

Summary of Research

Itay Goldstein

April 2008

1. Overview

My research interests are in the areas of corporate finance, financial institutions, and financial markets. I investigate problems related to learning and coordination behavior and the effects that they have on firms, institutions, and markets. Most of my work to date has been devoted to two main themes: **(i) financial fragility and crises** and **(ii) the feedback effect from financial markets to the real economy**. More recently, I have become interested in studying issues that arise in the context of **(iii) firm organization and governance**. The majority of my work is theoretical. As an applied theorist, however, I am also naturally drawn to data and empirical methodologies that allow me to test the theoretical ideas developed in my models. I view this dialogue between theoretical and empirical work as an important component of my research agenda. In what follows, I describe my research, along its main themes, in more detail.

2. Financial Fragility and Crises

2.1 General Description and Motivation

As a PhD student, I was fascinated by the events of the (then) recent Asian financial crisis. A number of highly successful economies that had grown at a rapid pace over a long period of time suddenly collapsed, impacting, not only their own residents, but the entire world. Many commentators viewed this (and other) crises as the result of a coordination failure or a self-fulfilling belief. That is, many argued that investors withdrew their money from emerging markets or attacked their currencies simply because they believed that other investors were going to do the same thing.

These events prompted me to study models that could generate and explain such devastating phenomena. A classic example is the bank-run model of Diamond and Dybvig (1983), in which strategic complementarities among agents lead to multiplicity of equilibria: either all the depositors run on the bank or none of them does. This feature is attractive as it clearly demonstrates the fragility of financial systems: an economy can all of a sudden jump from one equilibrium to another, and hence collapse. At the same time, this feature made it difficult to answer some of the theoretical questions I was interested in. For example, in the Diamond-Dybvig model, banking contracts can generate a good equilibrium and a bad equilibrium, but are these contracts overall desirable? What

will be the optimal contract offered by the bank when the effect of the contract on the likelihood of runs is taken into account? Outside the direct context of the Diamond-Dybvig model, I was interested in questions like: Does a crisis in one country increase the probability of a crisis in another country (as the contagion phenomenon suggests)? Does a banking crisis increase the probability of a currency crisis and vice versa (as the twin-crises phenomenon suggests)? What is the optimal policy to stop or prevent crises? Answering these questions and others requires that we be able to characterize the likelihood of a crisis as a function of the parameters and variables of the model, yet in the traditional multiple-equilibria framework, there is little guidance about the set of circumstances that will generate a crisis.

A recent development in game theory, called “global games”, offers a way to analyze some of these questions. The global-games literature starts with the paper by Carlsson and van Damme (1993), who show that the multiplicity of equilibria in models with strategic complementarities is a result of the assumption that agents have common knowledge about the fundamentals of the game. Introducing small amounts of noise in agents’ signals about the fundamentals will break common knowledge and generate a unique equilibrium. Morris and Shin (1998) demonstrate that Carlsson and van Damme’s result can apply to financial crises and generate a unique equilibrium in a model of currency attacks. The unique equilibrium is characterized by a threshold signal level below (above) which agents attack (do not attack) the currency.

As I started working on global-games models, I found the approach very appealing for several reasons. First, the global-games equilibrium enables the researcher to determine the likelihood of a crisis and analyze how it is affected by the parameters and variables of the model. This was a first step in addressing the research questions I posed to myself. Second, the global-games framework enriches models of strategic complementarities in a realistic and interesting way. The assumption that agents do not have common knowledge about the fundamentals brings *strategic risk* into the model, such that in equilibrium agents are uncertain about what other agents are going to do. Finally, the notion of financial fragility that is based on self-fulfilling beliefs is still present in the global-games solution despite the fact that the fundamentals uniquely determine the outcome. That is, agents still take an action because they believe other agents will take it. The key point is that the fundamentals uniquely determine the expectations about what other agents will do, and this indirectly determines agents’ actions.

