Referee report of the manuscript 3077 entitled "Market Runs of Hedge Funds during the financial Crises"

Summary

The paper undergoes a theoretical analysis of runs by hedge funds. In the paper, these refer to the decision of hedge fund managers to cut their arbitrage positions, i.e., to reduce their exposure to risky (profitable) investments and so increase their cash holdings.

The paper highlights the role of strategic uncertainty in triggering these runs: a fund manager chooses to disinvest because she/ he fears that others would do the same. This behaviour hinges on the existence of strategic complementarities. Strategic complementarities emerge in the paper because the proportion of fund manager disinvesting influences the short-term return (i.e., the market price) of the risky technology: The more fund managers run, the lower the short-term return. The endogenous short-term return represents the central and novel element of the paper.

Normally, a setting exhibiting strategic complementarities would feature multiple equilibria. By using global games the authors overcome this and uniquely pin down the run probability. This, in turn, allows them to characterize fund managers' initial asset allocation (i.e., how much to invest in the risky asset and how much to hold as cash) taking into account how this decision impacts the run probability.

The basic setup of the paper is as follows. There are four dates and three groups of agents: fund managers, fund investors and trend followers. At the initial date, arbitrage opportunities arise as the price of the risky asset falls below its fundamental value. In the subsequent date, fund managers raise 1 unit of resources from investors and allocate it between a risky asset and cash. At $t1$, θ funds are hit by a funding shock in that they go bankrupt and exit the market. The proportion of funds hit by the shock is a uniformly distributed random variable, whose realization is not publicly observable. Fund managers only observe a private imperfect signal about it and based on this signal they decide whether to exit the market. If they do not exit the market, they need to meet the demand for liquidity by investors, which is assumed to correspond to the overall proportion of funds exiting the market λ. At the final date, all returns are produced and payoffs of remaining agents realize.

Relevance and contribution

I think the paper investigates a relevant and interesting issue. Understanding the determinants behind fund managers' decision to cut their arbitrage positions and how their initial asset allocation affects the exposure to runs is very important also in light of the recent crisis.

In particular, I praise the authors for trying to endogenize the short-term return (also referred to as market price). This is not only relevant and more realistic than having a fixed liquidation value, but it is also, especially in the context of global games model, quite challenging. In my opinion, the endogenization of the price at which risky assets are sold in the market to raise liquidity at short notice would represent a key contribution of this paper to the existing literature.

Despite finding the paper interesting and relevant, I have a number of reservations on the analysis. As I already mentioned, in my opinion, the endogenization of the market price represents a significant contribution. However, the way it is achieved in the current version of the paper raises a number of important issues regarding the way strategic complementarity is modelled and the determination of r (λ). Furthermore, the exposition in the current version of the paper is often obscure, making difficult to follow the derivations and to grasp the intuition behind the results.

Below some detailed comments about these issues.

Fund investors' withdrawal decision, fund managers' action and strategic complementarity

Unlike other papers in the literature (e.g., Liu and Mello (2011)), the paper focuses on the strategic complementarity between fund managers rather than fund investors. This allows the authors to consider the strategic interactions between different funds and so endogenize the market price. However, I find that the way this is modelled very ad hoc.

In the paper, the proportion of funds exiting the market is stochastic and each fund manager only receives an imperfect signal about it. Based on this signal they decide what to do- i.e., exiting the market or not. The proportion of fund managers exiting the market is λ. The variable λ also represent the proportion of resources that investors withdraw from the exiting funds. This is crucial as it affects the amount that remaining funds may need to raise at short notice in the market and so the market price.

Maybe I am missing something, but it seems to me that the proportion of funds exiting the market λ affects the market price only because it translates (in an exogenous and ad hoc way) in the amount of withdrawals by fund investors. I found this approach problematic as it highlights that, although stated differently in the paper, what really matters is the fund investors' withdrawal decisions. If so, then, it is not clear why the authors do not simply consider the strategic complementarity between fund investors as in Liu and Mello (2011). They mention something in the introduction about this, but I do not find their argument particularly convincing.

Additionally, in the current model it is more complicated to appreciate and separate the two stages of the analysis. In current version, the fund managers' decision is essentially analogous at t1 and t2. At t1, they choose the how much to invest in the risky asset and how much to hold in cash. At t2, the decision is similar in that it boils down to choose whether to hold just cash or also the risky asset. Focusing on the strategic complementarity between fund investors would allow overcoming this.

