#### Extreme stress and investor behavior: Evidence from a natural experiment

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#### **1. Introduction**

Traumatic experience such as exposure to intense violence can induce tremendous stress. Scientific studies show that extreme and prolonged stress can adversely affect cognitive skills through damage to the hippocampus (a brain area involved in learning and memory) and loss of brain neurons. Identifying the effect of such extreme form of stress on financial decision making, however, is a challenging task. First, poor financial conditions can lead to stress-related health issues, giving rise to reverse causality concerns. Second, stress from market-wide shocks affects all agents simultaneously and is confounded with many factors such as changes in investor wealth. To address these issues, we use the 2008 Mumbai terrorist attacks as a distinctive natural experiment to capture shock to investor stress. Commonly referred to as "India's 9/11", the attacks lasted for more than three days, the longest ever carried out by a terrorist group. Terrorists used lethal weapons to kill random civilians, held and tortured the hostages, and induced extreme and prolonged stress among Mumbai residents, including symptoms of posttraumatic stress disorder (PTSD). Moreover, extensive real-time media coverage of this war-like massacre exacerbated and widely spread fear throughout Mumbai. Therefore, Mumbai attacks provide a unique laboratory to examine how extreme and prolonged stress affects financial decision making in the stock market.

## 2. Our study

We obtain a proprietary dataset that contains all investor-day-stock level trading records on the National Stock Exchange (NSE) of India, as well as information on investor location. We use the difference-in-differences (DID) methodology around the attacks to compare changes in trading behavior for Mumbai investors (treatment group) that were more exposed to the attacks

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with those of non-Mumbai investors (control group). We include day fixed effects to control for the effect of asset fundamentals (e.g., market return, risk, and liquidity) that can simultaneously affect investors' trading behavior.

We find that after the attacks, individual investors based in Mumbai exhibit significantly less trading activity compared with the controls, and the changes are economically significant. Daily trading volume for an average individual investor from Mumbai after the attacks decreased by 8% of the sample average. Motivated by prior literature that relates cognitive factors to trade performance, we also find that despite trading less, Mumbai traders on average suffer from a decline of 0.539% in abnormal trade performance post attacks compared with the controls. Moreover, Mumbai traders located closer to the site of attacks suffer from worse performance while more distant traders are unaffected. We further find that Mumbai investors are less likely to initiate trading on new stocks that would require more cognitive ability for information processing, perform worse on familiar stocks (i.e., those in which they invested prior to the attacks), and exhibit a longer response time, as measured by the elapsed time between corporate news announcements and trade placements. When we examine two "placebo" samples of institutional and algorithmic traders, we do not find significant change in trading activity and performance for the treated groups in both these samples. Together, this evidence suggests that deterioration in cognitive ability of Mumbai investors explains the lower trading activity and poor performance after the attacks.

We further explore both time-series and cross-sectional variations in exposure to stress. We separate the traders based on their distance to Mumbai, and find the treatment effects of trading activity and performance decline monotonically with the distance. Economic magnitude of the treatment effects is the greatest for investors located within 30 kilometers, and eventually becomes insignificant for those over 400 kilometers away. Moreover, prior scientific findings suggest that stress level has to be significant and prolonged to cause damage to human cognition. We find insignificant changes in investor trading activity and performance around less severe attacks in India during our sample period, such as the 2005 Delhi bombings, 2006 Mumbai train bombing, 2008 Assam bombings, and 2010 Jnaneswari Express train derailment, suggesting that the stress exposures are not significantly large to induce cognitive impairment for individuals exposed to these events.

Next, we examine two alternative channels that can affect investor trading behavior. First, prior studies find traumatic experiences can change individuals' risk preferences. Our data is limited in that we do not observe investors' entire portfolio investments that may also include bonds, savings accounts, and cash holdings. Therefore, we can only examine if risk preference explains the stock trading behavior, but cannot draw a definitive conclusion about whether investors overall become more or less risk-averse. Considering only stock trades, greater risk aversion predicts less purchase and more sale as investors are less willing to take financial risks, and vice versa. However, we find that both purchase and sale activities decline after the attacks for Mumbai investors compared with the controls. In addition, we find that Mumbai investors do not change their propensity to trade (both buy and sell) risky stocks after the attacks. Second, Mumbai investors may pay more attention to the attacks and less attention to the stock market. Given that attention is clearly a part of human cognitive ability, it is neither necessary nor possible to fully separate out attention from other aspects of cognitive skills. In fact, any stress-induced inattention is consistent with cognitive impairment. However, it is still important to investigate whether our results are completely unrelated to stress and *only* due to inattention. We exploit investor-, stock-, and time-level variations in attention, and document three findings suggesting that attention is perhaps not the only cognitive factor driving the changes in investor behavior around the 2008 Mumbai attacks: i) Conditional on investors trading and thus paying attention to stocks due to large financial stake (average volume of \$2,849 per trader per day), Mumbai investors still perform worse, trade less on new stocks, perform worse on familiar stocks, and take longer time to respond to corporate news; ii) Using stock ticker search activity to measure attention on stocks, we do not find investor attention from Maharashtra (of which Mumbai is the capital city) is different from the aggregate attention across India; and iii) Between the event date and the third trading day afterwards, there was an immediate spike in the attention on the attacks (based on Google Trend keyword search), followed by a sharp reversal once the attacks were over. However, dynamic treatment effect estimates show that Mumbai investors' trading activity did not change significantly until the fourth trading day after the attacks.

The delayed reaction of investor trading resonates well with the General Adaptation Syndrome theory of Hans Selye, and prior scientific evidence showing that chronic, but not acute, stress impairs cognitive abilities. The General Adaptation Syndrome theory posits that there are three stages of reaction to stress: alarm reaction, resistance, and exhaustion. Facing stress, the human body first releases stress hormones and generate fight and flight responses. The body then tries to adapt to stress and restore to the normal state. Finally, significant and prolonged stress makes the restoration unsuccessful, as it drains the adaptive reserves, leads to exhaustion, and adversely affects performance.

Finally, we explore other channels that can affect investor trading behavior, such as asset fundamentals, local bias, pseudo market timing, wealth effect, commuting issues, and financial crisis. Our collective evidence is inconsistent with these alternative explanations. First, the 2008 Mumbai attacks did not cause large scale economy-wide damages to asset fundamentals. For example, excluding the Taj Mahal hotel, the property loss was estimated to be approximately \$8.7 million. In addition, in all our analyses we control for day fixed effects that absorb any change in aggregate market conditions such as market return, risk, liquidity, and interest rates. Moreover, emotionless "rational" agents should trade in a similar fashion based on shocks to fundamental values of stocks, instead of trading differently based on their proximity from the site of attacks. Second, Mumbai investors may trade differently (i.e., strategically) if they have better information on their local stocks. For example, Mumbai investors may profit from potential overreaction of other investors in Mumbai stocks due to the attacks. In this case, Mumbai investors should perform better, which is not supported by our finding of worse performance. We also observe no difference in stock returns between Mumbai stocks and non-Mumbai stocks after the attacks, and Mumbai traders do not change their propensity to trade Mumbai stocks after the attacks. Third, Mumbai investors may have poor performance by chance due to pseudo market timing, i.e., they buy (sell) less prior to a period of good (bad) stock returns. Since our measure of abnormal performance already adjusts for the benchmark returns, it explicitly controls for any pseudo timing effect. We also find that Mumbai investors' buy and sell volume decline in similar magnitude, which further weakens the possibility of less net purchase under good market conditions, or vice versa. Fourth, investors may suffer from losses in property values, rental fees, or business income from a decline in tourism activities, i.e., a local wealth effect. However, as discussed earlier, property losses in the 2008 Mumbai attacks were not severe and nowhere comparable to the 9/11 in the U.S. In addition, if there were significant expected losses from business revenue and property damages within the city of Mumbai, we should also see the Mumbai-based publicly listed firms to be adversely affected. We do not find any difference in stock returns for Mumbai firms after the attacks compared with the controls. Fifth, investors may have trouble commuting via public

transportation after the attacks and have less time to pay attention to stocks. However, anecdotal evidence suggests that the public transportation system was not much affected by the attacks. In addition, if commuting is a problem, we should observe the greatest decline in trading activity during the first few days after the attacks, while our results of delayed investor reaction suggest otherwise. Moreover, our conditional trading activity measures are conditional on investors allocating time and attention to the stocks, despite any commuting issues. Lastly, institutions should be more affected by commuting issues since their employees should have a greater need to commute to their trading desks and utilize their proprietary resources to trade, while we find institutions are not affected. Sixth, our test of the parallel trend assumption shows that the pre-event trading behavior between Mumbai and non-Mumbai investors is similar in our sample period, suggesting that our results are not due to different reactions to the global financial crisis between the treatment and controls. To further control for differences between Mumbai and non-Mumbai investors, we adopt a matched sample approach and continue to observe that Mumbai individuals trade less and perform worse after the attacks.

