Report on Ph.D. Dissertation Defence

Ph.D. Candidate	Krist Dacharux
Main referee	LEON-GONZALEZ, Roberto
Referees	HSU, Minchung
	PORAPAKKARM, Ponpoje
	SONOBE, Tetsushi (Chairperson of the Ph.D. Committee)
	FUJIWARA, Ippei (Keio University)
Dissertation Title	Thailand Monetary Policy Analysis: A Bayesian Estimation of DSGE Models
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Result: Pass (subject to minor changes)

1. **Thesis overview and summary of the presentation.**

The thesis estimates Dynamic Stochastic General Equilibrium (DSGE) models with Bayesian techniques in order to analyse the impact of monetary policy on the economy of Thailand. The thesis estimates models of different complexity and evaluates the empirical performance and forecast ability of such models. Furthermore, it evaluates which aspects of the model are more important in order to obtain a model that realistically explains the Thai macroeconomic data.

The findings confirm both the predictions of economic theory and the empirical findings from less restricted (but also less informative) VAR models. In particular, the output, private consumption, and private investment expenditures are shown to respond negatively to an increase in the short-term interest rate, with peak effects at different lags for each variable. Investment is identified as the most responsive component of GDP to the monetary policy shock. The analysis of forecast performance reveals that a

medium-sized DSGE can compete with statistical Bayesian VAR models of different lags in explaining the dynamics of Thai data.

This analysis should be useful not only to monetary authorities in Thailand but also to theoretical economists developing DSGE models for the Thai economy, as the current study informs of the channels which are empirically important in Thailand.

Mr. Dacharux made a very clear presentation that lasted for about 1 hour and subsequently the referees made several questions and comments.

2. Notes from the Examining meeting (including changes required to the thesis by the referees).

The referees made the following comments:

Professor Ippei Fujiwara

1) Habit formation and investment adjustment cost are real frictions, but nominal frictions should be referred to as nominal rigidities.

2) In Chapter 3, the parameters in the Modified model, namely, α_x and α_π, are added into the model's structure in an ad-hoc manner.

3) It is not clear what the contribution of the dissertation is, particularly in light of the previous Bayesian estimation literature for Thailand (Bank of Thailand (Pongsaparn, 2008); IMF (Alp and Elekdag (2012)).

4) Chapter 3's model is smaller than and seems to be nested into the one used in Chapter 4. There should be a reason for estimating Chapter 3's model.

5) One possible way to make further contribution/connect the two chapters is to derive the Ramsey Optimal Monetary Policy for each model. This could be done by a command in DYNARE.

Professor Minchung Hsu

1) What are the research questions for each chapter?

2) For Chapter 3, why the backward looking behaviors are added into the model structure?

3) In the presentation, why Real Business Cycle is mentioned when it is not related to monetary policy?

4) How the posterior estimates in Chapter 3 and 4 stand in international comparison?

Professor Tetsushi Sonobe

1) Again, it is not clear what the contribution of this study is.

2) In conjunction with Professor Fujiwara's comment, it is important to carefully provide a review of previous studies in order to be clear about the contribution.

3) This dissertation deals primarily with Thailand, is there any reason for choosing this country?

4) Regarding chapter 4, what aspect of the Thai economy that has not been captured by the model?

5) More efforts should be put into providing connection between the main chapters.

Professor Ponpoje Porapakkarm

1) In Chapter 3, the sample employed for Bayesian estimation is between 1994-2013, which includes a period of sudden and drastic changes in the Thai economy, namely the Financial Crisis of 1997 and the shift from fixed exchange rate to floating system. Readers should be warned that the results and policy implications of this chapter should be taken with caution.

2) In this dissertation, the underlying model is a closed economy, thus ignoring shock from foreign countries.

3. **Confirmation by the Main Referee that changes have been done to the satisfaction of the referees.**

Mr. Dacharux has revised his thesis to incorporate the comments of the referees and has provided an explanation of the changes that I attach at the end of this report. The referees are satisfied with the revisions.

4. **Final recommendation.**

I recommend that the degree of PhD in International Economics be awarded to Mr. Dacharux.

Appendix: Report of how the comments of the referees where incorporated in the thesis by Mr. Dacharux.

PROFESSOR IPPEI FUJIWARA

1) *Habit formation and investment adjustment cost are real frictions, but price/wage stickiness should be referred to as nominal rigidities.*

    Response: This involves Chapter 4 in particular, and necessary changes have been made throughout the chapter to ensure the consistent terminology with the literature as Professor Fujiwara pointed out.

2) *In Chapter 3, the parameters in the Modified model, namely, α_x and α_π, are added into the model's structure in an ad-hoc manner.*

    Response: Even though the added backward-looking behaviors do not alter the model's steady state, it is agreed that both parameters should be derived theoretically starting from the household objective function and it will be included in the future research.

