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Interpreting Recent Changes in the Credit Spreads of Japanese Banks

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Abstract

This paper examines the recent period of relatively low credit spreads in Japan, with particular emphasis on the market's assessments of the credit risks of large Japanese banks implicit in the prices of credit derivatives. We extract the market-price implied likelihood of a credit event in the future, and explore the nature of the default risk premiums underlying recent changes in bank bond and credit derivatives prices. We document substantial increases in the "jump-at-default" default risk premiums for all of the large Japanese banks examined during the early part of 2006. These patterns in risk premia are related to the recent patterns in market indicators of global event risk, local equity market volatility, and an estimate of the duration of the Bank of Japan's zero interest rate policy.

Keywords: default risk premium; credit default swap; Japanese banks; zero interest rate policy; event risk

JEL classification: G13, G21, G32

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1 Introduction

This paper examines the recent period of relatively low credit spreads in Japan, with particular emphasis on the market's assessments of the credit risks of large Japanese banks implicit in the prices of credit derivatives. We extract the market-price implied likelihood of a credit event in the future, and explore the nature of the default risk premiums underlying recent changes in bank bond and credit derivatives prices. Of particular interest is the market's risk premium associated with a possible jump in bond prices due to a restructuring or other major credit event of one of the large banks in Japan.

These questions about Japanese banks seem particularly interesting now owing to the confluence of several macroeconomic developments. The Japanese economy is showing signs of recovery after many years of weakness and, concurrently, there has been a substantial increase in the equity prices of Japanese companies, including those of large Japanese banks. Moreover, with the improving economy (and the benefit of hindsight), the Bank of Japan abandoned its quantitative easing policy towards the end of our sample period, and it abandoned its zero interest rate policy (ZIRP) shortly after our sample period ended. We are interested in how market default-event risk premiums changed over the past few years as market participants reassessed the strength of the Japanese economy, the impacts of the strengthening economy on the policies of the Bank of Japan, and the likely impacts of both of these factors on the financial strengths of the Japanese banking system. Have default risk premiums fallen as a consequence of these economic developments, or have they increased? In either case, how should we interpret the patterns in risk premiums we document subsequently?

The remainder of this paper is organized as follows. Section 2 describes the credit default swap (CDS) market and provides an overview of the data used in our analysis. Section 3 examines the properties of Japanese sovereign credit risk through the lens of the prices of CDS contracts on Japanese government debt. This analysis serves to relate changes in the market's assessment of the credit quality of Japan as a whole to local and global risks. Then, in Section 4 we turn to the properties of the CDS spreads for the large Japanese banks, Mizuho, Sumitomo, and Bank of Tokyo-Mitsubishi. Particular attention is given to the co-movements among these spreads and their relation to both Japanese sovereign risk and equity market risk factors. Finally, Section 5 examines the properties of the credit event risk premiums of these banks.

2 Credit Default Swap Spreads for Japanese Banks

To extract market information about the credit quality of Japanese banks we rely on the credit default swap market. A credit default swap is essentially an insurance contract between the insurer and the insured, where the latter pays an insurance premium at some regular interval, usually every six months, in return for being "made whole" in the face of an insured credit event. That is, the purchaser of insurance pays the CDS spread (multiplied by the notional amount of underlying bonds insured) as the premium and if an insured event occurs, then the insurer pays the insured the difference between the post-event market value of the bonds covered by the CDS contract and their face value.

To price CDS contracts we follow Duffie and Singleton [1999] (see also the review of CDS contracts in Duffie and Singleton [2003]) and adopt a "reduced-form" pricing model. We let $\lambda^{\mathbb{Q}}$ denote the risk-neutral mean arrival rate of a credit event. One can think of $\lambda^{\mathbb{Q}}$ as approximately the probability of a (covered) credit event over the next, short interval of time under the pricing measure. Additionally, we let $R^{\mathbb{Q}}$ denote the expected fractional recovery of face value that bond holders receive immediately following a credit event, under the pricing measure. One minus $R^{\mathbb{Q}}$, $L^{\mathbb{Q}} \equiv (1 - R^{\mathbb{Q}})$, is the associated loss rate as a proportion of face value. Finally, $CDS_t(M)$ denotes the spread on a CDS contract with time to maturity of M years.

