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Experimental evidence on the 'insidious' illiquidity risk[☆]

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ABSTRACT

This paper introduces an experiment aiming to investigate the contribution of illiquidity risk to the total risk of a collective investment project. If implemented, the project succeeds with a known probability. Yet the project fails if the quota of investors is not reached in the first place. Hence strategic uncertainty compounds its effect with the "intrinsic risk" of the project. Results confirm the insidious nature of illiquidity: as long as a first collective default does not occur, investors accept high intrinsic risk projects. After a first default, they become extremely prudent and come back to market only gradually. After several defaults, private agents manage to coordinate on a relatively low intrinsic risk above which they refuse to participate in the project. Macroeconomic policy implications follow.

1. Introduction

In the past, illiquidity used not to be a top priority on economists' research agenda, who shared the optimistic belief according to which there will always be some deep-pocket investor able to rescue an illiquid but solvent debtor. Yet during the Great Recession of 2007–2009 illiquidity turned into a major factor of economic instability (Pedersen, 2009; Brunnermeier, 2009; Miller and Stiglitz, 2010). In a short lapse of time, in the last 4 months of 2008, traditional buyers of asset backed securities and bank commercial paper almost vanished. Taking one representative quote from *The Economist* of February 10, 2010, "Many of those clobbered in the crisis, including Bearn Sterns, Northern Rock and AIG – were struck down by a sudden lack of cash or funding sources, not because they run out of capital." The 2010–2012 turmoil in Euro public debt markets also carries the mark of illiquidity: after the partial Greek default on privately held public debt in March 2012, the dramatic increase in Treasury bond yields in Italy and Spain could be contained only by a major change in the ECBs position, which ultimately promised to finance distressed governments should ever they need it.[1] There is now a widespread consensus among economists and policymakers who acknowledge that illiquidity can originate major disruptions of economic activity.

Classical theoretical papers analyze illiquidity as special kind of coordination failure. The basic rationale was summarized by Summers (2000, p.7):

> A crude but simple game, related to Douglas Diamond and Philip Dybvig's (1983) celebrated analysis of bank runs, illustrates some of the issues involved here. Imagine that everyone who has invested $10 with me can expect to

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[1] The main "weapon" of the ECB is the *Outright Monetary Transactions* programme, introduced on 6 September 2012. See for details Cour-Thimann and Winkler (2013).

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> earn \$1, assuming that I stay solvent. Suppose that if I go bankrupt, investors who remain lose their whole \$10 investment, but that an investor who withdraws today neither gains nor loses. What would you do? Each individual judgment would presumably depend on one's assessment of my prospects, but this in turn depends on the collective judgment of all of the investors. Suppose, first, that my foreign reserves, ability to mobilize resources, and economic strength are so limited that if any investor withdraws I will go bankrupt. It would be a Nash equilibrium (indeed, a Pareto-dominant one) for everyone to remain, but (I expect) not an attainable one. Someone would reason that someone else would decide to be cautious and withdraw, or at least that someone would reason that someone would reason that someone would withdraw, and so forth. This phenomenon, which Douglas Hofstadter has labeled "reverberant doubt," would likely lead to large-scale withdrawals, and I would go bankrupt. It would not be a close-run thing. John Maynard Keynes's beauty contest captures a similar idea.

In this example, all investors would be better-off if everyone is investing; yet, extreme prudence would prompt individuals to opt-out, and everybody will be worse-off. This context relates to the classical two-player "stag-hunt" game, where the highest payoff can be reached if both hunters go for the stag, but each individual, hunting alone, can get one rabbit *for sure*. If one of them goes for the stag while the other goes for the rabbit, the former gets nothing. Without a coordination mechanism, nothing can rule out the emergence of the zero-risk, Pareto-dominated equilibrium where both players choose to hunt rabbits.

If we agree that illiquidity is first and foremost a matter of poor coordination of investors, it is interesting to study in the controlled environment of the Lab how human subjects behave when they are submitted to such "strategic" risk. More in detail, we are interested in the learning process through which subjects manage to assess this risk, and how they gradually incorporate it into their investment decisions. Such analysis brings its own light on the recent episodes of illiquidity and might guide policy reforms.

We build an experiment where subjects can participate to a collective investment project. By "collective" we understand a situation where the project can succeed only if a minimum participation threshold is achieved. The risk that the number of investors who choose to participate to the project is too small will be referred to as the "illiquidity risk". This probability that the project delivers nothing is representative of its "intrinsic risk". If the number of investors is large enough, the project is implemented and will succeed or not, depending on the above-mentioned probability of success. Hence, in this context, an investor must take into account not only the individual chances that his investment will bring the high payoff, but also the strategic uncertainty stemming from the decision of the other investors. While we take our inspiration from project financing, we avoid using words such as "investment, investor, default" that have their own emotional loading. Basically subjects can pay 20 cents in order to participate to a lottery that brings them 30 cents with a probability q or nothing with probability $(1-q)$. The positive gain (that occurs with the probability q) is delivered only if a majority of the subjects have participated to the investment.

Five relatively large groups of subjects were asked to play this game for several rounds, for varying levels of the intrinsic risk $(1-q)$.[2] The risk level was increased in successive steps until a first coordination default occurred, then was reduced until coordination was restored, then raised again, following a cyclical pattern. Thus the experiment aims to detect existence of a "threshold strategy" on which players will coordinate their decisions at the term of a learning process. Requiring people to coordinate on participating to a lottery (hence – an uncertain outcome) is, to the best of our knowledge, an original contribution of this paper to existing experimental literature on coordination games.

The problem addressed in this paper belongs to the general class of order-statistics coordination games where the individual payoff to some action is an increasing function in the number of agents that undertake that action. Bryant (1983) has shown that in a complete information set-up these strategic complementarities result in multiple equilibria with self-fulfilling beliefs. The polar situations where either all players undertake the highest action (the Pareto dominant or payoff dominant equilibrium) or the lowest action (the highest security or minimax equilibrium) are intuitively appealing but cannot be justified on pure deductive grounds. The multiplicity of equilibria disappears in one special case. If agents do not know the precise payoff of the others but receive private signals that allow them to approximate it, then beliefs are no longer common knowledge and the problem becomes a "global game" (Carlsson and van Damme, 1993). Morris and Shin (1998) study a n-player global game and show that it presents a single equilibrium, depending on the "state of the economy"; more precisely, that there is a "threshold" state that separates the high from the low equilibrium. They applied this equilibrium concept to speculative currency attacks, bank runs, private and public debt default, etc. (inter alia, Morris and Shin, 1998, 2001, 2002, 2004, 2009). Rochet and Vives (2004) use the Morris and Shin (1998) global game solution to work out a bank liquidity crisis model that justifies the role of lender-of-last resort of the central bank. In these models illiquidity arises if borrowers cannot roll over their short term debt, while insolvency is related to the riskiness of their long-term investment projects, conditional of not being illiquid at the first stage. In a different theoretical setup, Besancenot et al. (2004) analyzed the interaction between insolvency and illiquidity risk, trying to determine the threshold that would fully insulate governments from defaulting on sovereign debt. At that time, they argued that this zero-risk debt-to-GDP ratio would be very low, even for developed countries; they justified the absence of a illiquidity default premium on sovereign

[2] Between 9 and 16 subjects, depending on students' decision to answer our calls for paid decision experiments.