#### **5.** Conclusion

In this study, we use a unique dataset and a major terror attack to tackle the challenging question of how stress affects financial decision making. Our setting has several advantages. First, the exogenous nature of major attack in Mumbai in 2008 identifies a causal effect of extreme and prolonged stress on decision-making. Second, our difference-in-differences methodology reveals the change in behavior for treated versus controls, thus helps isolate any confounding effects that affect all individuals simultaneously. Third, compared with lab or field experiments that typically have small sample sizes, our test involves millions of individuals and helps present large-scale evidence. Finally, trading involves significant financial stakes, which provide strong incentives for individuals to utilize their cognitive skills.

Using records from millions of trading accounts, we document several novel findings. First, individual investors located closer to the attack site trade less and perform worse after the attacks compared with those located further away. Second, potential alternative channels such as change in asset fundamentals, risk preference, attention effect, and local bias cannot explain our findings collectively. Instead, our overall results show that the driving force behind less trading by and poor trading performance of the individual investors is likely to be on account of the cognitive

impairment due to exposure to extreme and prolonged stress. Lastly, we find that institutional and algorithmic trading activities are not affected.

Our findings have implications for pricing efficiency and liquidity in financial markets. Cognitive impairment can hinder information production and cause asset values to deviate from fundamentals, therefore amplifying asset volatility. Also, reduction in stock market participation, another consequence of cognitive impairment, could exacerbate liquidity dry-ups during market downturns.

## Private Placements and Wealth Constraints of Owner-Managers

## (White Paper, NSE-NYU Conference 2018)

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## **Background Motivation for Study of Private Placements in India**

The market for private placements through preferential allotment of equity to promoters (owner-managers) has grown significantly over the last few decades, especially in India. An important implication is that owner-managers in Indian companies become a critical source of financing in the Indian economy. Understanding the role they play and how they stack up with other sources of financing for companies is, therefore, critical to understanding the growth of the private sector of the Indian economy.

## Key Concerns Regarding Private Placements in India

Firms can issue new shares by allotting them preferentially to a selected group of investors that include existing promoters.<sup>1</sup> Since the corporate governance context in India differs significantly from that in developed countries, this practice merits special attention. Many Indian businesses are family-controlled and there is a significant overlap between a firm's management and its owners. Consequently, preferential allotments are frequently made to these owner-managers; thus, they are initiated by owners and subscribed to by them also, a situation that is rife with conflicts of interest. For instance, owner-managers can issue equity shares to themselves during times of market undervaluation, or much worse, deliberately manipulate their share prices downward in order to issue shares to themselves at low prices.

Despite the possibility of managerial self-dealing, the Indian regulator (SEBI) has largely encouraged the growth of the preferential allotment market, mainly because business families are important sources of new capital. Other than placing a restriction on the permissible issue price in a preferential allotment, there is generally no regulation prohibiting preferential allotments to owner-managers. While this approach may seem expedient in a market short of capital, is it well thought out? Do we know under what conditions would promoters choose to issue equity to themselves? Wouldn't the market recognize the inherent conflicts of interest and react accordingly upon announcement of such issuances? We use a simple model to examine these questions and test it empirically using preferential allotment issuances between 2001 and 2018 by Indian firms.

## **Model Features**

Information asymmetry plays an important role in the investment decisions of firms. If outside investors do not share the same positive information about future projects as owner-managers, they may be reluctant to invest in the firm unless owner-managers dilute more in their favour. This may result in owner-managers walking away from such projects even when the projects themselves yield positive net present value (NPV). Myers and Majluf (1984) point out the severity of this underinvestment problem in the U.S. context. We present a simple model that shows that such underinvestment can be mitigated if owner-managers are allowed by regulators to bring in capital to invest in these projects.

Our model is built around two key features: (i) information asymmetry between outsiders and owner-managers regarding the hidden value in a firm and (ii) wealth constraints faced by owner-managers. Our model shows that the optimal investment-financing decision of firms depends on the interaction between information asymmetry and wealth constraints faced by owner-managers, *after accounting for regulatory constraints imposed on the issue price in a preferential allotment*.

<sup>&</sup>lt;sup>1</sup> In general, such allotments can also be made to institutional players, banks and other financial institutions.

Our main results are as follows: Owner-managers employ preferential allotments when their private information is high (i.e., it exceeds a threshold level), otherwise they issue equity to outsiders. The possibility of preferential allotments allows good projects to be undertaken and is, therefore, socially desirable. This result is however altered when owner-managers are wealth-constrained. In such a situation, owner-managers *could* underinvest even when their private information is highly favourable. In other words, they deviate from their normal strategy (when wealth-unconstrained) of always employing preferential allotments whenever their private information exceeds a threshold level.

#### **Issue Price Regulation in a Preferential Allotment**

Keeping in mind the conflicts that preferential allotments pose, SEBI has imposed constraints on the issue price in the Indian context. Our model explicitly incorporates this feature in order to develop testable empirical implications.

SEBI regulations say that: "The issue of shares on a preferential basis (equity shares/ fully convertible debentures/ partly convertible debentures) can be made at a price not less than the higher of the following: (a) The average of the weekly high and low of the closing prices (a volume weighted average price) of the related shares quoted on the stock exchange during the six-month period preceding the relevant date; or (b) The average of the weekly high and low of the closing price of the related shares quoted on a stock exchange during the two week period preceding the relevant date." The relevant date for this purpose is the date 30 days prior to the date on which the Extra Ordinary General Meeting (EGM) of shareholders is held to seek their approval for the preferential allotment.

We illustrate the SEBI pricing rule in Figure 1 below. For the purposes of illustration, the price histories of two firms, Reliance Infra and HEG, have been displayed on the graph. For Reliance Infra, prices had been increasing (*High Price Path*). Thus, the average price in the two-week period prior to the relevant date is greater than the average price in the six-month period prior to the relevant date. Since SEBI rules force the firm to issue new equity at a price greater than (or equal to) the higher of these two prices, the issue price is determined by the average price in the two-week period prior to the relevant date. Exactly the converse situation arises for HEG, whose prices had been generally declining (*Low Price Path*). In general, if prices are declining, the (lower bound on the) issue price is determined by the historical six-month average price, and if prices are increasing, the (lower bound on the) issue price.

This arrangement ostensibly protects minority shareholders from managerial self-dealing (by manipulating the share price just prior to the preferential issue). Since declining price trends could arise due to manipulation, SEBI imposes the constraint that the issue price should be equal to the historical six-month average (under declining price trends). The logic behind this regulatory constraint is that it would be difficult for anyone to manipulate prices continuously over a six-month window. This feature of the SEBI regulations allows the market to preserve the potential social benefits of preferential allotments without causing an adverse effect on the minority shareholders' welfare.