Using this notation, the CDS spread satisfies

$$\frac{1}{2} CDS_t(M) \sum_{j=1}^{2M} E_t^{\mathbb{Q}} \left[e^{-\int_t^{t+.5j} (r_s + \lambda_s^{\mathbb{Q}}) ds} \right] \quad = (1 - R^{\mathbb{Q}}) \int_t^{t+M} E_t^{\mathbb{Q}} \left[\lambda_u^{\mathbb{Q}} e^{-\int_t^u (r_s + \lambda_s^{\mathbb{Q}}) ds} \right] du. \tag{1}$$

The left-hand side of (1) is the expected present value of the insurance premium paid by the insured, $CDS_t(M)/2$, semi-annually. These payments are made only so long as an insured credit event has *not* occurred, and this accounts for the presence of $\lambda^{\mathbb{Q}}$ in the discount factor. Premiums are made only if the underlying bank survives until the premium payment date. The right-hand side is the present value of the recovery received by the insured if an insured credit event occurs. Since a credit event can occur at any time over the life of the CDS contract, and the underlying bank must survive until date u for the bank to then default at this time, the pricing formula involves the terms $\lambda_u^{\mathbb{Q}} e^{-\int_t^u \lambda_s^{\mathbb{Q}} ds}$. For a given u, this term captures the probability of the bank surviving until date u and then defaulting immediately thereafter. All of the expectations in (1) are taken with respect to the risk-neutral pricing measure.

To interpret the spread $CDS_t(M)$ in terms of developments in credit markets, it is instructive to step back and first review the interpretation of credit spreads on corporate bonds. To a first approximation, the credit spread on an M-year floating rate bond, say $C_t(M)$, is approximately equal to $\lambda^{\mathbb{Q}} L^{\mathbb{Q}} + \ell_t^C$, where $\lambda^{\mathbb{Q}} L^{\mathbb{Q}}$ is the mean loss rate associated with holding a corporate bond and ℓ^C captures compensation for liquidity. Heuristically, when holding a corporate bond, the investor is compensated for the time value of money, the mean rate of loss expected to be incurred due to default– the probably of loss ($\lambda^{\mathbb{Q}}$) times the loss given default ($L^{\mathbb{Q}}$), and a convenience yield associated with the provision of liquidity.

Absent arbitrage opportunities and large transactions costs, $CDS_t(M)$ is also approximately equal to $\lambda^{\mathbb{Q}} L^{\mathbb{Q}}$.[1] Thus, a systematic decline in CDS (or corporate) spreads typically means one or more of the following occurred: the probabilities of a credit event declined, the

[1]We could, as well, include a liquidity adjustment to $CDS_t(M)$. For many issuers the CDS contract is more liquid then their associated bonds and so many researchers have assumed that liquidity premiums are larger in the bond than in the CDS markets (see, e.g., Longstaff, Mithal, and Neis [2005]). For our analysis what is important is that the $CDS_t(M)$ spreads for the large Japanese banks considered be largely due to credit risk.

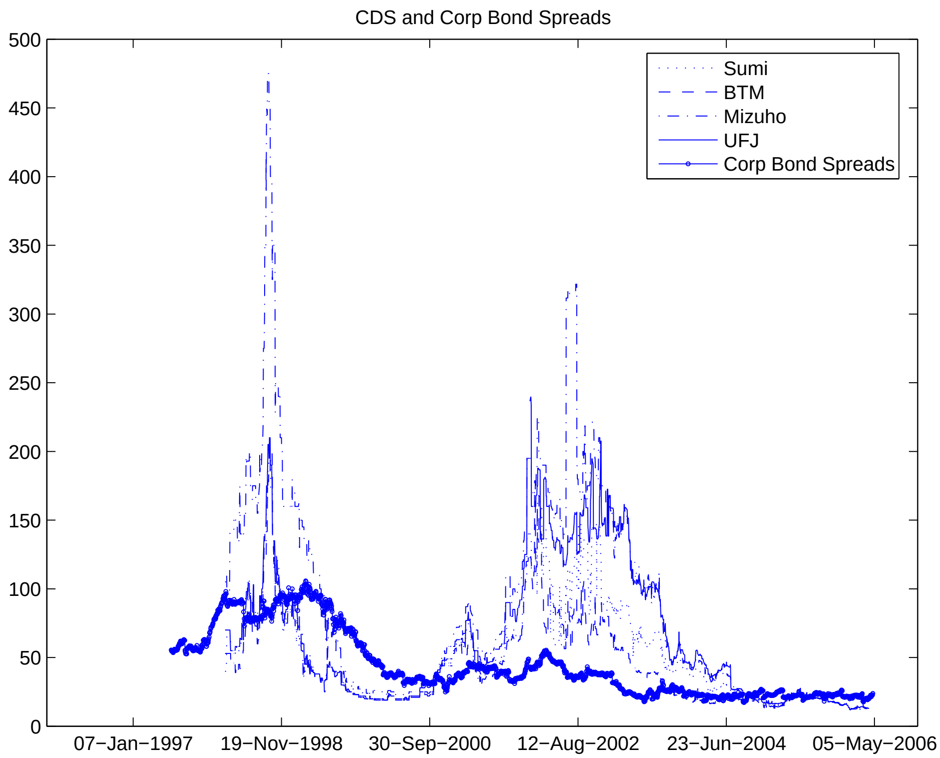

Figure 1: U.S. Dollar CDS Spreads on Japanese Banks

risk premiums associated with credit events declined (more on this later), or expected loss rates declined.

