

Prat, Andrea; Dasgupta, Amil

Article

Financial equilibrium with career concerns

Theoretical Economics

Provided in Cooperation with:

The Econometric Society

Suggested Citation: Prat, Andrea; Dasgupta, Amil (2006) : Financial equilibrium with career concerns, Theoretical Economics, ISSN 1555-7561, The Econometric Society, New York, NY, Vol. 1, Iss. 1, pp. 67-93

This Version is available at:

<https://hdl.handle.net/10419/150074>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by-nc/2.5>

Financial equilibrium with career concerns

AMIL DASGUPTA

Department of Accounting and Finance, London School of Economics

ANDREA PRAT

Department of Economics, London School of Economics

What are the equilibrium features of a financial market where a sizeable proportion of traders face reputational concerns? This question is central to our understanding of financial markets, which are increasingly dominated by institutional investors. We construct a model of delegated portfolio management that captures key features of the US mutual fund industry and embed it in an asset pricing framework. We thus provide a formal model of financial equilibrium with career concerned agents. Fund managers differ in their ability to understand market fundamentals, and in every period investors choose a fund. In equilibrium, the presence of career concerns induces uninformed fund managers to *churn*, i.e., to engage in trading even when they face a negative expected return. Churners act as noise traders and enhance the level of trading volume. The equilibrium relationship between fund return and net fund flows displays a skewed shape that is consistent with stylized facts. The robustness of our core results is probed from several angles.

KEYWORDS. Career concerns, financial equilibrium, trade volume.

JEL CLASSIFICATION. G0, C7.

1. INTRODUCTION

There has been a substantial increase in the institutional ownership of corporate equity around the world in recent decades. On the New York Stock Exchange, for example, the percentage of outstanding corporate equity held by institutional investors has increased from 7.2% in 1950 to 49.8% in 2002 (NYSE 2003). For OECD countries as a whole, institutional ownership now accounts for around 30% of corporate equity (Nielsen 2003).

Institutional traders may be guided by incentives that are not fully captured by standard models in finance (Lakonishok et al. 1992).¹ Consider, for example, the case of

Amil Dasgupta: a.dasgupta@lse.ac.uk

Andrea Prat: a.prat@lse.ac.uk

We would like to thank the editor, Bart Lipman, and two anonymous referees for insightful comments. We are grateful to Franklin Allen, Sudipto Bhattacharya, Jordi Blanes, James Dow, Douglas Gale, Rohit Rahi, Dimitri Vayanos, and Michela Verardo for helpful conversations. We are also grateful to seminar participants at Berkeley, Bocconi, Carlos III, CORE, Delta, Duke, Harvard/MIT, Humboldt, LSE, Stanford, Turin, UCL, ULB, and Yale, as well as conference participants at the 2004 meetings of the Society for Economic Design for their comments.

¹Allen (2001) presents persuasive arguments for the importance of financial institutions to asset pricing.

US mutual funds, which make up a significant proportion of institutional investors in equity markets.² Because of SEC regulations, most mutual funds charge fees that are independent of performance.³ Their revenue depends only on the amount of assets that investors choose to entrust to them. At the same time, there is a substantial amount of empirical evidence that investors shift their money towards funds that have performed well in the recent past creating a “flow-performance” relationship (Ippolito 1992 and Chevalier and Ellison 1997). Funds have implicit incentives to “impress investors” in the current period in order to retain their investor base and attract new business in future periods. Indeed, Chevalier and Ellison present evidence that funds alter their behavior in response to such implicit incentives.⁴ Given the size of the mutual fund industry, such behavior is likely to affect prices and quantities in financial markets. In this paper, we consider the theoretical implications of the situation just described. In particular, we ask: What are the equilibrium features of a financial market in which a sizeable proportion of traders face implicit incentives of the kind that drive US mutual funds?

As a starting point, we draw upon the burgeoning theoretical literature on career concerns for experts (e.g. Holmström and Ricart i Costa 1986, Scharfstein and Stein 1990, Prendergast and Stole 1996, and Ottaviani and Sørensen 2006). An expert is an agent whose type determines his ability to understand the state of the world. This differs from “classical career concerns” (Holmström 1999) in which the agent’s type determines his ability to exert effort. Expert models are particularly suited to analyze agency relationships in financial setups, in which the key driver appears to be the ability to pick the right portfolio rather than pure effort exertion. Some expert models have been used to analyze precisely such settings. For example, Scharfstein and Stein (1990) develop an agency theoretic model in which experts mimic the decisions of other experts due to career concerns. However, that paper, and other such applications, consider only partial equilibrium analysis in which prices are fixed.

The main contribution of this paper is to develop a financial equilibrium model in which prices are determined endogenously by the behavior of experts with reputational concerns.⁵ This enables us to examine the effects of career concerned behavior on financial market variables.⁶

In our model there are four classes of agents: *investors* who cannot trade directly, *fund managers* who trade on behalf of investors, *noise traders* who trade for unmodelled liquidity reasons, and uninformed traders who act as *market makers*. It is a dynamic model: in every period the investors select among available fund managers. Fund managers face career concerns, which are the driving force behind our results.⁷

²Around 37% of equity held by institutions in 2002 was held by mutual funds; this number does not include state and private pension funds (NYSE 2003).

³See Elton et al. (2003) for details. Only 1.7% of US mutual funds charged incentive fees in 1999.

⁴Lakonishok et al. (1991) present evidence of related “window dressing” behavior by pension fund managers.

⁵We survey the related literature on asset pricing and agency problems below.

⁶It also enables us to examine whether career concerns can persist in a setting where prices play both informational and allocational roles.

⁷For tractability, we abstract from agency problems between the fund company and the fund manager,

In the baseline model, the form of the payment from the investor to the fund manager is exogenously given and places little or no weight on performance. As discussed above, this assumption applies by and large to US mutual funds. This allows us to make our main points in a simple, tractable model. Later in the paper we show that the results are still valid in an environment with endogenous contracting.

There are two periods. In each period there is a market for a risky asset, which is liquidated at the end of the period. In the beginning of the first period, investors entrust a fund manager with a sum of money. The fund manager trades on their behalf, and at the end of the period the investors observe the return obtained by the manager. At the beginning of the second period the investors can choose to retain the current fund manager or to replace him with a new one. Again, the fund manager trades on behalf of the investors.

Fund managers are characterized by their ability to observe market fundamentals. A good fund manager is more likely to learn the liquidation value of the asset before the asset is liquidated. In equilibrium investors can attempt to infer the ability of their fund manager from the outcome of trading.

The rest of the market is made of noise traders who trade for exogenous liquidity reasons (see, for example, [Grossman and Stiglitz 1980](#)) and a large number of uninformed traders who act as market makers. Market makers post bid and ask prices. As market makers are rational, there may be an endogenous bid-ask spread to account for adverse selection.

The main findings are as follows.

1. *Without career concerns, fund managers trade if and only if they possess valuable private information.* As a benchmark case, suppose that the fund manager has no career concerns, because the decision to replace or retain him is exogenous. Then we show that informed managers trade but uninformed managers do not. Informed managers trade because they can make profits in the presence of noise traders. Such trade by informed managers leads to a strictly positive bid-ask spread, which, in turn, implies that trading without information is a negative expected utility gamble. Thus, uninformed managers do not trade.
2. *With career concerns, young fund managers trade regardless of whether they possess information or not.* If the decision to replace or retain the fund manager is endogenous, there exists a *churning equilibrium* in which a young manager always trades. If he is informed, he trades correctly. If not, he churns, that is, he buys or sells at random. If an uninformed young manager does not churn, he signals his lack of information and gets replaced in the following period.
3. *Churning enhances trading volume.* The trading volume is higher in the churning equilibrium than it is in the equilibrium of the model without career concerns:

such as those documented by [Chevalier and Ellison \(1999\)](#). In our set-up, the fund manager and the fund company are the same entity: the terms fund manager and mutual fund can be (and are) used interchangeably.

all young fund managers and all informed old managers engage in trading. The effect on trading volume is highest when there are very few informed managers: in such a market, trading volume is lowest in the case without career concerns (because only informed managers trade), leading to the largest relative increase due to churning. Below, we examine the existing literature and argue that this finding contributes towards a potential solution to the “trade volume puzzle.”

4. *The endogenous compensation function is skewed against average performers.* In the churning equilibrium, achieving an average return (as a result of non-trading) is as bad as achieving a negative return (as a result of a wrong trade). Both outcomes signal poor information and lead to the manager being replaced. Instead a positive outcome ensures that the manager is kept. The endogenous incentive structure is such the implicit compensation of an average performer is closer to that of an under-performer than to that of an over-performer.

While our model is special, the intuition is general. If bad agents have less useful private information than good agents, their expectations of fundamentals are less likely to deviate from the market expectation (the technical conditions for this to be true are examined in [Section 3](#)). Hence, bad agents are less likely to benefit by trading, and in equilibrium lack of trade must carry a reputational cost. This in turn creates an incentive for fund managers to take excessive risk. An uninformed manager prefers randomizing over performance rather than getting stuck with an average outcome. Both the shape of the implicit compensation function and the risk-taking behavior are consistent with the findings of [Chevalier and Ellison \(1997\)](#). Their empirical flow-performance relationship displays convexity, and, as a consequence, recently established funds face a measurable incentive to increase the variance of performance.

