Journal of Economic Dynamics & Control 37 (2013) 1–17

Contents lists available at SciVerse ScienceDirect

Journal of Economic Dynamics & Control

journal homepage: www.elsevier.com/locate/jedc

Pairwise trade, asset prices, and monetary policy ☆

Ed Nosal [a,*], Guillaume Rocheteau [b]

[a] Federal Reserve Bank of Chicago, 230 S LaSalle St, Chicago, IL 60604, USA
[b] University of California, Irvine and Federal Reserve Bank of Cleveland, USA

ARTICLE INFO

Article history:
Received 12 January 2011
Received in revised form
7 November 2011
Accepted 1 June 2012
Available online 16 July 2012

JEL classification:
E40
E50

Keywords:
Search
Money
Bilateral trades
Inflation
Asset prices

ABSTRACT

We construct a search-theoretic model where fiat money coexists with real assets, and all assets can be used as a media of exchange. The terms of trade in bilateral matches are determined by a pairwise Pareto-efficient pricing mechanism. We do not have to appeal to exogenous liquidity constraints to generate asset prices that are consistent with the following facts: (i) fiat money can be valued despite being dominated in its rate of return; (ii) real assets with identical dividend flows can have different rates of return; and (iii) an increase in inflation raises asset prices, lowers their returns, and widens the rate-of-return differences between assets. On the normative side we show that there is a range of inflation rates that implement the first-best allocation.

1. Introduction

What determines an asset's liquidity? More than 20 years ago, Kiyotaki and Wright (1989) provided an answer in the context of a monetary model with bilateral exchange. They found that the moneyness of an asset depends on its physical properties (e.g., storage costs), the fundamentals of the economy (e.g., the pattern of specialization) and conventions (e.g., how agents coordinate on one of many possible equilibria). These insights were derived under the extreme portfolio restriction that agents cannot hold more than one unit of an asset, and the stark assumption that assets and goods are indivisible. Subsequently, these restrictions and assumptions have been relaxed, see e.g., Shi (1997) and Lagos and Wright (2005), which led to a renewed interest in the question that prompted this literature in the first place: What makes money money?

Recent work has shown that liquidity differences across assets can arise from either informational asymmetries or exogenous asset specific liquidity constraints. For example, Lester et al. (2012) show that fiat money is a superior means of payment because it is can be authenticated at zero cost.[1] Rocheteau (2011) finds that when asset holders are privately

☆ The views expressed are those of the authors and not necessarily those of the Federal Reserve Bank of Chicago, the Federal Reserve Bank of Cleveland or the Federal Reserve System. We thank Veronica Guerrieri for her insightful discussion, an anonymous referee and the editor, Jim Bullard, for their comments, and seminar participants at the Bank of Canada, Federal Reserve Bank of New York, Federal Reserve Bank of St. Louis, University of California at Irvine, and the 2008 annual meeting of the Society of Economic Dynamics.

* Corresponding author. Tel.: +1 312 322 6070; fax: +1 312 322 5943.
E-mail address: ed.nosal@chi.frb.org (E. Nosal).

[1] The recognizability of money is an old theme in monetary theory. Recent formalizations include Williamson and Wright (1994) and Banarjee and Maskin (1996).

0165-1889/$ - see front matter © 2012 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.jedc.2012.07.005

informed about dividends, the liquidity of assets depends on the properties of their dividend processes. Kiyotaki and Moore (2005) and Lagos (2010) impose exogenous liquidity constraints on some financial transactions in order to match some asset pricing facts that are viewed as anomalies.

In this paper, we take an alternative approach to generate liquidity differences across assets that does not require either informational asymmetries or exogenous constraints on payments. We generalize the argument of Zhu and Wallace (2007), who propose a trading mechanism for bilateral matches that has good normative properties and that, from a transactions perspective, treats assets asymmetrically.[2] The allocations for our bilateral trading mechanism, like Zhu and Wallace (2007), are Pareto efficient.[3] We further restrict our trading mechanism by requiring asset pricing patterns to be the same those from models with exogenous liquidity constraints. In particular, asset prices should exhibit: (i) rate of return dominance; (ii) rate of return differences between assets with identical cash flows; (iii) and a positive correlation between asset prices and inflation. The key difference in our approach relative to that of Kiyotaki and Moore (2005) and Lagos (2010) is that all assets held by an agent can be used to finance consumption opportunities without any restrictions. Our mechanism does not leave any asset unused as a means of payment, unless there are no further gains from trade.[4] The key difference in our approach relative to that of Zhu and Wallace (2007) is that our trading mechanism is more general than what they consider and, as a consequence, our model is able to deliver a non-degenerate liquidity structure of asset returns. The family of trading mechanisms that we consider is parametrized by a single parameter – just like the generalized Nash solution – and it admits as particular cases the pricing mechanisms considered in Geromichalos et al. (2007), Lagos (2010), Lagos and Rocheteau (2008), and Zhu and Wallace (2007).