This figure is an example of the preferential allotments of two firms, namely Reliance Infra Limited and HEG Limited. The figure has number of trading days before the relevant date (date 0) on the x-axis and the corresponding daily prices for those days on the y-axis. As per SEBI regulations, the issue price should be the *higher* of either the two-week average of the weekly High-Low prices or the six-month average of the weekly High-Low prices prior to the relevant date. The relevant date is itself 30 days (or 22 trading days) prior to the date of the Extraordinary General Meeting of shareholders held to approve the issue. Hence, for Reliance Infra, the SEBI-mandated issue price is the two-week average weekly High-Low price, whereas, for HEG, the SEBI-mandated issue price is the six-month average weekly High-Low price.



Figure 1: SEBI regulations on the issue price in a preferential allotment

## **Testable Empirical Implications**

The model implies that preferential allotments would be greeted favourably by the market because the inference is that the owner-managers must be holding favourable private information. The empirical implication is that announcement period reaction of preferential allotments should be positive. More importantly, the model suggests the following empirical implications on the cross-sectional variation in announcement period reactions.

P1. The announcement period price reaction to preferential allotments should be positive.

P2. The announcement price reaction of pure *institutional* investor preferential allotments should be lower than that of pure *owner-manager* preferential allotments (to proxy for wealth constraints).

P3. The announcement period reaction to preferential allotments should be (a) negatively related to the market capitalization of the firm, (b) positively related to volatility of returns (if it proxies for information asymmetry), (c) negatively related to the volatility of returns (if it proxies for the uncertainty in the private information of owner-managers of the firm), and (d) unrelated to the owner-managers' pre-announcement shareholdings.

P4. The difference in announcement period reaction to preferential allotments under a high price path and a low price path should be greater for pure institutional investor preferential allotments than for pure owner-manager preferential allotments (to proxy for the strength of information. A preferential allotment subsequent to a price rise indicates that the owner-manager's private information must favourable enough to cover the additional costs imposed by the higher issue price.)

Taken together, the implications of the model are referred to as the <u>Undervaluation Hypothesis</u> (because the preferential allotment reveals undervaluation implicit in prior price due to information asymmetry).

## The Competing Hypotheses

The positive announcement effect of preferential allotments can also be explained by other motivations suggested in prior literature.

- *Certification Hypothesis*: Private placements to institutional investors acts a credible certification signal for the quality of the firm (Hertzel and Smith (1993));
- *Monitoring Hypothesis*: Private placements are used to attract active shareholders who provide monitoring benefits (Wruck (1989));
- *Managerial Entrenchment Hypothesis*: Private placements are used to bring in passive shareholders enabling greater control by owner-managers (Wu (2004) and Barclay et al. (2007));
- *Managerial Self-Dealing Hypothesis*: Private placements to owner-managers are made at significant discounts, which is a variation of Managerial Entrenchment Hypothesis (Wu (2004), Baek et al. (2006) and Barclay et al. (2007));
- *Manipulation Hypothesis*: Owner-managers have incentives to manipulate stock prices downward before preferential allotments which explains the positive stock market reaction upon announcement of such allotments;
- Business Group Hypothesis: Business groups are known for tunnelling resources (Bertrand and Mullianathan, 2002). This reasoning implies that there should be

negative lower announcement effects for business group firms in comparison to standalone firms.

## **Empirical Analysis**

Some of the above predictions (P1-P4) can also arise from competing hypotheses while other predictions are unique to our model; thus, a comprehensive empirical analysis would help us distinguish between competing explanations. For instance, Prediction P1 states that the announcement period returns in preferential allotments to owner-managers should be positive. The Certification Hypothesis and the Monitoring Hypothesis also suggest the same prediction. However, exactly the converse of Prediction P1 is implied by the Entrenchment Hypothesis, which suggests that preferential allotments should be associated with negative announcement period returns because of managerial self-dealing.

Prediction P2 states that pure institutional investor preferential allotments (which reflects severe wealth constraints) should have a lower announcement period reaction as compared to pure owner-manager preferential allotments because of the potential underinvestment problem. This prediction differs from the implication of the Monitoring Hypothesis, which argues that since institutional players are active shareholders, the announcement period reaction should be higher. Similarly, the Certification Hypothesis argues that private equity players often possess superior information about the prospects of a firm and their participation is a signal of value. Thus, the Certification Hypothesis also argues that the announcement period reaction of preferential allotments to institutional investors should be higher, contrary to P2. The Entrenchment Hypothesis would also argue that owner-managers expropriate shareholder wealth and therefore preferential allotments to institutional (outsiders) should have higher announcement period returns. These hypotheses have opposite predictions to that of the Undervaluation Hypothesis.

The Competing Hypotheses have no predictions regarding market-cap (P3a). The Undervaluation Hypothesis states that announcement period returns could be negatively related to volatility (Prediction P3c). This hypothesis is also implied by the Certification Hypothesis and the Monitoring Hypothesis. As information asymmetry (volatility is a proxy) increases, certification and monitoring costs increase, thereby implying an adverse impact on announcement period returns. The Entrenchment Hypothesis has no predictions for the relation between announcement period returns and volatility.

Prediction P3d states that announcement period reaction should be unrelated to owner-manager shareholdings. On the other hand, the Certification Hypothesis and the Monitoring Hypothesis suggest that announcement period returns should be positively related to owner-manager shareholdings because the owner has more skin in the game. The Entrenchment Hypothesis suggests that greater insider ownership is associated with greater managerial self-dealing and announcement period reaction should therefore be decreasing in insider ownership.

Prediction P3a and P4 are unique to the Undervaluation Hypothesis. The competing hypotheses have implications related to the remaining hypothesis (in some cases in same direction as the Undervaluation Hypotheses and in other cases the opposite). More precisely, (i) Predictions P1 - P4 can be classified under the Undervaluation Hypothesis , (ii) Predictions P2, P3c, and the converse of Prediction P3d can be classified under the Certification Hypothesis, (iii) the converse of Prediction P2, Prediction P3c, and the converse of Prediction P3d can be classified under the Monitoring Hypotheses, and (iv) the converse of Prediction P1 and converse of P1

Prediction P3c can be classified under the Entrenchment Hypotheses. Given the overlapping nature of these hypotheses, a comprehensive analysis of the Undervaluation Analysis and the competing hypotheses is required to help us understand the relative validity of alternative hypotheses in explaining preferential allotments.

## **Multivariate Regression Analysis**

We test the validity of the Undervaluation Hypotheses and the Competing Hypothesis by conducting an empirical analysis of 1,064 preferential allotments issued in the Indian capital markets during 2001-2018. Table 1 shows the relation between announcement period returns (Cumulative Abnormal Returns, CAR), over different windows and relevant variables of interest.

There is a significant positive coefficient on the owner-manager issuance dummy term in all the regressions, except in the case of the 21-day window in which the coefficient is of the same sign but of weaker statistical significance. This result confirms that pure owner-manager preferential allotments have a higher announcement returns than institutional based preferential allotments, consistent with Prediction P2 of the Undervaluation Hypothesis.

The overall sample announcement period return effect could be computed as the sum of the intercept term and the coefficients on the owner-manager issuance dummy and the institution issue dummy. The 21-day window regression results suggest that the overall announcement return effect is positive, confirming Prediction P1.

The coefficient on owner-issuance dummy is positive (confirming P2). The coefficient on Log Market Capitalization is positive (confirming P3a). The coefficient on Annualized Volatility is negative (confirming P3c). Prediction P3d is also confirmed in that they coefficient on owner-manager's equity holding (prior to the preferential allotment) is statistically insignificant.

The coefficient on the price path dummy is significantly positive, but this effect could be an artifact of momentum. The coefficient on the interaction term between price path dummy and owner-manager issuance dummy is negative in all the four regressions, but statistically significant only in the 1-day and 5-day window regressions. The negative sign is consistent with Prediction P4.

