2020 年 8 月 19 日

博士論文審査結果報告

Report on Ph.D. / Doctoral Dissertation Defense

National Graduate Institute for Policy Studies (GRIPS)

Professor Roberto Leon-Gonzalez

審査委員会を代表し、以下のとおり審査結果を報告します。

On behalf of the Doctoral Thesis Review Committee, I would like to report the result of the Doctoral Dissertation Defense as follows.

<table>
<tr><td>学位申請者氏名
Ph.D. Candidate</td><td colspan="3">Punzalan Reynalyn Guevarra</td></tr>
<tr><td>学籍番号
ID Number</td><td colspan="3">PHD17301</td></tr>
<tr><td>プログラム名
Program</td><td colspan="3">Policy Analysis Program</td></tr>
<tr><td rowspan="5">審査委員会
Doctoral Thesis Review Committee</td><td>主査
Main referee</td><td>LEON-GONZALEZ Roberto</td><td>主指導教員
Main Advisor</td></tr>
<tr><td>審査委員
Referee</td><td>HSU Minchung</td><td>副指導教員
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<tr><td>論文タイトル
Dissertation Title
(タイトル和訳)※
Title in Japanese</td><td colspan="3">Essays on Bank Risks: The Case of Philippine Banks

銀行リスクに関する研究：フィリピン銀行の場合</td></tr>
<tr><td>学位名
Degree Title</td><td colspan="3">博士（国際経済学）Ph.D. in International Economics</td></tr>
<tr><td>論文提出日
Submission Date of the Draft Dissertation</td><td>2020 年 6 月 16 日</td><td>論文審査会開催日
Date of the Doctoral Thesis Review Committee</td><td>2020 年 7 月 14 日</td></tr>
<tr><td>論文発表会開催日
Date of the Defense</td><td>2020 年 7 月 14 日</td><td>論文最終版提出日
Submission Date of the Final Dissertation</td><td>2020 年 8 月 19 日</td></tr>
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※ タイトルが英文の場合、文部科学省に報告するため、和訳を付してください

Please add a Japanese title that will be reported to MEXT.

1. 論文要旨 Thesis overview and summary of the presentation.

The final defense was the 14th of July and because of the pandemic it was implemented online using the software Zoom, being open to all faculty and students. The candidate first gave a presentation of about an hour, and after that the examiners gave comments and asked questions to the candidate for about 30 minutes.

Banking supervision has evolved from regulating individual banks to promoting the soundness and stability of the whole financial system. Meanwhile, bank risks continue to dynamically change over time. Hence, bank supervisors should be able to thoroughly understand the risk dynamics of banks and develop more risk-based prudential regulations. While there are several research on bank risks, many of them cover financial institutions in advanced economies. This dissertation contributes to the limited literature on bank risks in developing countries and employs quarterly bank-level data to provide a more granular analysis of bank risks than previous studies did.

The first analytical chapter (Chapter 3) of this dissertation examines the sensitivity of daily bank stock returns to changes in domestic interest rate, foreign interest rate, and exchange rate using generalized autoregressive conditional heteroskedasticity (GARCH) models and model averaging techniques. The results indicate that the mean and the variance of Philippine bank daily stock returns seem to be sensitive to US interest rate risk and exchange rate risk between 2006 and 2013 (crisis period) but not between 2014 and 2018 (normal period). In addition, fluctuations in US interest rate and exchange rate seem to contribute to the high volatility of daily bank stock returns during the global financial crisis period (2007 to 2009) as illustrated by GARCH-based indicators in Section 3.6. Moreover, the different sensitivities of stock returns between sub-periods indicate that US interest rate and exchange rate risks of Philippine bank stocks are changing over time.

Furthermore, this chapter investigates the effect of changes in US interest rate on quarterly bank income using linear panel model and find that the profitability of Philippine universal banks seems to be also sensitive to US interest rate risk. Hence, these results suggest that Philippine largest banks tend to be vulnerable to US financial markets and US interest rate risk seems to be an important risk exposure of Philippine universal banks.