It is useful to place the present contribution in the context of the literature on the trade volume puzzle. Any attempt to model financial trading faces the mighty obstacle of no-trade theorems.⁸ Under general conditions, the arrival of new private information cannot generate trade among rational traders. The intuition is related to Akerlof’s lemons problem. A trader who shows willingness to buy (sell) a given asset signals that he has private information indicating that the asset is worth more (less) than its market price. In equilibrium, this adverse selection problem results in zero trading. To get around the no-trade issue, the finance literature, beginning with [Grossman and Stiglitz \(1980\)](#), has assumed the presence of noise trading. Noise traders are agents who must sell or buy because something has changed in their personal situation. For instance they are compelled by unforeseen circumstances to generate or utilize liquidity (hence, noise traders are sometimes referred to as liquidity traders) or they need to buy particular securities to hedge against new risks. The presence of noise traders reduces adverse selection and allows for trade by informed speculators.

However, noise trading theories have come under increasing attack for their perceived inability to explain the order of magnitude of financial trade. While no conclusive

⁸See [Brunnermeier \(2000\)](#) for an overview of the topic and for further references.

evidence is available, many scholars are reluctant to accept that the trading volumes observed on modern stock markets (over \$10 trillion in 2002 on the New York Stock Exchange) can be explained by the kind of exogenous events that drive noise trading (Glaser and Weber 2003). (De Bondt and Thaler 1995, p. 392) go as far as to say that the high trade volume observed in financial markets “is perhaps the single most embarrassing fact to the standard finance paradigm”. One solution to the trading volume puzzle is to abandon the rational paradigm, for instance by allowing for overconfidence (e.g. Kyle and Wang 1997 and Glaser and Weber 2003). Our paper provides an alternative solution. We show that the presence of implicit incentives similar to those faced by US mutual funds can lead to excessive trading by institutions and thus enhance the volume of trade in financial markets. Moreover, the model yields testable implications, which are discussed in the conclusion.

Our core results are derived in the simplest possible setting. We probe the robustness of our conclusions by extending the analysis in several directions. First, we show that any putative equilibria of our game in which churning does not occur must be perverse: in these equilibria, investors must punish managers for obtaining high returns on their behalf.

Second, we extend our analysis to incorporate a richer information structure. We show that a necessary and sufficient condition for churning to occur is that a good fund manager is more likely than a bad fund manager to receive a signal about the liquidation value of the asset. If that mild condition is satisfied, there is a strict reputational cost of not trading. In equilibrium, a fund manager who has received an uninformative signal prefers churning to not trading.

Finally, we incorporate endogenous short-term contracts, which allow for payment contingent on current performance but not payment contingent on future performance. We show that, as long as the proportion of informed managers is small enough, the optimal contract is not contingent on performance and thus churning persists.

Our paper is closely linked to the pioneering work of Dow and Gorton (1997). They embed a moral hazard problem between investors and their fund managers into an asset pricing model and show that under the optimal contract fund managers have an incentive to trade even when they have no private information, that is, they churn. In their model, some uninformed traders are motivated by the desire to hedge against risks that arise with exogenous probability. In equilibrium, the presence of an agency problem may generate a high trade volume even in the presence of a small hedging component.⁹ While Dow and Gorton consider a static model with complete contracts, we focus on a dynamic model with incomplete contracts, which is perhaps a better representation of the mutual fund industry. As a consequence, we are able to study phenomena of practical interest, such as the endogenous incentive structure faced by fund managers (the equilibrium flow-performance relationship) and the relationship between churning and seniority. We are also able to show the optimality of non-contingent pay for fund management companies, which is a common feature of the mutual fund industry in the US and elsewhere.

⁹For further discussion of Dow and Gorton's results, see Bhattacharya (2002).

In a related paper, [Allen and Gorton \(1993\)](#) present a model in which prices can diverge from fundamentals due to churning by portfolio managers. In their model, bad fund managers buy bubble stocks at prices above their known liquidation value in the hope of reselling them before they die—at even higher prices—to other bad fund managers. Their behavior is the result of an option-like payoff structure under which profits are shared with managers but losses are not. Churning thus creates the possibility of short-term speculative profits. In contrast, in our setting, churning occurs under a flat fee structure due to reputational concerns over the life of the fund.

An earlier paper by [Trueman \(1988\)](#) considers a delegated portfolio management model in which the fund manager's ability is unknown. Compensation depends on performance and on the posterior belief on the fund's manager ability. Trueman shows that there is a churning equilibrium in which uninformed fund managers trade. Our paper differs in two respects. First, Trueman assumes that the fund manager's future compensation depends on his posterior in an exogenously given way. Instead in our model, future compensation depends on the investor's retention decision, which is endogenous. Second, Trueman considers a partial equilibrium model (and therefore cannot discuss trade volume) while we take into account the feedback that the fund manager's trade has on the asset market.

In a recent study of active management, [Berk and Green \(2004\)](#) present a model with symmetric information, learning, and diminishing returns to fund size that replicates several features of the data, including the flow-performance relationship. Berk and Green consider a partial equilibrium framework. Hence, unlike us, they do not focus on prices and volume. While our goals are different, our results overlap with theirs in providing an alternative explanation for the flow-performance relationship (based on career concerns). It is worth noting that, in examining the financial equilibrium impact of institutional trading, we do not attempt to match another aspect of the data—the lack of performance persistence—that is captured by Berk and Green. It would be interesting, though beyond the scope of the current exercise, to incorporate diminishing returns to scale (as in [Berk and Green \(2004\)](#)) in a general equilibrium framework (such as ours) to match the data along a further dimension.

Finally, our paper bears a general connection to a number of recent papers examining the asset pricing implications of delegated portfolio management, some of which we survey here. [Cuoco and Kaniel \(2001\)](#) show that exogenously specified performance fees can have significant asset pricing implications. Symmetric and asymmetric fees induce different effects. [Dasgupta and Prat \(2005\)](#) show that the presence of career concerns can diminish the ability of a financial market to aggregate information over time and can lead to information cascades and systematic mispricing. [Gümbel \(2005\)](#) develops a model in which agency problems arising out of delegated portfolio management lead to short-termism by fund managers, which in turn can have implications on asset prices. [Vayanos \(2003\)](#) considers the implications of delegation incentives on liquidity premia in financial markets.

The rest of the paper is organized as follows. The following section develops the simplest model which is sufficient to generate our main results. [Section 3](#) extends the baseline model in various directions. [Section 4](#) concludes.

2. THE BASELINE CASE

To present the essence of our results, we begin by discussing a simple baseline model. The main assumptions are: (1) contracts are exogenously given, and (2) a good manager has perfect information while a bad manager has no information. These assumptions are made for analytical convenience and are relaxed in [Section 3](#).

2.1 *Model*

Consider an economy with two periods, $t = 1, 2$. There is a single risk-neutral principal (investor) and a large pool of ex ante identical risk-neutral agents (fund-managers). One of these is hired at random at $t = 1$ to trade for the principal. At the end of the period, the principal may retain the agent or hire a new one at random from the pool. The agent can be of two types: $\theta \in \{b, g\}$ with probabilities $1 - \gamma$ and γ respectively. The type of any given agent is unknown to both the principal and the agent, and remains fixed for the duration of the game.

At each time period t , there is exactly one risky asset with liquidation value $v_t \in \{0, 1\}$; each value occurs with probability $\frac{1}{2}$. The payoff v_t is realized at the end of each period and is independent across periods. The agent's type θ and the asset payoff v_t are independent.¹⁰

In each period t , the fund manager submits a market order $a_t \in A = \{0, \emptyset, 1\}$, where 0 stands for “sell one unit at highest available price”, 1 stands for “buy one unit at lowest available price”, and \emptyset , the empty set, represents lack of activity.

At the end of each period, the principal and the market can observe the net return obtained by the agent. After such observation, the principal decides whether to retain or fire the fund manager. The retention decision of the investor is observed by the market.¹¹

In each period, there are $N \geq 1$ “noise traders” who trade for liquidity reasons unrelated to the value of the asset. Each such trader enters (independently of each other and of asset value and manager type) with probability $\eta \in (0, 1)$ and buys or sells one unit of the asset available in the period with equal probability.

There are a large number M of risk-neutral uninformed rational traders who act as market makers.¹² In any period, market makers can each buy or sell at most one unit of the asset available in that period. The action of each market maker consists of setting two prices: an ask price $p_t^A \in [\frac{1}{2}, 1]$ for $a_t = 1$ and a bid price $p_t^B \in [0, \frac{1}{2}]$ for $a_t = 0$. The fund manager and any noise trader is free to trade with any market maker, and,

¹⁰While we thus consider only one short-term asset per period, the spirit of our arguments would extend also to the case where there are multiple long term assets, as long as the identities of particular assets regarding which informed managers have private information change over time, and if returns and turnovers are observable. We are grateful to an anonymous referee for pointing this out.

¹¹The principal observes the return but not the portfolio choice or the liquidation value. As will be apparent later, this assumption is immaterial to our results. This property is a feature of the simple setting used here. See [Prat \(2005\)](#) for a more general analysis of the effect of the structure of the principal's information on the agent's behavior.

