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Search-based models of money and finance: An integrated approach

Alberto Trejos [a], Randall Wright [b,c,d,*]

[a] *INCAE, Costa Rica*
[b] *UW–Madison, USA*
[c] *Federal Reserve Bank of Minneapolis, USA*
[d] *Federal Reserve Bank of Chicago, USA*

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Abstract

Many applications in monetary economics of search-and-bargaining theory use Shi–Trejos–Wright, hereafter STW; many applications in finance use Duffie–Gârleanu–Pedersen, hereafter DGP. These models share several features, and both concern liquidity, yet they also differ: in STW agents use assets as payment instruments when trading goods; in DGP they pay with goods (or transferable utility) when trading assets. We integrate the two. This clarifies connections between the literatures, and generates novel insights. Several new results are provided for the baseline STW and DGP models, while the integrated structure generates even more interesting outcomes, including endogenous transactions patterns and belief-based dynamics.

JEL classification: E40; E44

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* Corresponding author at: Department of Finance, Investment and Banking, 5262B Grainger Hall, 975 University Avenue, Madison, WI 53706, USA. Fax.: +1 608 262 3656.
E-mail address: rwright@bus.wisc.edu (R. Wright).

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1. Introduction

One of our jobs as scholars is to explore connections between disparate theories, or models that seem related yet different. In search-and-bargaining theory, many applications in monetary economics use Shi (1995) or Trejos and Wright (1995), hereafter STW, while applications in finance use Duffie, Gârleanu and Pedersen (2005), hereafter DGP. The STW and DGP models use very similar building blocks, and both concern liquidity, yet they also have significant differences. First, most analyses of STW concentrate on fiat money, although there are a few discussions of commodity money, while in DGP there are assets that pay dividends and agents have heterogeneous valuations for the dividends. Second, existing analyses of DGP have linear (i.e., transferable) utility, while STW has curvature. We integrate the models, incorporating general dividends with heterogeneous valuations, plus nonlinear utility. This clarifies connections between the literatures and leads to several new insights.[1]

As motivation, first, it is desirable to allow dividends in monetary economics not only to go beyond fiat currency as a matter of principle, but because it matters for results. We show in STW that assets might circulate if the dividend is positive or negative, but if it is negative and big agents dispose of it, while if it is positive and big they hoard it. For fixed dividends, there can coexist equilibria where assets circulate and where they do not. We characterize the perfect-foresight equilibrium set for STW, with any dividend, something not in existing papers. Additionally, different from previous analyses that use generalized Nash bargaining, we use the Kalai bargaining solution. While this does not affect the substantive economics, it is more tractable, and thus allows us to derive stronger results than previous papers (e.g., easier uniqueness/multiplicity results and cleaner comparative statics). This suggests that our version, with Kalai bargaining, should take over as the benchmark STW model in applications and in the classroom.[2]

Moreover, it should go without saying that it is desirable to consider nonlinear utility in finance, and this also matters for results. In the benchmark DGP model there is a unique equilibrium with a very simple pattern of exchange: trade occurs iff a low-valuation agent with an asset meets a high-valuation agent without one. In our nonlinear version, there are several possible exchange patterns, and high-valuation agents sometimes give assets to other high-valuation agents, or even to low-valuation agents. We describe how transaction patterns vary over parameter space, in the spirit of the original search-based model of asset exchange in Kiyotaki and Wright (1989). Also, there is not necessarily a unique equilibrium in the nonlinear model, and a

[1] Here is a literature review that one can skip for now without loss of continuity. Both STW and DGP use what New Monetarists – see Williamson and Wright (2010) or Nosal and Money (2011) for surveys – call second-generation models, where assets are indivisible and agents can hold at most 1 unit; first-generation models going back to Kiyotaki and Wright (1989, 1991) also have indivisible goods. For third-generation models, with divisible assets and goods, versions related to STW include Shi (1997), Green and Zhou (1998), Lagos and Wright (2005), Rocheteau and Wright (2005) and Molico (2006); versions more related to DGP include Lagos and Rocheteau (2009), Lagos et al. (2011), Babus and Kondor (2012), Monnet and Narajabad (2012), Geromichalos and Herrenbreuck (2012), Lagos and Zhang (2013), Mattesini and Nosal (2013) and Han (2014). Indeed, the last four combine elements of STW and DGP, sharing with us a desire to integrate money and finance, and to relax the DGP assumption that agents have arbitrarily deep pockets. Despite these developments with divisible-asset models, indivisible-asset models are still useful and sometimes more natural or more tractable. A sample of applications includes Trejos and Wright (1993), Wallace (2001, 2010), Wright and Trejos (2001), He et al. (2005), Nosal and Wallace (2007), Wallace and Zhu (2007), Zhu and Wallace (2007), Ales et al. (2010) and Choi (2012), who use STW, and Duffie et al. (2007), Weill (2007, 2008), Vayanos and Weill (2008), Pagnotta and Philippon (2011) and Chiu and Koeppl (2012), who use versions of DGP.

[2] To be clear, this is only relevant in the model with nonlinear utility – with linearity, as in the baseline DGP model, the two bargaining solutions give exactly the same results.