The second analytical chapter (Chapter 4) of this dissertation examines the microeconomic and macroeconomic determinants of non-performing loans (NPL) across six loan categories in the Philippines using instrumented dynamic panel models. Our results indicate that all NPL types tend to persist over time. In addition, bank-specific characteristics and macroeconomic conditions are likely to affect agricultural and SME NPLs (mandatory loans), while only macroeconomic factors seem to have an impact on corporate and consumption NPLs (regular loans). In particular, cost-inefficient banks tend to have higher agricultural and SME NPLs indicating that the loan quality of these two mandatory credits is associated with operational inefficiency. Additionally, rising unemployment rates seem to increase agricultural NPL. Furthermore, highly capitalized banks tend to have more agricultural NPL implying higher credit risk for agricultural loans. Meanwhile, higher SME NPL is associated with tighter credit standards. In addition, rising GDP growth rates are likely to contribute to higher SME NPL and the impact tends to last for a long period. These findings suggest a deterioration in SME loan quality and a possible credit risk build-up in SME lending segment of banks along with Philippine economic progress. Similarly, higher GDP growth rates tend to increase corporate and consumption NPLs (regular loans). However, microfinance and housing NPLs seem to be not sensitive to macroeconomic developments.

2. 審査報告 Notes from the Doctoral Thesis Review Committee (including changes required to the thesis by the referees)

All the examiners provided a list of comments for revisions. The candidate revised the thesis taking into account all comments, and provided an explanation to each examiner of how the comments had been taken into account. For brevity I only provide here some of the comments, and answers from the candidate, which were as follows:

III. On Chapter 3

Literature

It seems that the author wants to link this chapter with the literature on so called market discipline (e.g., Bliss and Flannery 2001, Flannery 1998), which is closely related to the third pillar of the Basel II capital requirements. However, I am not very convinced with the current exposition on this link.

- This comment is based on different focuses on the two literature:
- Studies on bank stock return sensitivity focus on:

Systematic risk (as this chapter currently does)

- Studies on market discipline focus on:

Idiosyncratic as well as systematic risk

(see Bliss and Flannery 2001, Flannery 1998)

Reply: The paragraph on market discipline was deleted and replaced with literature on bank stock returns. For example, Section 3.1 was revised as follows:

"Several studies investigate the usefulness of bank stock prices in assessing bank financial conditions relative to bank supervisory ratings. For example, Krainer and

Lopez (2008) find that abnormal US bank stock returns are useful in predicting changes in supervisory ratings. Likewise, Gropp et al. (2006) find that distance to default based on bank stock equity can predict changes in agency ratings (as proxy for supervisory ratings) in European banks. However, Berger et al. (2000) find that equity market indicators, such as bank stock returns, and supervisors' ratings are not related plausibly because these indicators may capture different perspectives, i.e., bank examiners concentrate on current condition, while market participants focus on expected future earnings.

While this chapter also utilizes bank stock returns, we do not evaluate the informational content of bank stock prices in reflecting bank's financial health or distress. Rather, we utilize bank stock returns to evaluate the risk exposures of banks to changes in macro-financial variables such as interest rate and exchange rate. Our study is more related to the works of Choi et al. (1992), Wetmore and Brick (1994), and Tai (2000) who jointly examine the sensitivity of bank stock returns to stock market, interest rate, and exchange rate…"

This comment is also related to policy implications that this analysis potential has.

- The author states like "the results of panel estimation confirm that changes in foreign (US) interest rate affect bank's profits and these effects are partially reflected in bank stock returns" …

"Hense, bank stock price can be used to timely assess some of the risk exposures of banks" (p.38).

- However, this is the relation between macroeconomic variable and stock returns, both of which are easily observable from outside. I do not think regulators do not monitor such variables.
- A more relevant issue for regulators regarding market discipline is unobservable idiosyncratic risk (shocks) to banks. They expect that market prices of securities issued by banks contain some information on idiosyncratic risk that regulators cannot observe.
- Thus, it is unclear how the current analysis provides an implication in terms of market discipline.
- That having said, similar analysis has already been conducted in the literature on banks stock return sensitivity. It is more natural to motivate this chapter and interpret the results from the viewpoint of these studies.