Figure 1 displays the U.S. dollar, five-year CDS spreads for four large Japanese banks– Sumitomo (Sumi), Bank of Tokyo-Mitsubishi (BTM), Mizuho, and UFJ– over the period 1998 through the middle of 2006. For comparison, we have also included the yield on a portfolio of A-rated Japanese corporate bonds. Clearly CDS spreads fluctuated substantially over the sample period, with notable spikes upwards in the fourth quarter of 1998 and during the banking crisis in Japan in 2002. Most of our attention will be focused on the later part of this period, starting in mid-2003 and running through mid-2006. This was a relatively quiet sub-period in credit markets, but one that witnessed a strengthening of the Japanese economy and, at the end, the abandonment of the Bank of Japan's policy of quantitative easing.

One cannot always translate our findings about CDS spreads immediately into implications for bank debenture spreads, because we often see a non-zero basis ($CDS_t(M) - C_t(M) \neq 0$). In particular, it is often quite expensive to short corporate bonds and it is often the bond that is expensive relative to the CDS spread. This is illustrated in Figure 2 where the five-year CDS spread for the BTM is plotted against the yield spread on its five-year bonds. For most of this period the CDS spread was above the corporate bond spread, and this partly reflects the shorting costs in the corporate market. The CDS-bond basis was particularly

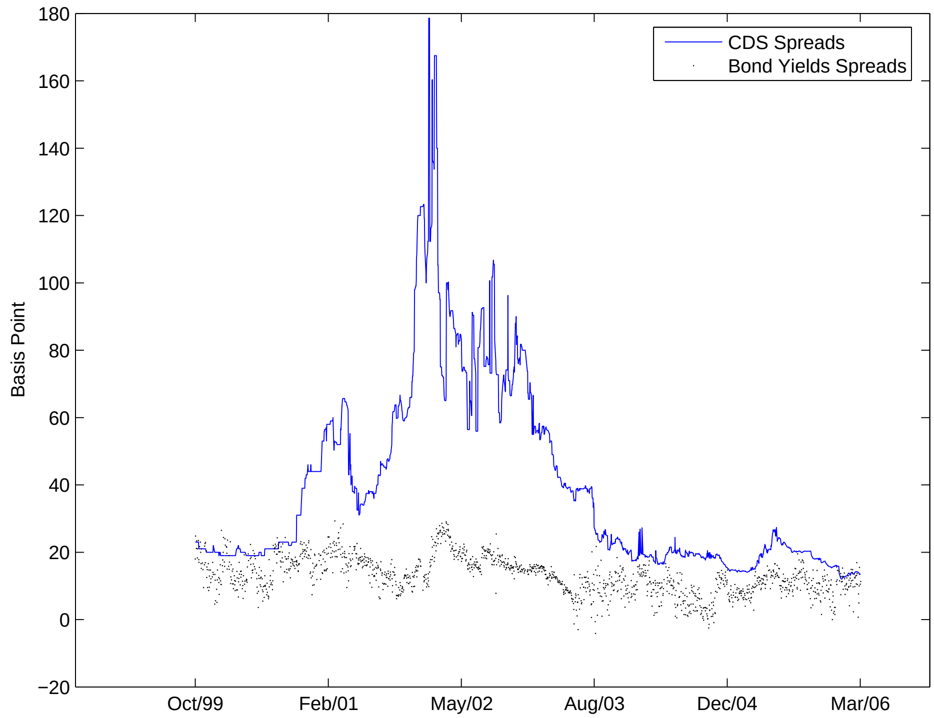

Figure 2: CDS and Bond Yield Spreads for Bank of Tokyo-Mitsubishi

large during the banking crisis in 2002 when there was a notable increase in bond yield spreads. However, given that our focus is on the post-2003 period, most of our findings can be interpreted as applying as well to the yields on bonds issued by Japanese banks.

3 Japanese Sovereign Credit Risk

Before exploring the properties of bank CDS spreads in depth, it will be informative to first examine the relation between sovereign risk for Japan and various factors related to global and local event risks. For our analysis, sovereign risk is measured by the spreads on the U.S. dollar (USD), five-year CDS contract for Japanese government bonds.

