The term structure of credit spreads and business cycle in Japan☆

Tatsuyoshi Okimoto [a,*], Sumiko Takaoka [b]

[a] *Associate Professor, Crawford School of Public Policy, Australian National University and RIETI, 132 Lennox Crossing, ANU, Acton, ACT 2601, Australia*
[b] *Faculty of Economics, Seikei University, 3-3-1, Kichijoji Kitamachi, Musashino, Tokyo 180-8633, Japan*

ABSTRACT

This paper investigates the usefulness of the term structure of credit spreads to predict the business cycle in Japan. Our analyses provide clear evidence that the term structure of credit spreads has more predictive power than the government bond yield. Specifically, the paper shows that the credit spread curve of medium-grade corporate bonds has more useful information than the government bond yield curve for predicting the business cycle. However, our results indicate that the increase in the BBB-rated credit spread is associated with future economic expansion, contradicting the theoretical prediction in the existing literature. Our Markov-switching analysis demonstrates that this peculiar relationship holds only during the global financial crisis regime, and the 1-year government bond yield and the term spread of A-rated credit spread information have significant predictive power for the business cycle, regardless of the economic state.

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1. Introduction

Two disasters, the 2008 global financial crisis and the 2011 Great East Japan earthquake, have struck the Japanese economy since 2000. Although these two events are different types of disasters, a financial disaster and a natural disaster, they caused turmoil in the credit market. The impacts of the subprime mortgage crisis and the Lehman Brothers bankruptcy on Japanese financial institutions were not as severe as on American financial institutions. However, the credit crunch and the rapid appreciation of the Japanese yen resulted in a severe impact on economic activity. In 2008, the Japanese straight corporate bond market experienced its first straight corporate bond default in seven years during this period of turmoil. For the period 2008–2010, eleven cases of straight corporate bond defaults caused a sharp increase in credit spreads,

which is the difference in the yields between defaultable debt instruments and risk-free government securities of comparable maturity. Then the Bank of Japan's (BOJ's) efforts to support market liquidity and the bank's policy-based financing to facilitate corporate financing calmed the turmoil in the market.

In contrast to the global financial crises, which were an external shock to the Japanese economy, the 2011 Great East Japan earthquake followed by the tsunami, which was unpredictable, caused huge capital stock losses and increased uncertainty about future macroeconomic fundamentals. This negative shock to the economy raised the credit spreads. In addition, the nuclear disaster that occurred at Tokyo Electric Power Co.'s (TEPCO's) Fukushima Daiichi Nuclear Power Plant on March 11, 2011, had a severe impact on TEPCO, which was Japan's largest corporate bond issuer at that time. The credit spreads for outstanding TEPCO corporate bonds jumped to about 400–500 basis points after the earthquake and tsunami, from just 8 basis points before the disaster.[1] The down-grading of electric power companies resulted in the widening of credit spreads in the market. That is, the credit spreads in Japan respond directly or indirectly to changes in economic fundamentals and monetary policy.

[1] Uranaka, T. (2011, May 2). Japan says no limits to Tepco liability from nuclear disaster. *Reuters.*

The credit cycle has been considered to affect the business cycle at least since Fisher (1933), and asset prices are recognized as useful predictors of output growth because they are forward-looking (see Stock and Watson, 2003 for the survey). Among a number of asset prices, including dividend yields, exchange rates, interest rates, stock returns and term spreads, which is the difference between the longest yield and the shortest maturity yield, the usefulness of credit spreads as predictors of economic activity has been shown empirically (see, e.g., Gilchrist et al., 2009; Gilchrist and Zakrajšek, 2012; Faust et al., 2013; Mueller, 2009) and theoretically (for the general equilibrium framework, see Bernanke et al. (1999), Miao and Wang (2010)). Gilchrist and Zakrajšek (2012) show that a reduction in the credit supply by a deterioration in the capital position of financial intermediaries caused an increase in the cost of debt financing (the widening of credit spreads) and a subsequent reduction in spending and production. Nielsen (2012) demonstrates that the slope of credit spread curves as well as the level of credit spreads are correlated with the state of the economy, indicating a countercyclical level and procyclical slope of credit spread curves across both investment and speculative grade bonds. This is because the leverage, which has a cyclical pattern (e.g. Korajczyk and Levy, 2003), affects the level and slope of credit spreads, and the state of the economy leads to substantial changes only in the short end of the curve while spreads on the long term bonds are essentially weighted average across all states of the economy. Findings in Gilchrist and Zakrajšek (2012) and Nielsen (2012) suggest that the higher credit spread today indicates bad times tomorrow, and the higher the term spread of credit spreads, the larger economic expansion is expected to be in the future.

