My dissertation is motivated by the difficulties modern macroeconomic models have matching basic sample moments of asset prices, such as a large risk premium, a low risk-free rate, and the volatility of stock returns (Mehra and Prescott, 1985, Jermann, 1998, Cochrane, 2005). Economists have worked for more than thirty years to solve this puzzle because the pricing mechanisms of asset and financial markets are crucial to describing and understanding the real, financial, and monetary business cycle. The failure of dynamic, stochastic general equilibrium (DSGE) models to explain asset prices is not just an academic concern. Central banks are interested in learning about the interaction between asset prices, macroeconomic risk, the real economy, financial activity, and monetary policy to support their goal of stabilizing the economy over the business cycle.

My dissertation adds to economists’ knowledge of the mechanisms that generate movements in asset prices and business cycle fluctuations. I study the role credit markets can have in creating dynamics in DSGE models. These credit markets have lenders imposing collateral constraints on borrowers. A collateral constraint requires borrowers to offer an asset to lenders as an alternative means of repaying the loan in the event that the borrowers default (Kiyotaki and Moore, 1997). The fraction of an asset’s value that is acceptable as collateral is a measure of that asset’s liquidity; the more liquid an asset, the more of its value is acceptable as collateral, and the greater the amount that can be borrowed against it. Motivated by the recent financial crisis, macroeconomic research has worked to shed new light on how changes in liquidity can affect asset prices and real economic activity. Leading examples are Kiyotaki and Moore (2005), Jermann and Quadrini (2012), Shi (2015), and Bigio (2012, 2015).

The two essays of my dissertation build on this line of research. These essays describe DSGE models that feature heterogenous households, a fraction of which are savers, and the rest of which are entrepreneurs. Entrepreneurs lack the resources necessary to invest in projects generating output. They want to borrow to fund investment, but are unable to make a credible ex ante pledge to savers that all the returns promised to them will be paid ex post. To solve this problem, savers offer entrepreneurs a secured debt contract that requires entrepreneurs to post collateral to obtain a loan. If entrepreneurs fail to repay a loan with interest, the savers take the posted collateral. Entrepreneurs fail to repay a loan when negative productivity shocks drive down the value of collateral to less than the cost of repaying the loan with interest.

Much of the current literature on collateral constraints in DSGE models specifies liquidity with an exogenous stochastic process. I innovate in the essays of my dissertation by
endogenizing the liquidity of assets offered as collateral. Liquidity prices the risk of default. The higher the volatility of productivity shocks, the more likely a large negative shock that triggers default, holding liquidity constant. In equilibrium, liquidity must fall to reduce the risk of default on debt held by savers. I write the debt contract in my dissertation as a pair of a future contract and an option contract. An entrepreneur finances the purchase of an asset by agreeing to sell it to a saver in the next period, but retains an option to repurchase it by paying interest on the loan.

My first essay introduces these endogenized collateral constraints into a purely real DSGE model in which total factor productivity for entrepreneurs and savers are subject to separate, persistent growth shocks and a common volatility shock. I perform a moment matching exercise following Mehra and Prescott (1985) and Bansal and Yaron (2004). The model is calibrated to annual U.S. data from 1929-2012 and quarterly U.S. data from 1947-2012. A complete solution allows me to quantify the effects of volatility shocks on asset prices through two channels: a direct effect on asset prices and an indirect effect through changes in liquidity created by the endogenous collateral constraint.

My second essay introduces the endogenized collateral constraints into a standard medium-scale new Keynesian DSGE model (Christiano et al., 2005, Smets and Wouters, 2003), a type of model commonly used at central banks for conducting policy in response to productivity and other standard business cycle shocks. I calibrate the model and use it to explore the effects of volatility shocks through the endogenous collateral constraint on the monetary policy transmission mechanism over the business cycle. The model gives insight as to how a central bank should respond to volatility shocks through traditional monetary policy tools as well as macroprudential regulatory tools, such as minimum down payments.
References