¹²We assume that $M \gg N$.

when indifferent between them, chooses one at random. Market makers are thus subject to Bertrand competition (as is now standard in the literature, following [Glosten and Milgrom \(1985\)](#) and [Kyle \(1985\)](#)) and each sets prices equal to the expected value of the asset conditional on the order.

The fund manager and noise traders submit their orders to the market makers simultaneously.¹³ Within a period, a given market maker observes only orders that arrive to him. Trades are anonymous: a market maker who receives an order does not know whether it comes from the fund manager or from a noise trader.¹⁴

The fund manager's information structure is common to both periods and depends on the fund manager's type. In each period t , a good fund manager receives a signal conveying the true liquidation value v_t , while a bad fund manager receives no signal. The signal s_t can take three values, 0, 1, and \emptyset , and it is determined as follows:

$$s_t(\theta, v_t) = \begin{cases} v_t & \text{if } \theta = g \\ \emptyset & \text{if } \theta = b. \end{cases}$$

In the present setup, s reveals θ . When the fund manager learns his signal he also learns his type. The investor does not observe either the signal or the type.

In each period, the net return on investment is

$$\chi_t(a_t, p_t^A, p_t^B, v_t) = \begin{cases} 0 & \text{if } a_t = \emptyset \\ v_t - p_t^A & \text{if } a_t = 1 \\ p_t^B - v_t & \text{if } a_t = 0. \end{cases}$$

Write a time- t mixed strategy for an agent as the mapping $a_t : S \rightarrow \Delta A$.

In this baseline version of the model, the contractual arrangement between the investor and the fund manager is exogenously determined. Note that we abstract throughout from agency problems that may arise *within* fund management companies. Thus, mutual fund managers can be identified with mutual funds companies. Accordingly, we model payoffs to managers along the lines of the fees charged by mutual fund companies. Given return χ_t , the payment from the investor to the manager is

$$\pi_t = \alpha \chi_t + \beta,$$

where $\alpha \in (0, 1)$ and $\beta \in (0, \infty)$. In most of the results of the present section we focus on the case $\alpha \rightarrow 0$. However, the fact that $\alpha > 0$ guarantees that when career concerns are absent, the interests of the fund manager are aligned with those of the investor.

¹³Since $M \gg N$, we neglect the possibility that a noise trader and the fund manager or two noise traders give their orders to the same market maker.

¹⁴We have in mind a large OTC market, such as the NASDAQ, that has many dealers who make markets simultaneously. There is no central order book, and thus one dealer is typically unaware of contemporaneous orders that arrive to other dealers.

This formulation simplifies the analysis substantially without being essential to our results. Our results would also hold in a single dealer market as long as there were sufficiently many trading periods for each asset. See [Dasgupta and Prat \(2005\)](#) for an analysis of such a market.

For simplicity there is no discounting. The investor's payoff is given by $\chi_1 - \pi_1 + \chi_2 - \pi_2$. The fund manager's payoff is $\pi_1 + \pi_2$.

It is clear that if α and β were very large (for example, if $\alpha \rightarrow 1$ and $\beta > 0$), it would never be in the investor's interest to employ a fund manager. To keep the problem interesting, we assume that α and β are not too large. In particular, we assume that

$$\frac{1}{2}(1 - \alpha)\gamma \frac{N\eta}{1 + N\eta} - \beta \geq 0. \quad (1)$$

We show below that this condition is sufficient to guarantee that the investor wants to hire the manager rather than to stay out of the market. Furthermore, we later show that the optimal short-term contract between the investor and the fund manager satisfies this condition.

To summarize, the timing is as follows.

- $t = 1$
- The fund manager learns s_1 and chooses a_1 .
 - Traders observe a_1 and set prices.
 - The investor and the market observe the net return obtained by the manager; v_1 is revealed to the market; payments to the fund manager are made.
- $t = 2$
- The investor retains the incumbent or hires the challenger. The investor's action is observed by the market.¹⁵
 - The fund manager learns s_2 and chooses a_2 .
 - Traders observe a_2 and set prices.
 - The investor and the market observe the net return obtained by the manager; v_2 is revealed to the market; payments to the fund manager are made.

2.2 No churning without career concerns

We show below that the presence of career concerns can induce bad fund managers to trade without information, that is, to *churn*. Before doing so, however, we establish a benchmark case without career concerns, in order to reassure readers that our core results are indeed due to the presence of implicit incentives and not to other features of our dynamic model.

Career concerns arise when the fund manager knows that his chance of being replaced depends on his behavior. To eliminate the implicit incentive component, assume that the probability that the first period fund manager is retained is exogenously given by $r \in [0, 1]$ and is stochastically independent from any other variable in the model.

PROPOSITION 1. *For any exogenous $r \in [0, 1]$, fund managers trade if and only if they have private information. That is, only good managers trade.*

¹⁵We are thus assuming that the investor and the market share the same beliefs about the fund manager at $t = 2$.

The proof of this result, and that of all results other than the main result (**Proposition 2**), are detailed in the **appendix**. In the absence of career concerns, fund managers behave optimally. Because of the presence of noise traders, the market is never fully efficient. Thus, it is optimal for managers with perfect private information to trade. Market makers realize that they may face an informed fund manager and thus set a strictly positive bid-ask spread. This, in turn, implies that uninformed fund managers lose in expectation when they trade because of adverse selection. Thus, they do not trade.

2.3 Churning with career concerns

We now return to the initial model and let the retention choice be made by the investor. What follows is our core result on the existence and characterization of the churning equilibrium.

PROPOSITION 2. *If α is small enough,¹⁶ there exists an equilibrium in which:*

- (i) *The investor retains the fund manager at $t = 2$ if he trades correctly at $t = 1$ and replaces him with a new fund manager if he trades incorrectly or does not trade.*
- (ii) *A good fund manager always trades. A bad fund manager churns if $t = 1$ and does not trade if $t = 2$. Formally,*

$$a_t(s_t) = s_t \text{ for } t = 1, 2, s_t \neq \emptyset$$

$$a_1(\emptyset) = \begin{cases} 0 & \text{with probability } \frac{1}{2} \\ 1 & \text{with probability } \frac{1}{2} \end{cases}$$

$$a_2(\emptyset) = \emptyset.$$

- (iii) *Market makers set prices:*

$$p_1^A = \frac{1}{2} \frac{1 + \gamma + N\eta}{1 + N\eta} \quad \text{and} \quad p_1^B = \frac{1}{2} \frac{1 - \gamma + N\eta}{1 + N\eta}$$

$$p_2^A = \frac{1}{2} \frac{2\tilde{\gamma} + N\eta}{\tilde{\gamma} + N\eta} \quad \text{and} \quad p_2^B = \frac{1}{2} \frac{N\eta}{\tilde{\gamma} + N\eta}$$

where $\tilde{\gamma}$ is the probability that the period 2 fund manager is good:

$$\tilde{\gamma} = \begin{cases} \frac{2\gamma}{1 + \gamma} & \text{if first period manager was retained} \\ \gamma & \text{otherwise.} \end{cases}$$

PROOF. *Fund manager's strategy at $t = 2$:* At $t = 2$, a bad manager never trades because $p_2^A > \frac{1}{2}$ and $p_2^B < \frac{1}{2}$. A good fund manager with signal $s = 1$ is strictly better off buying because $1 - p_2^A > 0$. A good fund manager with $s = 0$ is better off selling because $p_2^B > 0$.

¹⁶In particular, we require that $\alpha \leq (1 + N\eta)\beta/\gamma$.

Investor's belief: Given the price structure, only three possible first-period realizations of the gross return are possible: the one corresponding to a successful purchase or sale:

$$\chi_1 = 1 - p_1^A = p_1^B = \frac{1}{2} \frac{1 - \gamma + N\eta}{1 + N\eta};$$

the one corresponding to an wrong purchase or sale:

$$\chi_1 = -p_1^A = p_1^B - 1 = -\frac{1}{2} \frac{1 + \gamma + N\eta}{1 + N\eta};$$

and the one corresponding to no trade: $\chi_1 = 0$.

In the present equilibrium only the former two are observed. The requirement that investors beliefs are consistent with equilibrium play implies that

$$\tilde{\gamma}(\chi_1) = \Pr(\theta = g \mid \chi_1) \begin{cases} = 0 & \text{if } \chi_1 = -\frac{1}{2}(1 + \gamma + N\eta)/(1 + N\eta) \\ = \frac{\gamma}{\gamma + \frac{1}{2}(1 - \gamma)} = \frac{2\gamma}{\gamma + 1} & \text{if } \chi_1 = \frac{1}{2}(1 - \gamma + N\eta)/(1 + N\eta) \\ \in [0, 1] & \text{if } \chi_1 = 0. \end{cases}$$

The return $\chi_1 = 0$, which corresponds to the action $a = \emptyset$, is off the equilibrium path at $t = 1$. Perfect Bayesian equilibrium imposes no restriction. We choose to set¹⁷

$$\Pr(\theta = g \mid \chi_1 = 0) = 0.$$

Investor's retaining strategy: In the second period, managers produce a strictly positive return if and only if they are of the good type. At the beginning of period $t = 2$, given belief $\tilde{\gamma}$ about the quality of fund manager, the expected return of the investor at $t = 2$ is

$$\frac{1}{2} \tilde{\gamma} \frac{N\eta}{\tilde{\gamma} + N\eta} (1 - \alpha) - \beta,$$

which is increasing in $\tilde{\gamma}$. Thus, the investor should retain the fund manager at $t = 2$ if and only if

$$\tilde{\gamma}(\chi_1) \geq \gamma,$$

that is, if and only if the manager produces a positive return at $t = 1$.