3) *It is not clear what the contribution of the dissertation is, particularly in light of the previous Bayesian estimation literature for Thailand (Bank of Thailand (Pongsaparn, 2008); IMF (Alp and Elekdag, 2012))*

    Response: Pongsaparn(2008) estimates a *semi-structural* NK model which is not derived from maximizing problems and thus does not estimate the deep parameters, such as the habit formation parameter and investment adjustment cost. There are several other studies that use similar *semi-structural* NK models for Thailand, including Aiyar and Tchakarov (2008) and Amonvivat et al. (2009).

    More relevant to our study are the following two papers:

    (1) Chuantantikamon (2008) performs Bayesian estimation of an open-economy DSGE model with sticky prices and habit formation in consumption for Thailand. His model incorporates a smaller set of frictions compared to our model in Chapter 4.

    (2) Alp and Elekdag (2012) estimate an elaborate open-economy NK-DSGE model, focusing on the counterfactual experiments when three powerful shocks hit the Thai economy, during 2008-2011. Their model takes into account the trading sector and international bond market which are not explicitly derived in our model in Chapter 4.

    However, neither of the two studies above compares the model's forecast performance with

statistical tools (BVAR) and neither do they provide sensitivity analysis for *all the frictions* included in their model. Our dissertation offers the first formal assessment of NK-DSGE forecast performance for Thailand, by comparing between the estimated NK-DSGE and the BVAR models, the powerful non-theoretical statistical tool that provides superior description of the data. We also identify which friction is model-improving and which one is not for Thailand. These highlight the main contributions of our study, which not only reconfirms the choice of frictions included in the model, but also informs future model-builders of necessary ingredients for their endeavors.

(The discussion of the related previous studies is offered on the Pages 23-25 in the dissertation.)

4) *Chapter 3's model is smaller than and seems to be nested into the one used in Chapter 4. There should be a reason for estimating Chapter 3's model.*

Response: We aim to find a NK-DSGE model that can provide a good description of the Thai data dynamics and capture the monetary policy impacts. In addition to dynamic analyses, we also perform an assessment of how well the estimated NK-DSGE model can predict the data for Thailand. Although the small model in Chapter 3 is capable of showing the non-neutrality of the monetary policy, further analysis shows that its forecast performance is still outperformed by the statistical BVARs. This provides a motivation for us to pursue a richer model that can compete with BVARs in Chapter 4.

5) *One possible way to make further contribution/connect the two chapters is to derive the optimal monetary policy for each model. This could be done by a command in DYNARE.*

Response: Following Professor Fujiwara's suggestion, the optimal monetary policy responses are estimated for the Modified model (Chapter 3) and the Baseline Model (Chapter 4), in line with the works by Adjemian et al.(2007), Adolfson et al.(2008), and Nakornthab(2009). Essentially, the social planner is solving an optimization problem with a quadratic loss function that consists of two arguments: inflation and output gap. A comparison between the optimal policy responses and the ones implied by the estimated models are added to each chapter (Pages 56 and 108). Nevertheless, we feel that a more thorough investigation is needed and reserve the complete analysis for the future.

PROFESSOR MINCHUNG HSU

1) *What are the research questions of this study?*

   Response: In order to clarify the direction of the study, in addition to the objectives of this dissertation, the research questions are added into the introduction chapter (Page 2) as follows:

   (1) To what extent monetary policy can influence the Thai real economy under the estimated NK-DSGE framework?

   (2) Which kind of frictions is model-improving, which one is not, and to what extent? and lastly

   (3) How the forecast performance of the estimated DSGE model stands in comparison with statistical tools such as BVAR models for Thailand?

   These three questions provide the direction for our analyses in the main chapters.

2) *For Chapter 3, why the backward looking behaviors are added into the model structure?*

   Response: In addition to the response to Professor Fujiwara's second comment, it is also worth noting that the reason for adding the lagged output gap and inflation is to test against the purely forward-looking IS and Phillips curves. Ireland (2004) claims that the estimation of purely forward-looking model may run the risk of overestimating the persistence of certain shocks, since the model overlook the backward-looking behavior.

3) *In the presentation, why Real Business Cycle is mentioned when it is not related to monetary policy?*

   Response: The reason is purely for the sake of explanation as per how the NK models are developed by incorporating frictions on to the RBC foundation, the result of which allows for monetary non-neutrality and also helps improve the model fit.

4) *How the posterior estimates in Chapter 3 and 4 stand in international comparison?*

   Response: Comparison with international findings is provided for key parameters of interest such as habit formation, labour supply elasticity, and Taylor rule's weights (Pages 87-89 and 110-111). In essence, we highlight the similarity as well as the difference of our posterior estimates with those offered by not only international studies but also earlier findings for Thailand. For example, our posterior estimate of habit formation parameter of 0.55 for Thailand, though smaller than previous calibration and estimation results of Tanboon (2008) and Chuantantikamon (2008), is in line with the findings for the US, the Euro area, as well as Malaysian economy (Christiano et al. (2005), Smets and Wouters (2003), and Alp,Elekdag,&Lull (2012)).