Our trading mechanism is embedded into a search-theoretic model with divisible money, along the lines of Lagos and Wright (2005), where a lack of double coincidence of wants and the absence of a record-keeping technology generate an explicit need for a tangible medium of exchange. There are multiple types of assets: money and real assets that yield a flow of real dividends.[5]

The main insights of our theory are as follows. First, fiat money can be held and valued despite being dominated in its rate of return by competing assets. In contrast to earlier works, we do not need to impose trading restrictions to generate a rate of return dominance pattern: a plain-vanilla Lagos–Wright model can account for this puzzle. Second, the model is capable of generating a liquidity-based structure of asset yields, where assets can exhibit different rates of returns, even if they share the same risk characteristics, or if agents are risk-neutral.[6] Those rate of return differences, which are all anomalies from the standpoint of standard asset pricing theories, reflect differences in the liquidity of the assets; some assets can be liquidated at better terms of trade than others. Third, our model also has implications for the transmission mechanism of monetary policy to asset prices. Under our pricing protocol, real assets have a liquidity value in the sense that a buyer is able to capture some surplus in a bilateral meeting when paying with real assets. Hence, an increase in inflation will raise their prices and lowers their returns. Moreover, inflation widens the rate of return differences between assets. And finally, from a normative standpoint, there is a range of inflation rates that implement the first-best allocation, including the Friedman rule. As a consequence, a small inflation above the Friedman rule does not impose a welfare cost on society.

2. The environment

Time is discrete and continues forever. The economy is populated with a [0,1] continuum of infinitely lived agents. As in Lagos and Wright (2005), each period is divided into two subperiods, called DM and CM. In the first subperiod, DM, trade takes place in decentralized markets, where agents are bilaterally matched in a random fashion. In the second subperiod, CM, trade takes place in competitive markets.

[2] One can interpret bilateral meetings as an over-the-counter market. Formalizations of over-the-counter markets in finance have been proposed by Duffie, Garleanu, and Pedersen (2005), Weill (2008), and Lagos and Rocheteau (2008).

[3] Shi (1997) and Lagos and Wright (2005) assume that the terms of trade in bilateral matches are determined by the generalized Nash bargaining solution. Aruoba et al. (2007) investigate the robustness of the results to alternative bargaining solutions. Other mechanisms have been studied such as auctions and competitive posting. For a mechanism design approach, where the mechanism is chosen by normative considerations, see Hu et al. (2009).

[4] More generally, our paper is related to the recent literature in macroeconomics that takes into account the transaction role of assets in order to explain asset pricing anomalies and the effects of monetary policy on assets' returns. For instance, Bansal and Coleman (1996) explain the risk-free rate and the equity premium puzzles in a pure exchange economy where there are different transaction costs associated with the use of different means of payment, e.g., fiat money, government bonds and credit. Recently, Aruoba and Schorfheide (2010) estimated a search-based monetary DSGE model in which agents in the decentralized market can only use a fraction of their capital stock holdings in addition to money to finance consumption opportunities. They find that the estimated fraction of capital that is liquid is close to zero.

[5] The first attempt to introduce capital goods into the Lagos–Wright model is Aruoba and Wright (2003), but capital goods were not allowed to be used as means of payment in bilateral matches. Lagos and Rocheteau (2008) relax the restriction on the use of capital as a means of payment, and show that fiat money and capital can coexist provided that there is a shortage of capital to be used as means of payment. In a similar context Rocheteau (2011) adopts a mechanism design approach to show that the coexistence of money and higher-return assets is both socially optimal and individually rational. Geromichalos et al. (2007) follow a similar approach but assume that capital is in fixed supply. Lagos (2010) calibrates the model where money is replaced by risk-free bonds and capital is a risky asset, and shows that it can account for the risk-free rate and equity premium puzzles under a mild restriction on the use of capital as means of payments.

[6] Wallace (2000) provides a theory of the liquidity structure of asset yields based on the indivisibility of assets. Weill (2008) explains differences in liquidity across seemingly identical assets by the presence of thick market externalities in decentralized asset markets.