Reply: The analyses and conclusions relating to market discipline were deleted. The analyses now focus on sensitivity of bank stock returns and bank profits. For example, Section 3.8 was revised as follows:

"The mean and the variance of Philippine daily bank stock returns seem to be sensitive to US interest rate risk and exchange rate risk between 2006 and 2013 (crisis period) but not between 2014 and 2018 (normal period). Specifically, changes in US 3-month Treasury bill rate and PHP/USD exchange rate seem to have offsetting effects on the mean of Philippine bank stock returns with US interest rate risk dominating the impact. In addition, fluctuations in US interest rate and exchange rate seem to contribute to the high volatility of daily bank stock returns during the global financial crisis period (2007 to 2009), as illustrated by GARCH-based

indicators in Section 3.6. Moreover, the different sensitivities of stock returns between sub-periods indicate that US interest rate and exchange rate risks of Philippine bank stocks are changing over time.

Meanwhile, rising US interest rates tend to adversely affect quarterly bank income based on linear panel model. This finding indicates that the profitability of Philippine universal banks seems to be sensitive also to US interest rate risk. Given the effects of changes in US interest rate on daily bank stock returns and on quarterly bank profits, these results suggest that Philippine largest banks tend to be vulnerable to US financial markets. Hence, bank supervisors should also monitor the transmission of US financial risk to the Philippine banking industry and incorporate US financial markets in their market surveillance. Additionally, the findings imply that US interest rate risk seems to be an important risk exposure of Philippine universal banks. Thus, bank supervisors could strengthen their regulations on foreign assets and foreign currency-related transactions and thoroughly examine how banks manage their foreign assets and liabilities during on-site examination. Moreover, the GARCH-based indicators presented in Section 3.6 may serve as early warning signals on banks' vulnerability to shocks from external financial markets."

This comment is also related to the contribution of this chapter.

- The literature review in Sec. 3.2 is okay, but it is unclear how this chapter is different from these papers. What is more exact contribution of this chapter, especially when compared with closely related studies like Elyasiani and Mansur (1998)?

Is it only a difference in data? Any methodological contribution?

Reply: Section 3.1 was revised to explicitly state the differences from earlier studies and contribution to literature. Additionally, the specific reference to Elyasiani and Mansur (1998) in Subsection 3.3.5 was deleted as it is not a multi-index model of bank stock returns and replaced with references on multi-factor index model of banks stock returns. For example, the following revisions were made:

In Section 3.1: "In addition, we follow the growing literature on asset returns, which captures the time-varying conditional variance of bank stock returns using generalized autoregressive conditional heteroskedasticity (GARCH) models. However, this chapter differs from previous research and contributes to the literature in the following ways. First, we incorporate foreign (US) interest rate risk along with domestic interest rate risk, exchange rate risk, and stock market index, as earlier studies analyze only domestic interest rate risk. The risk variables are measured by daily changes in domestic interest rate, US interest rate, and Philippine peso to US dollar (PHP/USD) exchange rate. We also include additional regressors, such as PH and US monetary policy rates as measures of policy-induced interest rate changes, and the six sectoral stock indices, instead of a single stock market index, as control for general market conditions. Second, we employ model-averaging techniques to capture model uncertainties arising from covariates selection. Third, we construct indicators for abnormal bank stock returns using GARCH estimates, which could serve as early warning signals of banks' vulnerability to drastic changes in financial market conditions. Fourth, we also investigate the effects of changes in interest rate and exchange rate on quarterly bank profits. Finally, to the best of our knowledge, this research is the first study on the sensitivity of Philippine bank stock returns,

which contribute to the limited literature on bank stock returns and bank profits in developing countries."

In Subsection 3.3.5: "Also, this research follows the multifactor index model of bank stock returns (Choi et al., 1992; Wetmore & Brick, 1994; Tai, 2000) but it differs from earlier studies as we incorporate foreign (US) interest rate as one of the variables. We focus on US financial markets since foreign currency assets and deposits of Philippine banks are mostly denominated in US dollars (BSP, 2019b). Likewise, US dollar is a major trading currency in the Philippines. Additionally, we include domestic (PH) and foreign (US) monetary policy rates as measures for policy-induced interest rate changes, since monetary policies may have time-varying effects on bank profitability (Ampudia & Van den Heuvel, 2019). Furthermore, we assume that the risk variables affect the mean of bank stock returns in a linear manner, but they influence the variance of bank stock returns in a non-linear fashion."

