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Revisiting the tale of two interest rates with endogenous asset market segmentation ☆

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ABSTRACT

We develop a monetary model that is unique in its ability to deliver a negative correlation between aggregate consumption growth and short-term real interest rates consistent with U.S. data. The essential ingredient to this success is endogenous asset market segmentation permitting the extent of household participation in asset markets to vary smoothly with changes in aggregate conditions. Households in our model incur fixed transactions costs when exchanging bonds and money and, as a result, carry money balances in excess of current spending to limit the frequency of such trades. While we impose no stickiness at the microeconomic level in either prices or portfolio adjustment, our model drives gradual adjustment in the aggregate price level following a monetary shock and thus persistent non-neutralities. In our model, households can alter the timing of their trading activities in response to changes in both individual and aggregate states. We show that this added flexibility relative to fixed segmentation models can substantially reinforce the sluggishness in aggregate price adjustment following a monetary shock, and it can transform dramatic, transitory changes in real and nominal interest rates into more moderate and persistent liquidity effects. When we extend our setting to consider production, we find that small changes in household participation rates add substantial persistence to movements in inflation, and they deliver persistence in real interest rates that is otherwise absent. These changes are also critically important to our model's success in reproducing the empirical correlation between aggregate consumption growth and real interest rates; when they are suppressed, the success is lost.

1. Introduction

There is a wealth of empirical research documenting co-movement between real and nominal series, and what is widely accepted as evidence of persistent responses in real variables following nominal disturbances. Towards better understanding such relationships, we develop a monetary model with endogenous asset market segmentation wherein heterogeneous households face fixed costs to shift their wealth between interest-bearing assets and money. Given these transactions costs, households in our model infrequently access their interest income, and they carry money balances in excess of current spending to help finance their spending over coming periods.

The most common approach to analyzing the relations between movements in real and nominal aggregate series is to use models with nominal prices that are sticky at the firm level and assume that firms must produce to satisfy demand at

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their given prices. These models have grown in sophistication with the inclusion of various aggregate frictions and stochastic driving processes, and they are widely used by central banks for monetary policy analysis.[1] However, there are still open issues confronting the sticky-price framework, beyond the well-known debate over the frequency of microeconomic price adjustment.[2] Below, we describe two such issues involving the model's predictions for the relation between short-term interest rates and real economic activity, each of which is resolved in our model without imposing nominal rigidity at the microeconomic or aggregate level.

First, because sticky price models assume a representative household, they have at their core a consumption Euler equation leading them to predict real interest rates tied to the growth rate of aggregate consumption. Canzoneri et al. (2007) show that this prediction is refuted in the data not simply in terms of average levels, but more critically in the directions of change. Using U.S. consumption data, Canzoneri et al. retrieve the interest rate series implied by the model's Euler equation under a series of leading preference specifications (including five commonly used variants of habit persistence). They find that the model-implied interest rate series is consistently negatively correlated with observed U.S. interest rates.

Second, without additional elements specifically designed to obtain it, the model has no inherent liquidity effect.[3] This issue arises irrespective of whether firm-level price stickiness is imposed or endogenous.[4] Dotsey and King (2005) resolve a long-standing issue for the sticky-price literature by developing an (S,s) model of nominal price setting that is consistent with empirical estimates of the persistence in inflation movements. In doing so, however, they find that the model predicts a rise in short-term nominal interest rates following a persistent positive shock to money growth rates.

Like other settings with segmented asset market participation, open market operations have real effects in our model economy because they directly involve only a subset of households, and because real balances are essential in facilitating goods market transactions. As we explain below, our model produces gradual adjustment in the general price level through a velocity mechanism associated with changes in the distribution of money holdings across periods.[5] This velocity mechanism is strengthened in our model by time variation in the fractions of households participating in the bond markets; as a result, it delivers greater persistence in inflation movements relative to models with exogenous market segmentation.

Our model has a natural liquidity effect. Because households participating in the bond markets at the date of an unanticipated rise in money growth carry unusually high real balances, they experience raised consumption relative to households participating in the bond markets in subsequent dates. This implies a fall in the real interest rate exceeding the rise in expected inflation. Unlike settings with time-invariant segmentation, however, the liquidity effect in our model is persistent, because endogenous changes in household participation rates limit the rise in inequality at such times. In particular, raised participation rates spread the rise in real balances out beyond the initial group of households to those households participating in the bond markets at later dates, thus generating a persistent rise in participating households' consumption.

Importantly, our model succeeds in reproducing the negative correlation between aggregate consumption growth and real interest rates observed in postwar U.S. data. As noted above, this is essentially impossible in any model that assumes a representative household. By contrast, real interest rates in our economy have no direct mapping to the aggregate consumption series; rather, they are determined by the relative marginal utilities of subsets of households participating in the bond markets at adjacent dates. Interestingly, however, the mere presence of asset market segmentation is not sufficient to deliver the empirical correlation between aggregate consumption growth and real interest rates. While exogenous segmentation moves the correlation further from 1, we show that it remains positive unless the extent of market segmentation is allowed to change over time in response to aggregate conditions.

Our work builds on an important literature that studies monetary policy in models with exogenously segmented markets.[6] We contribute to the segmented markets literature what the menu cost model contributes to the sticky-price literature. We endogenize the microeconomic stickiness at the heart of the model's non-neutralities – in this case, the infrequency of household portfolio adjustments.

[1] Prominent examples are the models of Christiano et al. (2005) and Smets and Wouters (2003).

[2] See Bils and Klenow (2004) and Nakamura and Steinsson (2008).

[3] Friedman (1968) highlights the liquidity effect as the starting point for the monetary transmission mechanism, noting "*The initial impact of increasing the quantity of money at a faster rate than it has been increasing is to make interest rates lower for a time than they would otherwise have been.*" VAR studies consistently uncover liquidity effects. See, for example, Leeper et al. (1996) or Christiano et al. (1996, 1999).

[4] This is a well known problem for the basic sticky price model; see, for example, King and Watson (1996) or Christiano et al. (1997). Christiano et al. (2005) add habit persistence in consumption and aggregate investment adjustment costs to create a liquidity effect. Edge (2007) shows the same result can be achieved through a combination of habit-persistence alongside time-to-build and time-to-plan in aggregate investment.

[5] Many VAR studies suggest that the general price level adjusts slowly following nominal shocks. See, for example, Leeper et al. (1996), Christiano et al. (1999), and Uhlig (2005). King and Watson (1996) also show that the price level is positively correlated with lagged real output at business cycle frequencies. Further evidence of gradual aggregate price adjustment may be seen in the relation of short-term movements in velocity to those in the ratio of money to consumption, as is discussed by Alvarez et al. (2009). The correlation between the ratio of money (M2) to consumption (PCE) and the corresponding measure of velocity is −0.89 for HP-filtered monthly data.

[6] See Alvarez et al. (2001) and the references therein.