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Liquidity and capital under uncertainty and changing market sentiment: A simple analysis

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ABSTRACT

This study introduces a general approach to investigate resource allocation and asset prices in an economy with uncertainty and shifts in market sentiment. The approach presents a number of key features: first, it proposes a choice-theoretic model that determines the utility that the agents derive from holding assets with different liquidity. Second, it incorporates a variable (endogenously-determined) cost structure of asset liquidation, which reflects the (in)efficiencies of the financial infrastructure and changes in market moods. Third, it also incorporates a model of expectations formation under uncertainty and changing market sentiment. While rich in structure, the approach offers a simple analytical framework to investigate resource allocation decision and asset price dynamics under various sources of uncertainty, and to explore the microeconomics of speculative bubbles and boom–bust sequences. The use of a possible market-specific prudential policy tool is discussed.

1. Introduction

1.1. Purpose and scope of this study

This study investigates resource allocations and asset price dynamics in an economy with uncertainty and shifts in market sentiment. It does so through a novel approach.

First, it introduces a choice-theoretic model that determines the utility that individual agents derive from holding assets featuring different degrees of liquidity and value-storing capacity. Second, the choice-theoretic model incorporates a variable cost structure of asset liquidation that makes the liquidation cost dependent on: (*i*) aspects of optimal asset trading under uncertainty, (*ii*) the (in)efficiencies of the economy's financial infrastructure, and (*iii*) changing market sentiment. Third, the approach introduces a general model of expectations formation that reflects agents' knowledge and information and the prevailing market mood.

The approach is used to gauge how inter-temporal utility maximizing agents change resource allocation between consumption and money and non-money assets under increasing uncertainty, and to analyze the nature of bubble–bust sequences as expectations are affected by shifts in market sentiment.

The approach makes a parsimonious use of assumptions, and builds upon general as well as realistic behavioral and structural functions. While rich in structure, the approach offers a simple analytical framework to investigate relevant economic problems, requiring no more than inspecting f.o.c.s.

In line with the work by Frydman and Goldberg (2011), and yet through a different methodological setup, the approach proposed in this study incorporates imperfect knowledge and extra-economic factors determining market moods within a rational choice-theoretic framework, and shows how these may lead the economy into disequilibria (or sub-optimal equilibria).

The study is organized as follows. Section 2 builds the model underpinning the proposed approach; it defines and formalizes the concept of asset utility, derives optimal resource allocation rules, and proposes a general model of expectations formation under uncertainty and shifting

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market moods. Section 3 investigates the effects of various sources of uncertainties on portfolio allocations and asset prices, and studies how the dynamics of expectations may lead to speculative bubbles and generate boom–bust sequences. Section 3 concludes the study.

1.2. Relation to the literature

The economic and financial analysis of uncertainty and market sentiment has so far proceeded following two separate threads. A first strand of research has historically devoted large attention to the effects of uncertainty on resource allocation, and investment decisions in particular, and to the analysis of how risk and uncertainty affect asset prices. While the related literature is much too extended to be recalled here, recent contributions and references to earlier works can be found in Kacperczyk and Damien (2011), Bloom, Bond, and Van Reenen (2007), and Bekaert, Engstrom, Eric, and Xing (2009). The second strand of research, which has evolved more recently with the development of behavioral economics, has focused on the effects on asset prices of changing market sentiment (see the survey in Scherbina (2013)). One of the innovative features of this study, which distinguishes it from the existing literature, is the integration of *both* uncertainty and market sentiment in the analysis of resource allocation and asset pricing. This has in fact required setting up the new approach developed below.

Also, this study is fundamentally about liquidity and asset prices, an issue that has been analyzed in depth by Amihud, Mendelson, and Pedersen (2005, 2012). While its results are consistent with theirs, especially as they relate to the effects of asset liquidation (trading) costs, this study, unlike theirs, is concerned with how the agents' liquidity preference changes as a result of changes in the state of uncertainty and market moods in the economy, and affects resource allocations and asset prices. Kiyotaki and Moore (2005) analyze the effect of liquidity on asset prices; however, they are interested in the impact of liquidity supply shocks on the business cycle, whereas this study focuses on the demand for liquidity from agents responding to changes in the state of the economy and in their perceptions.

2. The model

2.1. The utility of money and non-money assets

This study introduces and gives an operational definition of the concept of the *utility of money and non-money assets*. All assets are considered as vehicles to future consumption, when needed or desired, each being characterized by its own "speed" (liquidity) and "power" (capacity to store and to accumulate wealth over time). If all different types of assets provide holders with utility, they can be directly comparable based on one single criterion, and the agents' portfolio composition and consumption decisions may be simultaneously determined as inter-temporal solutions to optimal programming problems. More than that: if all assets provide their holders with utility, in equilibrium, the agents will allocate resources amongst assets so that, at the margin, each will provide the same utility than coterminous consumption (irrespective of technologies, preferences, growth dynamics, and institutional and social constraints). The challenge is then to model consistent and economically meaningful relationships between assets and the utility that they deliver, but the resulting analytical framework will be simple and the implications deep. This is the basic methodological strategy underpinning this study.