PROFESSOR TETSUSHI SONOBE

1) *Again, it is not clear what the contribution of this study is.*

   Response: Our response echoes the ones offered for Professor Fujiwara's third comment and also Professor Minchung's first comment. We postulate the three aforementioned research questions as well as incorporate the discussion of related literature. Essentially, our study is the first in assessing the forecast performance of NK-DSGE by comparing it with that of BVARs for Thailand. We also inform future researchers which friction is model-improving and which one is not, providing a cross-check for the frictions included in the model. The discussion of the research questions and contribution is added to the introduction section of each chapter, the Introduction Chapter (Pages 2-3) and the Conclusion Chapter (Pages 109-113).

2) *In conjunction with Professor Fujiwara's third comment, it is important to carefully provide a review of previous studies in order to be clear about the contribution.*

   Response: In response to this comment and that of Professor Fujiwara's, we provide a detailed discussion of the earlier works related to our study as outlined above and also in subsection 2.3 on Literature Review on Pages 23-25 of the dissertation.

3) *This dissertation deals primarily with Thailand, is there any particular reason for choosing this country?*

   Response: Thailand is an interesting case. The Thai economy plays an important role in both the regional and the global scales. Given its size and high linkage to the regional supply chain and financial markets, understanding the shocks and economic repercussions in the Thai economy has strong bearings to other countries. This is evident in the contagiousness of the 1997 Asian Financial Crisis as well as the 2011 record-breaking floods in Thailand that disrupted not only the regional but also the global network of manufacturing production. Regarding monetary policy conduct, Thailand is one of the emerging market economies which have adopted inflation targeting framework since 2000. For 15 years, the central bank has committed to a clear mandate of preserving price stability through the main instrument, the policy interest rate.

4) *Regarding Chapter 4, what aspect of the Thai economy that has not been captured by the model?*

   Response: For the period of 2001-2014, approximately 15 percent of Thai GDP comes in the forms of net exports. The model used in Chapter 4 assumed that the shocks from foreign

economies are captured by the fluctuations in exogenous spending, but does not allow for the role of exchange rate in absorbing/amplifying the shocks. In relation to Professor Porapakkarm's second comment, the future extension seeks to explicitly incorporate this external disturbance into the model to reflect the open-economy characteristic of the country.

5) *More efforts should be put into providing connection between the main chapters.*

Response: In addition to the responses provided for Professor Fujiwara's fourth and fifth comments, we also add the discussion that highlights similarities/differences between the results of Chapter 3 and Chapter 4 in the subsection 6.1 of Chapter 4 (Pages 87-89) and the Conclusion Chapter 5 (Pages 109-113).

PROFESSOR PONPOJE PORAPAKKARM

1) *In Chapter 3, when additional frictions, in terms of lagged output gap and inflation, are added into the Baseline model, the resulting model is called the Extension model. This is misleading since the model is not extended, but only modified.*

Response: Following this comment, we make the name change throughout the Chapter 3 to replace Extension model with *Modified model* to properly reflect the way the model is changed and to avoid the confusion as Professor Porapakkarm has pointed out.

2) *In Chapter 3, the sample employed for Bayesian estimation is between 1994-2013, which includes a period of sudden and drastic changes in the Thai economy, namely the Financial Crisis of 1997 and the shift from fixed exchange rate to floating system. The results and policy implications of this chapter should be taken with caution.*

Response: We totally agree with this comment as the Thai economy has weathered through important structural reforms during 1997-1998 as outlined in our Chapter 2. Accordingly, a note of caution is added to the conclusion section of the Chapter 3 to remind readers of this concern in the interpretation of estimated results and their policy implications, while also points out that the data (2001-2014) and the analysis carried out in Chapter 4 is not subject to the same structural changes. (Page 54)

3) *In this dissertation, the underlying model is a closed economy, thus ignoring shock from foreign countries.*

Response: From the data perspective for Chapter 4, the exogenous spending represents GDP less

consumption and investment, meaning that it includes not only the government spending but also net exports, though the model does not distinguish between the two categories of demands. Foreign shocks are thus contained in the fluctuations of exogenous spending. The future research is aimed at relaxing the closed-economy assumption and allow for the explicit role of exchange rate and foreign interest rate shocks in the model structure. Household consumption is not limited to only the domestic production of goods but can also expand to include imported goods. At the same time, households can also invest in foreign bonds offering returns equal to the foreign interest rate. The value of foreign bonds is translated into local currency by the exchange rate. In addition to the output gap and inflation, monetary policy rule may also take into account the exchange rate movement (as in Alp and Elekdag, 2012).