



## Do managers overreact to salient risks? Evidence from hurricane strikes<sup>☆</sup>



Olivier Dessaint<sup>a,\*</sup>, Adrien Matray<sup>b</sup>

<sup>a</sup> Rotman School of Management, University of Toronto, 105 St. George Street, Toronto, ON M5S 3E6, Canada

<sup>b</sup> Bendheim Center for Finance, Princeton University, 26 Prospect Avenue, Princeton NJ 08540, United States

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### ABSTRACT

We study how managers respond to hurricane events when their firms are located in the neighborhood of the disaster area. We find that the sudden shock to the perceived liquidity risk leads managers to increase corporate cash holdings and to express more concerns about hurricane risk in 10-Ks/10-Qs, even though the actual risk remains unchanged. Both effects are temporary. Over time, the perceived risk decreases, and the bias disappears. The distortion between perceived and actual risk is large, and the increase in cash is sub-optimal. Overall, managerial reaction to hurricanes is consistent with salience theories of choice.

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\* Corresponding author.

E-mail addresses: [olivier.dessaint@rotman.utoronto.ca](mailto:olivier.dessaint@rotman.utoronto.ca) (O. Dessaint), [amatray@princeton.edu](mailto:amatray@princeton.edu) (A. Matray).

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"It is a common experience that the subjective probability of traffic accidents rises temporarily when one sees a car overturned by the side of the road."

A. Tversky and D. Kahneman (1974)

### 1. Introduction

How do managers assess risk? Most corporate finance decisions involve risk assessment. For example, the first step in capital budgeting is to estimate future cash flows by judging the likelihood of various scenarios for a wide range of variables (e.g., customer demand, production costs, competition, and regulatory changes). The standard assumption is that managers estimate probabilities using all available information. However, prior research in psychology finds that individuals frequently deviate from this assumption (e.g., Tversky and Kahneman, 1973, 1974). This literature shows that individuals use heuristics, i.e.,

mental shortcuts, for assessing probabilities. In doing so, they save time and effort, but they also make mistakes because their risk assessment ignores part of the information that is available. This paper asks whether firm managers use heuristics and make predictable risk assessment mistakes that may affect corporate policies.

One such heuristic is to infer the frequency of an event from its availability, i.e., the ease with which concrete occurrences of the event come to mind (Tversky and Kahneman, 1973, 1974). As the quote above suggests, the drawback is that availability may be affected by the salience of the event, which is specific to the local context in which the risk is estimated (Bordalo, Gennaioli, and Shleifer, 2012b, 2013).<sup>1</sup> Contextual factors such as emotional affect, novelty, time proximity, or media coverage increase the salience of an event. Because salient events come to mind more easily, people using the availability heuristic will then overestimate their frequency until the local context changes. If firm managers also use this heuristic, they may overreact to salient risk situations. Specifically, we hypothesize that managers' perceived risk temporarily increases even though the real risk does not change.

Testing this hypothesis empirically involves two main difficulties. First, the risk perceived by the manager cannot be directly observed. To address this issue, we focus on how managers estimate the risk of a liquidity shock at the firm level, and we use variation in corporate cash holdings to measure how their perception of this risk changes. Given the evidence that corporate cash holdings are used as a buffer against the risk of a liquidity shortage, variation in cash holdings provides a good indication of changes in perceived liquidity risk.<sup>2</sup> Second, testing this hypothesis also requires the identification of a change in a local context affecting the salience of the risk but not the real risk. We address this problem by using hurricanes as a source of liquidity shocks and by focusing on firms that could have been affected by a hurricane but were not because of chance.

Hurricanes are well suited for our purpose for the following reasons. First, the occurrence of a hurricane contains no information about the probability of a hurricane occurring again in the near future. Estimating the marginal increase in the local probability of hurricane landfall in response to the occurrence of a hurricane over the past two years produces a statistically insignificant coefficient that is negative or equal to zero. This result is consistent with the climate literature, which shows that, in the US main-

land, hurricane frequency has been mostly stationary since 1850 (e.g., Elsner and Bossak, 2001; Pielke, Landsea, Mayfield, Laver, and Pasch, 2005). Second, their occurrence is exogenous to firm and manager characteristics. As a result, variations in corporate policies observed after a hurricane cannot easily be attributed to unobserved heterogeneity or reverse causality. Third, hurricanes inflict heavy damage to the affected region. As such, they are salient events, not only for firms located in that area but also for firms located in its neighborhood that could have been affected by a similar liquidity shock. Finally, hurricane events permit a difference-in-differences identification strategy because the salience of the danger decreases with distance from the disaster zone. This feature allows us to estimate the effect of risk saliency on perceived risk by comparing how a treatment group of unaffected firms located in the neighborhood of the disaster zone and a control group of distant firms adjust their cash holdings after a disaster.

We document three main findings. First, managers of unaffected firms respond to a hurricane in their proximity by increasing corporate cash holdings. Cash holdings increase by 1.1 percentage points of total assets relative to firms farther away. This effect represents an average increase in cash of \$15 million and accounts for 10% of the within-firm standard deviation of cash holdings. Second, this cash increase is temporary. The amount of cash increases during the first four quarters following the disaster and then reverts to pre-hurricane levels over the year. Third, cash increases the first and second time a firm is located in the neighborhood area but not in subsequent occurrences. All three findings are consistent with the availability heuristic theory. The sudden salience of liquidity risk increases perceived risk and leads managers to increase cash holdings even though the real risk does not change. Over time, as salience decreases, both perceived risk and cash holdings revert to pre-hurricane levels. Finally, when the salience of the event decreases because the same event repeats and becomes less unusual, the overreaction is weaker and the increase in cash tends to disappear.

To further document the risk perception channel, we show that managers of firms located in the neighborhood area are also more likely to explicitly mention hurricane risk in subsequent regulatory filings. This effect occurs exactly at the peak of the increase in cash holdings. At this time, the likelihood that hurricane risk is mentioned is 62% higher than the unconditional probability. This effect is also temporary. Two years after the event, the likelihood that these firms mention hurricane risk reverts to the pre-hurricane level. Finally, firms that mention hurricane risk in their 10-Ks/8-Ks/10-Qs also increase cash holdings more. The observed increase in cash is three times larger for this subset of firms. This latter test allows us to include county-year fixed effects, which eliminates any time-varying heterogeneity across counties, including possible fluctuations in local economic activity.

Measuring the distortion between perceived and actual risk is challenging. Ideally, one should compare the manager-assessed probability of future hurricanes with the actual probability. This is not possible because the perceived probability is not observable. Instead, we com-

<sup>1</sup> Our definition of "salience" follows the definition given in the literature. "Salience refers to the phenomenon that when one's attention is differentially directed to one portion of the environment rather than to others, the information contained in that portion will receive disproportionate weighting in subsequent judgments" (Taylor and Thompson, 1982).

<sup>2</sup> Froot, Scharfstein, and Stein (1993) and Holmstrom and Tirole (1998, 2000) provide a theoretical basis for predicting that cash will be used in imperfect financial markets as an insurance mechanism against the risk of liquidity shock. Empirically, several papers document a positive correlation among various possible sources of cash shortfall in the future and the current amount of cash holdings; these studies thus confirm that precautionary motives are central to accumulating cash reserves (e.g., Kim, Mauer, and Sherman, 1998; Opler, Pinkowitz, Stulz, and Williamson, 1999; Almeida, Campello, and Weisbach, 2004; Bates, Kahle, and Stulz, 2009; Acharya, Davydenko, and Strebulaev, 2012).

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