Dependent Variable	CAR	CAR	CAR	CAR
	[-1,+1]	-5,+5	[-10,+10]	[-21,+21]
[et anot	0.07.6167	0.001001	0.0007	0.000130
interrarps.	(1.4)	(0.07)	(0.55)	(1.94)
	64	·····	()	A
Firm Characteristics				
Age (in years)	-0.00015	0.000105	0.000304	0.000698
Log Market Capitalization	-0.00008***	(0.29) -0.0144**	(0.69) -0.02522***	-0.0408***
EEITDA (%)	(-2.71) 0.000273** (2.36)	(-2.37) 0.00059** (2.61)	(-3.21) 0.000719** (2.14)	(-1.55) 0.001/294*** (2.87)
Debt-Equity (Multiple)	-0.00066	-0.00056	-0.0018	-0.00199
Annualized volatility (%)	-0.02528	-0.0657**	-0.12548**	-0.29632***
Prior Pariod CARs (-252, -30)	(-1.09) 0.002314	(-2.09) 0.080611***	(-2.15) 0.202674***	(-3.34) 0.481738***
Owner-Manager's Equity (%)	(0.2) 0.000221	(3.82) 0.000338 (0.070)	(7.21) 0.00069 (1.41)	(11.75) 0.000688 (1.73)
Institutional Equity (%)	-0.00011	0.000117	0.002019**	0.007252**
Owner-Manager's Pledging of Equity $(\Re_{\rm r}$ )	(-0.27) 0.000422** (2.51)	-1.5E-05 (-0.05)	(2.15) 0.000194 (0.54)	(2.87) 0.000747 (1.51)
Group Affiliation Dummy	0.012744**	0.023046*	0.017887	0.029211
Allotment Size as % of Total Equity	-0.00012	-0.00025	-0.00024	-0.00041
Qualified Institutional Placement Dummy	(-1.13) -0.00504 (0.015)	(-1.27) 0.009973	(-0.9) 0.016701	(-0.89) -0.02094 (-0.70)
Owner-Manager Issuance Durrray	0.027985**	0.083571***	0.080916**	0.097461**
Institution Issuance Dummy	0.009268	0.054001"	0.050711	0.056302
Price Path Durnny (=1 if high price path)	(0.75) 0.007929	(1.68) 0.083031*	(1.37) 0.103625	(1.22) 0.052021
Price Path Durnny* Owner-Manager Issuance Durnny	(0.3) -0.02642*	(1.76) -0.06093**	(1.56) -0.04T36	(0.53) -0.02939
Price Path Durnny* Institutional Issuance Durnny	(-1.72) -0.01871 -0.1 97)	(-2.2) -0.05198 (-1.49)	(-1.23) -0.02876 (-0.69)	(-0.57) -0.02267 (-0.43)
Price Path Durnny* Log Market Capitalization	0.004735	0.002117	0.003526	0.007034
Owner Manager Issuance Dunrny*Pledging % by Owner-Managers	-0.00045**	-0.00037	-1.7E-05	-01000023
Annualized Garman-Klass Volatility	(-2.03) -0.08381 (1.03)	(-0.89) 0.018504 (0.10)	(-0.03) 0.084202 (0.05)	(-0.96) 0.082989
Amihud Illiquidity Ratio over provious month	0.000183 (0.76)	0.000396 (0.65)	0.000329 (0.54)	0.000673 (0.8)
Varianos Ratio	0.000181	0.00065#**	0.000934	0.000672
Prior Partial CAVs (-252, -30)	(1.57) 1.60E406 (0.7%)	(2.11) 2.18E-06 (0.22)	(2) -6.87É-06 (-1.02)	-1.6E-05*** (.7.7)
Year Dummies	YES	YES	YES	YES
R-square Number of Observation	0.08 813	0.15 813	0.23 813	0.37

# Table 1: Cross-sectional Variation in Cumulative Abnormal Return over Different Windows

All coefficients are in units of 10<sup>-2</sup>. T-statistics are in parentheses.

This table presents regression estimates for determinants of CARs (cumulative abnormal returns) using proxies for price manipulation in addition to all control variables used in Table 5. Amihud illiquidity measure is computed as the average ratio of return over value traded over the previous month. Variance ratio represents the ratio of monthly volatility over scaled daily volatility (daily volatility x square root of 21). Prior period CAVs (cumulative abnormal volume) represent CAVs over a 220 day window prior to the issuance date (252 days prior to 30 days prior). CAVs are computed similar to CARs using a market model with daily value traded of the stock and of the market (value traded in the entire Bombay Stock Exchange as reported in the exchange website). Results are reported for each of the CARs separately. All coefficients are in units of  $10^{-2}$  except prior period CAV which is in units of  $10^{-4}$ . T-statistics are in parentheses. \* , \* \* and \* \* \* represent significance with 90% , 95% and 99% confidence respectively.

Overall, we find that announcement period returns for preferential allotments are (1) positive, (2) higher for pure owner-manager preferential allotments, (3) negatively related to market capitalization, (4) negatively related to volatility, (5) unrelated to pre-announcement insider ownership and (6) dependent on regulatory constraints that determine the issue price. Our findings are robust to the effects of manipulation of pre-placement stock prices, which would depress the placement price to the advantage of owner-managers but to the detriment of other shareholders.

The strong positive coefficient on EBITDA, which has been included as control variable is along expected lines. The magnitude of hidden value is likely to be correlated with EBITDA and the positive sign of the coefficient indicates that the market factors this information in the announcement period reaction. Finally, our results are robust to the role of manipulation in explaining positive announcement period returns.

To evaluate the relative importance of the Undervaluation Hypothesis and the Competing Hypothesis, we compare the actual findings with their predicted findings. Table 2 presents the findings. In Panel A, we assess the validity of the Undervaluation Hypothesis, the Certification Hypothesis, the Monitoring Hypothesis and the Entrenchment Hypothesis by comparing the predictions of the hypotheses with the actual empirical findings. There are two columns under each hypothesis – a predictions column and a confirmation column whose entries show a  $\sqrt{}$  if the prediction is confirmed in the data, otherwise an X if the findings are inconsistent with the prediction. Overall, when we inspect the confirmation column, we can see that the Undervaluation Hypothesis fares quite well with maximum number of  $\sqrt{s}$ . The Certification Hypothesis and the Monitoring Hypothesis show mixed results with some predictions confirmed and others rejected. The Entrenchment Hypothesis can be rejected for this sample of data.

	Underva	aluation	Certifie	cation	Monit	oring	Entren	chment
Empirical Test	Hypothesis		Hypothesis		Hypothesis		Hypothesis	
	Pred.*	Conf.*	Pred.	Conf.	Pred.	Conf.	Pred.	Conf.
P1. Ann. Period Returns	+ve	$\checkmark$	+ve	$\checkmark$	+ve	$\checkmark$	-ve	Х
P2. Ann. Ret: $(\gamma = 0 \text{ vs. } \gamma = 1)^{**}$	lower	$\checkmark$	higher	Х	higher	Х	higher	Х
P3a. Ann. Period Ret vs. Mkt-cap	-ve	$\checkmark$						
P3b/3c. Ann. Period Ret vs.	+ve/-ve	$\sqrt{(-\mathrm{ve})}$	-ve	$\checkmark$	-ve	$\checkmark$		Х
Volatility								
P3d. Ann. Period Ret vs. Owner-	none	$\checkmark$	-ve	Х	-ve	Х	-ve	Х
ship								
P4. Ann. Period Ret vs. Price path	-ve	$\checkmark$						
interaction with owner-issuance								

Table 2:	Comparison	of the U	ndervaluation	Hypothesis	and the C	Competing	Hypothesis
I abit 2.	Comparison	of the Of	nuci varuation	inypounces	and the C	ompeting	ii y pounesis

## Contribution

Private placements to owner-managers are an attractive source of capital in emerging economies such as India but come with inherent conflicts of interest. Our work tries to unravel the key trade-offs using a simple model that extends the classic Myers and Majluf (1984) model based in a developed market's context. We show that underinvestment in good projects can be mitigated, if not eliminated, by issuing equity through private placements to owner managers. The model provides support for the Indian regulator's choice of allowing such preferential allotment to promoters subject to constraints on the issue price. Our empirical tests confirm that the market is indeed aware of such benefits as seen in the positive price effect upon announcement of such issuances.

