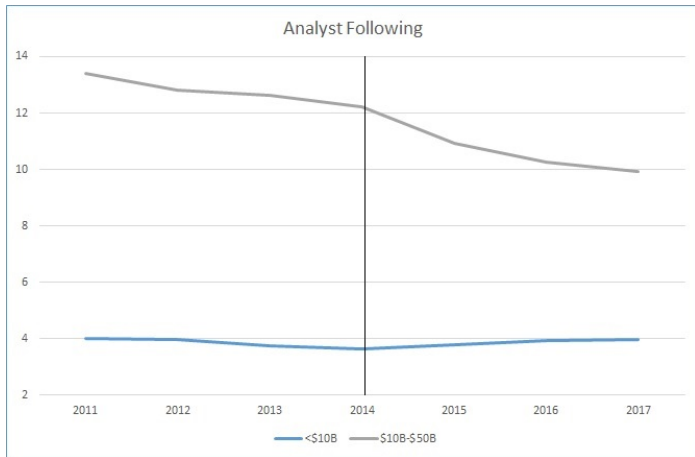
DESCRIPTIVE STATISTICS

Table 1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Mean	SD	Min	P25	Med	P75	Max	N
EPS_ANALYSTS	6.9988	5.5451	1.0000	3.0000	6.0000	10.0000	34.0000	6,772
SEASONED_FCST	6.1031	4.9251	0.0000	2.0000	5.0000	8.0000	29.0000	6,772
ROOKIE_FCST	1.1196	1.2570	0.0000	0.0000	1.0000	2.0000	10.0000	6,772
EPS_FCSTNUM	7.2956	5.7761	1.0000	3.0000	6.0000	10.0000	42.0000	6,772
EPS_ABS_FE	0.0111	0.0449	0.0000	0.0006	0.0015	0.0037	0.3440	6,516
EPS_DISPERSION	0.0070	0.0284	0.0000	0.0006	0.0011	0.0024	0.2137	5,942
EPS_PRIVINFO1	0.0039	0.0151	0.0000	0.0002	0.0005	0.0017	0.1274	5,849
EPS_PRIVINFO2	0.0349	0.1659	0.0000	0.0009	0.0023	0.0060	1.2647	6,428
GPIN_INFTRADE	0.4244	0.1491	0.0765	0.3083	0.4831	0.5320	0.6801	543
OWR_INFTRADE	0.5102	0.2344	0.0015	0.3590	0.5472	0.6603	1.0000	543
IDIOSYN	1.0691	1.3305	-2.0947	0.1762	0.8134	1.7330	7.7041	6,761
NCO	0.0017	0.0025	-0.0003	0.0002	0.0006	0.0021	0.0131	6,772
LNASSETS	15.1358	1.0604	13.2691	14.2655	15.0179	15.8959	17.7491	6,772
MTB	1.1684	0.4789	0.2287	0.8759	1.1490	1.4083	3.0994	6,772
CAPITAL	0.1108	0.0297	0.0494	0.0926	0.1070	0.1247	0.2705	6,772
SIGMA	0.0232	0.0142	0.0064	0.0142	0.0176	0.0269	0.1251	6,740
SKEW	0.2416	0.7101	-4.0293	-0.0668	0.1647	0.4819	7.8608	6,736
KURT	3.4632	5.7463	-0.4423	1.1346	1.9993	3.4726	119.7090	6,736

TRENDS IN ANALYST FOLLOWING

Figure 1



BANK-RUN STRESS TEST DISCLOSURES CONTAIN INFORMATION

Table 2: Return Results

Panel A: Disclosure Window Returns

	N	Raw	Positive / Negative	DGTW	Positive / Negative
All Banks	406	-0.0046 (-2.50)**	217 / 189	-0.0013 (-0.89)	214 / 192
Non-Fed DFAST	136	-0.0015 (-0.50)	71 / 65	0.0008 (0.35)	73 / 63
Fed DFAST	270	-0.0062 (-2.57)**	146 / 124	-0.0023 (-1.33)	141 / 129
First Release (Non-Fed)	51	-0.0084 (-2.10)**	24 / 27	-0.0035 (-0.9)	23 / 28
Subsequent Releases (Non-Fed)	85	0.0027 (0.78)	47 / 38	0.0034 (1.09)	50 / 35

BANK-RUN STRESS TEST DISCLOSURES CONTAIN INFORMATION

Table 2: Return Results

Panel B: Five-day Absolute Returns and Volume around Company-Run DFAST Disclosures