Philippon (2009) documents that the predictive content of corporate bond credit spreads for economic activity could be more precise than the equity prices by showing that a market-based measure of q based on corporate bond prices outperforms the traditional one using equity prices. One possible explanation for this result is that the bond market is less susceptible to bubbles than the equity market as discussed by Philippon (2009) (see Shiller, 2015 for financial market mispricing).

As Bernanke and Blinder (1992) demonstrate the channels of monetary transmission, the slope of the government bond yield curve or the term spread is informative. In recessions, the central bank lowers yields on short-term bonds in order to stimulate the economy, while the yields on long-term bonds are higher reflecting the investor's unwillingness to take on risk in hard times. Thus, recessions have upward sloping yield curves that reflect the monetary policy. If the monetary policy is effective, recessions are followed by expansions; thus, upward sloping yield curves in recessions also predict better times tomorrow. On the other hand, during times of strong economic expansion, monetary tightening raises short-term interest rates, which produces an economic slowdown with flattening yield curves. A number of works (e.g., Harvey, 1989; Stock and Watson, 1989; Dotsey, 1998; Hamilton and Kim, 2002) show the predictive power of the term spread, in a sense, an indication of an effective monetary policy. On the other hand, Ang and Piazzesi (2003) and Ang et al. (2006) develop dynamic models for gross domestic product (GDP) growth and yields by shedding light on the behavior of the yield curve and find that the short-term rate has more predictive power for U.S. GDP growth than the term spread.

Despite the significance of credit risk in Japan, there has been relatively little research about corporate bond credit spreads in the Japanese secondary market. Notable exceptions include Ohyama and Sugimoto (2007), Nakashima and Saito (2009), Shirasu (2014),

2016), and Okimoto and Takaoka (2017).[2] Ohyama and Sugimoto (2007) show that credit spreads are related to the macroeconomics factors, while Nakashima and Saito (2009) explore the determinants underpinning the credit spread of corporate bond rates over interest swap rates, identifying them as firm-level financial factors, including debt-to-equity ratios, volatility, and maturity. In addition, Shirasu (2014) documents that Japanese bond spreads are affected by the credit risk, macroeconomics, market liquidity, primary bond holder's funding liquidity, and the issuer's funding liquidity. The importance of the supply of credit is examined by Shirasu (2016), who shows that the flight-to-quality phenomenon in Japan during the global financial crisis was caused by the banks, which transferred assets from illiquid corporate bonds to their highly liquid government counterparts. These papers suggest that the credit spreads in the Japanese secondary market reflect not only the individual issuers' financial circumstances, but also the macroeconomic factors and the liquidities. What is more, Okimoto and Takaoka (2017) demonstrate that both the global and domestic economic and financial variables significantly influence the Japanese credit spreads, based on the no-arbitrage framework.

Few studies have shown the usefulness of the term structure of credit spreads to predict future economic activity in Japan. Kobayashi (2015) estimates the credit spreads' global factors for Japan from 26 firm data based on Diebold et al. (2008) and confirms that they have significant predictive power for the macro economy. However, the study does not compare the predictive power of credit spread curve and the government bond yield curve or use any rating information. This could be critical, as the premium for external funds, which is the difference between the cost of obtaining external finance and the opportunity cost of internal finance, depends inversely on the financial strength of the borrowers, as suggested by Bernanke and Gertler (1989) and Bernanke et al. (1996) along the lines of the theory of the financial accelerator. Gertler and Lown (1999) use U.S. data on high-yield corporate bonds, whose market was developed in the mid-1980s, and show a strong inverse relationship between the high-yield spread and the output gap for the period 1985–1999. Similarly, Mody and Taylor (2004) test the predictive ability of the high yield spread for real economic activity and document that this was a significant predictor of economic activity during the 1990s.

The main contribution of this paper is to examine the predictive power of credit spreads for the business cycle in Japan for the period from June 2000 to September 2015 focusing on the term structure of the credit spread and taking the rating information into account. This could be a significant contribution to the existing literature investigating the predictive power of credit spreads on future economic activity such as Gilchrist et al. (2009) and Gilchrist and Zakrajšek (2012), as research showing the usefulness of credit spread curve information and its dependence on credit ratings is scarce. Our dynamic model for business activity incorporates short-term rates and the term spreads of Japanese government bonds and corporate bond spreads. To highlight the differences in the premium stemming from the financial health of the borrowers, we provide evidence using the yields/rating matrix of corporate bonds traded over-the-counter, which is calculated by the Japan Securities Dealers Association (hereafter JSDA).

Our findings can be summarized as follows. First, our in-sample analysis confirms the usefulness of credit spread curve information for predicting the business cycle in Japan. Our benchmark model using government bond yield curve information shows that the short-term rate is significantly useful, despite the extremely low

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[2] Meanwhile, credit spreads in the primary market (launch spreads) are examined by Hamao and Hoshi (2000), Takaoka and McKenzie (2006), and Ohyama and Hongou (2010), among others.