Indeed, due to these features, the global-games paradigm has become more and more successful ever since I started using it for my research. My papers made various contributions to this literature, generating new insights on the channels behind financial fragility and crises.

2.2 Theoretical Work

Together with Ady Pauzner, I wrote the paper [Demand Deposit Contracts and the Probability of Bank Runs](#) (*Journal of Finance*, 2005). Our goal was to apply the global-games methodology to the context of bank runs, in order to answer some of the questions mentioned above. At the very outset of the project, we discovered a fundamental difficulty in applying global-games techniques to bank runs. While previous papers on global games assumed that agents' incentives to take a certain action monotonically increase in the number of other agents who are expected to take this action, this feature is not satisfied in a bank run model. In such a model, conditional on many agents running on the bank, an agent is better off if he runs while fewer other agents run and share the liquidation value with him. Essentially, in addition to the usual force of strategic complementarities, there is a "crowding out" effect that dominates in some range of the payoff function. Thus, to prove equilibrium uniqueness in this context the paper develops a new proof technique for "bank-run payoffs".

After establishing the uniqueness of equilibrium in our model, the paper proceeds to tackle the other questions that were suddenly within reach. First, we characterize the probability of a bank run and how it is affected by the demand-deposit contract. We find that the probability of a bank run monotonically increases in the degree of risk sharing offered by the demand deposit contract. Hence, when setting the demand deposit contract, the bank needs to consider, not only the risk sharing it provides, but also the resulting effect on the probability of a run. We thus characterize the optimal demand-deposit contract that trades off the benefit from risk sharing against the cost of bank runs. Finally, a crucial question is whether demand deposit contracts are overall desirable (given that they have negative and positive effects). We develop conditions under which demand-deposit contracts are desirable. Specifically, we show that they are desirable as long as the long-term investment held by the bank is going to be efficient with a sufficiently high probability.

Overall, the paper makes contributions to two strands of the literature. First, our analysis of global games with "bank-run payoffs" adds an important dimension to the characterization of equilibria in such games. This analysis should apply to other finance contexts, such as debt rollovers, IPO investments, and financial-market runs. Second, the analysis of the interaction between the banking contract and the probability of a run endogenizes an important and realistic dimension of the underlying problem, and enables analysis of many open questions in banking, related to issues of contagion, lender-of-last-resort policy, etc.

In [Contagion of Self-Fulfilling Financial Crises Due to Diversification of Investment Portfolios](#) (*Journal of Economic Theory*, 2004), Ady Pauzner and I use the global-games methodology to study contagion of financial crises. Contagion is one of the most pervasive features of financial crises in recent decades. Many economists have asked why crises spread from one country to another even when it seems that the correlation in fundamentals is not that strong. Our paper provides an explanation based on the diversification of investment portfolios by international investors. The basic set up is one where the same group of investors invests in two countries that have independent fundamentals. In each country a crisis may erupt as investors withdraw their investments believing that other investors will do the same thing.

The occurrence of a crisis in one country decreases investors' wealth and makes them more risk averse. As we show in the paper, this increases their tendency to "run" in the other country, as they become more averse to the *strategic risk* associated with the uncertainty about the behavior of investors in the other country. Consequently, the probability of a crisis in the other country increases. A key insight of the paper is that changes in wealth may induce future coordination failures, as they make agents averse to strategic risk. It is the use of global games that naturally allows the presence of strategic risk, since, in equilibrium, agents are uncertain about what other agents will do.

The contagion result generates correlation between the investment outcomes in the two countries, even when they have independent fundamentals. An interesting implication is that diversification becomes self defeating. Agents diversify their portfolios between the two countries because they have independent fundamentals. However, diversification introduces contagion that changes the probability of crises in a way that generates correlation between the two countries. This reduces the benefits from diversification. In general, there is an externality here. When an investor in our model diversifies her investments, she affects not only the variance of her portfolio's return, but the probabilities of crises (and thus the distribution of returns in the two countries). Since the investor is small, she ignores this externality and takes the distribution of returns in each country as given when she chooses the initial allocation of her portfolio. This raises the natural question of whether government intervention, that puts restrictions on diversification, can be welfare improving. Indeed, we present an example, in which partial diversification yields higher welfare than full diversification. In this example, capital controls imposed by the government may improve welfare.