(additional minor comment) As for market discipline, the author may also want to discuss the difference between market monitoring and market influence (Bliss, R.R., Flannery, M.J., 2002. Market discipline in the governance of U.S. bank holding companies: monitoring versus influencing. European Finance Review 6 (3), 361–395).

- market monitoring: market investors' and depositors' assessments of banks' conditions which are to be reflected in the banks' securities prices and deposit rates or quantities, and

- market influence: banks' reactions brought on by market monitoring to counteract adverse changes in bank condition. The present paper deals with market monitoring.

Reply: The reference to market discipline was deleted and replaced with literature on bank stock returns. Please refer to reply to comment # 1 on Chapter 3.

Presentation

(2nd para on p.11) The author motivates the analysis on "how the US financial markets affect the ten universal banks in the Philippines" by (or after) indicating that there was no severe impact of GFC. But no impact does not seem to motivate the relevant analysis.

Reply: This paragraph was deleted. This chapter is now motivated by foreign assets holdings of Philippine banks. And Section 3.1 was revised as follows:

"In the Philippines, the big banks are engaged in foreign currency-denominated transactions such as foreign loans and deposits as well as foreign exchange derivatives. In fact, 20% of Philippine banking assets are foreign assets that are mostly denominated in US dollars. These transactions can make the Philippine largest banks directly expose to foreign interest rate and exchange rate risks aside from domestic interest rate risk. Against this backdrop, we aim to provide empirical evidence on how US financial markets affect the ten universal banks in the Philippines."

Insufficient expositions for the model (e.g., ARCH equations (1) and (2))

- Please define the variables and parameters, e.g., what are Y and sigma? (Explain the notations)

Reply: The following definitions were added in Subsection 3.3.1 as follows:

"where Y_t is a random variable at time t, X_t is a vector of explanatory variables which may include lagged Y_(t-1), and ε_t is the error term of conditional mean with conditional variance σ_t^2, ε_t^2 is the squared error term, and α and β are the unknown parameters."

Methodology

It might be informative for readers to add discussion (comparison) on GARCH vs event study (or other method to analyze stock returns).

Reply: We will consider this comment in future versions of this chapter.

Questions on variable choice

- Why do interest rates and policy rates need to be used simultaneously? They should move in a similar manner.

Reply: Monetary policy rates were added to control for policy-induced interest rate changes. Nevertheless, we will re-estimate the models without simultaneously incorporating policy rates in future versions of this chapter.

- Why do the author use the long term interest rate for PH only

and not for the U.S.?

Reply: We will re-estimate the models with long-term US interest rates in future versions of this chapter.

Role (purpose) of the panel model

- Purpose of (or motivation behind) the panel analysis is unclear.
- The author claims that it is "To determine whether the significance of sensitivity coefficients in GARCH models arises from the effects of interest rate and exchange rate movements on bank profitability" (p.27), but if so, why not running a GARCH model for bank profitability? - Maybe the author cannot do so, because there is no daily data for profitability.
- My point here is that the author should explain something like these.

Reply: This sentence was deleted. The new motivation for panel analysis is to investigate the sensitivity of bank profits to changes in interest rate and exchange rate. The following sentences were in Section 3.5 and Section 3.7 as follows:

In Section 3.5:

"Hence, PH bank daily stock returns do not seem to be sensitive to domestic interest rate risk possibly as a consequence of anticipated interest changes. To overcome this limitation, we further examine the effects of changes in domestic interest rates on quarterly bank profits in Section 3.7 of this chapter."

"To have a better understanding on the effects of US variables on bank's operations, we further investigate the impact of changes in US 3-month T-bill rate on bank profits in Section 3.7 of this chapter."