Additionally, we examine three risk factors that might be related to variation in the sovereign CDS spread. The first is the VIX option implied volatility index for U.S. equities. This index is often interpreted as a measure of global event risk, an interpretation that is consistent with the very high correlations between emerging market CDS spreads and VIX documented in Pan and Singleton [2005]. A second risk factor is the bond market's expected duration of the Bank of Japan's zero interest rate policy (ZIRP), as computed from Japanese government bond yields by the Bank of Japan.[2] A larger value of ZIRP means

[2]We are grateful to the Bank of Japan for providing this data for our analysis. ZIRP is constructed by the Financial Markets Department for monitoring purposes. For more details see Baba [2006].

Constant	VIX	ZIRP	Nikkei IV	Adj R^2
-6.672	0.960			0.55
(0.601)	(0.045)			
3.429		3.855		0.36
(0.145)		(0.143)		
0.259			0.381	0.21
(0.396)			(0.024)	
-6.438	0.646	2.413	0.096	0.65
(0.529)	(0.059)	(0.169)	(0.022)	

Table 1: Regression of USD Japanese Sovereign CDS Spread on VIX, ZIRP, and NikkeiIV. Sample period: June 3, 2003 through June 2, 2006. Standard errors are given in parentheses.

a longer duration of the policy of zero short-term interest rates. Finally, for our third risk factor we use the implied volatility on the Nikkei index option (NikkeiIV) as an index of local market volatility and risk.

Table 1 displays the results from regressing the sovereign CDS spreads for Japan on VIX, ZIRP, and NikkeiIV. All of the coefficients are positive; sovereign CDS spreads widened as either global or local event risk increased (as measured by equity option volatility) or the market believed that it was likely that the Bank of Japan would maintain its zero interest rate policy for a longer period. When all three risk factors are included simultaneously, the adjusted coefficient of determination (R^2) is 0.65, indicating that about 35% of the variation in the sovereign spread for Japan was due to risk factors not captured by VIX, ZIRP, or Nikkei. We will want to keep the high correlation between these risk factors and the Japan CDS spread in mind in interpreting subsequent regressions that include all four of these variables as right-hand side risk factors.

4 Bank CDS Spreads

There is, not surprisingly, substantial co-movement among the CDS spreads on large Japanese banks. Accordingly, we begin our exploration of the credit risk implicit in Japanese CDS spreads by computing the first principal component (PC) from the covariance matrix of spreads for Mizuho, BTM, Sumitomo, and UFJ over the sample period of June 3, 2003 through June 2, 2006. The first PC is then regressed on the risk factors VIX, ZIRP, NikkeiIV, and JapanSov, where the latter is the USD CDS spread for Japan (our measure of sovereign risk). The results are displayed in Table 2, and standard errors are given in parentheses.

From the first four sets of regression coefficients in Table 2 it is seen that, among VIX, ZIRP, and NikkeiIV, variation in VIX contributes the most to explaining variation in the first PC of bank spreads. At the same time, for the fifth set of results it follows that the first PC of bank spreads behaves very much like Japan risk– the R^2 in the projection of the first PC of bank spreads onto JapanSov is 0.95%. When all of the risk factors are included in the same projection (the sixth set of coefficients in Table 2), JapanSov largely drives out

Constant	VIX	ZIRP	Nikkei IV	Japan Sov	Adj R^2
-83.92	9.61				0.61
(5.345)	(0.399)				
20.84		35.26			0.33
(1.444)		(1.461)			
-21.19			4.17		0.28
(3.407)			(0.210)		
83.87	6.29	21.07	1.39		0.69
(4.701)	(0.554)	(1.503)	(0.214)		
-11.67				9.29	0.95
(0.739)				(0.109)	
-30.17	0.898	0.922	0.590	8.36	0.96
(1.324)	(0.165)	(0.683)	(0.086)	(0.171)	
-28.07	1.57			8.39	0.96
(1.338)	(0.126)			(0.136)	

Table 2: Regression of First Principal Component of USD CDS Spreads on Risk Factors. Sample period: June 3, 2003 through June 2, 2006.

ZIRP and the coefficients on VIX and NikkeiIV fall substantially from their values when these variables are the sole regressor. This is in part a manifestation of the high degree of correlation between JapanSov and the other risk factors noted above. Yet it is also an indication of apparent interpretation by investors (in USD CDS contracts) of the common "level" factor underlying bank CDS spreads as largely being equivalent to Japanese sovereign risk.

An interesting question is whether investors in Japanese yen (JPY) CDS contracts (more likely domestic than foreign entities) view the risks of banks differently than those who invest in USD CDS contracts. To examine this question we computed the corresponding first PC of JPY CDS spreads on the same four banks and then projected the difference between the USD and JPY PCs onto our risk factors (Table 3). All three of the risk factors VIX, ZIRP, and NikkeiIV are positively correlated with this difference in PCs, suggesting that as credit event risk increases CDS spreads denominated in USD widen more than they do in JPY. One potential interpretation of this finding is that foreign investors in Japanese bank CDS contracts either assign a higher likelihood to an adverse credit event for Japanese banks following an increase in global event risk (as measured by VIX) or domestic economic risk (as measured by increases in either ZIRP or NikkeiIV), or the risk premiums demanded by these investors increase with increases in the risk factors.

