Financial Contagion and Reputational Concerns of Fund Managers in Diversified Funds

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1 Introduction

We discuss an infinite horizon delegated portfolio management problem with two risky assets and one risk free bond. We have four types of managers from absolutely uninformed about the risky asset values to perfectly informed of the asset values and three types of funds; only specialized on one risky asset and the risk free bond, or diversified on both risky assets and riskless bond. The types of managers are private information while the types of funds is common knowledge. Funds hire the managers and delegate the investment decision to them. In the beginning of each day, unemployed managers seek an employment by strategically signalling their types to the funds. While managers can choose their signal, their employment history is a public information and they cannot hide any earlier firing or detachment from another fund. Funds decide to offer a contract to a manager given his employment history and his signal. If funds choose to hire a manager, they offer a contract that pays him a fixed share of the return at the end of each period and retains him for the next period only if his investment decision has been successful. We first show that the compensation scheme and the firing threat is partially separating uninformed managers from informed and partially informed ones. In particular, the managers only informed of asset 1(2) only accept the offers of the funds specializing in markets 1(2) while perfectly informed and absolutely uninformed managers are accepting any offer from any fund. Hence, there exists a nonzero measure of absolutely uninformed managers in any fund.

Second, we show that uninformed managers hired by diversified funds faced with the firing threat transmit shocks from one market to the other, resulting in price contagion. When one of the risky assets defaults, the reputation of the uninformed managers investing in that asset suffers and they are fired. When both risky assets repay the uninformed managers investing in any other opportunity except the less expensive risky asset lose their reputation and if both assets are defaulting, investors only retain the uninformed managers investing in the risk free bond. Therefore, following Guerrieri and Kondor (2011), for high default probabilities uninformed managers should be compensated with a premium over the return of the risk free bond to invest in the risky assets. Moreover, the reputational premia and the prices of both risky assets are not independent of each other although their fundamentals are totally independent. As the default risk of risky asset 1 is rising, the reputational premia for both assets rise and hence prices of both assets should reduce to compensate for the higher reputational premia. Thus any shock to one of them has contagious effect on the price of the other.

2 Static case

2.1 Model

There are two risky assets and one risk free bond paying $R > 1$. Risky assets are sold at prices $p_i \leq \frac{1}{R}$ and repay 1 unit of consumption good with probability q_i and 0 with probability $1 - q_i$. Risky assets are supplied inelastically by the mass of borrowers who want to finance 1 unit of consumption. We define b_i as the mass of suppliers of risky asset i and assume that it is a random variable distributed uniformly in $[\underline{b}, \overline{b}]$. There is also an infinite supply of risk free bonds.

We have three kinds of agents; investors, fund managers and a hypothetical auctioneer. Investors are of three types, only investing in asset 1 and bond, I_1, investing in asset 2 and bond, I_2, or investing in both assets and bond, I_3. We assume that the mass of I_1 and I_2 investors are equal to I. We can think of each type of investor as one type of fund. Fund managers are also of four types; let $T = \{M_0, M_1, M_2, M_3\}$ be the set of types of fund managers where M_0 means perfectly informed about both assets, M_1 is perfectly informed about asset 1, M_2 perfectly informed about asset 2, and M_3 is uninformed. The types of investors are observable. We also assume that the investors are able to verify the types of M_1 and M_2 managers while the types of M_0 and M_3 managers are private information and not verifiable by investors. We relax this assumption and resort to unobservable types later on when we discuss the full-fledged dynamic version of the model. M_i managers receive perfect signals of χ_i that reveal the repay of asset i if $\chi_i = 0$, and the default of asset i if $\chi_i = 1$, for $i = 1, 2$. M_0 managers receive both χ_1 and χ_2.

Let the mass of M_1 and M_2 managers be the same and equal to m, the mass of M_0 managers be m_0, and the mass of M_3 managers be m_3. We assume that the mass of $M_1(M_2)$ managers is less than the mass of $I_1(I_2)$ funds.