In Section 3.7:

"Since the GARCH analysis on daily bank stock returns might fail to correctly capture the effect of domestic interest rates possibly due to the anticipation effects of changes in interest rates, we further examine the impact of changes in domestic interest rate, US interest rate and exchange rate on quarterly bank income. In addition, assessing the impact of changes in interest rate and exchange rate on bank profits may be more relevant for policy development, since operating losses could possibly erode bank capital and threaten the viability of banks."

- Relatedly, it is unclear what the frequency of observations for the panel model is (esp. for the right-hand-side (RHS) variables) (quarterly data?)

Reply: The notations and definition of variables in Equation (20) were revised as follows:

"where NI_iq is net income to average equity ratio of bank i at quarter q. This data is obtained from the proprietary reports submitted by banks to the BSP."

- And more importantly, because you do not find the causality "R (stock return) □ RHS variables" for the 2nd sub-period, this subsample analysis cannot fulfill the above purpose.

Reply: This argument was deleted. However, Equation (16), which is equation (21) in the revised dissertation, was retained to examine the link between bank stock returns and bank profits. Additional sentences were added in Section 3.7 as follows:

"As an additional analysis, we examine the link between bank stock returns and bank profits using a linear panel model given by: …"

"Net income to equity ratios are statistically significant at 5% significance level indicating that bank stock prices are positively associated with bank income particularly between 2006 and 2013 (coefficient = 0.735, first sub-period of Table 3.8), although several other factors also affect bank stock prices (R-squared = 0.395, first sub-period of Table 3.8). Nevertheless, this finding implies that stock returns are not driven solely by market speculation, but are also related to fundamental such as bank income."

- Also, the specification for equation (16) is ad hoc.

Reply: The purpose of equation (16), which is equation (21) in the revised version, is simply to illustrate that stock returns are not driven solely by market speculation, but are also related to fundamental such as bank profits. We have indicated this in the revised version.

- (Minor comment on interpretation) Keep in mind that the dependent variables differ between the GARCH and the panel analyses when interpreting the results on p.36.

Reply:: This sentence was deleted and the comparison between GARCH estimates and panel estimates were removed. Results of both estimations were interpreted independent of each model.

Because ARCH or GARCH already takes into account time-varying volatility, it make sense to put more emphasis on the non-split sample analysis (i.e., that using the whole sample)(?).

Reply: The sample was divided into two sub-periods because they have different macroeconomic conditions, which may substantially alter the maturity mismatch (asset and liabilities management) strategies of banks. This in turn might make the coefficients of the estimated equations be different between the two sub-periods, which is what we empirically find. The following sentences were added in Section 3.4.1 as follows:

"We also term the first and second sub-periods as the crisis period and the normal period, respectively, in this chapter.

"Additionally, the maturity mismatch (asset and liabilities management) strategies of banks may substantially differ between the crisis and the normal periods implying that the coefficients in the equations might be different in the two periods."

On mean averaging

Why does the author adopt models like those shown in Table 3.1?

To me, it makes more sense to change the variable choice within the sets of variables, rather than between.

Reply: The variables were grouped into PH or US variables to separate the country-specific and joint effects of US variables from PH variables. Additional explanations were provided in Subsection 3.3.5 as follows:

"Such grouping allows us to estimate the simultaneous effects of long term and short term domestic interest rates on PH bank stock returns and to capture the sensitivity of bank stock returns to yield curve dynamics. Likewise, the set of US variables will provide the joint impact of US interest rate and exchange rate on PH bank stock returns, which reflects the vulnerability of Philippine banks to US financial markets. Lastly, we alternately include PH and US variables in the mean and the variance of bank stock returns. This model combination allows us to segregate the joint impact of US variables from PH variables and highlights the country-specific effects of risk variables on bank stock returns."

Result interpretation

An interpretation for a result is ad hoc and not convincing: Insignificance of the domestic interest rate risk is "probably because the anticipated changes in domestic interest rates might have been earlier incorporated in bank stock prices" (end of 1st par on p.33)

Maybe this is something that the author can directly test.