I have written two additional papers that apply global games to financial crises, both started during my PhD. In [Strategic Complementarities and the Twin Crises](#) (*Economic Journal*, 2005), I study another economic phenomenon that received a lot of attention: the "twin crises". A model is developed, where strategic complementarities exist, not only within groups of bank creditors and

currency speculators, but also between the two groups. This generates a vicious cycle between banking crises and currency crises, where each crisis occurs just because agents believe the other crisis is going to occur. One of the main implications of the paper is that, due to the interaction between the banking sector and the currency market, a Lender of Last Resort might not be able to prevent bank runs. In [*The Choice of Exchange Rate Regime and Speculative Attacks \(Journal of the European Economic Association, 2004\)*](#), Alex Cukierman, Yossi Spiegel, and I study the strategic interaction between the ex ante choice of exchange rate regime and the likelihood of ex post currency attacks. The optimal regime is determined by a policymaker who trades off the loss from nominal exchange rate uncertainty against the cost of adopting a given regime. This cost, in turn, increases with the fraction of speculators who attack the local currency. The paper shows that imposing transaction costs on currency speculation induces policymakers to set less flexible regimes. Surprisingly, this ends up generating an increase in the probability of currency attacks. Overall, the paper demonstrates that global games can be an important tool in policy analysis.

More recently, I extended the global-games framework to study economic situations in which strategic complementarities result from information aggregation and learning. This work is the object of a working paper [*Learning and Complementarities: Implications for Speculative Attacks*](#) with Emre Ozdenoren and Kathy Yuan. Since some of the ideas in this paper are related to my research on the feedback effect, I will describe it later in the statement.

Finally, I wrote one paper on financial fragility that does not involve coordination games: [*An Information Based Trade off Between Foreign Direct Investment and Foreign Portfolio Investment \(Journal of International Economics, 2006\)*](#), with Assaf Razin. The paper is motivated by an empirical fact: during an international financial crisis, foreign portfolio investors (who are not in control positions) tend to withdraw their investments out of the crisis countries, while investors that hold foreign direct investments (FDI) do not. We suggest an explanation based on a corporate-finance foundation. In the model, FDI investors are effectively the managers of their investments. Because they have access to better information than portfolio investors about changes in the fundamentals of their investments, they can manage their investments more efficiently. On the other hand, in case they need to sell their investments due to a liquidity shock, they are in a worse position than portfolio investors. This is because potential buyers know that they are informed about the fundamentals and suspect that they try to sell because of adverse information. This creates a tradeoff between portfolio investments and FDI. As we show, investors with greater expected liquidity needs are more likely to choose the former than the latter. Because of this ex-ante self selection into the two types of investments, FDI investors are less likely to experience liquidity

shocks, and hence our model predicts that this kind of investment is less likely to be liquidated. The paper provides additional results on how the tradeoff is altered by changes in transparency, and draws various links to existing empirical regularities.

2.3 Empirical Work

Most of my research above is based on models where strategic complementarities generate financial fragility. Although the literature to which this research contributes is large, it is almost entirely theoretical. Indeed, there is virtually no empirical evidence to support the idea that strategic complementarities increase financial fragility. Using global games in my theoretical work, I realized that one of the advantages of the framework is that it generates empirical predictions that can be taken to the data. This is because the global-games framework enables the researcher to determine the likelihood of withdrawals and link it to the parameters of the model. On the basis of this observation, I recently wrote [Payoff Complementarities and Financial Fragility: Evidence from Mutual-Fund Outflows](#) with Qi Chen and Wei Jiang.