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## How do Debt Markets React to Mandatory CSR? Evidence from the Indian Companies Act 2013

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## Introduction

Advocates of Corporate Social Responsibility (CSR) have long argued for a socially responsible strategy that includes broader participants such as employees, community, environment and lenders. While CSR diverts cash flows from bondholders and stockholders, the argument is that firms should view CSR as a value enhancing corporate strategy as CSR engenders benefits by way of increased goodwill that enhances productivity and firm performance. Whether CSR is value enhancing or is merely costly social externality, therefore, depends on the benefits relative to the costs. A rich literature has examined the net impact of CSR on stockholders. In this paper, we add to the empirical evidence by examining the impact of exogenously imposed CSR on the bond market.

We focus our analysis on the impact of CSR on the bond markets for multiple reasons. We expect bond markets to be more sensitive to the positive impact of CSR. Simple logic implies that spending on CSR activities reduces resources available to meet obligations to bond holders. However, this may be offset by a rise in cash flow due to the increased goodwill from the firm's involvement in the community. Any such positive impact will first affect the bond markets, debt being the first claimant on cash flows. It is also plausible that CSR impacts bondholders differently than it does stockholders. CSR may serve to reduce the volatility of future cash flows and reduce the probability of financial distress. Such a reduction in risk will result in a positive impact on bondholders but will have a negative impact on shareholders. Lastly our work adds to the literature on CSR by examining its impact in a setting when CSR is mandated. Examining the effect of CSR when it is externally imposed, resolves the endogeneity issue that clouds the interpretations of results on the impact of CSR.

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That CSR is an important issue can be judged by the emphasis on CSR by corporate leaders and the resources devoted on social investments. The PwC Global CEO Survey 2016 reveals that Ò64% of CEOs believe CSR is core to their business rather than being a stand-alone program. U.S. and European markets had over \$8.72 trillion and \$11.4 trillion in certified socially responsible assets in 2015 (Social Investment Forum, 2016). Researchers have previously studied the impact of CSR on the bond markets and have examined the impact of CSR on credit ratings and the cost of debt. They find that firms engaging in CSR activities see an increase in credit rating and their cost of debt decreases. Studies have also found that CSR firms have a lower cost of bank loans as compared to non-CSR firms. Several issues cloud the interpretation of these results as they primarily examine firms that voluntarily engage in CSR activities. Firms that engage in CSR activities voluntarily are those that expect to benefit from such activities or are profitable enough to have the resources for CSR spending.

To resolve the endogeniety issues in analyzing the impact of CSR on debt markets, we use a unique setting in India. The Indian government incorporated a clause mandating minimum amounts of CSR spending for profitable firms as part of the 2013 Company Act. Provisions in the 2013 Act (henceforth the CSR rule) imposed a *mandatory* requirement that firms meeting specific cutoffs with respect to Net Worth, Sales, and Net Profit spend at least 2% of their profit on CSE related activities. Discussions on the CSR provisions began in 2009 and clauses specific to requiring CSR by profitable firms, were passed by the Lok Sabha in 2012 and was included as Clause 135 of the 2013 Company Act. We therefore designate 2013 as the CSR YEAR, i.e. the year after which CSR was required for Indian firms. The CSR Rule specifies the following cut offs to identify firms subject to minimum CSR spending: the firm should have either (1) a net worth of Indian Rupees (INR) 5 billion (about U.S. \$83 million) or more; (2) sales of INR 10 billion (about U.S. \$167 million) or more; or (3) a net profit of INR 50 million (about U.S. \$0.83 million) or more. Firms meeting this criteria are required to spend 2% of their average net profit, calculated over a three year period, on CSR related activities.<sup>1</sup> The exogenously imposed CSR Rule presents a natural setting for examining the causal impact of CSR on bondholders.

<sup>&</sup>lt;sup>1</sup>Approved CSR activities comprises of: (i) eradicating extreme hunger and poverty; (ii) promotion of education; (iii) promoting gender equality and empowering women; (iv) reducing child mortality and improving maternal health; (v) combating HIV, AIDS, malaria and other diseases; (vi) ensuring environmental sustainability; (vii) employmentenhancing vocational skills; (viii) social business projects; (ix) contribution to the Prime Ministers National Relief Fund or any other fund set up by the Central Government or the state governments for socioeconomic development, and relief and funds for the welfare of the scheduled castes, the scheduled tribes, other backward classes, minorities and women; and (x) such other matters as may be prescribed.

#### Data and Empirical Design

We obtain data on bond issues by Indian firms in the eight year period from 2009 to 2017 from the SDC Platinum Fixed-Income Issues database. We ignore all preferred stock issues and bonds with contingent features such as step-up and convertible bonds. We augment the bond issue data with company data from CMIE's ProwessDx database. As there is no common identifier in between SDC and prowess database, we hand match the two datasets using the name of the firm. We are able to match data for 236 firms with 3,466 bond issues over the nine year period from 2009 to 2017.

We next apply the filters specified by the 2013 companies act to determine whether a firm is affected by the mandatory CSR rules. The dummy variable AFFECTED is set equal to one if a bond is issued by a firm that is affected by the CSR Rule and zero otherwise. Of the three criteria, profit and net worth are the primary determinants of whether a firm is subject to mandatory CSR spending. We find that there are 3,357 bonds issued by firms affected by the mandatory CSR Rule and 109 bonds issued by firms not affected by the rule. We use AFFECTED to isolate the effects of CSR on bond yield-spreads and implement two empirical specifications. First, we use a Regression Discontinuity Design to capture the differential effects of the CSR Rule on firms that just meet the CSR cutoff to those that just miss the CSR cutoff. Any CSR effects is likely to be the sharpest between these two sets of firms. Second, we use a Diff-in-Diff approach to examine the impact of the passage of the CSR rule in 2013. Our focus is on the interaction between the variable AFFECTED and the time dummy POSTCSR that is equal to one for bonds issued in the period 2013-2016 and zero for bonds issued in the period 2008-2012. In running our regression, we also control for industry fixed effects. A large percentage of bonds issued in India are by banks and industry fixed effects controls for unobservable characteristics across industries. We also control for bond characteristics, such as bond ratings and maturity, and for firm characteristics.

#### **Results and Discussion**

We find that the coefficient on the interaction term between AFFECTED and POSTCSR is positive and significant. Both the Regression Discontinuity Design and Diff-in-Diff approaches thus show that yields on bonds are 22 basis points higher in the POSTCSR period for firms affected by the CSR Rule. The CSR mandate results in an increases the cost of debt capital. We also find that the yield spreads on bonds issued by firms that just meet the criteria is higher than the yield spreads on bonds that just miss the CSR criteria. Our results, therefore, indicate the significant causal economic effect of mandated CSR

To explore and examine the robustness of our results further, we individually examine the impact of each of the three criteria used to determine whether a firm is subject to the CSR mandate. We find that bonds issued by firms that are subject to mandatory CSR spending based on the individual criteria also have higher spreads. Our tests on bonds issued by firms subject to the individual criteria rather than the collective criteria also address another important methodological issue. Diff-in-diff and RDD tests assume that the treatment effects, i.e. the the sample of treated firms subject to the CSR Rule and the sample of non-treated firms, are exogenous. Manager's ability to manage financial statements through accruals, gives rise to a concern that managers could easily evade the CSR requirements if they choose. This is less feasible in our setting. While manager's have discretion on reported income, it is less likely that manager's are able to simultaneously manipulate the total revenue of the firm, its net worth and its total profit. The treatment effect is therefore truly exogenous in our specification.

The negative impact of CSR that we find can arise for several reasons. Bond markets could perceive the CSR mandate to be in the nature of a tax imposed on the firm that reduces the cash flow available to the firm to service debt. in other words, mandatory CSR reduces the resources and flexibility that firms have in using their cash flows to meet debt obligations. Moreover, the mandate for CSR spending also includes an approved list of CSR activities so that CSR activity can be monitored. It is plausible that for some firms, the approved lists does not include activities that have a positive benefit for the firm. Approved CSR activities can therefore be such that they benefit society but with none of the associated benefits that proponents of CSR argue will accrue to the firm. An approved list of CSR activities may also have an unintended side effect in that the approved avenues for CSR could allow for private benefits to the insiders of the firm.<sup>2</sup> The mandatory nature of CSR could thus provide an avenue for insiders to extract private benefits, thereby exacerbating the moral hazard between managers and shareholders.