Once JapanSov is included as a regressor, VIX is largely driven out of the projection of differences in PCs onto the risk factors, while the coefficients on ZIRP and NikkeiIV remain large relative to their standard errors. Thus, variation in the difference in (the first PCs of) USD and JPY CDS spreads is not entirely due to differences in the assessments of how sovereign risk will affect the credit risks of banks. Over and above sovereign risk, increases in the local equity market volatility or the risk of a deterioration in the Japanese macro

Constant	VIX	ZIRP	Nikkei IV	Japan Sov	Adj R^2
-3.58	0.7787				0.25
(0.715)	(0.056)				
3.475		3.912			0.30
(0.176)		(0.237)			
0.285			0.386		0.22
(0.586)			(0.036)		
-1.267				1.368	0.53
(0.434)				(0.079)	
-3.915	-0.128	2.249	0.328	0.771	0.62
(0.555)	(0.052)	(0.363)	(0.034)	(0.108)	

Table 3: Regression of the Difference Between the First Principal Components of USD and JPY CDS Spreads on Risk Factors. Sample period: June 3, 2003 through June 2, 2006.

economy (as measured by an increase in ZIRP) are both associated with wider USD-JPY CDS spreads.

5 Default Risk Premia for Japanese Banks

We turn next to the nature of default risk premia for large Japanese banks. We suppose the probability of a credit event is state-dependent (varies with macroeconomic and industry conditions), while the loss in value due to a credit event is constant.[3] We set the (risk-neutrally) expected percentage loss in face value owing to a credit event to 0.60, following industry practice in the pricing of CDS contracts on Japanese banks.[4]

There are two distinct types of credit risk that are reflected in CDS spreads and in expected excess returns on bond positions. The first is compensation for the usual risk factors associated with business and macro conditions: movements in interest rates, movements in balance sheets that affect likelihoods of default; movements in regulation or monetary policy by central banks; etc. The other is compensation for jump-at-default risk. More concretely, the instantaneous expected excess return on a defaultable zero-coupon bond with price $B(t,T)$ can be expressed as:

$$\begin{aligned} e_{Bt} &= Comp(\text{risk factors}) + Comp(\text{jump-at-default}) \\ &= \quad ... \quad + \frac{w_t - B(t,T)}{B(t,T)} \lambda_t^{\mathbb{P}} \left(1 - RP(t)\right). \end{aligned} \tag{2}$$

The first term in (2) captures the compensation investors receive for bearing the risks as-

[3] This assumption is now standard in studies of credit default risk premia; see, for example, Driessen [2005] and Berndt, Douglas, Duffie, Ferguson, and Schranzk [2005]. It is surely not literally true, but rather is made for convenience in order to focus on the timing risks associated with credit events.

[4] See Ueno and Baba [2006] for a discussion of industry practice in Japan for the pricing of bank CDS contracts.

sociated unpredictable variation in the state variables underlying yield curve movements. These include both the state variables determining the default-free term structure and those that govern variation over time in $\lambda^{\mathbb{Q}}$.[5] Thus at least a portion of this component of excess returns is capturing risk related to credit.

Separate from the risk related to unpredictable variation in $\lambda^{\mathbb{Q}}$ is the risk of a jump in the price of the underlying bonds in the event that a bank does restructure. It is this jump-at-default risk that we are particularly interested in, and it is the premium associated with this risk that is most often referred to as the *default risk premium*. The compensation for this risk, as reflected in excess returns, is captured in the second term of (2), $\frac{w_t - B(t,T)}{B(t,T)}\lambda_t^{\mathbb{P}}(1 - RP(t))$. The term w_t is the recovery value of the bond; $\frac{w_t - B(t,T)}{B(t,T)}$ is the percentage loss of value due to default; and RP_t is the market price of default risk. If the risk premium is one then this last term is zero and does not affect excess returns; there is no concern about jumps at the time of credit events. On the other hand if the risk premium is greater than one, then $(1 - RP_t)$ is negative. Since the term $(w_t - B(t,T))/B(t,T)$ is negative if prices jump down when there is a credit event, the overall contribution of this term to excess returns is positive.

