

# 博士論文要旨

## Essays on Empirical Analysis of Financial Risk and Fixed Income

### Market

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This dissertation consists of four chapters, where the first chapter is introduction and each of the latter chapters investigates financial markets from the perspective of financial risks and fixed income market. In chapter 2, I discuss investor's attitudes toward risk, especially in international financial markets. In chapter 3, I explore financial risks of the fixed income market, which is crucially important for the risk management of the commercial banks. In chapter 4, I discuss the determinants of the term structure of interest rate by taking advantage of quantitative and qualitative easing (QQE) conducted by the Bank of Japan (BOJ).

#### ***Chapter 2: Reserves and Risk: Evidence from China***

Chapter 2 is a collaborative work with Rasmus Fatum and Yohei Yamamoto. This chapter investigates the risk from the foreign reserve's point of view. The build-up of international reserves across several emerging economies, including and most noticeably the case of China, took off after the Asian Financial Crisis (AFC) and has further accelerated since the Global Financial Crisis (GFC). Emerging economies accumulate reserves to provide

insurance in the event of a financial crisis under the experience of the financial crisis. However, the counterproductive cost from moral-hazard induced private-sector risk-taking. If reserves correlate with the ability of the government to provide insurance in times of financial stress, private sector agents may be willing to take on more risk knowing that as reserve holdings increase, so does the ability of providing insurance and private sector bailouts. Considering the existing literature, there are very few researches related to the international reserve and the risk taking.

We focus our efforts on China as China is particularly interesting in this regard for two reasons. First, China holds more international reserves than any other country and has done so since before the GFC. Second, to our knowledge, China is the only emerging economy for which survey data on market expectations of reserve announcements exists. Specifically, survey expectations of Chinese reserve announcements are available from 2008 and onwards. This is important as it enables us to consider the surprise component of reserve announcements rather than having to rely only on either actual announcements or on model-based measures of expectations to identify the surprise component of a given reserve announcement.

To address whether reserve accumulation in China is associated with increased risk taking, we first carry out monthly frequency time-series estimations to assess the influence of GDP-normalized reserves separately on two risk-taking indicators, Chinese sovereign credit default (CDS) spreads and Chinese stock market (index) prices. Next, we consider daily data event study regressions of the effects of reserve announcement surprises on our two risk-taking indicators. Third, we extend our analysis to incorporate tick-level prices from three Chinese stock indices to perform an intraday analysis of whether reserve announcement surprises influence risk-taking as indicated by stock prices.

Overall, our results suggest that as reserve holdings increase, CDS prices decrease while stock prices increase. This is consistent with the suggestion that an increase in reserve holdings is associated with an increase in risk-taking.

### ***Chapter 3: The Information Content of the Implied Volatility of Interest Rates: Evidence from USD, EUR, and JPY Swaption***

Chapter 3 investigates interest rate risk, which is a primary concern for risk management in financial institutions. Currently, traders tend to use IV (implied volatility) from the option price of interest rate swap (swaption) for forecasting interest rate risk, while financial institutions tend to use GARCH prediction or historical volatility. From a practitioner's point of view, it is vital to know the accuracy of a volatility prediction related to the interest risk.

Many studies have discussed the information content of IV based on other assets, such as equity options and foreign exchange. Even though it is vital for practitioners, to my knowledge, there is no paper that studies the information content of IV based on swaption for major currencies.

In chapter 3, I analyze the information content of IV based on swaption for three major currencies: the US dollar (USD), the Euro (EUR), and the Japanese yen (JPY). The result shows that IV has greater power to predict future realized volatility than GARCH predictions or historical volatility for the USD and EUR, which is consistent with the equity or futures options markets. However, GARCH forecasts and historical volatility have stronger predictive power for the JPY because of the lack of liquidity.

### ***Chapter 4: The Impact of Quantitative and Qualitative Easing on Term Structure:***

### *Evidence from Micro-level Data*

Chapter 4 investigates the effect of QQE conducted by the BOJ on the JGB price using micro-level panel data. I consider that the event of the implementation of the QQE policy should be an ideal situation to test the market segmentation theory (the preferred habitat theory), in which markets are segmented, investors demand bonds of a specific maturity, and the interest rate is determined by the supply and demand of bonds of that particular maturity. In this chapter, I use the micro-level panel data of JGBs to empirically show that the exogenous demand shock significantly affects the JGB price.

For identification, I take advantage of the institutional change in BOJ's market operations, which is unique to the BOJ's policy. Before March 2017, the BOJ notified the market participants at 10:10 a.m. whether it would conduct an operation or not. However, after March 2017, the BOJ decided to publish detailed schedules of its planned asset purchases in advance and inform market participants of the dates of its bond-buying operations. Following this policy change, the open market operation schedule is predetermined and cannot be institutionally changed by the BOJ; therefore, I can interpret the purchases by the BOJ as an exogenous shock, which suggests that this is an ideal situation for empirically testing the market segmentation theory.

I show that the BOJ's purchase significantly affects the JGB price, which is consistent with previous research such as D'Amico and King (2013). However, the estimated effect is considerably small; e.g., the operation could affect the yield of the 10-year JGBs by less than 1%. As Vayanos and Vila (2021) describe, the extent of the market segmentation depends on the investors' attitude to risk. The FRB conducted its QE policy during the financial crisis, which amplified the effect, while the BOJ implemented its QQE policy in a stable period, which should be a natural situation where the impact of

the QQE is considerably small.