Good fund manager's strategy at $t = 1$: A good fund manager who plays $a = s$ produces net return $1 - p_1^A = \frac{1}{2}(1 - \gamma + N\eta)/(1 + N\eta)$ in $t = 1$. He is retained and produces net return $1 - p_2^A(\tilde{\gamma} = 2\gamma/(\gamma + 1)) = \frac{1}{2}N\eta/(2\gamma/(\gamma + 1) + N\eta)$ in $t = 2$. His total payoff is

$$\pi_g(a = s) = \frac{1}{2}\alpha \left(\frac{1 - \gamma + N\eta}{1 + N\eta} + \frac{N\eta}{2\gamma/(\gamma + 1) + N\eta} \right) + 2\beta.$$

It is clear that that $\pi_g(a = s)$ is higher than the payoff (β) that the fund manager gets if he plays $a = \emptyset$ and the payoff ($< \beta$) the manager gets if he plays $a = 1 - s$.

¹⁷The proof works also with any $\Pr(\theta = g \mid \chi_1 = 0) \in (0, \gamma)$.

Bad fund manager's strategy at $t = 1$: A bad fund manager who does not trade generates a zero net return in $t = 1$ and is not retained. Therefore, his total payoff is

$$\pi_b(a = \emptyset) = \beta.$$

If instead the bad manager plays either $a = 1$ or $a = 0$ in $t = 1$, he is successful with probability $\frac{1}{2}$. His expected net return at $t = 1$ is

$$\frac{1}{2} - p_1^A = -\frac{1}{2} + p_1^B = \frac{1}{2} \left(1 - \frac{1 + \gamma + N\eta}{1 + N\eta} \right) = -\frac{1}{2} \frac{\gamma}{1 + N\eta}.$$

If the churning is successful, he is retained and does not trade at $t = 2$. His total expected payoff is

$$\pi_b(a \in \{0, 1\}) = \alpha \left(-\frac{1}{2} \frac{\gamma}{1 + N\eta} \right) + \beta + \frac{1}{2}\beta.$$

Then, $\pi_b(a \in \{0, 1\}) \geq \pi_b(a = \emptyset)$ if

$$\alpha \leq \frac{\beta(1 + N\eta)}{\gamma}.$$

Traders' pricing strategy: At $t = 1$, market makers know that a buy order can be from an informed manager (with probability $\gamma/(1 + N\eta)$), an uninformed manager engaged in churning (with probability $(1 - \gamma)/(1 + N\eta)$), or a noise trader (with probability $N\eta/(1 + N\eta)$). So he would set the ask price as follows:

$$p_1^A = \frac{\gamma}{1 + N\eta} 1 + \frac{1 - \gamma}{1 + N\eta} \frac{1}{2} + \frac{N\eta}{1 + N\eta} \frac{1}{2} = \frac{1}{2} \frac{1 + \gamma + N\eta}{1 + N\eta}.$$

Similarly, the first period bid price can be determined as

$$p_1^B = \frac{\gamma}{1 + N\eta} 0 + \frac{1 - \gamma}{1 + N\eta} \frac{1}{2} + \frac{N\eta}{1 + N\eta} \frac{1}{2} = \frac{1}{2} \frac{1 - \gamma + N\eta}{1 + N\eta}.$$

In the second period the market makers know that trades arrive either from noise traders or from informed managers. If a bad type of manager gets retained in error, he does not trade. Market makers share the investor's beliefs about the probability that the fund manager at $t = 2$ is good.¹⁸ Thus, their beliefs ($\tilde{\gamma}$) are as follows:

$$\tilde{\gamma} = \begin{cases} \frac{2\gamma}{1 + \gamma} & \text{if first period manager is retained} \\ \gamma & \text{otherwise.} \end{cases}$$

¹⁸The qualitative properties of our results do not depend on whether market makers share the investor's beliefs. If, instead, they did not observe the returns of the period 1 manager and whether the investor retains the manager, then $\tilde{\gamma}$ would simply be equal to the ex ante probability of a good manager in the second period, $\gamma + \frac{1}{2}(1 - \gamma)\gamma$, given the equilibrium.

They now set prices as follows:

$$p_2^A = \frac{\tilde{\gamma}}{\tilde{\gamma} + N\eta} 1 + \frac{N\eta}{\tilde{\gamma} + N\eta} \frac{1}{2} = \frac{1}{2} \frac{2\tilde{\gamma} + N\eta}{\tilde{\gamma} + N\eta}$$

and

$$p_2^B = \frac{\tilde{\gamma}}{\tilde{\gamma} + N\eta} 0 + \frac{N\eta}{\tilde{\gamma} + N\eta} \frac{1}{2} = \frac{1}{2} \frac{N\eta}{\tilde{\gamma} + N\eta}. \quad \square$$

It is easy to see that delegation to a fund manager is optimal for the investor. The calculations above show that the expected return produced at $t = 1$ by a good manager is $\frac{1}{2}(1 - \gamma + N\eta)/(1 + N\eta)$ and by a bad manager is $-\frac{1}{2}\gamma/(1 + N\eta)$. Thus the return to the investor from delegating to the fund manager is $(1 - \alpha)\frac{1}{2}\gamma N\eta/(1 + N\eta) - \beta$. Therefore, if α and β satisfy condition (1), then delegation at $t = 1$ is optimal for the investor. It is clear that the condition required for delegation to be beneficial to the investor at $t = 2$ is weaker than condition (1), and thus delegation is also beneficial for the investor at $t = 2$.

Proposition 2 identifies a churning equilibrium. All first-period fund managers trade. The good ones make correct trades by following their private information. The bad ones randomize between buying and selling.

The investor realizes that a successful trade may come from a lucky churning. Still, she knows that a good manager is more likely to be right and she revises her posterior upwards if she observes a successful trade. She knows also that a wrong trade can come only from a bad manager, and she believes that no-trade (an off-equilibrium event) is more likely to come from a bad manager. Given this set of beliefs, the investor retains the first-period manager if and only if he has traded successfully.

A good manager makes positive returns in both periods. He knows the liquidation value and he buys or sells at prices that are strictly between 0 and 1. He is also certain to be retained.

A bad manager faces a depressing choice between churning and non-trading. If he churns, he makes negative expected return $-\frac{1}{2}\gamma/(1 + N\eta)$ but has a 50% of being retained. If he does not trade, he makes a zero return and is fired for sure. If the direct-stake parameter α is low enough, the bad manager prefers to churn.

We now discuss in detail two important implications of **Proposition 2**: the effect of churning on trading volume and the equilibrium incentives faced by fund managers.

2.4 The impact of churning on trading volume

Trading volume is the expected number of assets traded on average in the two periods of our model. It is instructive to compute the trading volumes generated by the model in the absence and presence of career concerns. This allows us to measure the extent to which career concerns enhance trading volume in financial markets, and enables us to examine comparative statics.

In the model without career concerns, the two periods are identical. In each period, there is a probability γ that a manager will possess private information and trade based on it. In addition, in each period, N noise traders each trade with probability η . Thus,

trading volume in the absence of career concerns can be measured by

$$\frac{1}{2} [(\gamma + N\eta) + (\gamma + N\eta)] = \gamma + N\eta.$$

In the presence of career concerns, in the first period, fund managers trade with *and* without information. In the second period, however, only informed fund managers trade. The ex ante probability that the second-period fund manager is good is equal to the probability that the manager is good in $t = 1$ (because he is retained for sure) plus the probability that a bad $t = 1$ manager is identified to be bad and is replaced with a good one:

$$\gamma + \frac{1}{2}(1 - \gamma)\gamma.$$

Thus, the trading volume with career concerns can be measured by

$$\frac{1}{2} [(1 + N\eta) + (\gamma + \frac{1}{2}(1 - \gamma)\gamma + N\eta)].$$

Thus the increase in trading volume due to career concerns is given by

$$\frac{1}{2} [(1 + N\eta) + (\gamma + \frac{1}{2}(1 - \gamma)\gamma + N\eta)] - (\gamma + N\eta) = \frac{1}{2} (1 - \frac{1}{2}\gamma - \frac{1}{2}\gamma^2).$$

We can now state:

COROLLARY 1. *The proportionate increase in trading volume due to the presence of career concerns is given by*

$$\frac{1}{2} \frac{1 - \frac{1}{2}\gamma - \frac{1}{2}\gamma^2}{\gamma + N\eta}.$$

As the proportion of talented fund managers gets small, the presence of career concerns leads to larger percentage increases in trading volume.

It is exactly when there are many potential churners in the market that churning leads to the greatest increase in trade volume. Furthermore, we show below that it is also exactly when there are very few talented fund managers in the market that the optimal contract is not contingent on performance ($\alpha = 0$), thus creating the conditions ideal for churning.

Note that the increase in trading volume due to career concerns is driven by two factors. First, young fund managers churn at $t = 1$. Second, the probability that a good fund manager will be hired (and so trade) at $t = 2$ increases from γ to $\gamma + \frac{1}{2}(1 - \gamma)\gamma$, due to selection. To isolate the first effect (the pure churning effect), one could, instead, focus only on the first period, when the relevant ratio would be $(1 - \gamma)/(\gamma + N\eta)$, which has very similar properties to the ratio above.