It is plausible that firms that are not subject to the CSR Rule voluntarily engage in CSR activity because CSR spending is optimal. Given the lack of data on CSR spending, we cannot

<sup>&</sup>lt;sup>2</sup>Reports in the popular press, e.g. The Economic Times on Oct 21, 2015; The Guardian on Apr 05, 2016; and The Wire on Dec 22, 2018; have alleged that some firms have misused the CSR funds for private and political gain through Trusts that are lightly supervised.

identify and exclude firms that voluntarily engage in CSR activity or examine them separately in our tests. This raises two issues. One, some firms in our treatment sample would have engaged in CSR voluntarily and as such should not experience the negative impact of reduced flexibility. That is, while CSR activity is mandated for treatment firms, the CSR activity matches what would have been optimal anyways. This effect biases against finding significant effects from the tests as designed. Our results are however significant in spite of such confounding issues. Two, the lower credit spreads for some of the bonds issued by firms in the untreated sample could be because of their voluntary CSR activities. Our basic point however continues to hold – requiring firms to engage in CSR increases bond yield spreads compared to the yield spreads on bonds issued by firms that are not required to engage in CSR activity.

#### Extensions

We extend our analysis of yield-spreads by examining the differential impact of the CSR Rule by analyzing carefully constructed subsamples based on shareholder ownership and corporate governance. In addition to comparing affected and unaffected firms, we also analyze the cross-section of affected firms in these tests. In our first set of extensions, we contrast bonds issued by firms that have concentrated shareholding, bonds issued by firms affiliated with business groups, and bonds issued by government owned firms. Promoter holdings in India represent the stake in the firm held by the original founder/promoter of the firm and is many firms have a higher fraction of shares held by the original founder. We find that concentrated holdings by promoters does not affect yield spreads for affected firms in the POSTCSR period. The promoters shareholding therefore does not contribute, or ameliorate, the adverse impact of CSR. We use a dummy variable BG, which is equal to one for firms with business group affiliations, to examine the impact of group affiliation. Bonds issued by firms that are affiliated to a business group have lower yields post CSR. Membership in business groups can result in best practices with respect to CSR and also allow the group firms to collaborate on an effective CSR strategy. Finally, we identify bonds issued by government owned firms. We find that yield spreads are higher in the POSTCSR period for government owned firms. Bonds issued by state owned firms and stand alone firms unaffiliated with a business group, are negatively affected by the mandatory CSR Rule. This is consistant with media reports and that corporate governance is a huge issue in government owned firms.  $^{3}$ 

In our second set of extensions, we contrast firms with good governance and poor governance. One measures of good governance is based on the level of board independence. Firms that have a larger fraction of their directors who are independent are considered to be better governed, with the fraction of independent directors on the board used as a measure of good governance. A second of good governance is based on whether the firm is audited by affiliates of leading multinational auditing firms. Affiliates of large multinational accounting firms have reputational concerns that ensures high quality audits of their clients. Having an affiliate of a multinational firm can, therefore, improve external monitoring and is a measure of good governance. We find that yield-spreads are lower for bonds issued by firms that have a larger fraction of independent directors and audited by reputed auditors, i.e. for better governed firms. These results suggest that better governed companies may be better able to target their CSR spending and maximize the strategic benefits of CSR activity.

#### Summary and Conclusions

In summary, our findings are consistent with CSR reducing the cash available to meet obligations, which increases the perceived costs of financial distress. Good governance, and group affiliation mitigates these effects, and suggests that well governed firms may be better able to benefit from the positive effects of CSR activity. One size, thus, does not fit all. Our result finds that mandatory CSR negatively impacts bondholders and augments the results of earlier work that shows that mandatory CSR activity reduces wealth of stockholders.

<sup>&</sup>lt;sup>3</sup>The corporate governance issue in government owned firms is covered in newspapers like First Post (Dec 20, 2014), Times of India (Nov 23, 2015), Hindu Business Line (Aug 21, 2017) and similar others.

## Corporate Governance and Insider Trading in Other Stocks

Prachi Deuskar, Aditi Khatri, and Jayanthi Sunder<sup>1</sup>

#### 1. Introduction

It is well established that insiders – promoters, directors, employees – have superior information about the prospects of their own firm. Since other firms in the industry are also affected by the same economy-wide and industry-wide conditions, it is very likely that the insiders' information advantage extends to other firms in the same industry. Then, they can trade profitably in other stocks in the same industry. What are the trade-offs involved in trading in other stocks? Insiders trading in their own stock based on price sensitive information is prohibited by SEBI (Prohibition of Insider Trading) Regulations. Further, a strong corporate governance mechanism such as independent board or foreign institutional investors may further discourage insider trading. In such cases, the insiders may turn to trading in other stocks to trade profitably on their information. Trading by insiders in other stocks is not required to be reported. Also, it is not directly detrimental to the minority shareholders in insiders' own firm and thus is less likely to be discouraged by an independent board or institutional investors.

Prior research, from the U.S, has shown that insiders' trades in stocks in the same industry as their firm are profitable. We first establish that this is true in the Indian setting as well. Then we examine the profitability for different levels of corporate governance.

#### 2. Profitability of own and related trades

Regulation 13 of the Prohibition of Insider Trading Act 1992 mandates that directors and officers and substantial shareholders in a listed Indian company report the trades in the stock of that company that are above a certain threshold, to the stock exchange. We match the reported insider trades to a detailed transaction level Bombay Stock Exchange (BSE) Trade Data to identify insiders' trades in their own stock and other stocks. The insiders are likely to have superior knowledge about the industry in which their firm operates. We call such stocks

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"related" stocks. Prior research has argued that insiders' purchases are more likely to be based on their superior information. They may sell shares based on their need for funds or to achieve portfolio diversification. So we focus on the profitability of insider's purchases to decipher about their information.

To examine the profitability of insiders' trades we use the return for a period (3 or 6 months) following the insider's trade on the stock purchased. A higher subsequent return on stocks purchases indicates superior stock-picking ability. From each stock's return, we subtract average return on stocks with similar market capitalization, book-to-market ratio and past 12 month returns to obtain "abnormal" return on the traded stock. This abnormal return is more likely to be driven by information rather than overall stock-market movements. Further, to understand the nature of the information, we decompose the abnormal return into the average industry abnormal return and the balance, which is firm-specific abnormal return.

Table 1 below shows the results of regressing 6-month industry or firm-specific returns for all trades by insiders. The results control for the possibility that each insider may have a different level of skill and thus is able to trade more or less profitably compared to other insiders (This adjustment is done by including insider fixed effects). The coefficient for "Own" indicates the profitability of insiders' purchases of their own stock compared to the profitability of purchases of stocks in industries other than their own. We see that insiders earn 6.24% higher 6-month firm-specific return (3.36% over 3 months) on the purchases of their own stock. Their own stock purchases do not earn any positive industry return.

	3-month industry return	6-month industry return	3-month firm-specific return	6-month firm-specific return
Own	-0.00325**	-0.00272	0.0336***	0.0624***
	(0.00140)	(0.00208)	(0.00574)	(0.00820)
Related	0.00316***	0.00744***	-0.000139	0.0122*
	(0.00122)	(0.00171)	(0.00468)	(0.00664)
Observations	33,823	33,823	33,823	33,823

Table 1: Profitability of own and related purchases

\*\*\*, \*\*, \* indicate statistical significance at 1%, 5%, and 10% respectively.

