Economic Modelling xxx (2018) 1–21

Contents lists available at ScienceDirect

Economic Modelling

journal homepage: www.journals.elsevier.com/economic-modelling

Financial factors and labor market fluctuations☆

Yahong Zhang

Department of Economics, University of Windsor, 401 Sunset Avenue, Windsor, Ontario, N9B3P4, Canada

ARTICLE INFO

JEL: classification:
E32
E44
J6

Keywords:
Financial frictions
Financial shocks
Unemployment
Search and matching models

ABSTRACT

The recent financial crisis has been associated with a significant rise in the unemployment rate in the U.S. To understand the impact of financial frictions and shocks on unemployment fluctuations, I develop a monetary DSGE model with explicit financial and labor market frictions. The model is estimated using U.S. data over the period of 1984Q1 to 2016Q4. I find that the model accounts well for the cyclical behavior of unemployment and vacancies observed in the data. The historical decomposition results show that financial wealth shocks contribute significantly to the rise in the unemployment rate following the recent financial crisis. Overall, I find that financial wealth shocks contribute more than 30 per cent of the fluctuations in unemployment and vacancies in the U.S. during the sample period.

1. Introduction

The recent financial crisis has been associated with a significant rise in the unemployment rate in the US. The unemployment rate more than doubled from 4.8 percent at the beginning of the recession to peak at 10 percent in the last quarter of 2009. To understand the impact of financial frictions on unemployment fluctuations, this paper develops and estimates a quantitative macroeconomic model that incorporates both labour and financial market frictions using US time series data from 1984Q1 to 2016Q4. The objective of the paper is to explore the interaction of financial and labour market frictions, and assess quantitatively, through this interaction, how important it is to consider financial frictions and shocks when addressing the fluctuations in aggregate unemployment.

There is an important strand of literature studying the effect of financial market imperfections on unemployment. These studies usually assume that there exist some difficulties for firms to access credit and these difficulties affect firms' hiring decisions. For example, prior to the 2008–2009 financial crisis, Wasmer and Weil (2004) assume that new entrepreneurs have no wealth of their own and must raise funds in an imperfect credit market before they enter labour market to search for workers. Acemoglu (2001) studies a model in which an agent needs to decide to become an entrepreneur or a worker. In order to hire workers, entrepreneurs either borrow funds or use their own wealth. Both studies show that credit frictions increase unemployment.

The recent financial crisis and the following slow recovery have drawn more attention to the relationship between financial frictions and unemployment (employment) dynamics. Monacelli et al. (2011) study a model in which firms issue debt under limited enforcement. They show that in this environment credit shocks can generate large employment fluctuations. Petrosky-Nadeau (2014) assumes that firms must seek external funds to finance the costs of posting vacancies and that credit market is subject to costly state verification frictions. He shows that the credit market frictions amplify and propagate the responses of unemployment and vacancies to productivity shocks. Branch et al. (2014) use a model similar to that of Petrosky-Nadeau (2014) but focus on financial frictions that affect households instead of firms. In their model, households' ability to borrow is subject to a collateral constraint, and firms' hiring decisions depend on this constraint. During the financial crisis, the fall in housing prices tightened the financial constraint. As a result, firms post fewer vacancies. Arellano et al. (2016) focus on the uncertainty faced by firms. They argue that hiring labour is particularly a risky decision when firms face financial constraints and show that the increased volatility of firm-level production shocks worsens credit conditions, resulting in a decline in labour demand.

☆ I am grateful to two anonymous referees and editor Sushanta Mallick for their very useful comments. I thank Jim MacGee and Audra Bowlus for their helpful suggestions. I have benefited from the discussions from seminar participants at the University of Saskatchewan, the Bank of Canada, the Annual Meetings of the Canadian Economics Association, Computing in Economics and Finance, and Far-East Econometric Society.

E-mail address: yzhang@uwindsor.ca.

https://doi.org/10.1016/j.econmod.2018.05.002
Received 30 March 2017; Received in revised form 31 March 2018; Accepted 2 May 2018
Available online XXX

Similar to the abovementioned papers, this paper focuses on assessing the impact of financial frictions on firms' hiring decisions. In the model, the labour market frictions are modeled using a search and matching framework (Mortensen and Pissarides, 1994). The financial frictions are modeled as in Bernanke et al. (1999) (herein, BGG). Due to costly state verification, there exist financial frictions when firms borrow. Different from the papers listed above – most of them are stylized models and only consider the effects of productivity shocks on unemployment – I introduce labour market and financial market frictions in a Dynamic Stochastic General Equilibrium (DSGE) model and allow for the financial frictions and shocks to compete with other frictions and shocks. In this sense, the model is more suitable for assessing the contribution of financial frictions and shocks to unemployment fluctuations.

In the model, financial imperfections affect unemployment and vacancies in the following way: Following a negative financial shock that reduces entrepreneurs' net worth, the worsened balance-sheet position forces entrepreneurs to face a higher risk premium when borrowing external funds. Since external financing becomes more costly, the demand for capital declines. Due to the constant returns to scale aggregate production function, it is optimal for entrepreneurs to keep a constant capital labour ratio. Thus, the demand for labour declines, leading firms to post fewer vacancies. This reduces labour market tightness and the probability for a worker to find a job. As a result, fewer workers leave the unemployment state. In the model, the financial accelerator mechanism amplifies financial wealth shocks and generates large fluctuations in unemployment and vacancies even though firms' decisions on vacancy postings are not subject to financial frictions directly.