2.4.1 *Relaxing the optimal delegation condition: can churning substitute for noise trade?*

In the analysis so far, we have always insisted that investors delegate to fund managers only if such delegation is optimal for them. The optimal delegation condition (1) is sufficient to guarantee this. In practice, however, there is substantial empirical evidence that retail investors use actively managed funds even when the use of such funds is clearly

suboptimal. A number of empirical studies have underscored the fact that actively managed funds underperform passive index funds after accounting for expenses (see, for example, Gruber 1996 or Wermers 2000). Nevertheless, U.S. investors put only 12% of their delegated funds in index funds, and Europeans put just 2% (Economist 2003). It seems natural, therefore, to explore the predictions of our model when we ignore the optimal delegation condition (1). We examine one such case below.

Holding fixed $\alpha > 0$ and $\beta > 0$, we let $N\eta \rightarrow 0$. This clearly violates condition (1): As noise trade vanishes, there is no abnormal profit to be made by trading. Suppose our investor behaved as retail investors in the real world seem to do, i.e., she still chose to delegate to an active fund manager. In this case notice that $p_2^A \rightarrow 1$ and $p_2^B \rightarrow 0$, so that $p_2^A - p_2^B \rightarrow 1$, so that the market becomes extremely illiquid in the second period, when career concerns are absent. However, period 1 prices behave differently: $p_1^A \rightarrow \frac{1}{2}(1 + \gamma)$ and $p_1^B \rightarrow \frac{1}{2}(1 - \gamma)$, so that $p_1^A - p_1^B \rightarrow \gamma < 1$, and the market thus remains liquid. This is because at $t = 1$ churners replace genuine noise traders and provide liquidity to the market by being willing to take losses in expectation to informed managers. The (irrational) investor effectively finances this noise trade by taking losses in expectation via delegation to fund managers.

In this case the proportionate increase in trading volume is $\frac{1}{2}(1 - \frac{1}{2}\gamma - \frac{1}{2}\gamma^2)/\gamma$, which grows without bound as γ gets small. Thus, if investors have a behavioral bias towards delegating to active fund managers, the volume impact of churning can be arbitrarily large. The existence of one anomaly—retail overinvestment in actively managed funds— aids our efforts to resolve another anomaly—the trade volume puzzle—via the career concerns of fund managers.

In the remainder of the paper, however, we return to the baseline, fully-rational setup, and insist that the optimal delegation condition (1) holds. We now proceed to examine another important property of the baseline model.

2.5 Asymmetric flow-performance relationship

A further consequence of Proposition 2 is that the implicit incentives of young fund managers are skewed. The reputational reward for good performance is higher in absolute terms than the reputational cost of bad performance. The existence of such a flow-performance relationship has been documented empirically by Chevalier and Ellison (1997). In a seminal empirical study of a large sample of income and growth funds from 1982 to 1992, they find that fund companies face an asymmetric flow-performance relationship. Funds with better past performance receive larger net in-flows. However, starting from average performance, the absolute effect of an increase in performance is greater than the absolute effect of a decrease of the same size. This form of convexity is much more evident for young funds. As a consequence, Chevalier and Ellison find also that young funds face incentives for excessive risk taking.

Equilibrium behavior in our model generates a similar, albeit more stylized, picture. A fund manager who trades successfully (i.e. generates a positive return) has an investment in-flow of zero. A fund manager who makes either a wrong trade (negative return) or no trade (average return) has an investment in-flow of -1 . This translates into skewed

implicit incentives.¹⁹ To fix ideas, let the explicit incentive component go to zero: $\alpha \rightarrow 0$. The manager's payoff depends only on whether he is retained and it can be written as

$$t_1 + t_2 = \begin{cases} \beta & \text{if } \chi_1 < 0 \\ \beta & \text{if } \chi_1 = 0 \\ 2\beta & \text{if } \chi_1 > 0. \end{cases}$$

As in Chevalier and Ellison, our young fund manager may have an incentive to increase the variability of the first-period return. If he is uninformed, he prefers a lottery over χ_1 , which he achieves by churning, rather than $\chi_1 = 0$ for sure, which he could obtain by not trading.

The intuition behind the asymmetry of the flow-performance relationship goes beyond our simple set-up. In any model of career concerns for experts, the value of an expert must depend on his ability to obtain information that is not publicly available (see [Zitzewitz 2001](#)). If the expert is a fund manager, his usefulness corresponds to his ability to form an opinion that differs from the market opinion. This leads a manager to identify assets that are over- or under-priced. A better manager holds a portfolio that is farther away from the market portfolio and, as consequence, generates a return that is less correlated to the market return (but on average higher). Such a manager should garner reputational rewards. Conversely, a fund manager who systematically tracks the market must have limited private information and should be less sought after by rational investors. In equilibrium, managers who obtain returns that are close to the market return must face some reputational cost.

3. DISCUSSION AND EXTENSIONS

It is important to probe the robustness of the findings of the previous section. In this section, we discuss the robustness of churning and endogenous contracts.

3.1 *How robust is churning?*

The core analysis focused on one particular equilibrium (the churning equilibrium) given one particular information structure (good agents know everything, bad agents know nothing). We now show that the churning equilibrium is the most plausible one and that our results do not depend on the particular information structure we chose for expositional purposes.

In order to abstract from pathological equilibria supported by carefully chosen out-of-equilibrium beliefs, we carry out both of these exercises under the assumption that an arbitrarily small proportion μ of managers are “naive”: These traders always choose $a = s$. This implies that a small proportion of managers who receive signal $s = \emptyset$ do

¹⁹Two potential criticisms of our flow-performance relationship are that it depends on the specific information structure used in the baseline model and that non-trading is an off-equilibrium event. Both criticisms are addressed in [Section 3.1.2](#), where we show the equilibrium of the baseline model arises in settings with richer information structures and where no-trade is not an off-equilibrium event. Thus, the asymmetric flow-performance relationship persists.

not trade. Thus, no-trade is no longer an off-equilibrium event. All other features of the baseline model are as before.

3.1.1 Non-churning equilibria While churning need not be an essential property of all equilibria of our baseline game, we shall show here that equilibria without churning must be “peculiar”: in these equilibria, over some ranges of returns, investors must *punish* a manager for *doing well*. To be precise, denote the equilibrium retention probabilities used by the investor by $r(1)$, $r(0)$, and $r(-1)$ for the cases where the manager generates positive, zero, and negative returns respectively. Now we can state:

PROPOSITION 3. *When α is sufficiently small, in any equilibrium in which managers do not churn, it cannot be the case that $r(1) \geq r(0) \geq r(-1)$.*

If $r(1) \geq r(0) \geq r(-1)$, it is clear that informed fund managers would trade according to their signals. Then it must be the case that $r(0) = 0$.²⁰ In addition, for the investor's strategy to be optimal, it must be the case that $r(1) > 0$. Thus, $r(1) > r(0) = r(-1) = 0$. But then it follows that $r(0) < \frac{1}{2}[r(1) + r(-1)]$, and then (for small α) the uninformed manager will churn.

The relative values of the equilibrium retention probabilities determine the slope of the flow-performance relationship discussed above. The interpretation of this result is that any equilibrium where fund managers' strategies are different from those identified in **Proposition 2** must be characterized by a flow-performance relationship that is strictly decreasing over some range. In other words, fund managers must be explicitly punished for doing better. This is at odds with empirical findings.

3.1.2 A more general information structure The core result was obtained under the assumption that the agent has an extremely simple information structure: a good agent receives a perfectly informative signal, a bad agent receives no signal. We now generalize the information structure to allow a good agent to also receive no signal and a bad agent to also receive an informative signal.

Suppose that the distribution of the private signal s can be written as

$$\Pr(s \mid v, \theta) = \begin{cases} \rho_\theta & \text{if } s = v \\ 1 - \rho_\theta - \tau_\theta & \text{if } s = \emptyset \\ \tau_\theta & \text{if } s = 1 - v, \end{cases}$$

where ρ_g , τ_g , ρ_b , and τ_b are parameters with values in the interval $[0, 1]$ such that $\rho_g + \tau_g \leq 1$ and $\rho_b + \tau_b \leq 1$. The information structure is based on the implicit assumption that the signal is symmetric in $v = 1$ and $v = 0$. Our core results were obtained under the assumption that $\rho_g = 1$ and $\tau_g = \rho_b = \tau_b = 0$. The agent does not observe his own type θ .

We assume that the signal is useful, in the sense that it provides some information on the valuation v (even for a bad agent). Moreover, a good agent gets a more useful

²⁰This is because beliefs are no longer arbitrary in the presence of a small measure of naive managers.

signal than a bad agent:

$$1 \geq \rho_g > \rho_b > \tau_b > \tau_g \geq 0. \quad (2)$$

We now identify an important condition that implies that receiving informative signals is “good news” about a manager:

$$\Pr(\theta = g \mid s \neq \emptyset) > \Pr(\theta = g \mid s = \emptyset). \quad (3)$$

Stated in terms of primitives, this is equivalent to $\rho_g + \tau_g > \rho_b + \tau_b$. We now show that this condition is necessary and sufficient for churning.