Now it turns out theoretically that the risk premium associated with jump-at-default risk is the ratio between the risk-neutral and historical arrival rate of credit events:

$$RP_t = \frac{\lambda_t^{\mathbb{Q}}}{\lambda_t^{\mathbb{P}}}, \tag{3}$$

where $\lambda^{\mathbb{P}}$ is the historical mean arrival rate of credit events. (See Yu [2002] for a heuristic discussion of this relation.) Typically, this ratio is larger than one since, assuming investors are averse to jump-at-default risk, in order to obtain the correct market prices using risk-neutral valuation, $\lambda^{\mathbb{Q}}$ must be set larger than λ^P. Effectively, the investment environment must, risk-neutrally, be much riskier (default must be more likely) than what has been experienced historically.

Our objective is to compute the risk premiums RP_t and investigate how these premiums have changed recently with the strengthening of the Japanese economy and the changing expectations of market participants about the possible abandonment of the Bank of Japan's zero interest rate and quantitative easing policies. As an approximation to $\lambda^{\mathbb{Q}}$ we use the five-year CDS spread, which we noted is approximately $\lambda^{\mathbb{Q}}L^{\mathbb{Q}}$, divided by 0.60 (by convention, the market's estimate of $L^{\mathbb{Q}}$).

To compute $\lambda^{\mathbb{P}}$ we rely on the estimate of the market's expected probability of default over the next year calculated by Moody's-KMV using a Merton-style balance sheet model of credit events.[6] Letting $EDF(t)$ denote their estimated probability of default over the next year, $1 - EDF(t)$ is the estimated probability of survival. If $\lambda^{\mathbb{P}}(t)$ is the mean arrival rate

[5] There is no presumption that the state variables driving the riskfree yield curve and those determining $\lambda^{\mathbb{Q}}$ are distinct. In general they will not be; the short-term riskfree rate and $\lambda^{\mathbb{Q}}$ are generally correlated over time. See Duffee [1999] for some evidence of negative correlation among these variables in U.S. corporate bond markets.

[6] We are grateful to Moodys-KMV for providing us with their default estimates for the four Japanese banks examined in this analysis.

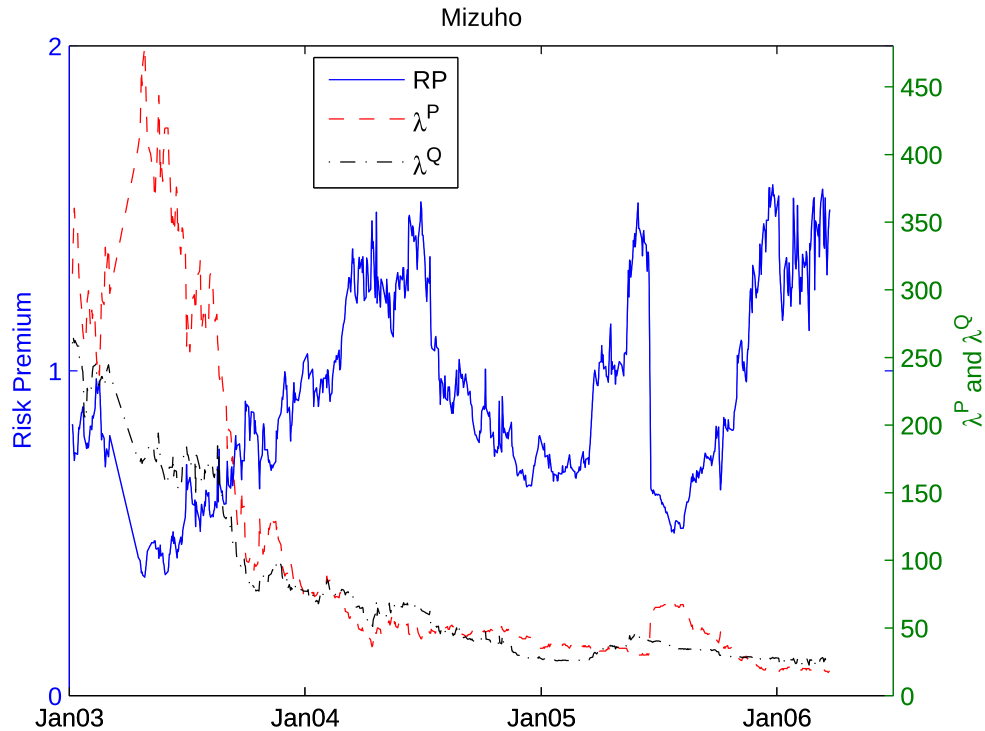

Figure 3: Risk Premiums for Mizuho Bank

of default under the historical distribution, then

$$1 - EDF(t) = E_t^{\mathbb{P}}\left[e^{-\int_t^{t+1} \lambda^{\mathbb{P}}(s)\, ds}\right]. \tag{4}$$

Therefore, approximately,

$$\lambda^{\mathbb{P}}(t) \approx -\log[1 - EDF(t)]. \tag{5}$$

The ratio of our estimated $\lambda^{\mathbb{Q}}$ to the estimated $\lambda^{\mathbb{P}}$ gives our estimate of RP.