In this paper, we test predictions from a global-games model of strategic complementarities in the context of mutual-fund redemptions. We use mutual funds for two reasons. First, based on the previous empirical mutual-fund literature, we argue that there are strategic complementarities among investors in the decision to redeem their shares from a mutual fund. When investors redeem their shares they receive the net asset value (NAV) of the fund's assets as of the day of redemption. These redemptions, in turn, impose costs on the fund, as they force the fund to trade suboptimally. Yet, the costs are usually not reflected in the NAV received by redeeming investors, as trades happen mostly after the day of redemption. Hence, the costs are borne mostly by investors who stay in the fund, and this creates an incentive to redeem when other investors are expected to redeem. Second, the richness of mutual-fund data enables us to provide a clear identification of the underlying mechanisms. In fact, even though other types of institutions (like hedge funds) may exhibit stronger complementarities, the available data provides limited opportunities for identification. Hence, we view the mutual funds context to be a good laboratory to test the theories.

We document two main empirical results that are consistent with the predictions of a global-games model of redemptions. First, we find that the sensitivity of outflows to bad performance is stronger in funds that hold illiquid assets ("illiquid funds") than in funds that hold liquid assets ("liquid funds"). This is consistent with the theory, since strategic complementarities, which are stronger in illiquid funds (due to higher trading costs), are expected to amplify the effect of bad performance on investors' behavior. Intuitively, consider investors holding shares in an illiquid fund (say, an

emerging-market fund) vs. investors that hold shares in a liquid fund (e.g., a fund that invests in large-cap U.S. stocks). Faced with the same bad performance, the former will have a stronger tendency to redeem their shares because they know that the redemptions by others will impose non-negligible costs on the fund, which will hurt them if they choose to stay. Second, we find that the effect of the illiquidity of the funds' assets on the sensitivity of outflows to bad performance weakens or even disappears when looking only at funds that are held mostly by large/institutional investors. Again, this result supports a global-games model of redemptions, as such investors are likely better at internalizing the externalities in redemptions.

The paper's main contributions are to show that the global-games paradigm provides predictions that are consistent with the data and to confirm, for the first time, that strategic complementarities generate financial fragility. At a more general level, the paper provides unique evidence that strategic interactions are an important determinant of events and outcomes in financial markets. This brings a new dimension to empirical research in finance. For example, consider the vast mutual-fund literature. So far, the empirical analysis was conducted under the assumption that investors care only about fund fundamentals (e.g., performance) when they make redemption choices. Our analysis points out that investors' decisions are also affected by what they think other investors are going to do, and that this may amplify their reaction to news about fundamentals.

2.4 Summary

Financial crises have always been an important feature of financial markets and institutions. In fact, recent events demonstrate that crises are not a matter of the past, and that they are still an unavoidable feature of financial systems. My work analyzes financial crises from the point of view of coordination problems. It uses and extends tools from the global-games paradigm, enabling us to analyze the determinants of crises and to derive clear and testable predictions that can be empirically assessed.

3. The Feedback Effect from Financial Markets to the Real Economy

3.1 General Description and Motivation

The basic premise behind my work on feedback effects is that financial markets are more than just a side show. Many economic agents who take decisions that impact firm cash flows are influenced by events in financial markets. As a result, financial markets, not only reflect firm cash flows and values, but end up affecting them. There are plenty of examples. Managers may gauge new information from the market about the profitability of investment opportunities (e.g., do investors think that a

proposed acquisition is a good idea?). Directors may learn about the need to replace the CEO or to govern the firm in other ways (as is often argued in the corporate governance literature). Providers of capital may use the information in the price to decide whether to provide capital to the firm (indeed, debt ratings are known to be affected by stock prices). Regulatory agencies may learn about the need to intervene in the firm's business (e.g., in the topical issue of market-based bank supervision).

The idea that financial markets affect firm cash flows is very natural. The trading process in the financial market aggregates information and (more importantly) opinions from many different people in the economy. Hence, the trading outcomes (price, volume) reflect information that can provide additional guidance for some of the decisions mentioned above. That is, even though decision makers possess some information that guides their choices, their decisions can benefit from what they learn from others through financial markets. In fact, the feedback effect from financial markets to firm cash flows adds an important angle to the large debate on market efficiency. That is, the discussion on whether prices in financial markets are efficient becomes even more interesting when prices have an effect on the real economy. This enables us to provide insight into the link between market efficiency and economic efficiency.