PROPOSITION 4. *Suppose $\rho_g + \tau_g \neq \rho_b + \tau_b$. When α is sufficiently small:*

(i) *There exists a churning equilibrium in which*

$$\begin{aligned} a_t(s_t) &= s_t \text{ for } t = 1, 2, s \neq \emptyset \\ a_1(\emptyset) &= \begin{cases} 0 & \text{with probability } \frac{1}{2} \\ 1 & \text{with probability } \frac{1}{2} \end{cases} \\ a_2(\emptyset) &= \emptyset \end{aligned}$$

if and only if $\rho_g + \tau_g > \rho_b + \tau_b$.

(ii) *Further, when $\rho_g + \tau_g > \rho_b + \tau_b$, there exists no equilibrium in which the agent follows his signal in both periods: $a_t(s) = s$ for $t = 1, 2$ and all s .*

If inequality (3) is satisfied, there cannot exist a equilibrium in which the fund manager follows his signal. The condition requires that observing an informative signal is better news for the manager’s type than observing an uninformative signal: a good expert is more likely than a bad expert to get some kind of information, however flawed, rather than no information at all. If this condition is satisfied and the fund manager follows his signal, then not trading is bad news about the manager’s type. The investor should fire a non-trader. If explicit incentives are not too large, an uninformed fund manager would then prefer to churn and there exists no equilibrium in which the manager follows his signal.

While we are thus able to substantially generalize the information structure used in the baseline model, it is clear that several formulations are excluded. For example, an information system in which bad managers always receive (imprecise) information ($\rho_b = \tau_b = \frac{1}{2}$) but good managers sometimes receive very precise information and sometimes receive no information at all ($\rho_g = \frac{2}{3}, \tau_g = 0$) violates condition (3) (because $\rho_g + \tau_g = \frac{2}{3} < \rho_b + \tau_b = 1$) and is excluded from our analysis. Such an information structure would not support churning. In such a setting, the receipt of a signal serves as evidence that a fund manager is of low quality.

3.2 Endogenous contracts

The baseline model postulates exogenously given linear contracts. We now remove this assumption and consider endogenous contracting between the investor and the fund manager(s). We assume that the investor has all the bargaining power: he makes a take-it-or-leave-it offer to the fund manager. For simplicity, we also normalize the fund manager's participation constraint to zero.

To keep the problem interesting, we assume also that the fund manager must receive a minimum non-negative payment \bar{w} if he is employed (for every period he is employed). If this were not the case, the investor would just offer a zero payment in both periods and the fund manager would be entirely indifferent (and therefore he might as well behave optimally). Since $\bar{w} > 0$, we can disregard the fund manager's participation constraint.

Finally, we restrict attention to short-term contracts, which seem to be more appealing for financial settings.²¹ We show that the results of the baseline model are still valid.

There are two short-lived investors. Investor 1 offers a contract b_1 to the fund manager in the beginning of the first-period and receives payoff $\chi_1 - \pi_1$. The payment between investor 1 and the manager may depend on all the observables at $t = 1$ (but cannot depend on what happens in $t = 2$). Investor 2 is born in the beginning of the second period and observes the return obtained by the manager in the previous period. She then chooses between the incumbent manager and the challenger, and selects a contract b_2 . We can then write a contract as a triple (corresponding to positive, negative, and zero net returns respectively):

$$b_t = (b_t(\text{success}), b_t(\text{failure}), b_t(\text{no trade})),$$

under the constraint—discussed above—that all three values are not below \bar{w} . The time line is:

- $t = 1$
 - Investor 1 specifies contract b_1 ; the contract is observed by the market.
 - The fund manager learns s_1 and chooses a_1 .
 - Traders observe a_1 and set prices.
 - Investor 1 and the market observes the net return; v_1 is revealed to the market; payments to the fund manager are made.
- $t = 2$
 - Investor 2 observes the net first period return. She retains the incumbent or hires the challenger. She specifies contract b_2 ; the investor's action and the contract are observed by the market.
 - The fund manager learns s_2 and chooses a_2 .
 - Traders observe a_2 and set prices.
 - Investor 2 and the market observes the net second period return; v_2 is revealed to the market. Payments to the fund manager are made.

²¹When long-term contracting is allowed, the existence of churning under the optimal contract depends on parameter values, and no clear result emerges.

We show that, as long as the proportion of good managers is small enough, and there is sufficient amounts of noise trade, there exists an equilibrium that is identical to the churning equilibrium that we found in the baseline model:

PROPOSITION 5. *For any $\bar{w} > 0$, if the proportion of good managers γ is low enough and there is a sufficient amount of noise trade, there exists a churning equilibrium in which:²²*

- (i) *Investor 1 hires a fund manager and selects a flat contract $b_1 = (\bar{w}, \bar{w}, \bar{w})$.*
- (ii) *Investor 2 retains the fund manager if and only if he traded successfully. Otherwise, she hires a new manager. In either case, the investor selects a flat contract for her fund manager $b_2 = (\bar{w}, \bar{w}, \bar{w})$.*
- (iii) *A good fund manager always trades. A bad fund manager churns if $t = 1$ and does not trade if $t = 2$.*
- (iv) *Traders set prices as in [Proposition 2](#).*

Even with endogenous contracting, the churning equilibrium of [Proposition 2](#) is still an equilibrium if: (i) only short-term contracts are possible; and (ii) the proportion of good managers is low. Such an equilibrium has the same high levels of trading volume identified in [Section 2.4](#).

Trading by good managers benefits the first period investor, but churning by bad managers hurts her. The investor can eradicate churning by offering an appropriate contract. The benefit of churning to a bad manager is given by a 50% chance of being hired again in the next period: $\frac{1}{2}\bar{w}$. To persuade him to stop trading, the investor needs to set

$$b_1(\text{no trade}) > \bar{w} + \frac{1}{2}\bar{w}.$$

The proof in the [appendix](#) shows that as long as $\frac{N\eta}{1+N\eta} \frac{\gamma}{\gamma+N\eta} \leq \bar{w}$, the costs of paying for non-trading outweighs the benefits, and the investor prefers to offer a flat contract. Holding fixed the amount of noise trading, this condition implies that as long as the proportion of good managers is small enough, it is optimal for the investor to offer a flat contract.

The damage of churning *per churner* on investor 1 is lowest when the proportion of good types γ is low because the bid-ask spread is narrow. Churning is least costly when there are many churners. Therefore, if γ is low enough, the benefit of stopping churning is lower than the cost of reimbursing the bad manager for the lost career opportunity.

At a deeper level, the result may also be understood in terms of inefficiencies generated by bilateral contracting in an environment with more than two agents. Churning increases the probability that the fund manager is retained in the second period. This creates an additional rent to the incumbent which in part is paid for by investor 2 (who cannot tell for certain between a good and a bad incumbent) and by the challenger (who

²²In particular, we require $\frac{N\eta}{1+N\eta} \frac{\gamma}{\gamma+N\eta} \leq \bar{w}$ and $N\eta > 2 - \gamma$.

is hired with a lower probability).²³ As investor 1 and the incumbent do not internalize the cost that churning imposes on the other two parties, they find it optimal to sign a contract that does not prevent churning. That is why full bilateral contracting can still lead to socially inefficient outcomes.

When we reduce the proportion of informed traders holding fixed the minimum fee that must be paid to fund managers, it is natural to wonder whether delegation is still optimal for investors. The proof in the [appendix](#) shows that this is indeed the case as long as $N\eta > 2 - \gamma$, that is, as long as there is enough noise trade. The presence of such noise trade creates sufficient opportunities to make positive profits from trading, thus making delegation via uncontingent contracts optimal even when bad managers churn and good managers are rare.

4. CONCLUSION

In this paper we have studied the equilibrium features of a financial market in which a non-negligible share of the market participants are fund managers who face career concerns. These features differ markedly from the features of a standard market: prices are less informative and there is more trade. Uninformed fund manager engage in churning and in equilibrium they behave as if they were noise traders.

While we have examined several extensions of our model, many interesting avenues of research remain unexplored. First, it would be interesting to enlarge the set of assets and trades to make the analysis more comparable to standard financial models such as CAPM. It would also be important to introduce an element of risk-aversion for both investors and fund managers. Second, our results were derived in a static trading game. Each security lasts for one period only and trade occurs at one specified instant. One should consider a richer setting in which both trading activity and career concerns display their effects over time. Finally, as we discussed in the introduction, the present model may contribute towards a solution to the trade volume puzzle. But then one should ask how the career concerns explanation fares compared to the over-confidence explanation ([Kyle and Wang 1997](#)).

To conclude, we briefly consider some of the empirical implications of our work. Our theory suggests that increasing level of institutional ownership in financial markets should lead to higher volume over time. Our theory is, thus, falsifiable: if an increase in the share of institutional trading is, ceteris paribus, accompanied by a decrease in trading volume, we should reject the career concerns explanation. For the period 1955–1988 on the NYSE, [Dow and Gorton \(1997\)](#) regress turnover on institutional ownership and real commissions and find that the coefficient on institutional ownership is positive and significant. Our theory also suggests a cross-sectional implication: stocks with high institutional ownership should have, ceteris paribus, higher turnover. The recent work of [Dennis and Strickland \(2002\)](#) shows that stocks owned by institutions have higher abnormal turnover on days with big market movements.