Figure 3 displays RP, as well as its components $\lambda^{\mathbb{Q}}$ and $\lambda^{\mathbb{P}}$, for Mizuho Bank. Notice first of all that, aside from the early part of our sample in 2003, λ^{Q} and $\lambda^{\mathbb{P}}$ track each other remarkably closely. The ratio of these variables, RP, fluctuates above and below one over the sample period. Towards the end of the sample, during late 2005 and early 2006, there is a substantial run up in the risk premiums in the market. Thus it appears that as the price of Mizuho Bank's equity was increasing, and as the likelihood that the Bank of Japan would abandon quantitative easing was increasing with the strengthening of the macro economy, risk premiums related to jump-at-default risk were *increasing*.

The corresponding results for Sumitomo Bank in Figure 4 are even more striking. Throughout the period from 2003 through the early part of 2005, RP for Sumitomo Bank stayed roughly constant at a level notably below one. Then there was a steep increase in RP that continued through the end of our sample in 2006.

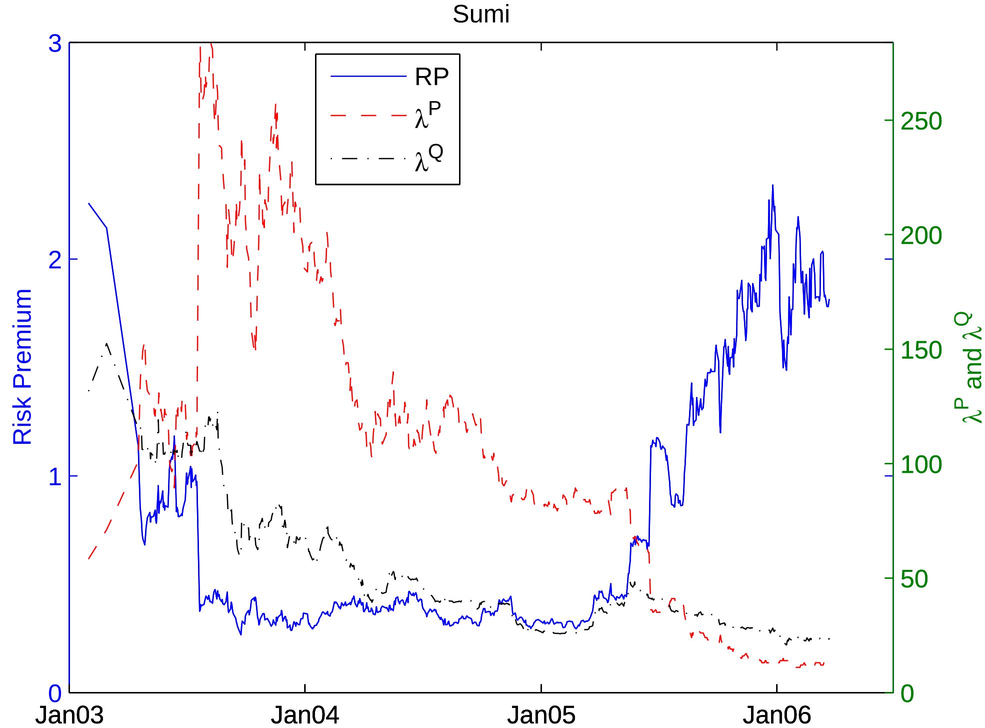

Figure 4: Risk Premiums for Sumitomo Bank

There are two features of these results that warrant further discussion: (i) Why did we see prolonged periods during which RP was substantially below unity?; and (ii) Why did the risk premiums increase substantially over the later part of our sample period when, by most accounts, the Japanese economy was improving, as were the balance sheets of the large banks in Japan?

With regard to the risk premiums being below unity, this may partially reflect mismeasurement of λ^Q or $\lambda^{\mathbb{P}}$, or both. Focusing first on $\lambda^{\mathbb{Q}}$, recall that $\lambda^{\mathbb{Q}}$ is extracted from the CDS spread by scaling by $L^{\mathbb{Q}}$ set at 0.60. If we have set $L^{\mathbb{Q}}$ too high, then this will tend to understate both $\lambda^{\mathbb{Q}}$ and RP. An interesting question then is: What level of $L^{\mathbb{Q}}$ would ensure that RP_t is greater than or equal to unity throughout our sample period? We computed these $L^{\mathbb{Q}}_{min}$ values for Mizuho and Sumitomo Banks and obtained 0.23 and 0.16, respectively. These values, though substantially smaller than market convention, are perhaps not wholly implausible. There have been very few defaults or episodes of restructuring by major financial institutions in Japan. Moreover, if there was to be a restructuring, then one might argue that regulators would manage such events in a manner that ensured that investors in the bonds of these banks would lose at most a small percentage of the face value of their bonds. Of course relying on such implicit guarantees makes the run-up in RP at the end of our sample, especially for Sumitomo Bank, even more puzzling unless one also argues that the implicit financial guarantees within the Japanese banking system were weakening

