

# Dissertation Report on “Three Essays on Monetary Policy” by Jakub Matějů

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The thesis consists of three chapters, which all deal from a theoretical and empirical perspective with different issues related to monetary policy. The first chapter is the most extensive one, with the candidate as the sole author. It presents a New Keynesian general equilibrium model with financial assets that is able to replicate relevant features of a credit cycle. The model is calibrated and simulated to analyse responses to monetary policy and financial shocks as well as different monetary policy reaction functions. The second chapter (co-authored by Jan Filàček) sets out a model of boundedly and fully rational agents to explain adverse reactions to a monetary policy shock such as the “price puzzle”. It documents in a panel regression that such effects seem indeed to be present in a sample of 12 OECD countries. The final chapter (co-authored by Tomáš Adam and Soňa Benecká) investigates non-linear behaviour of CEE exchange rates in a Markov-switching vector autoregressive (VAR) model.

Overall, all three essays are well written and deal with relevant monetary-policy questions in an innovative way. The work documents that the author(s) are familiar with the relevant literature and master a broad range of state-of-the-art theoretical and empirical methods. By analysing the topics at hand with these methods they are able to generate new evidence on the working of financial markets and their impact on the economy.

## **Chapter 1: Endogenous Asset Price Bubbles and the Credit Cycle: the Role of Monetary Policy**

The first chapter presents a model of monetary policy that combines the occurrence of asset price bubbles as pioneered by Allen and Gale (2000) with a financial accelerator model in the spirit of Bernanke, Gertler and Gilchrist (1999) (BGG) in a New Keynesian general equilibrium model. The key friction in the model originates from leveraged investors with limited liability, who consider only the positive-profit part of the return distribution and do not internalise the full cost of losses. This leads to an overpricing of equity, implying that in equilibrium equity prices exceed the present value of expected future dividends. The overpriced equity can be used as collateral, which then in turn affects credit availability, lending and real activity and gives rise to a credit cycle.

The model is calibrated and the impulse responses to a monetary policy and a financial shock are compared to those that arise in a standard BGG model. The responses to a monetary policy shock of macro variables such as output, consumption, investment, inflation and the return on capital are dampened relative to the BGG model. The same is true for investors’ wealth and defaults. With regard to the length of the holding period of the financial asset, no visible difference in the reactions of the macro variables is present. By contrast, borrowing and the lending rate react more than in the benchmark BGG model in response to the monetary policy shock, in particular when asset maturity is longer. One reason is that with a nominal interest rate hike, the cost of loans rises and asset prices

fall, leading to a fall in investors' wealth and forcing them to borrow more, which smooths the reaction of investment and other macro variables.

Regarding a shock to the non-fundamental part of the asset price, output, investment, capital returns and inflation increase on impact, while consumption and the interest rate first decrease and later increase. Depending on the length of the holding period, the reaction of the financial variables to the shock changes qualitatively and sometimes even switches sign. Again, the evolution of investors' wealth is key in propagating the effects of the shock to the real variables. When maturities are short, the lending rate, borrowing and defaults increase in response to a positive shock to the non-fundamental part of the asset price, whereas they decrease if the maturity exceed two quarters.

Finally, the efficiency of different monetary policy rules is assessed by simulating rules that react to inflation and output and rules that also react to the asset price. It turns out that the lowest standard deviations of inflation and output are achieved when monetary policy disregards the asset price, which could be explained by the non-fundamental component of the asset price acting as a shock absorber with which monetary policy should not interfere.

In sum, the model gives rise to a number of interesting results. First, the non-fundamental component of equity prices dampens the effect of the monetary policy shock relative to the BGG model. If assets are held for more than one period, the impact of an asset price shock on credit availability, lending and real activity is stronger. Second, if the equity market maintains a sufficient momentum, real variables grow faster than in the BGG model, which can be interpreted as the existence of a financial cycle. Finally, limited liability leveraged investors prefer investment in risky equity over a diversified portfolio because they do not fully internalise losses on their investments.

## **Chapter 2: Adverse Effects of Monetary Policy Signalling: The Updating Channel**

It has been discussed among theorists and practitioners whether central bank decisions can have unintended effects by signalling the central bank's assessment of the state of the economy. If the central bank evaluates the state of the economy as being worse than the market participants expected, they may revise their expectations which would counteract the intended monetary policy effect. This channel relies on the assumption that the central bank has superior information so that private agents can learn about the state of the economy from the central bank's actions. If this "updating" effect dominates, an expansionary monetary policy shock could even lead to an unintended tightening of financial conditions.

The updating channel of monetary policy is modelled in a standard New Keynesian open economy model (following Gali and Monacelli 2005) where the two countries are interpreted as two different sectors of the economy that are characterised by fully rational agents on the one hand and boundedly rational agents on the other. Assuming a common monetary policy for both sectors and a unitary exchange rate, this modelling approach is an elegant way to allow for comprehensive interactions between the rational and boundedly rational agents in the economy. Importantly, the rational agents take the bounded rationality in the other sector into account when they optimise and form their expectations. The boundedly rational agents behave optimally, given how they build their expectations.