While several papers in the literature include the feedback effect in models of financial markets, the vast majority of existing work is conducted under the assumption that firm cash flows are exogenous and unaffected by the events in financial markets (for example, see the papers on price formation by Grossman and Stiglitz (1980), Glosten and Milgrom (1985), and Kyle (1985)). As a result, many of the theoretical implications of the feedback effect from financial markets to firm cash flows and values remain unexplored.

A general insight that comes out of my theoretical research is that the price formation process is fundamentally affected by the very fact that prices impact firms' cash flows. My research develops models that analyze the joint and endogenous determination of decisions made at the corporate level and decisions made by participants in financial markets, in order to uncover the behavior of financial-market and corporate-finance variables in the presence of a feedback effect. The main challenge in introducing the feedback effect into models of financial markets is the presence of a loop from market prices to firms' decisions, and back to market prices. This loop renders traditional methodologies unusable, and so requires the development of new modeling approaches.

3.2 Theoretical Work

My first paper on the feedback effect was [Manipulation and the Allocational Role of Prices \(Review of Economic Studies, 2008\)](#) with Alexander Guembel. While exploring the implications

of models with a feedback effect, we discovered an important feature of such models, namely that the very fact that financial-market prices affect the cash flows of firms opens up opportunities for market manipulations, which reduce firm value. The paper models a firm facing an investment opportunity with an uncertain net present value (so that it is sometimes optimal to undertake the investment and sometimes not). There is a speculator who may have information about aspects of this opportunity that are relevant for the optimal investment decision and that are not yet known to the firm. The speculator can trade on his private information, which gets partially reflected in the stock price. Information revealed by the price will then optimally be taken into account by the firm in its investment decision. We show that even when the speculator has no private information he may want to trade in order to affect the firm's investment decision. In particular, he may want to establish a short position in the firm and subsequently drive down the firm's stock price by further short sales. The firm infers that the lower price may reflect negative information about the investment opportunity and therefore does not invest. On average this is the wrong decision and will in itself reduce the value of the firm. This enables the speculator to cover his short position at a lower cost and make a profit.

The paper demonstrates that the introduction of a feedback effect in models of financial markets can have significant effects on equilibrium prices and investments. Traditionally, models of financial markets cannot accommodate the possibility that manipulation occurs in equilibrium. This is because in such models the speculator's trades move the price in a direction that is unfavorable to him, when he is uninformed. In our model, such a trading strategy can be profitable because of the feedback effect that prices have on the underlying asset value. When an uninformed speculator acquires a position, he knows that his trade affects not only the price, but also the underlying asset value in a way that on average will enable him to unwind the position at a profit.

While the paper is written in the context of a firm learning from the price about the profitability of its investment opportunity, the main insight is the same if the feedback effect results from other agents learning from the price and taking decisions that affect the firm's value. For example, providers of capital could learn from the price about the profitability of the investment and decide whether or not to finance it. In this context, manipulation that reduces the stock price limits the firm's access to capital and reduces its value. In that, our paper is consistent with complaints by small firms about the damage caused by short sellers and with the thinking that underlies various regulatory restrictions on short sales. In fact, to the best of our knowledge, our paper is the first to provide theoretical justification for the concerns about short sales. Other situations, in which the model may have strong real-world implications, include trading around acquisition announcements. It has been

shown that price changes after an announcement have a substantial effect on the decision to complete or abandon the acquisition. Hence, price manipulation around such announcements may have large real effects.