	Raw	DGTW	Volume
Disclosure Window	0.0009 (1.73)*	0.0011 (2.75)***	0.0005 (2.22)**
Earnings Announcement	0.0018 (3.11)***	0.0022 (5.03)***	0.0012 (3.65)***
2016 Presidential Election	0.0120 (23.51)***	0.0057 (9.30)***	0.0019 (5.58)***
Tax Cuts and Jobs Act Window	-0.0019 (-3.31)***	0.0006 (0.81)	-0.0010 (-1.78)*
Constant	0.0099 (135.31)***	0.0075 (106.22)***	0.0065 (112.10)***
Bank FE	Yes	Yes	Yes
SE Cluster	Bank	Bank	Bank
Observations	5,130	5,130	5,130
R-squared	0.1258	0.0999	0.1720

ANALYST FOLLOWING AND FORECASTS DECREASE

Table 3: Number of Analysts and Analyst Forecasts

	(1)	(2)
	EPS_ANALYSTS	EPS_FCSTNUM
DISCLOSE x TREAT	-0.8130 (-2.07)**	-0.7670 (-2.05)**
LNASSETS	2.3008 (5.53)***	2.2310 (5.26)***
NCO	-14.5046 (-0.48)	-15.4160 (-0.51)
MVE	-0.0000 (-2.11)**	-0.0000 (-1.99)**
MTB	0.0271 (0.09)	-0.0099 (-0.03)
CAPITAL	8.4666 (1.60)	9.5439 (1.78)*
Year-Quarter FE	Yes	Yes
Bank FE	Yes	Yes
Observations	6,769	6,769
R-squared	0.9320	0.9361

DISCLOSURE LEADS TO FEWER SEASONED ANALYSTS

Table 4: Number of Seasoned and Rookie Analysts

	(1)	(2)
	SEASONED.FCST	ROOKIE.FCST
DISCLOSE x TREAT	-0.6260 (-2.00)**	-0.1351 (-0.97)
Bank-Quarter Controls	Yes	Yes
Year-Quarter FE	Yes	Yes
Bank FE	Yes	Yes
Observations	6,772	6,772
R-squared	0.9148	0.3779

ANALYST FORECAST ERROR AND DISPERSION

Table 5: Analyst Forecast Error and Dispersion

	(1)	(2)
	EPS.FE	EPS.DISPERSION
DISCLOSE x TREAT	-0.0047 (-1.56)	-0.0051 (-2.68)***
Bank-Quarter Controls	Yes	Yes
Year-Quarter FE	Yes	Yes
Bank FE	Yes	Yes
Observations	5,849	5,942
R-squared	0.5934	0.6417

ANALYSTS PRODUCE LESS IDIOSYNCRATIC INFORMATION

Table 6: Private Information Production

	(1)	(2)
	EPS_PRIV_INFO1	EPS_PRIV_INFO2
DISCLOSE x TREAT	-0.0033 (-2.66)***	-0.0193 (-1.69)*
Bank-Quarter Controls	Yes	Yes
Year-Quarter FE	Yes	Yes
Bank FE	Yes	Yes
Observations	5,849	4,357
R-squared	0.3604	0.5153

Thus far, the evidence has suggested that analysts produce less private information

- Fewer analysts make forecasts
- Forecasts contain less idiosyncratic information

But, perhaps the information produced is of a higher quality

- Forecasts are less dispersed but no more accurate

How does this translate to price informativeness?

TRANSLATION TO PRICE INFORMATIVENESS IS AN EMPIRICAL QUESTION

What does price synchronicity measure?

- Extent to which a firm's returns are explained by the overall market and its industry: Higher synchronicity indicates that firm returns are less driven by firm-specific information

Will stress test disclosures increase or decrease the amount of idiosyncratic information in returns?

- Model presented in Goldstein and Yang (2019) suggests that the effect of disclosure on price informativeness depends on the type of information disclosed:
 - If information disclosed is along a dimension the regulator already knows (wishes to learn), traders will produce more (less) along a dimension the regulator wishes to learn

Ultimately, the effect DFAST disclosures have on price informativeness is an empirical question...

PRICES ARE LESS INFORMATIVE

Table 7: Market Synchronicity

	(1) IDIOSYN
DISCLOSE x TREAT	-0.276 (-4.013)***
Equity Controls	Yes
Bank-Quarter Controls	Yes
Year-Quarter FE	Yes
Bank FE	Yes
Observations	6,736
R-squared	0.7232

- Interpreting the Decline in Price Informativeness
- Characteristics of Analysts Leaving
- Other Market Participants
- Matched Sample Analysis
- Comparison to Fed DFAST Banks

A potential alternative explanation for decline in idiosyncratic information in price:

- Stress tests fully reveal the riskiness of a bank's assets such that returns become solely a function of market and industry information

Under this alternative interpretation:

- Betas rise (fall) for banks revealed to have riskier (safer) net assets
- Betas become constant after stress tests disclosure