Reply: This sentence was deleted. A revised explanation was provided in Section 3.5 as follows:

"This finding implies that domestic interest rate risk does not seem to affect bank stock returns. This result is surprising given that the core activities of Philippine banks are domestic lending and deposit taking. One plausibly explanation is our choice of variables, since we utilize actual changes in interest rates, which may substantially include anticipated changes in daily PH 3-month T-bill rate and PH 10-year T-bond rate. Stock market participants may have been correct in their expectation on domestic interest rates and already incorporate them in their pricing of bank stocks. Hence, PH bank daily stock returns do not seem to be sensitive to domestic interest rate risk possibly as a consequence of anticipated domestic interest changes. To overcome this limitation, we further examine the effects of changes in domestic interest rates on bank profits in Section 3.7 of this chapter."

Why does foreign exchange risk matter for stock return and not for net income?

Reply: The direct comparison between stock returns and bank net income was deleted. Nevertheless, the following possible explanation was provided in Section 3.7 as to why foreign exchange has no effect on bank net income:

"One plausible explanation is the "asset cover" regulation of the BSP, wherein banks are required to match certain portion of their foreign assets and foreign liabilities in the same currency. Thus, said policy may have minimized the exchange

rate risk of Philippine banks. Likewise, the use of foreign exchange derivatives may have helped banks manage their currency risk."

Policy implication

Due to the concerns that I have indicated, I do not fully agree with the policy implications that the author claims in Ch.4 and Ch.5.

- Also the current implications seem to be somewhat superficial. For example, the implication like "the use of financial market data for bank risk assessment should be combined with other supervisory techniques" (2nd para. On p.71) is a statement that sounds always correct, and need not be based on this chapter's findings. And in reality, regulators probably have already done that.

Reply: This statement was deleted. Note that we added a new Section 3.6 Early Warning Indicators that may be useful for market surveillance of bank supervisors. The conclusions and Section 3.6 were revised as follows:

In Section 3.6:

This section illustrates how to use GARCH estimates in constructing indicators for abnormal bank stock returns and periods of highly volatile bank stock returns. These risk indicators may serve as early warning signals on banks' vulnerability to external financial markets and may be useful in market surveillance of bank supervisors. For example, prolonged period of volatile bank stock returns above their historical average could possibly signal that banks are exposed to higher interest rate and exchange rate risks, which could merit further investigation from bank supervisors."