In [Incentives for Information Production in Markets where Prices Affect Real Investment](#), James Dow, Alexander Guembel, and I analyze the incentives of speculators to produce information in a model where the information in financial markets affects corporate decisions, and thus firm value. As noted by Grossman and Stiglitz (1980), for markets to be informationally efficient, speculators must have sufficient incentives to produce information. Yet, the traditional literature analyzes the incentives to produce information in markets that do not affect the real economy, and so where the information has no implications for production efficiency. Thus, our analysis provides an important contribution, as it studies the underpinnings of market efficiency in cases where it actually matters for production efficiency.

We show that the way in which a firm's investment decisions respond to stock price movements has important implications for information production incentives. Our main results stem from the fact that if a firm is more likely to cancel investment projects following negative price responses, the incentives for speculators to produce information will decrease. This is because, once the investment is cancelled, the security value is less sensitive to information on the project, and thus the information loses its speculative value.

Based on this insight, we derive several results and describe the rich set of empirical predictions they generate. First, speculators have a stronger incentive to produce information when investments are ex-ante more profitable. This is because high ex-ante profitability implies that the firm is more likely to invest, and this increases expected speculative profits. This result implies that endogeneity in the level of information production amplifies small changes in fundamentals into large changes in firm values: the increased amount of information associated with improved fundamentals enables more efficient investment decisions, which increase value further. Second, in standard models of financial markets, holding the cost of information fixed, the incentive to produce information will increase in the degree of uncertainty about the underlying fundamentals. This is because higher uncertainty implies greater profit opportunities. In our model, where the investment decision is affected by the information in the market, this is not always true. Third, our analysis has implications for incentives to collect information about assets in place versus new projects. Even though information production about the former is socially wasteful, our model shows that speculators' incentives go in the direction of producing this kind of information, because of the risk that new projects may end up not being undertaken. Fourth, our analysis implies that firms with a tendency to overinvest will

attract more speculative information production. As a result, some deviation from ex-post optimal investment decisions always increases ex-ante firm value in our model. Hence, our analysis shows that there is a positive side to the “empire-building” phenomenon.

In [Market-Based Corrective Actions: The Case of Bank Supervision](#) with Philip Bond and Edward Simpson Prescott, we study a pervasive problem associated with the feedback effect from market prices to *corrective* corporate actions. This problem has several applications including CEO turnover, shareholder activism, or corrective regulatory action such as bank supervision. Currently, the paper focuses on the latter. However, we are now rewriting the paper in a more general context, and this will be reflected in the new version (coming soon).

Let me illustrate the main idea using the example of CEO turnover. Suppose that a decrease in firm fundamentals below a certain threshold is expected to lead the board of directors to take a corrective action and replace the CEO (a new CEO can improve the fundamentals of the firm). This will benefit the shareholders of the firm. Suppose also that the board of directors is not fully informed about the fundamentals, and that it tries to infer some information from the price of the stock. Since the stock price is forward looking, it reflects information, not only about firm fundamentals, but also about the expectation in the market regarding the board’s future action. Inferring information from the price is then a challenge: a moderate price may indicate either that fundamentals are bad and that the board is expected to replace the CEO, or that fundamentals are not bad enough to justify intervention. It is the non-monotonicity of the price with respect to the fundamentals (due to the effect of the corrective action) that complicates learning from the price. This is a new feature in the feedback literature described above.

The key question is what will be the price and the corrective action in equilibrium. The equilibrium analysis is quite challenging given that the price has to reflect the expected corrective action, which depends on the price in a non-trivial way (due to non-monotonicity). We show that a key parameter in the characterization of equilibrium outcomes is the quality of the board’s own information. When the board has relatively precise information, it is able to learn from market prices and implement its preferred intervention rule as a unique equilibrium. When the board’s information is moderately precise, additional undesirable equilibria exist in which the board intervenes either too much, or too little. Interestingly, in this range, the type of equilibrium – i.e., whether there is too much or too little intervention – depends on whether the traded security has a convex payoff (equity or junior debt) or a concave payoff (senior debt). Finally, when the board’s information is imprecise, it is unable to implement its preferred intervention strategy in equilibrium. Based on these results, the paper generates normative policy implications and positive implications for future empirical research.