At each point in time, any asset Q yields to its holder a level of utility that reflects the opportunity that the holder has to liquidate the asset and to use its proceeds to finance real consumption C. This feature is particularly useful under uncertainty when, owing to intervening shocks, the agent may face at any point in time the eventuality of having to finance extra consumption with probability ϑ. Call $R^Q = (1 + r^Q)(1 + \pi^Q)(1 - \pi^C)$ the gross real rate of return on asset Q, where r is the net nominal rate of return, π^C stands for consumer price inflation and π^Q is the rate of change of asset price P^Q. Let E_t be the expectation operator conditional on the information available at time t. For convenience of exposition, assume the agent's time discount factor β and return R^Q to be constant, and set the price of consumption at $P^C = 1$. (The latter two assumptions will be removed later.) The utility of asset Q at date t can be obtained by summing over two terms: (i) the utility derived from converting the asset into consumption at the next date $t + 1$ with probability ϑ_{t+1}, and (ii) the utility from holding the asset available to access consumption at some later date with residual probability $(1 - \vartheta_{t+1})$. Substituting iteratively for $u(Q)$ at each future date yields

$$\begin{aligned}
u(Q_t) &= \beta R^Q\left[E_t u\left(P^Q_{t+1}Q_t\right)\vartheta_{t+1} + u(Q_t)(1-\vartheta_{t+1})\right]\\
&= \beta R^Q E_t\left[u\left(P^Q_{t+1}Q_t\right)\right]\vartheta_{t+1} + \left(\beta R^Q\right)^2(1-\vartheta_{t+1})\\
&\quad\times\left\{E_t\left[u\left(P^Q_{t+2}Q_t\right)\right]\vartheta_{t+2} + u(Q_t)(1-\vartheta_{t+2})\right\}\\
&= \beta R^Q E_t\left[u\left(P^Q_{t+1}Q_t\right)\right]\vartheta_{t+1}\\
&\quad+\left(\beta R^Q\right)^2(1-\vartheta_{t+1})E_t\left[u\left(P^Q_{t+2}Q_t\right)\vartheta_{t+2}\right]\\
&\quad+\left(\beta R^Q\right)^3(1-\vartheta_{t+1})(1-\vartheta_{t+2})\\
&\quad\times\left\{E_t\left[u\left(P^Q_{t+3}Q_t\right)\right]\vartheta_{t+3} + u(Q_t)(1-\vartheta_{t+3})\right\}(\ldots)\\
&= \beta R^Q E_t\left[u\left(P^Q_{t+1}Q_t\right)\right]\vartheta_{t+1}\\
&\quad+\left(\beta R^Q\right)^2(1-\vartheta_{t+1})E_t\left[u\left(P^Q_{t+2}Q_t\right)\right]\vartheta_{t+2}+\ldots \qquad \ldots\\
&\quad+\left(\beta R^Q\right)^i(1-\vartheta_{t+1})\ldots(1-\vartheta_{t+i-1})\\
&\quad\times\left\{E_t\left[u\left(P^Q_{t+i}Q_t\right)\right]\vartheta_{t+i} + u(Q_t)(1-\vartheta_{t+i})\right\}
\end{aligned} \tag{1}$$

and so on for each subsequent substitution of $u(Q)$. Assuming that the agent consumes all her wealth through the time horizon, and summing over the agent's time horizon, the utility of asset Q at date t is

$$u(Q_t) = \sum_{T=t+1}^{\infty}\prod_{i=1}^{T-1}\left(\beta R^Q\right)^i(1-\vartheta_{t+i-1})\vartheta_T E_t\left[u\left(P^Q_T Q_t\right)\right]. \tag{2}$$

Releasing the assumption of constant R^Q and P^C allows to write Eq. (2) as

$$u(Q_t) = E_t\left[\sum_{T=t+1}^{\infty}\beta^T\prod_{i=1}^{T-1}R^Q_i(1-\vartheta_{t+i-1})\vartheta_T u\left(P^Q_T Q_t/P^C_T\right)\right]. \tag{2a}$$

Every financial asset Q can therefore be regarded as a vehicle for transferring purchasing power across time. Each asset has its own capacity to store and to accumulate purchasing power over time through its real return profile. Two additional features qualify each asset's performance as a vehicle of purchasing power: the costs involved in the process of trading the asset or of transforming it into cash (i.e., its liquidity), and the volatility of the purchasing power that the asset grants to its holder (i.e., the risk profile of the asset's real return). These features are dealt with next.

The strategy adopted in this study moves beyond the money-in-the utility function vs. cash-in-advance constraint controversy on how to