²³This second kind of externality is present even when there are long term contracts.

APPENDIX: OMITTED PROOFS

PROOF OF PROPOSITION 1. The presence of noise traders ensures that $p_t^A < 1$ and $p_t^B > 0$ for all t . The fund manager of type $\theta = g$ will buy as long as

$$p_t^A \leq v_t.$$

Thus, the good fund manager will buy if he knows that $v_t = 1$, which in turn implies that $p_t^A > \frac{1}{2}$. Similarly, the fact that the good fund manager will sell if he knows that $v_t = 0$ implies that $p_t^B < \frac{1}{2}$. For a fund manager with $\theta = b$, the expected value of the asset is $E[v]$. The bad fund manager never buys because

$$E[v_t] = \frac{1}{2} < p_t^A$$

and he never sells because

$$E[v] = \frac{1}{2} > p_t^B. \quad \square$$

PROOF OF PROPOSITION 3. Given the presence of noise traders, we know that prices satisfy $p_t^A < 1$, $p_t^B > 0$ for both $t = 1$ and $t = 2$. Since there are no career concerns at $t = 2$, and because $\alpha > 0$ it is easy to see that in any equilibrium managers must choose $a_2 = s_2$. Then prices at $t = 2$ are given exactly as in the baseline model, so that expected returns generated by the fund manager are an increasing function of the principal's posterior $\tilde{\gamma}$. Thus, as in the baseline model, the investor retains fund managers for whom the posterior assessment $\tilde{\gamma}(\chi_1) > \gamma$. Now consider $t = 1$ strategies. To begin, notice that in any equilibrium when α is sufficiently small, if $\frac{1}{2}(r(1) + r(-1)) > r(0)$ fund managers who do not receive information will churn. Suppose that $r(1) \geq r(0) \geq r(-1)$, and that there is an equilibrium with no churning at $t = 1$. Consider the payoffs to the informed (good) manager. When $v_1 = 1$

$$\begin{aligned} \pi(a_1 = 1) &= \beta + \alpha(1 - p_1^A) + r(1)\pi_2^* \\ \pi(a_1 = 0) &= \beta + \alpha(p_1^B - 1) + r(-1)\pi_2^* \\ \pi(a_1 = \emptyset) &= \beta + r(0)\pi_2^*, \end{aligned}$$

where π_2^* represents payoff from optimal behavior at $t = 2$. Notice that $\pi_2^* \geq \beta > 0$. For $\alpha > 0$, $r(1) \geq r(-1) \Rightarrow \pi(a_1 = 1) > \pi(a_1 = 0)$ and $r(1) \geq r(0) \Rightarrow \pi(a_1 = 1) > \pi(a_1 = \emptyset)$. Thus, when $v_1 = 1$ good managers will play $a_1 = 1$. It is easy to check that when $v_1 = 0$, good managers will play $a_1 = 0$. Thus, good managers always play $a_1 = s_1$. Given the small fringe of naive managers, the investor's beliefs upon seeing zero return are not arbitrary. They must (at least) be consistent with the equilibrium behavior of good fund managers. Thus, upon observing $\chi_1 = 0$, the investor knows that the manager cannot be of type $\theta = g$, and thus optimally, $r(0) = 0$. Under the maintained hypothesis, this implies that $r(-1) = 0$. The two possible cases are $r(1) = r(0) = r(-1) = 0$ (the manager is replaced for sure) and $r(1) > r(0) = r(-1) = 0$. But under any arbitrary mixed strategy chosen by the bad managers, it must be the case that $\tilde{\gamma}(\chi_1 > 0) > \gamma$. Thus, $r(1) = 0$ cannot be optimal for the investor. Thus, $r(1) > 0$, which implies that $\frac{1}{2}(r(1) + r(-1)) > r(0)$, and thus non-naive managers of type $\theta = b$ will churn. \square

PROOF OF PROPOSITION 4. We use the following notation for unconditional probabilities:

$$\begin{aligned}\rho &= \gamma\rho_g + (1-\gamma)\rho_b = \Pr(s = v) \\ \tau &= \gamma\tau_g + (1-\gamma)\tau_b = \Pr(s = 1 - v),\end{aligned}$$

which implies

$$1 - \rho - \tau = \Pr(s = \emptyset).$$

Consider the first part of the proposition. Suppose that $\rho_g + \tau_g > \rho_b + \tau_b$. It is clear that in the second period, due to the lack of career concerns, managers set $a = s$. Let $\tilde{\gamma}$ be the principal's posterior, which, as in the baseline model, is shared by market makers. Define

$$\begin{aligned}\tilde{\rho} &= \tilde{\gamma}\rho_g + (1-\tilde{\gamma})\rho_b \\ \tilde{\tau} &= \tilde{\gamma}\tau_g + (1-\tilde{\gamma})\tau_b.\end{aligned}$$

Then it is easy to see that prices at $t = 2$ are as follows:²⁴

$$p_2^A(\tilde{\gamma}) = \frac{\tilde{\rho} + \frac{1}{2}N\eta}{\tilde{\rho} + \tilde{\tau} + N\eta}, \quad p_2^B = 1 - p_2^A.$$

The expected return generated by the fund manager at $t = 2$ is given by

$$\begin{aligned}\tilde{\rho}(1 - p_2^A(\tilde{\gamma})) + \tilde{\tau}(0 - p_2^A(\tilde{\gamma})) &= \tilde{\rho} - p_2^A(\tilde{\gamma})(\tilde{\rho} + \tilde{\tau}) \\ &= \frac{N\eta}{2} \frac{\tilde{\rho} - \tilde{\tau}}{\tilde{\rho} + \tilde{\tau} + N\eta},\end{aligned}$$

which is increasing in $\tilde{\gamma}$ since $\tilde{\rho}$ increases in $\tilde{\gamma}$ and $\tilde{\tau}$ decreases in $\tilde{\gamma}$. Thus the manager is retained if and only if $\tilde{\gamma} \geq \gamma$. Since everyone trades at $t = 1$, it is easy to see that $\tilde{\gamma}(\chi_1 > 0) > \gamma$ and $\tilde{\gamma}(\chi_1 < 0) < \gamma$, and thus $r(1) = 1$ and $r(-1) = 0$, reusing the notation introduced above. Consider $\tilde{\gamma}(\chi_1 = 0)$. Since the only agents who do not trade at $t = 1$ are the naive managers who receive no information, we have

$$\tilde{\gamma}(\chi_1 = 0) = \Pr(\theta = g \mid \chi_1 = 0) = \frac{\gamma \Pr(\chi_1 = 0 \mid \theta = g)}{\Pr(\chi_1 = 0)} = \frac{\gamma \mu(1 - \rho_g - \tau_g)}{\mu(1 - \rho - \tau)} < \gamma.$$

Thus, $r(0) = 0$. Therefore $r(1) > r(0) = r(-1) = 0$. It is then immediate that the manager's best response is as outlined in the putative equilibrium strategies.

Now suppose that $\rho_g + \tau_g \leq \rho_b + \tau_b$. If the equilibrium strategies are as above, then as before, the agent is kept if and only if $\tilde{\gamma} \geq \gamma$. Again, under the putative equilibrium strategies, $\tilde{\gamma}(\chi_1 > 0) > \gamma$ and $\tilde{\gamma}(\chi_1 < 0) < \gamma$, and thus $r(1) = 1$ and $r(-1) = 0$. However, when $\rho_g + \tau_g \leq \rho_b + \tau_b$, $\tilde{\gamma}(\chi_1 = 0) \geq \gamma$, and thus $r(0) = 1$. Consider the payoffs to a trader who receives a period 1 signal $s = \emptyset$. Given the retention probabilities induced

²⁴Note that when we set $\rho_g = 1$, and $\rho_b = \tau_g = \tau_b = 0$ to return to the baseline model, we get $\tilde{\rho} = \tilde{\gamma}$ and $\tilde{\tau} = 0$, so that $p_2^A(\tilde{\gamma}) = \frac{1}{2}(2\tilde{\gamma} + N\eta)/(\tilde{\gamma} + N\eta)$ exactly as before.

by equilibrium behavior, trading without information leads to an expected payoff of $\beta + \frac{1}{2}\beta$ as $\alpha \rightarrow 0$, while not trading without information leads to an expected payoff of $\beta + \beta$. Clearly, then, it is not optimal to churn, and the strategies outlined above cannot constitute an equilibrium.

For the second part of the proposition, suppose $a_2 = s_2$. As in the first part, the agent is kept if and only if $\tilde{\gamma} \geq \gamma$. Suppose $a_1 = s_1$. The principal's belief is

$$\tilde{\gamma}(\chi_1) = \Pr(\theta = g \mid \chi_1) = \begin{cases} \gamma \rho_g / \rho & \text{if } \chi_1 > 0 \\ \gamma(1 - \rho_g - \tau_g) / (1 - \rho - \tau) & \text{if } \chi_1 = 0 \\ \gamma \tau_g / \tau & \text{if } \chi_1 < 0. \end{cases}$$

If $\rho_g + \tau_g > \rho_b + \tau_b$,

$$\frac{1 - \rho_g - \tau_g}{1 - \rho - \tau} < 1$$

and $\tilde{\gamma}(\emptyset) < \gamma$: a fund manager who does not trade gets fired. Instead, by (2),

$$\frac{\rho_g}{\rho} > 1,$$

and $\tilde{\gamma}(1) > \gamma$: a fund manager who trades correctly is retained. It is then clear that for α small enough, a fund manager who observes $s_1 = \emptyset$ prefers to play $a_1 = \{0, 1\}$ rather than $a_1 = \emptyset$. \square

PROOF OF PROPOSITION 5. In the second period, the optimal contract is the flat wage $b_2 = (\bar{w}, \bar{w}, \bar{w})$. It is the cheapest compensation and induces optimal behavior on the part of the fund manager (who is indifferent).