Another problem associated with the feedback effect is analyzed in [Learning and Complementarities: Implications for Speculative Attacks](#) with Emre Ozdenoren and Kathy Yuan. We show that when using the information aggregated in the market, decision makers adversely affect the trading incentives of speculators in a way that reduces the informational content of the market signal. Hence, learning from market events can be self-defeating. In the model, since the aggregate action of speculators affects a decision that changes the value of the traded security, strategic complementarities arise among speculators and make them want to trade like others. As a result, the signal that comes from the aggregate action of speculators reflects not only *information* about asset fundamentals, but also *coordination* among speculators. We model these forces and analyze the equilibrium outcomes in the context of a central bank that tries to learn from the size of a speculative attack about the optimal exchange rate regime, but the insight should apply to other contexts of learning from the market.

This paper is also related to my research on financial fragility and crises. In particular, it provides a methodological contribution to the global-games literature by studying a global game, where strategic complementarities are not built in the payoff structure, but rather result from the process of information aggregation and learning.

3.3 Empirical Work

My paper with Qi Chen and Wei Jiang [Price Informativeness and Investment Sensitivity to Stock Price \(Review of Financial Studies, 2007\)](#) is an attempt to provide empirical evidence for the presence of an information channel that generates a feedback effect from market prices to firms' investment decisions. We find a unique way to look at the data that brings evidence for this channel. In particular, we show a positive relation between two measures of the amount of private information in stock price – price non-synchronicity and the probability of informed trading (both were established in prior literature) – and the sensitivity of corporate investment to price.

The logic behind the test is as follows. It is commonly believed that stock prices reflect public information and private information about firms' fundamentals. The private information gets into the price via speculators' trading activities. If, at a given point in time, managers decide on the level of investment attempting to maximize the expected value of the firm, they will use all information available to them at that point. This includes both the information in the stock price, and other information that managers have and that has not found its way to the price yet. In this environment, investment will be more sensitive to stock price when the price provides more information that is new to managers. Information that managers already had will move the price, but not affect the

investment decision (as it already affected past investments), and thus will decrease the sensitivity of investment to price. Hence, the empirical finding of a positive relation between investment sensitivity to stock price and the amount of private information incorporated into the price by speculators implies that the private information in price is new to managers, and that managers look at the price to learn this information and use it in their investment decisions.

The paper provides an important contribution to the literature by documenting, for the first time, that information in the price matters for corporate investment decisions. While previous research studied correlations between prices and investments or analyzed the effect of capital constraints and mispricing on the correlation between investment and price, our paper is the first to suggest that this correlation is partly due to new information revealed via the trading process that affects corporate investment decisions. An obvious concern about the interpretation of the result is that our measures of informativeness capture some other stock characteristics. There is no way to completely avoid this concern. After all information in the price is a slippery concept that is difficult to measure. Our paper tries to alleviate the concern by using two measures that are largely exogenous to firms' choices and that were independently developed in different streams of the literature, and by conducting a battery of robustness checks that try to rule out alternative explanations.

[Shareholder Activism and Price Dynamics: Evidence from Closed-End Funds](#), with Michael Bradley, Alon Brav, and Wei Jiang, provides empirical analysis of feedback from a completely different angle. An empirical challenge in the case of market-based corrective actions is that a low price 'invites' corrective actions, but at the same time, expected corrective actions increase the price (see the description of my theoretical paper with Philip Bond and Edward Simpson Prescott above). Then, if running a simple probit regression of corrective actions on observed market price and other control variables, the effect of price on the probability of corrective actions will appear to be weak. The correct empirical model is one where there are simultaneous equations, such that the probability of a corrective action is affected by the price and reflected in the price at the same time.