More interesting is the profitability of "Related" purchases. These are purchases of other stocks, but that belong to the same industry as insiders' firm. We see that insiders earn profits by way of industry return on these purchases -0.74% over 6 months and 0.32% over 3 months. Not much of the profitability in these related trades is due to firm-specific return. Thus the industry-specific component of the information appears to be the source of spillover of insiders' information advantage into the other stocks in the same industry.

#### 3. Governance and Profitability of Insiders' Trades

Consistent with prior research, our results so far indicate that insiders do have information advantage about their own firm as well as other firms in the same industry. If the insiders exploit their private information by trading in their own firm's stock, they benefit at the expense of other shareholders. Then, corporate governance mechanisms, in an effort to protect the interest of the non-insider shareholders, is likely to restrict insiders' information-based trading in their own stock. Indeed, there is evidence that the profitability of directors' trades is lower for firms with strong governance. Further, strong internal control processes are able to deter informed trading by the insiders.

If strong corporate governance discourages insiders from trading in their own stock, they may choose the next best alternative to exploit their information – trading in the stocks of related firms. To throw light on this possibility we examine, when insiders' firm has strong corporate governance, whether

- i) their trades in their own stock are less profitable, and
- ii) their trades in stocks from the same industry are more profitable.

We measure corporate governance in three different ways – the fraction of independent board members, the fraction of foreign institutional investor (FII) ownership and the fraction of non-promoter institutional investor (NPII) ownership. Specifically, we consider insider's firm having relatively better governance if

- i) the fraction of independent board members in the insider's own firm is greater than or equal to 50% (Ind Board), or
- ii) the fraction of FII ownership is higher than 5% (FII>5%), or
- iii) the fraction of NPII ownership is higher than 5% (NPII>5%).

Tables 2 and 3 below shows the profitability of insiders' purchases in own and related stocks when their own firm is relatively better or poorly governed. Each column presents results for a different measure of corporate governance. Table 2 focuses on firm-specific return and Table 3 on industry return.

	6-month firm-specific return					
	Ind Board	NPII>5%				
Own	0.0777***	0.0715***	0.0687***			
Own* Governance	-0.017	-0.0615***	-0.0231			
Related	0.0101	0.00718	0.00557			
Related* Governance	0.00869	0.0184	0.0217			
Observations	31 705	33 637	33 637			

 Table 2 Corporate Governance and Firm-Specific Return of Insiders' Trades

\*\*\*, \*\*, \* indicate statistical significance at 1%, 5%, and 10% respectively.

	6-month industry return					
	Ind Board	FII>5%	NPII>5%			
Own	-0.00334	-0.00354*	-0.00385*			
Own* Governance	0.00355	0.00417	0.00393			
Related	0.00169	0.00493***	0.00467**			
Related* Governance	0.0186***	0.00986***	0.00921***			
Observations	31,705	33,637	33,637			

\*\*\*, \*\*, \* indicate statistical significance at 1%, 5%, and 10% respectively.

Insiders' Other Trades

In Tables 2 and 3, the coefficient "Own\*Governance" measures the extra profitability of insiders' trades in their own stocks when the firm is better governed compared to similar trades in case of relatively poor governance. We see that when the insiders' own firm is better governed, the insiders earn lower firm-specific returns for trades in their own stock. This evidence supports the interpretation that better corporate governance deters insiders from information-based trading in their own stock. The coefficient "Related\*Governance" measures extra profitability of insiders' trades in other stocks in the same industry when their own firm is better governed. We see that this coefficient is positive and significant in the case of industry return. Thus, when due to better governance in their own firm, insiders are constrained from trading in their own stock, they use an alternative by exploiting the information spillover by profitably trading in other stocks in the same industry.

#### 4. Conclusion

This study establishes that

- In line with prior research, insiders in Indian companies also trade profitably by buying their own stock.
- ii) Insiders have information particularly industry-related about other stocks in their industry and they exploit this by profitably purchasing such stocks.
- iii) Good corporate governance discourages insiders from conducting information-based trading in their own stock.
- iv) When faced with restrictions due to good corporate governance, insiders use the next based avenue by profitably trading in other stocks in their industry.

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#### Assessing the Quality of Bank Loan Ratings in India

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#### Introduction

Credit rating agencies serve an important role in credit markets around the world. By certifying the credit quality of borrowers, they provide confidence to investors about the value and quality of debt securities and also help avoid duplicative efforts by the investors to investigate credit quality for themselves. Rating agencies play a much more prominent role in India as apart from the bond market, they also have a central role in the development of India's banking sector. In this document, we highlight a concern that is relevant for market participants and regulators in India and provide some solutions to strengthen the health of the Indian commercial banking sector.

#### **Origins of Credit Ratings in India**

The credit rating industry in India started in 1987 when The Credit Rating Information Services of India (CRISIL) was created. CRISIL is now partially owned by S&P. While other firms were created over time, the "Big Three" credit rating agencies consist of CRISIL, the Investment Information and Credit Rating Agency of India Limited (ICRA), which was founded in 1991 and is now partially owned by Moody's, and CARE Ratings of India (CARE), which was founded in 1993.

As affiliates of S&P and Moody's, both CRISIL and ICRA, respectively, operate in a manner similar to that of their U.S. parents. Specifically, both firms employ the issuer-pay compensation model, i.e., are paid by the company attempting to raise debt capital, and try to assess a firms' overall credit risk "through the economic cycle." The latter suggests that changes in firms' or securities' assigned credit ratings are applied over the longest maturity structure possible for a given firm or security. This is done in an effort to reduce unnecessary ratings volatility.

More importantly, by providing an unbiased and informative view about the credit quality, rating agencies can not only help facilitate investors' investment decisions by helping them achieve the desired risk-return trade-off, but also enable worthy issuers obtain fairly priced capital to finance valuable investment opportunities. In this regard, credit rating agencies act as agents that can help price risk appropriately and allocate capital. Emphasizing the important role they can play in credit markets, relevant for our discussion, the Basel Bank Regulatory Accords allowed the use of credit ratings for allocating regulatory bank capital. In short, banks are required to hold capital to compensate for potential losses on their assets. The amount of capital they need to keep depends on the "risk weights" of the assets with higher weights necessitating higher capital. The Basel norms allowed the risk weightings to vary based on the asset's credit rating. While the Basel norms do not require banks to ensure all their borrowers have a credit rating, since unrated assets are likely to be assigned higher risk weights, which in some instances can exceed 100 percent, the regulations provide strong implicit incentives for all borrowers to obtain a favorable credit rating if possible. Not only will this reduce the cost of borrowing for the firm but will also enable the bank to conserve costly capital.

#### **Cause for Concern: The Dearth of Market Information**

While credit rating agencies' stated methodologies note that corporate debt securities are evaluated consistently across issuers, industries, and asset classes (Ganguin and Bilardello, 2005, Standard & Poor's, 2001), and that their reputations are their most valuable asset (Cantor and Packer, 1995, Covitz and Harrison, 2003), prior research casts doubt on some of these claims. For instance, both Bolton and Freixas (2012) and Bar-Isaac and Shapiro (2013) argue that rating agencies may allow their reputations to wane in periods of significant economic growth, and provide poor quality ratings, only to rebuild them during and after an economic downturn.

In addition, Kraft (2015), Baghai and Becker (2018), Griffin and Tang (2012), Griffin et al. (2013), and Cornaggia et al. (2016) provide evidence of inflated ratings in different contexts, while Bonsall et al. (2015) and Bruno et al. (2016) provide evidence of variability in rating agency monitoring based on their incentives. These studies suggest that rating agencies can strategically alter their rating methodologies in certain instances for listed firms, as well as the importance placed on their reputations. We compare the quality of credit ratings of listed and unlisted firms. In our setting, the presence of market information for listed firms – stock price, scrutiny by securities analysts etc., -- may serve as a mechanism to discipline rating agencies' actions, and thus limit their ability to adjust their rating methodologies relative to unlisted firms.