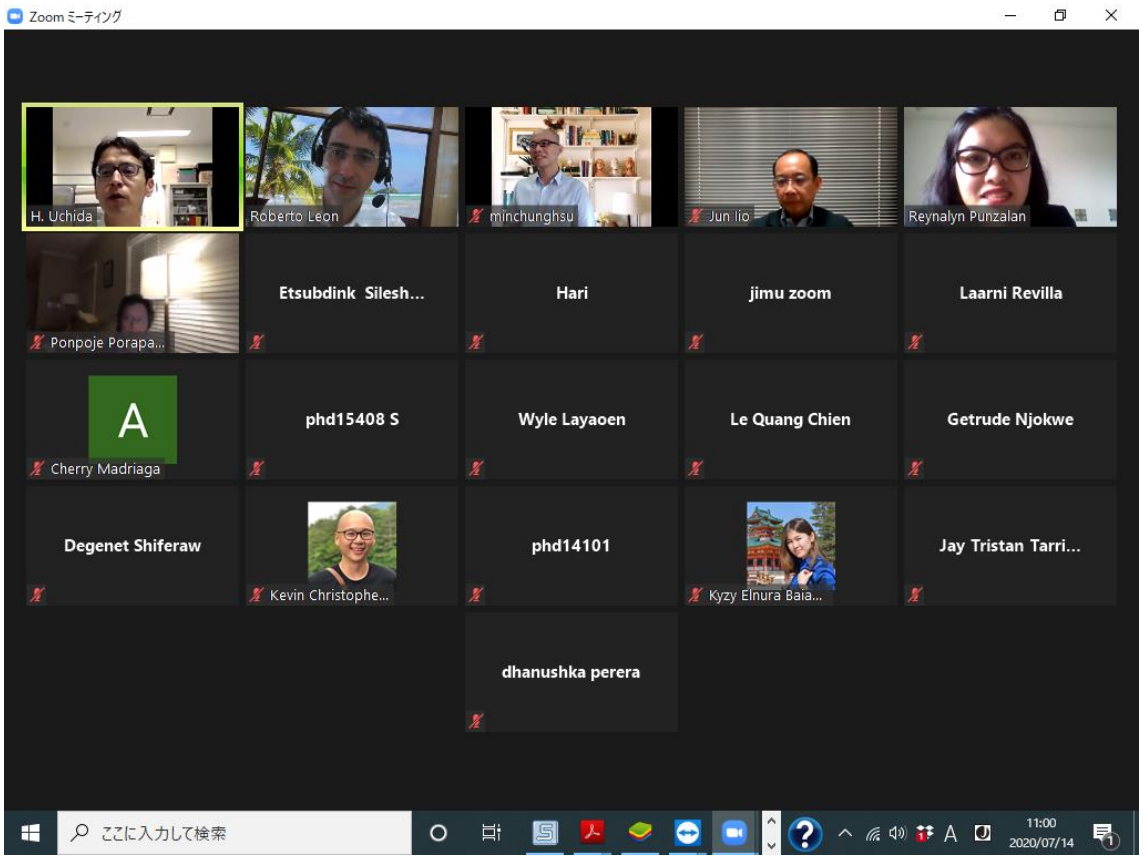
"…the seven-day moving volatility of ten bank stock returns are fluctuating above their historical average during 2007 to 2009, which indicate that Philippine bank stock returns are highly volatile during the global financial crisis period (Figure 3.3). Note that the risk indicators are derived from estimated coefficients in GARCH models, which capture the effects of volatile US interest rates and exchange rates on the variance of bank stock returns. Thus, this finding implies that the high volatility of daily bank stock returns during 2007 to 2009 may be attributed to changes in US interest rate and exchange rate during the period."

In Section 3.8 Conclusions:

"The mean and the variance of Philippine daily bank stock returns seem to be sensitive to US interest rate risk and exchange rate risk between 2006 and 2013 (crisis period) but not between 2014 and 2018 (normal period). Specifically, changes in US 3-month Treasury bill rate and PHP/USD exchange rate seem to have offsetting effects on the mean of Philippine bank stock returns with US interest rate risk dominating the impact. In addition, fluctuations in US interest rate and exchange rate seem to contribute to the high volatility of daily bank stock returns during the global financial crisis period (2007 to 2009), as illustrated by GARCH-based indicators in Section 3.6. Moreover, the different sensitivities of stock returns between sub-periods indicate that US interest rate and exchange rate risks of Philippine bank stocks are changing over time."

"Meanwhile, rising US interest rates tend to adversely affect quarterly bank income based on linear panel model. This finding indicates that the profitability of Philippine universal banks seems to be sensitive also to US interest rate risk. Given the effects

of changes in US interest rate on daily bank stock returns and on quarterly bank profits, these results suggest that Philippine largest banks tend to be vulnerable to US financial markets. Hence, bank supervisors should also monitor the transmission of US financial risk to the Philippine banking industry and incorporate US financial markets in their market surveillance. Additionally, the findings imply that US interest rate risk seems to be an important risk exposure of Philippine universal banks. Thus, bank supervisors could strengthen their regulations on foreign assets and foreign currency-related transactions and thoroughly examine how banks manage their foreign assets and liabilities during on-site examination. Moreover, the GARCH-based indicators presented in Section 3.6 may serve as early warning signals on banks' vulnerability to shocks from external financial markets."



3. 最終提出論文確認結果 Confirmation by the Main Referee that changes have been done to the satisfaction of the referees

The candidate revised the thesis following the comments from the examiners. The candidate provided an explanation of how each comment had been taken into account. The main adviser was satisfied with the revisions, and sent them to the other examiners, who did not suggest further comments. A software for plagiarism (Turnitin) was used and revealed no problems.

4. 最終審査結果 Final recommendation

The doctoral thesis review committee recommends that GRIPS award the degree of Ph.D. in International Economics to Ms. Reynalyn Punzalan Guevara.