The model is closed with the central bank setting the optimal interest rate based on its fully rational expectation of next period's output and inflation. By setting the nominal interest rate, the central bank conveys its forecast of the economy to the boundedly rational agents, who then update their otherwise static expectations.

The impulse responses of the model variables to a monetary policy shock differ substantially from those in a standard model. The boundedly rational agents misinterpret a contractionary monetary policy shock as a reaction of the central bank to higher expected output and inflation. When they update their expectations accordingly, this spills over to the fully rational sector and reinforces the restrictive effect of the shock. Aggregate output shows a slowly falling, hump-shaped response that matches better with the empirical evidence than the responses from typical structural models. Inflation can even increase on impact, giving rise to a price puzzle.

The implications of this theoretical setup are tested in a panel model that is estimated on data from 12 OECD countries. The regression equation tests whether changes in Consensus Forecasts for inflation at different horizons can be explained by lagged interest rate surprises and the central bank's own forecasts. After controlling for contemporaneous macroeconomic news releases, calendar effects, country fixed effects and potential endogeneity, a significantly positive coefficient on the policy rate surprise is found, which is consistent with the proposed updating channel. This result is robust to different definitions of a policy rate surprise.

A distinctive feature of this chapter is the close link between the theoretical and empirical setup where the authors resort to published forecasts to directly test the implications of their model. In the empirical analysis, they deal carefully with data issues such as timing and endogeneity that typically plague the available published forecasts.

## **Chapter 3: Financial Stress and Its Non-Linear Impact on CEE Exchange Rates**

The third chapter deals with financial stress and its non-linear impact on exchange rates of the Czech Republic, Poland and Hungary vis-à-vis the euro. It is argued that financial stress in the euro area can have different effects on the exchange rate of peripheral currencies: In a low-stress regime, a moderate increase in the level of stress may lead to an appreciation of the peripheral currency because investors diversify into higher yielding currencies. By contrast, if the stress level is already high, a further increase in stress may trigger a flight to safety. As investors reallocate their portfolios into larger and more liquid currencies, peripheral currencies depreciate.

The paper develops a model of portfolio choice between a core and a peripheral asset that has a higher return but also a higher volatility of returns than the core asset. The investors optimise their portfolios in terms of returns and variances. In case of mean-variance utility maximisation, it is shown that the reaction of the portfolio shares to changes in the volatility of returns in the core assets depends critically on the degree of risk aversion of the investors, as has been hypothesised in the motivation. The portfolio share of the peripheral asset increases with higher volatility of the core asset for low values of risk aversion, as the higher return dominates the increased variance of the portfolio. By contrast, if the risk aversion parameter is high enough, a higher volatility of the return on the core asset leads to a decrease in the portfolio share of the peripheral asset because now the

variance of the portfolio dominates in the investors' decision. By contrast, if investors have to satisfy a maximum variance constraint like in a value-at-risk context, no such switching occurs. In this case, one would have to assume that investors switch between different portfolio-allocation strategies, which is less elegant than the switching in the mean-variance model that is conditional on the risk aversion parameter only.

The empirical analysis employs a bivariate Markov switching VAR model, which provides a flexible framework to investigate regime changes such as those derived in the portfolio-allocation model. Coefficients and variances are assumed to switch together. Financial stress is measured either by the VIX or the CISS index, of which the latter seems better suited to capture euro-area related stress. With the CISS index the high-volatility regime occurs in all countries in the wake of the global financial crisis and again in late 2011 when the sovereign debt crisis in the euro area was at its height.

The empirical model slightly deviates from the theoretical setup in that three regimes are chosen. The drawback of the flexibility offered by a Markov switching approach is that the resulting regimes need some interpretation and their features do not always fully match with those derived in theory. One example is that the level of risk as measured by the CISS does not increase monotonically across regimes for all countries, which in turn affects the interpretation of the exchange rate reaction. Though impulse responses to a financial stress shock have different signs in different regimes, the assignment to the "diversification" and the "flight-to-quality" regime is not always as clear-cut as one would like. If regime changes over the response horizon should be taken into account, the method proposed by Koop, Pesaran and Potter (1996) could be used.

Since risk aversion cannot be observed directly, a Markov switching setup is an attractive modelling strategy because the transitions between different regimes occur probabilistically and need not be proxied by a specific variable. By modelling portfolio choice theoretically and empirically, this paper provides an important contribution to the notoriously hard-to-capture notion of "risk-on/risk-off" behaviour on the foreign exchange market.

**Overall, I confirm that the thesis satisfies the formal and content requirements for a PhD thesis in economics and I recommend the dissertation for a defence.**

## References

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