If the first-period investor offers a flat wage $b_1 = (\bar{w}, \bar{w}, \bar{w})$, it is easy to see that the continuation equilibrium is as in the statement of the proposition. Following familiar lines, we can also compute the first-period investor's expected payoff:

$$\begin{aligned} u^C &= \gamma(1 - p_1^A) + (1 - \gamma)(\frac{1}{2} - p_1^A) - \bar{w} \\ &= \frac{1}{2}\gamma \frac{N\eta}{1 + N\eta} - \bar{w}. \end{aligned}$$

The flat wage $b_1 = (\bar{w}, \bar{w}, \bar{w})$ offers the lowest compensation; induces the good type to behave optimally; but induces the bad type to churn. The only way in which the first-period investor can improve his expected payoff is by dissuading a bad fund manager from churning. The cheapest way to achieve this is to increase b_1 (no trade) up to a level at which a bad fund manager is exactly indifferent between churning and not trading. This is done by keeping b_1 (success) = b_1 (failure) = \bar{w} and setting b_1 (no trade) = $\bar{w} + \frac{1}{2}\bar{w}$.

If the fund manager is good, the first-period investor's payoff is now (note that traders realize that only good managers trade and change prices accordingly)

$$\frac{1}{2} \frac{N\eta}{\gamma + N\eta} - \bar{w}.$$

If instead the fund manager is bad, the payoff is just $-\frac{3}{2}\bar{w}$. Hence, the maximum expected payoff with no churning is

$$u^{NC} = \frac{1}{2}\gamma \frac{N\eta}{\gamma + N\eta} - \bar{w} - \frac{1}{2}(1 - \gamma)\bar{w}.$$

The difference between the expected payoff with churning and without is

$$\begin{aligned} u^C - u^{NC} &= \frac{1}{2}\gamma \left(\frac{N\eta}{1 + N\eta} - \frac{N\eta}{\gamma + N\eta} \right) + \frac{1}{2}(1 - \gamma)\bar{w} \\ &= \frac{1}{2}\gamma \frac{(\gamma - 1)N\eta}{(1 + N\eta)(\gamma + N\eta)} + \frac{1}{2}(1 - \gamma)\bar{w} \\ &= \frac{1}{2}(1 - \gamma) \left(\bar{w} - \frac{\gamma N\eta}{(1 + N\eta)(\gamma + N\eta)} \right), \end{aligned}$$

which is positive when $\bar{w} \geq \gamma N\eta / ((1 + N\eta)(\gamma + N\eta))$.

The condition imposes a lower bound on \bar{w} . From the definition of u^C , it is clear that $\bar{w} \leq \frac{1}{2}\gamma N\eta / (1 + N\eta)$ for delegation to be optimal. The lower bound must be smaller than the upper bound:

$$\frac{1}{2}\gamma \frac{N\eta}{1 + N\eta} \geq \frac{N\eta}{1 + N\eta} \frac{\gamma}{\gamma + N\eta},$$

which implies that $\gamma + N\eta \geq 2$. □

REFERENCES

- Allen, Franklin (2001), "Do financial institutions matter?" *Journal of Finance*, 56, 1165–1175. [67]
- Allen, Franklin and Gary Gorton (1993), "Churning bubbles." *Review of Economic Studies*, 60, 813–836. [72]
- Berk, Jonathan and Richard Green (2004), "Mutual fund flows and performance in rational markets." *Journal of Political Economy*, 112, 1269–1295. [72]
- Bhattacharya, Sudipto (2002), "Delegated funds management: incentives and behavior." Unpublished paper, London School of Economics. [71]
- Brunnermeier, Markus K. (2000), *Asset Pricing under Asymmetric Information: Bubbles, Crashes, Technical Analysis, and Herding*. Oxford University Press, Oxford. [70]
- Chevalier, Judith and Glenn Ellison (1997), "Risk taking by mutual funds as a response to incentives." *Journal of Political Economy*, 105, 1167–1200. [68, 70, 81]
- Chevalier, Judith and Glenn Ellison (1999), "Career concerns of mutual fund managers." *Quarterly Journal of Economics*, 114, 389–432. [69]
- Cuoco, Domenico and Ron Kaniel (2001), "Equilibrium prices in the presence of delegated portfolio management." Working paper, University of Pennsylvania. [72]

Dasgupta, Amil and Andrea Prat (2005), "Asset price dynamics when traders care about reputation." Discussion Paper 5372, CEPR, London. [72, 74]

De Bondt, Werner F. M. and Richard H. Thaler (1995), "Financial decision-making in markets and firms: a behavioral perspective." In *Finance (Handbooks in Operations Research and Management Science, Volume 9)* (Robert A. Jarrow, Vojislav Maksimovic, and William T. Ziemba, eds.), 385–410, Elsevier, Amsterdam. [71]

Dennis, Patrick and Deon Strickland (2002), "Who blinks in volatile markets, individuals or institutions?" *Journal of Finance*, 57, 1923–1950. [87]

Dow, James and Gary Gorton (1997), "Noise trading, delegated portfolio management, and economic welfare." *Journal of Political Economy*, 105, 1024–1050. [71, 87]

Economist (2003), "A survey of asset management." 5 July. [81]

Elton, Edwin J., Martin J. Gruber, and Christopher R. Blake (2003), "Incentive fees and mutual funds." *Journal of Finance*, 58, 779–804. [68]

Glaser, Markus and Martin Weber (2003), "Overconfidence and trading volume." Discussion Paper 3941, CEPR, London. [71]

Glosten, Lawrence R. and Paul R. Milgrom (1985), "Bid, ask and transaction prices in a specialist market with heterogeneously informed traders." *Journal of Financial Economics*, 14, 71–100. [74]

Grossman, Sanford J. and Joseph E. Stiglitz (1980), "On the impossibility of informationally efficient markets." *American Economic Review*, 70, 393–408. [69, 70]

Gruber, Martin J. (1996), "Another puzzle: the growth in actively managed mutual funds." *Journal of Finance*, 51, 783–810. [81]

Gümbel, Alexander (2005), "Trading on short-term information." *Journal of Institutional and Theoretical Economics*, 161, 428–462. [72]

Holmström, Bengt (1999), "Managerial incentive problems: a dynamic perspective." *Review of Economic Studies*, 66, 169–182. [68]

Holmström, Bengt and Joan Ricart i Costa (1986), "Managerial incentives and capital management." *Quarterly Journal of Economics*, 101, 835–860. [68]

Ippolito, Richard A. (1992), "Consumer reaction to measures of poor quality: evidence from the mutual fund industry." *Journal of Law and Economics*, 35, 45–70. [68]

Kyle, Albert S. (1985), "Continuous auctions and insider trading." *Econometrica*, 53, 1315–1335. [74]

Kyle, Albert S. and E. Albert Wang (1997), "Speculation duopoly with agreement to disagree: can overconfidence survive the market tests?" *Journal of Finance*, 52, 2073–2090. [71, 87]

Lakonishok, Josef, Andrei Shleifer, Richard Thaler, and Robert W. Vishny (1991), "Window dressing by pension fund managers." *American Economic Review*, 81, 227–231. [68]

Lakonishok, Josef, Andrei Shleifer, and Robert W. Vishny (1992), "The structure and performance of the money management industry." *Brookings Papers on Economic Activity*, 1992, 339–379. [67]

Nielsen, Kasper (2003), "Institutional investors and the market for corporate equity." Working paper, University of Copenhagen. [67]

NYSE (2003), *Factbook*. New York Stock Exchange. <http://www.nysedata.com/factbook>, chapter "Institutional investors". [67, 68]

Ottaviani, Marco and Peter Sørensen (2006), "Professional advice." *Journal of Economic Theory*, 126, 120–142. [68]

Prat, Andrea (2005), "The wrong kind of transparency." *American Economic Review*, 95, 862–877. [73]

Prendergast, Canice and Lars Stole (1996), "Impetuous youngsters and jaded oldtimers." *Journal of Political Economy*, 104, 1105–1134. [68]

Scharfstein, David and Jeremy Stein (1990), "Herd behavior and investment." *American Economic Review*, 80, 465–479. [68]

Trueman, Brett (1988), "A theory of noise trading in securities markets." *Journal of Finance*, 18, 83–95. [72]

Vayanos, Dimitri (2003), "Flight to quality, flight to liquidity, and the pricing of risk." Working paper, MIT. [72]

Wermers, Russ (2000), "Mutual fund performance: an empirical decomposition into stock-picking talent, style, transactions costs, and expenses." *Journal of Finance*, 55, 1655–1695. [81]

Zitzewitz, Eric (2001), "Measuring herding and exaggeration by equity analysts and other opinion sellers." Research Paper 1802, Stanford Graduate School of Business. [82]