This paper belongs to a growing literature attempting to include unemployment in the traditional medium-scale monetary DSGE models to study business cycle fluctuations. In these works, unemployment is introduced either in a fashion of Mortensen and Pissarides (1994) (see, for instance, Gertler et al., 2008, Furlanetto and Groshenny, 2016) or through involuntary unemployment (for example, Galí et al., 2012). This paper is also linked to the literature studying the effects of financial frictions and shocks on the aggregate economy. In this literature, financial frictions are typically introduced either à la BGG (for example, Christiano et al., 2010, 2014, Christensen and Dib, 2008) or Kiyotaki and Moore (1997) (e.g., Jermann and Quadrini, 2012). However, very few papers using medium-scale DSGE models include both financial and labour market frictions. Christiano et al. (2011) and Mumtaz and Zanetti (2016) are the exceptions. Both papers introduce the BGG-type financial frictions and Mortensen-Pissarides-type labour market frictions to an otherwise standard DSGE model. Mumtaz and Zanetti (2016) use a simple labour search model as in Blanchard and Gali (2010) and focus on how labour market frictions amplify the effects of financial shocks. In contrast, Christiano et al. (2011) use a more elaborate search model that incorporates the staggered wage contracting developed in Gertler and Trigari (2009), and focus on whether financial shocks and frictions have important impacts on business cycles.

In this paper, I augment a standard DSGE model with financial and labour market frictions along the lines of Christiano et al. (2011) (herein, CTW). The key differences between this paper and CTW are as follows: 1) CTW study the Swedish economy using a small-open economy model; I use a closed-economy model and estimate it to the U.S. economy; 2) Although CTW introduce unemployment in a comprehensive monetary business cycle model, analyzing labour market dynamics is not the focus of their paper. They stop short of providing a detailed analysis of how financial frictions and shocks affect labour market outcomes. In contrast, I focus on the impact of the financial factors on labour market activities. In particular, I highlight the role of the financial accelerator mechanism in amplifying the responses in unemployment and vacancies to financial shocks, and how the interaction between financial frictions and wage setting frictions affects labour market outcomes.

I estimate the model using US time series data from 1984Q1 to 2016Q4.[1] The main findings of the paper are as follows. First, financial wealth shocks, the shocks affecting firms' net worth, account for about 30 per cent of the variations of unemployment and vacancies in the long run. Second, to understand the role of the financial shocks in explaining the significant rise in the unemployment rate following the financial crisis, I conduct an historical decomposition for unemployment for this period 2008Q4 to 2011Q2 and find that the financial wealth shocks contribute significantly to the rise in the unemployment rate.[2] Third, I find that including financial data in estimation generates a higher elasticity of external finance, the key parameter capturing financial frictions, and this leads to a larger amplification effect from the financial accelerator. Lastly, I find that financial shocks become more persistent and volatile, and account for a larger portion of variations in unemployment and vacancies in the U.S. during recent years.

The paper is organized as follows. In Section 2, I describe the model. In Section 3, I discuss the data and estimation strategy. In Section 4, I present the estimation results, examine the performance of the model and quantify the sources of labour market fluctuations. In Section 5, I discuss several issues regarding the robustness of the results. Finally, in Section 6, I offer some concluding remarks.

2. The model

In this section, I describe the model economy. I consider an economy populated by a representative household, retailers, entrepreneurs, capital producers and employment agencies. A representative household with a large family structure has a fraction of its members unemployed, and the rest are employed. The household consumes, saves in bonds, pays taxes, and receives profits from retailers. Employment agencies hire workers from a frictional labor market, which is governed by an aggregate matching function. The nominal wage paid to an individual worker is determined by Nash bargaining. In each period, an employment agency has a fixed probability that it may renegotiate the wage. Employment agencies make hiring decisions and supply labor services to entrepreneurs at the price of marginal productivity of the labor services. Entrepreneurs also acquire capital from capital producers. Since entrepreneurs have to obtain external finance for their capital purchasing, they are subject to financial market frictions. Retailers purchase the wholesale goods produced by entrepreneurs and differentiate at no cost and sell them to final good producers, who aggregate differentiated goods into a homogeneous good and supply it to the representative household.

2.1. Households

There is a representative household with a continuum of members of measure one. The number of family members currently employed is n_t. The employed family members earn nominal wage w_t^n. The unemployed members receive unemployment benefit $\bar{b}_t$. Each member has the following period utility function

$$u(c_t) = e_t \log(c_t - hc_{t-1}),$$

where c_t is consumption of final goods in period t, and h is the degree of habit persistence in consumption. A preference shock e_t follows an

[1] Since 2009Q1, the nominal interest rate is at the zero lower bound (ZLB) in the U.S. Existing literature, for example, Gust et al. (2017) show that once the ZLB constraint is taken into account, negative shocks have larger impacts on the aggregate economy. In this paper, the model is linearized and solved without explicitly imposing the ZLB constraint. As a result, I expect that the model underestimates the effects of the shocks on unemployment fluctuations. See Section 5.2 for more discussions related to the ZLB.

[2] During the period of 2008Q4 to 2011Q2, the unemployment rate increased significantly in the U.S.