The primary consumers of credit ratings in India are banks. While banks may care about the quality of firms' credit ratings, several incentives exist which may cause banks to prefer inflated credit ratings. First, as ratings increase (i.e., move towards AAA), banks can hold less equity relative to assets. Second, banks can improve their short-term accounting-based performance by provisioning less against expected loan losses, since provisioning itself may be a function of credit ratings. Thus, banks have a regulatory incentive to encourage less stringent rating methodologies by rating agencies for all

borrowers. In response we expect rating agencies to provide inflated ratings especially for unlisted borrowers as in short, they can more easily get away with it.

Credit rating agencies may have fewer reputational concerns when assigning credit ratings to unlisted firms. This is due to the fact that unlisted firms' information environments are generally more opaque than those of listed firms. This opacity reduces external parties' ability to evaluate any differences in their assessments of unlisted firms' creditworthiness versus those of the credit rating agencies. Such is the case for India's primary bank regulator, the RBI, as market information will allow the RBI to better evaluate the quality of listed firms' assigned credit ratings relative to unlisted firms.

#### **Our Analysis**

Our hypothesis outlined in the previous section leads to several predictions. First, if the dearth of market information allows rating agencies to cater to opaque, unlisted firms, then we should expect that their ratings should be higher (i.e., closer to "AAA") after holding financial characteristics constant. Indeed, our first test shows that unlisted firms' ratings are on average 0.50 notches more favorable than listed firms after holding financial characteristics constant, as well as after netting out time-invariant factors at the industry level.

When we compare the sensitivity of ratings of listed and unlisted firms to financial ratios, we find that the ratings of unlisted firms are less sensitive to audited financial ratios relative to those of listed firms. For example, while an approximate 14 basis point increase in Leverage (Debt/Total assets) results in a one notch decrease in listed firms' credit ratings, a similar increase only translates to a 0.28 notch decrease in unlisted firms' credit ratings, on average. Furthermore, we find that a 25 (14) basis point decrease in Cash (Debt-to-Earnings) decreases listed firms' credit ratings by one notch, on average. However, unlisted firms' Cash (Debt-to-Earnings) is not statistically related to their ratings. These results suggest that rating agencies put less emphasis on quantitative factors such as Leverage, Debt-to-Earnings, and Cash when rating unlisted firms relative to listed firms.

Another way to capture the quality of unlisted firm ratings is to study the frequency with which they are changed over a given time period. We find that loan ratings for unlisted borrowers are downgraded less often than the ratings for listed borrowers, while no such asymmetry exists for upgrades. Lastly, we examine the ability of loan ratings to predict future default. We find that loan rating levels and transitions for listed borrowers have a greater sensitivity to future default, relative to bank loan ratings of unlisted borrowers. Alternatively stated, bank loan ratings (and more importantly transitions) for listed borrowers convey more information about subsequent defaults. Collectively, our results show that while unlisted borrowers have more favorable credit ratings, these ratings do not accurately reflect the underlying credit conditions of the borrowers, especially when external reputational concerns are low

#### **Our Recommendations**

Our results show that market information improves the quality of bank loan ratings. Given the recent default of IL&FS in India, our results have several policy recommendations that we enumerate below.

First, regulators in India and in other countries should reduce reliance on credit ratings in bank capital regulation. The Reserve Bank of India should ensure banks have a minimum level of capital independent of the ratings of their borrowers so as to reduce the reliance on ratings. Furthermore, banks should also be encouraged to develop an independent risk assessment model and they should be given freedom to use either the external rating or the internal model, whichever is more conservative in loan pricing. RBI should periodically audit the internal risk assessment models of the banks.

Regulators should also try to break the habit of issuers to shop for the best possible credit rating. This can be done in a number of easy ways. First, the regulator could pick the rating agency a borrower should use with the pricing of the rating services standardized based on issue size. The regulator can randomize the choice of the rating agency while ensuring the agencies eventually achieve a market share commensurate with their quality (see below). This will not only ensure that borrowers do not shop for ratings but also will prevent bargaining and concessions based on pricing of rating services. Alternatively borrowers should be forced to disclose all the ratings that they obtain and not just the ones they accept.

Finally the RBI should annually audit the rating model of rating agencies and evaluate their performance in predicting defaults. Agencies who ratings exhibit frequent jumps on the downside, i.e., those that frequently downgrade borrowers by multiple notches during one instance should be penalized. In the regulator pick model, such agencies should obtain a lower market share in the future.

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#### Are algorithmic traders distracted? Evidence from Indian financial markets

#### Kamran Quddus and Ashok Banerjee

**1.** Introduction

How does information get incorporated into security prices in the presence of agents with limited cognitive capacity? Do agents with limited cognition trade all firm-linked news? We explore some such questions in our study. Investor inattention based studies posit that limited cognitive resource acts as a deterrent in catering to all relevant firm-specific information. Our study utilizes capital market settings where non-economic shocks consume the attention of market participants. For academic explorations, we describe such fleeting instances as "distraction".

Anchored on Kahneman's argument that human brains face biological constraints in processing vast amounts of information, we conjecture that non-algorithmic traders with a greater reliance on human cognition trade less firm-specific information during distraction periods. We also explore whether the extent of underreaction will differ based on the nature of distraction. The capital market set up with a mix of both algorithmic and non-algorithmic traders provides an ideal setting for testing the implications of limited attention.

Our study also addresses some of the concerns that capital market regulators may have about the role of algorithmic traders. There has been widespread interest in understanding the potential impact that machine trading may have on market dynamics. Our study shows that machine trading helps in mitigating the attention constraints emanating from limited cognition. To that extent, machine traders are less amenable to distraction events.

#### **2.** Our Study

The predominance of machine trading allows information processing to be delegated to computers. Although algorithmic traders remain cognitively less affected, non-algorithmic traders continue to operate under the human cognition boundaries. Our study exploits the fundamental differences in the way order submission, routing, and trade processing gets affected for the two groups of traders operating under different sets of cognitive constraints. Algorithmic flags in the NSE data helps in the identification of messages originating from the algorithmic terminals as well as nonalgorithmic terminals.

We examine whether distraction events pose an impediment in quick assimilation of firm-linked news. In simple words, we investigate the trading behavior of machine traders and test whether the inattention effect is more pronounced among the non-algorithmic traders during distraction periods. We use distraction events covered on the front page of a newspaper as a proxy for investor inattention. We identify a list of macro-level events that may distract market participants. The extent of distraction is confirmed through the online search behavior for such non-market events. Moreover, we also classify the distraction events into subcategories using a machine learning algorithm.

We examine both order submission and trading behavior for both the groups of traders. Additionally, we also run a battery of robustness tests including checking the trading patterns of cross-listed stocks during distraction periods. We also examine whether we observe a similar drop in trading volumes if stock news arrives during or after market hours.

#### **3.** Results

Our study shows that the trading volume of non-algorithmic traders falls during distraction periods. We do not find a similar decline in trading volume for algorithmic traders. The primary explanation for such results arises from the limitations in cognitive abilities that non-algorithmic traders face. We argue that non-algorithmic traders rely on bounded cognition. On the other hand, algorithmic traders rely on machine-aided decision making and hence do not show a similar decline in trading volumes. Our results hold across a variety of distraction settings.

On a behavioral front, we also find that investors do not react homogeneously to the different distraction events. The heterogeneity in trading behavior may be explained through varying risk considerations associated with the different categories of distraction events. Traders may adapt to various risk considerations by reducing their risky positions in the securities market.

We find no significant drop in trading volumes on cross-listed stocks supporting investor inattention based explanations for the phenomena. Similarly, we find that the underreaction to news is more pervasive in stocks with higher retail ownership.

#### 4. Conclusion

Our empirical results suggest that competing information may impair the financial decisionmaking of non-algorithmic traders. Consistent with our conjecture, we find that non-algorithmic trading goes down on distraction days. As voluntary attention shifts towards distraction events, information processing constraints become even more binding. This is particularly true for the non-algorithmic traders relying on human cognition. As expected, we do not find a significant decline in the level of algorithmic trading. Our study provides new evidence on how competing stimuli may impact financial decision making. Furthermore it also addresses some of the concerns that market regulators may have about the role of machine traders.