While reading the paper, I was wondering whether it would be worth to try an alternative approach and so model directly the strategic complementarity between fund investors **within** a single fund and those **between i**nvestors in different funds, as it is done in Goldstein (2005). In other words, one could think to a situation where an investor in fund i is concerned not only about withdrawals in his own fund but also in other funds, since the more investors withdraw in other funds, the more these funds would need to liquidate and so the lower will be the market price. This approach would allow the authors to retain the interaction between different funds via the market price and so the its endogenous determination.

Asset market

In general, I found the description of the functioning of the asset market and so the determination of the market price (equation 3) not very accurate. I think the current version of the paper could be improved significantly by adding a few more details. In particular, I did not really understand who is buying the assets sold by fund managers Other funds? Outside investors? How is the market price determined? Is it a cash-in-the-market price? All these elements are important to understand how the market price is determined.

Relatedly, while equation 3 is a key equation in the paper, the authors do not provide many details about how it is determined. I think much more details and explanations should be added. For example, where does the function $LI(\lambda)$ come from? The authors refer to this as the new liquidity inflow in the risky asset market. Who is providing this liquidity? The exact expression assigned to $LI(\lambda)$ by the authors does not seem so "neutral" as they state as it cancel out with another term in the expression for the short-market return. What am I missing?

Finally, still regarding equation 3, it seems to me that the derivations could be simplified if the authors were to assume right from the beginning that all funds are the same in terms of initial asset allocation.

Why is this not the case? Which aspects of the analysis would be lost assuming that there is a continuum of mass one of funds and they have chosen the same asset allocation?

Market structure

At page 6, the authors state that fund managers compete with each other in the market and maximize their final asset value. In the same page, in the footnote, they state that the market is perfectly competitive. Which market are the authors referring to? Is it the market for resources or the asset market? I think a more detailed explanation is needed.

Trend followers

I do not find particularly clear the role that trend follower plays in the model. If I understand correctly, their presence allows the price of the risky asset to fluctuate around the fundamental value. I see the importance to have the price falling below the fundamental and then converging back to it in the final date. However, I am not sure having a third group of agents is really needed to do so. Would not be better to simply assume some shocks? The trend followers are really passive in the paper and their behaviour is simply assumed rather than modelled.

Exposition and clarity

As a general comment, I think that the paper falls short in clarity. Little intuition is provided for the results and in some cases explanations are quite obscure. Several (important) details of the model are hidden in the text or missing, thus making reading the paper a bit cumbersome. Furthermore, I found the paper language sometimes inappropriate for being an applied theory paper. For example, expressions like "In the meantime, in the meanwhile" used in the model section instead of specifying the exact timing, make really difficult to understand the framework and the interactions among the various agents and their actions.

I think that the exposition of the paper should be significantly improved regarding the description of the setup (i.e., timing, agents' actions, shocks etc). For example, the authors talk about fund managers runs often together with fund investors' withdrawals (which are usually what people have in mind when thinking of a run, especially given the existing literature). I think it would be useful to clearly separate the two things. In principle, fund investors' withdrawal decisions could also be strategic complements, thus runs could also emerge as large withdrawals of fund investors.

As a suggestion, given the presence of several agents in the economy, the model setup could be organized in small sections, each describing actions and payoffs of the different agents. Finally, I think it would be useful to include a figure illustrating the timing of the model. The description at page 6 is not very clear.

Minor Comments

- Page 4, last paragraph, I found the sentence "equilibrium problems of panic-based crises" a bit misleading. I think I understand what the authors mean, but do not find the expression used precise enough. Multiplicity of equilibria is a feature of games characterized by strategic complementarity not a problem…I would suggest to rephrase it
- Page 10 "As in the benchmark case", which benchmark are the authors referring to? Probably, the case where runs are not possible is the benchmark…
- Derivations at page 11 could be moved to the Appendix. This comment generally applies also to other parts of the paper. Derivations in the text could be moved to the appendix so to make the reading easier
- Proof of theorem 1 is missing. I understand that it is standard and many steps of the proof are already in the text, but it would be useful, especially for the readers that are not very familiar with the global game literature to include the proof in the appendix.