INTERPRETING THE DECLINE IN PRICE INFORMATIVENESS

Table 8: Bank-Level Beta Analysis

Panel A: Treated Bank Sample

	(1)	(2)
	2011-2017	2014-2015
	β	β
DISCLOSE x Positive CAR	0.0068 (0.20)	0.0044 (0.13)
DISCLOSE	0.1684 (1.28)	0.0063 (0.05)
Controls	Yes	Yes
Bank FE	Yes	Yes
Observations	1,098	354
R-squared	0.7228	0.6308

INTERPRETING THE DECLINE IN PRICE INFORMATIVENESS

Table 8: Bank-Level Beta Analysis

Panel B: Treated and Control Comparisons

	(1)	(2)
	2011-2017	2011-2017
	β	$\sigma(\beta)$
DISCLOSE \times TREAT	0.2191 (3.41)***	0.1709 (1.95)*
Controls	Yes	Yes
Bank FE	Yes	Yes
Year-Quarter FE	Yes	Yes
Observations	6,054	6,054
R-squared	0.6564	0.6344

CHARACTERISTICS OF DEPARTING ANALYSTS

Table 9: Analyst Characteristics

(1) Bank Asset Size	(2) Total Analysts in 2014	(3) Number of 2014 Analysts Staying	(4) Number of 2014 Analysts Dropping	(5) Mean of Analysts Staying	(6) Mean of Analysts Dropping	(7) Difference	(8) test statistic	(9) two-tailed p-value
Panel A: Analyst Experience (years)								
< \$10 billion	678	417	261	11.7687	10.6420	1.1267	2.2351	0.0257
\$10 - \$50 billion	496	299	197	10.6385	12.1472	-1.5087	-2.5076	0.0125
Panel B: Forecast Accuracy								
< \$10 billion	666	411	255	0.0025	0.0025	0.0000	0.0806	0.9358
\$10 - \$50 billion	478	292	186	0.0015	0.0016	0.0001	-0.5984	0.5499

Table 10: Other Market Participants

	(1)	(2)
	GPIN	OWR
DISCLOSE \times TREAT	-0.0177 (-0.61)	-0.0057 (-0.10)
Bank-Quarter Controls	Yes	Yes
Year-Quarter FE	Yes	Yes
Bank FE	Yes	Yes
Observations	543	543
R-squared	0.5881	0.4781

GPIN and OWR measures gathered from Edwin Hu's website:
<https://edwinhu.github.io/pin/>

MATCHED SAMPLE ANALYSIS

Table 11: Matched Sample Robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	EPS_ANALYSTS	EPS_FCSTNUM	SEASONED_FCST	ROOKIE_FCST	EPS_FE	EPS_DISPERSION	EPS_PRIV_INFO1	EPS_PRIV_INFO2	IDIOSYN
DISCLOSE x TREAT	-0.9083 (-2.34)**	-0.8506 (-2.26)**	-0.7294 (-2.34)**	-0.1199 (-0.84)	-0.0039 (-1.36)	-0.0040 (-2.13)**	-0.0027 (-2.20)**	-0.0181 (-1.70)*	-0.2487 (-4.05)***
Bank-Quarter Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,359	5,359	5,359	5,359	4,791	4,838	4,791	3,611	5,331
R-squared	0.9345	0.9392	0.9178	0.3888	0.6062	0.6406	0.3648	0.5169	0.7279

- Using coarsened exact matching, treatment firms are matched to control firms on terciles of capital, net charge-offs, and market-to-book ratio.
- Unmatched: 1,408 control observations, 5 treatment observations.

COMPARISON TO FED DFAST BANKS

Table 12: Large Banks as the Control Group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	EPS_ANALYSTS	EPS_FCSTNUM	SEASONED_FCST	ROOKIE_FCST	EPS_FE	EPS_DISPERSION	EPS_PRIV_INFO1	EPS_PRIV_INFO2	IDIOSYN
DISCLOSE x TREAT	-0.5824 (-0.81)	-0.2590 (-0.36)	-0.3044 (-0.43)	0.0631 (0.59)	0.0002 (0.79)	-0.0004 (-1.29)	-0.0003 (-0.15)	-0.0030 (-1.82)*	-0.1735 (-2.51)**
Bank-Quarter Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,492	1,492	1,492	1,492	1,484	1,484	1,484	1,279	1,487
R-squared	0.9551	0.9589	0.9513	0.1842	0.2898	0.4238	0.4907	0.1722	0.6669

We contribute to a large literature examining the impact of increased disclosure

- We test more recent theory models examining the consequences of regulatory disclosures

We find that the disclosure of bank-run stress tests are associated with:

- 1 New information being conveyed to the market
- 2 Decrease in private information production
- 3 Decrease in price informativeness

Our findings have implications for policy-makers regarding the impact stress test disclosures have on financial stability

Thank You!!