In the beginning of the day, investors (funds) are endowed 1 unit of consumption good to invest but they cannot invest it themselves and need to hire fund managers and delegate the investment decision to them. On the other hand, fund managers do not receive any endowment and gain a positive payoff only if they are hired by the investors.

To find an employment, each fund manager sends a public signal $t \in T = \{M_0, M_1, M_2, M_3\}$ to the pool of funds to announce his type. Note that the signal space is the same as type space. Since all type I_j funds are homogeneous, managers are indifferent between all type I_j funds. All funds prefer to hire M_0 managers whereas I_1 and I_2 funds also prefer to hire M_1 and M_2 managers. In addition, managers of each type are all homogeneous so funds have no preference over the managers with the same type. Given the signals received, any fund chooses to offer(O) a contract to a manager of type t or not(N) and randomly picks a manager from the pool of the managers sending the admissible signal(s). Then, managers receiving any offer decide to accept(A) or reject(R) the offer. If a fund decides to offer any contract, then it pays a fixed share of return γ, to his manager. In addition, when the investment of the manager is successful, she receives an exogenous reward W_j[1] The investments of hired managers by $I_1(I_2)$ funds are successful if they buy risky asset 1(2) when it repays and buy risk free bond when it defaults. For the employed managers in I_3 funds, the investment is successful whenever

[1]Later on we endogenize W_j. For the moment assume that it is the continuation utility of being employed.

they buy risk free bond when both assets default or they buy the repaying risky asset, or they buy the cheaper asset when both are repaying. If r_j^i is the return achieved by M_i hired by I_j fund, the payoffs to the employed manager of type M_i by fund I_j is $W_j^i = \gamma r_j^i + (1-\phi)W_j$, where ϕ equals 0 if the investment is success and 1, otherwise. The payoffs to the fund I_j that is hired M_i is then $V_j^i = (1-\gamma)r_j^i$.

Let $\lambda_M : T \to T \times \{A, R\}$ be the strategies of managers and $f_j : T \to \{O, N\}$ for $j = 1, 2, 3$. These together with the above specification of the payoffs complete the definition of the signaling game $\Gamma = \big(T, \lambda^M, \{f_j\}_{j=1}^3, \{m, m_0\}, \{W_j^i, V_j^i\}\big)$ between funds and managers.

In the afternoon, each hired manager submits their demand of the risky asset and the bond to an auctioneer. Employed fund managers by I_1 and I_2 funds can demand risk free bond, the risky asset that the fund specializes in or state indifference between them. Managers hired by I_3 funds can demand each of the risky assets, risk free bond or be indifferent between the three investment opportunities. The auctioneer's role is totally mechanical. It collects the demands of the managers, sets the market clearing prices and allocates managers. Given the submitted demands of managers, we assume that auctioneer assigns each manager either asset 1 or asset 2 or risk free bond.[2]

M_1 and M_0 managers employed by the funds of type I_1 receive the private signals χ_1 and submit the demand schedule $d_1^i(\chi_1, p_1) : \{0,1\} \times [0, \frac{1}{R}] \to 0, 1 \times [0, +\infty)$, $i = 0, 1$ to the auctioneer. If $d_1^1 = (0, 1/p)$ for some χ_1 and p, then the manager demands no bond and $1/p$ units of risky asset 1

[2]This is also a consequence of risk neutrality.

while $d_1^1 = (1, 1/p)$ means that the manager is indifferent between 1 unit of bond or $1/p$ units of risky asset. The same holds for M_0 and M_2 managers hired by I_2 funds. Uninformed managers, type M_3, employed by funds of type I_j, have no private signal and their demand schedules are given by $d_j^3(p_j) : [0, \frac{1}{R}] \to 0, 1 \times [0, +\infty)$ for $j = 1, 2$.