In the paper, we analyze data that lends itself directly to this type of estimation. Closed-end funds are investment funds, whose own shares are traded in the market. In most cases, they are traded at a discount relative to the net asset value of their assets. Over the last decade, there has been a trend by activist shareholders to attack these funds in an attempt to open end them and bring their price up to the level of the net asset value. The paper analyzes unique hand-collected data of all U.S. based equity closed-end funds since the late 80's and of all the attacks against them. Using this data and a new econometric technique in the corporate finance literature (in order to estimate a simultaneous system of an endogenous dummy variable and an endogenous continuous variable), the paper shows the bi-

directional relation between the price of closed-end funds and activists' activities. Indeed, a low price (or high discount) increases the probability of activists' attacks, while the expected attacks by activists increase the price.

This is the first paper to show empirically the bi-directional relation between the financial market and corporate-related events. An interesting implication is that the reflection of expected corrective actions in the price becomes a deterrent for actual activism to occur. This is because the increase in price reduces the profitability of activism. The paper provides additional important results for the governance literature regarding the determinants and consequences of activists' attacks.

3.4 Summary

The feedback effect from financial markets to corporate events and firm value is at the core of financial economics. Yet, there are very few theoretical papers exploring the implications of this effect, and even fewer empirical papers that find evidence for it. My theoretical research shows that considering the feedback effect explicitly changes basic results about price formation and generates important implications for financial-markets and corporate-finance variables. My empirical research provides evidence for the presence, the sources, and the implications of the feedback effect.

4. Firm Organization and Governance

Naturally, some of my research on the feedback effect touched on issues related to corporate governance and firm organization. Given the independent importance of these topics, I developed separate interest in them. Two papers that I wrote on these topics are described below.

[**Directors' Ownership in the U.S. Mutual-Fund Industry \(*Journal of Finance, forthcoming*\)**](#), with Qi Chen and Wei Jiang, uses a unique hand-collected dataset to shed light on a basic issue in corporate governance: the incentives of directors to monitor managers. One of the most important roles in mitigating agency problems between shareholders and managers is played by the board of directors. Yet, little is known about the incentives provided to directors to perform their monitoring role. One obvious way to provide incentives is to let directors own shares in the firms they oversee. An important empirical question is then what determines directors' ownership and what are its consequences.

To answer this question we collected newly-available data on directors' ownership in the mutual-fund industry. Our empirical design is based on the optimal-contracting hypothesis, postulating that ownership is determined optimally in equilibrium. Hence, the paper tests whether ownership is more

prominent in funds where the monitoring effort of directors is expected to generate greater value to shareholders. This approach is distinct from that taken in many other papers in the literature, where the focus is on the effect of a governance measure on return or performance. Under the optimal-contracting approach, ownership is determined endogenously, and thus the effect on performance may not be detectable (as we indeed confirm in our data).

The mutual-fund data offers interesting measures of the need for directors' monitoring effort, which are not easily available for regular firms. For example, the potential for managerial abuse is much more severe for actively managed funds than for index funds. Consistent with the optimal-contracting approach, we indeed find that directors' ownership is more prevalent in the former than in the latter. Other interesting results are that ownership is affected by the investor clientele of the fund: directors own fewer shares in funds that are held by institutional investors, where there is not much need for directors' ownership. Also, the style of assets held by the fund has an important effect; for example, directors hold more shares in equity funds (where managers have more flexibility) than in bond funds.

In [**The Positive Effects of Biased Self-Perceptions in Firms**](#) (*Review of Finance, 2007*), Simon Gervais and I study optimal incentives and organization in firms that exhibit synergies in production effort and where agents may have biased self-perceptions. Biased self-perceptions have been widely documented in psychology and applied to economics and finance. Drawing on insights from the literature on coordination games (related to parts of my research described above), we start by noting that the presence of an agent, who thinks that his effort is more productive than it really is, can benefit all agents, including the biased one (when there are synergies in production). Essentially, being overconfident about one's own ability, serves as a commitment device to work harder. This, in turn, helps in overcoming coordination failures by motivating other agents to work harder as well. Based on this observation, we characterize the incentives provided by the firm to the workers (i.e., the optimal payoff structure) and the optimal organization structure (i.e., who gets to be the leader). The paper provides one of the first theoretical analyses in the field of behavioral corporate finance.