Sumitomo Bank					
Constant	VIX	ZIRP	Nikkei IV	Sovereign	Adj R^2
8.604	-0.375				0.22
(0.4267)	(0.026)				
5.687		-2.475			0.38
(0.239)		(0.235)			
8.066	-0.213	-2.011	0.015		0.43
(0.408)	(0.033)	(0.235)	(0.019)		
4.926				-0.250	0.16
(0.220)				(0.025)	
9.025	-0.309	-2.371	0.0006	0.149	0.45
(0.428)	(0.036)	(0.250)	(0.020)	(0.022)	
Mizuho Bank					
Constant	VIX	ZIRP	Nikkei IV	Sovereign	Adj R^2
3.677	-0.079				0.08
(0.173)	(0.011)				
3.34		-0.778			0.30
(0.046)		(0.036)			
3.275	-0.107	-0.563	0.074		0.38
(0.140)	(0.013)	(0.045)	(0.007)		
3.299				-0.105	0.23
(0.057)				(0.005)	
2.678	-0.047	-0.338	0.083	-0.093	0.44
(0.161)	(0.014)	(0.042)	(0.007)	(0.008)	

Table 4: Projections of Risk Premiums onto Risk Factors

with increased liberalization and the recent strengthening of the Japanese economy.

At a mechanical level, the substantial increase in risk premiums towards the end of our sample is simply a reflection of the fact that, in our data, $\lambda^{\mathbb{P}}$ fell more rapidly than $\lambda^{\mathbb{Q}}$ in early 2006. Some insight into the economic forces that were in play during this period comes from inspection of the projections of the risk premiums (RP) onto the risk factors for the Sumitomo and Mizuho Banks (Table 4). Most notably, the largest correlation is between RP and ZIRP during during this sample period. That is, as optimism about the abandonment of the Bank of Japan's zero interest rate policies increased ($ZIRP$ declined), RP increased.

This pattern is consistent with the presence of *clientele* effects– essentially, different classes of investors were determining $\lambda^{\mathbb{Q}}$ and $\lambda^{\mathbb{P}}$. More precisely, $\lambda^{\mathbb{P}}$ is determined largely by expected returns and volatility in the Japanese equity market. On the other hand, $\lambda^{\mathbb{Q}}$ was computed from USD CDS spreads. Though overseas hedge funds were active investors in both markets (Japanese equities and the CDS markets), our impression is that those focusing on bank equities were funds following macro or directional strategies, while those focusing

Constant	VIX	ZIRP	Nikkei IV	Japan Sov	Adj R^2
-171.3	18.06				0.53
(9.941)	(0.731)				
29.94		62.1			0.25
(5.2)		(5.078)			
-80.58			9.248		0.34
(7.231)			(0.421)		
-9.068				13.96	0.53
(5.924)				(0.897)	
-142.9	5.071	27.31	4.753	5.813	0.65
(9.843)	(0.959)	(6.477)	(0.526)	(1.186)	

Table 5: Projections of $\lambda^{\mathbb{P}}$ for Sumitomo Bank Onto the Risk Factors

on the bank CDS market were pursuing arbitrage strategies.[7] From this perspective, the large run-ups in RP during the first part of 2006 could reflect a relatively more optimistic view on Japanese banks by macro/directional investors. That is, the directional investors' perception of the "distances to default" of these banks improved more during early 2006 than the corresponding perceptions of arbitrage traders. Consistent with this interpretation, in the projection of our estimated $\lambda^{\mathbb{P}}$ for Sumitomo Bank onto the risk factors VIX, ZIRP, NikkeiIV, and JapanSov (see Table 5), there is high correlation between $\lambda^{\mathbb{P}}$ and VIX, our measure of global event risk.

Of course there is the possibility that the recent run-up in RP for Japanese banks was also due in part to mis-measurement of the one-year default probability by Moodys-KMV. Reliable estimation of expected default frequencies is difficult under the best of circumstances. In the case of Japanese Banks, there were several mergers during our sample period that led to substantial changes in the balance sheets of these banks. Moreover, the high leverage ratios maintained by banks present challenges for the application of balance-sheet models of default. Particularly challenging is measurement of the appropriate default boundary.

A more extensive exploration of recent patterns of jump-to-default risk premiums for Japanese banks is an interesting topic for future research.

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