M_0 managers hired by I_3 fund receive both χ_1 and χ_2 and their demand schedule is $d_3^0 : \{0, 1\}^2 \times [0, +\infty)^2 \to \{0, 1\} \times [0, +\infty)^2$ accordingly. Uninformed managers hired by I_3 funds have no private signal and their demand schedule is $d_3^3(p_1, p_2) : [0, \frac{1}{R}]^2 \to \{0, 1\} \times [0, +\infty)^2$.

Managers hired by I_j funds are paid γ share of the return. Additionally, I_1 and I_2 funds pay $W_j = W$ reward to their managers if they succeed in their investment, meaning they invest in risky asset if it repays and risk free bond, otherwise. Fund managers of I_3 funds receive the reward of W_3 if they either invest in the repaying risky asset, or invest in the cheaper risky asset when both of them are repaying, or riskless bond when both assets are defaulting. Then any fund j is offering contract (γ, W_j) to the hired manager.

The timeline is as follows;

- In the morning,
  - Each manager sends a public signal $t \in \{0, 1, 2, 3\}$ to announce their type.
  - Given the managers signals, any fund I_j decides which managers to hire and randomly picks a manager from the pool of the unemployed managers sending signal t.
  - Managers decide to accept or reject the offer.

- In the afternoon,
  - Hired informed managers observe the realization of $\chi = (\chi_1, \chi_2)$; the auctioneer observes the realization of the inelastic supply of assets, $b_t = (b_1, b_2)$, issued to finance one unit of consumption; public signal $q = (q_1, q_2)$ is revealed to all the agents.
  - Managers choose their demand of the assets and the bond.
  - Auctioneer collects demands, sets $p = (p_1, p_2)$ and assigns managers.
- In the evening,
  - χ is publicly observed and the investments of the managers are realized by their funds.
  - Managers receive a share γ of the returns and the reward W_j if they succeed in their investment.

3 Dynamic Case

3.1 Model

We have an infinite horizon model that differs from the static case in letting the investors to fire fund managers. In this case, W_j^i is the value to the type i manager of being hired in the type j fund. Here, the employed fund managers receive γ share of the return and are retained for the next period if their investments are successful. We also assume that the employment history of any manager is observable for all the investors. Let the firing rule of the funds be ϕ_j, then any fund offers the contract (γ, ϕ_j) to any hired manager. The timing of the model is ;

- In the morning
  - Each manager sends a public signal $t \in \{0, 1, 2, 3\}$ to announce their type.
  - Given the managers signals, any fund I_j decides which managers to hire and randomly picks a manager from the pool of the unemployed managers sending signal t.
  - Managers decide to accept or reject the offer.
- In the afternoon,
  - Informed managers observe the realization of $\chi_t = (\chi_{1t}, \chi_{2t})$; the auctioneer observes the realization of the inelastic supply of assets, $b_t = (b_{1t}, b_{2t})$; public signal $q = (q_1, q_2)$ is revealed to all players.
  - Managers choose their demand of the assets and the bond.
  - Auctioneer collects demands, sets $p_t = (p_{1t}, p_{2t})$ and assigns managers.
- In the evening,
  - χ_t is publicly observed and the investments of the managers are realized by their investors.
  - Managers receive a share γ of the returns.
  - Investors receive exogenous binary signals, σ_{it}, about the type of the manager i. If manager i is informed, σ_{it} is always zero while if

they are uninformed, $\sigma_{it} = 0$ with probability ω and $\sigma_{it} = 1$ with probability $1 - \omega$.

- Investors decide about firing or retaining their manager.
- To make sure that the pool of unemployed managers is never empty of informed ones, we assume that with probability $1 - \delta$ any manager is exogenously separated from the job.
- Fired and separated managers and disjoint investors go back to the labor market and look for a new matching.

References

Guerrieri, V. and Kondor, P. (2011). Fund managers, career concerns, and asset price volatility. *The American Economic Review*, forthcoming.