

THE EFFECTS OF THE GLOBAL CREDIT CRISIS ON AUSTRALIAN INTEREST RATE FUTURES MARKETS

JENNIFER KRUK^{a*}, ANDREW LEPONE^b and GEORGE LI^c

Abstract

This paper examines the effects of the global credit crisis on three Australian interest rate futures contracts – 90 Day Bank Accepted Bill futures, 3 Year Government Bond futures, and 10 Year Government Bond futures. Following the onset of the credit crisis in July 2007, day session volumes decreased for all three contracts; however, night session volumes increased substantially for 3 and 10 Year Bond futures. The fear and uncertainty that resulted from the crisis produced significantly higher volatility, wider bid-ask spreads, and reduced depth at the best bid and offer across all three interest rate contracts.

This research was funded by the Sydney Futures Exchange under Corporations Regulation 7.5.88(2). The authors wish to thank the Securities Industry Research Centre of Asia-Pacific (SIRCA) and Reuters for providing the data and Nathan Williams for programming assistance.

*Corresponding Author: Finance Discipline, Faculty of Economics and Business, University of Sydney, NSW, 2006, Australia. Tel +61 2 9227 0908. Fax +61 2 9352 6461. Email: j.kruk@econ.usyd.edu.au

^a*Jennifer Kruk is a Ph.D. candidate in the Faculty of Economics and Business at the University of Sydney, Australia.*

^b*Andrew Lepone is a Senior Lecturer in the Faculty of Economics and Business at the University of Sydney, Australia.*

^c*George Li is a Ph.D. candidate in the Faculty of Economics and Business at the University of Sydney, Australia.*

1. Introduction

In a letter to investors dated early June 2007, a Bear Stearns hedge fund reported a 23 per cent fall in value since the beginning of the year. The fund, known as the High-Grade Structured Credit Strategies Enhanced Leverage Fund, invested primarily in sub-prime securities. The effective failure of this fund and another linked Bear Stearns hedge fund highlighted the risk inherent in sub-prime debt, and brought what has now become known as the 'sub-prime crisis' into the global media spotlight.

Repercussions from the downturn in the US housing market and subsequent defaults on sub-prime loans were felt in markets all over the world. On 12 July, 2007 it became clear the sub-prime crisis had reached Australia. It was on this date that Basis Capital, an Australian hedge fund, reported a 14% loss on their Basis Yield Alpha Fund in the month of June alone. The Basis Yield Alpha Fund invested in sub-prime securities. Basis Capital simultaneously imposed withdrawal limits on clients to prevent a run on the fund. Approximately one week later they had suspended all withdrawals from the fund and revealed that the value of Basis Alpha had fallen to less than one half of its May 31 value.

The problems in sub-prime debt markets quickly led to a re-pricing of risk across all markets, with effects spilling over into prime debt markets, equity markets, and eventually the real economy. Debt markets were affected not only by a significant increase in funding costs but also by a lack of liquidity in the wholesale market – banks were wary of lending to each other as they were unsure of their counterparty's

exposure to toxic sub-prime securities. This flow-on effect to prime debt markets is termed the 'global credit crisis' and is the focus of this paper.

This paper does not discuss the global credit crisis in detail or provide an opinion on the appropriate regulatory, fiscal, and monetary policy responses. Instead, this paper focuses on the impact of the global credit crisis on Australian interest rate futures markets. This paper is the first to quantitatively analyse the effects of the global credit crisis on interest rate futures by examining volume, volatility, bid-ask spreads and depth.

The paper is organised as follows. Section 2 discusses the data and method, Section 3 presents the results, and conclusions are reported in Section 4.

2. Data and methodology

The data used in this study are sourced from Reuters and describe transactions executed in three SFE interest rate futures contracts from January 11, 2007 to January 13, 2008. The sample includes trades executed in 90 Day Bank Accepted Bill futures (BABs), 3 Year Treasury Bond futures, and 10 Year Treasury Bond futures. Each trade record contains fields which document the date, time, price, volume, best bid price and volume, and best ask price and volume associated with each trade. Bid and ask quotes are the prevailing best quotes immediately prior to the trade.

The sample is restricted to trading in the near and deferred contracts. Trades occurring within 5 days of expiration of the near contract are excluded to minimise rollover

effects.¹ Off-market block trades are removed from the sample as they arrive to the market crossed and in some instances reporting is delayed.²

To analyse the effects of the global credit crisis on Australian interest rate futures, we divide the sample into two six-month periods; January 11, 2007 to July 11, 2007 and July 13, 2007 to January 13, 2008. This assumes the global credit crisis first affected interest rate futures markets in Australia on July 12, 2007 – the day the market first became aware of the massive sub-prime losses incurred by the Basis Capital Alpha Yield Fund.

Within each sub-period we measure four aspects of market quality in both the day and the night trading sessions – volume, volatility, the bid-ask spread and depth at the best bid and ask.³ These variables are defined in Table I below.

< INSERT TABLE I HERE >

¹ Frino and McKenzie (2002) report abnormal price behaviour in the period prior to contract expiration. We remove trades within five days of expiration to remove any bias from the sample as traders roll their positions from the near to deferred contract.

² Berkman, Brailsford, and Frino (2005) also remove block trades from their analysis of futures markets.

³ Interest rate futures trade on the Sydney Futures Exchange in two separate trading sessions. Day trading in 90 Day BAB futures occurs from 8.28 a.m. to 4.30 p.m., while night trading occurs from 5.08 p.m. to 7.00 a.m. (7.30 a.m. US Non-Daylight Savings Time). Day trading in 3 Year Bond futures occurs from 8.30 a.m. to 4.30 p.m., while night trading occurs from 5.10 p.m. to 7.00 a.m. (7.30 a.m. US Non-Daylight Savings Time). Day trading in 10 Year Bond futures occurs from 8.32 a.m. to 4.30 p.m., while night trading occurs from 5.12 p.m. to 7.00 a.m. (7.30 p.m. US Non-Daylight Savings Time). All times are Sydney times.

3. Results

Table II reports volume traded in the pre- and post- credit crisis periods for the 90 Day BAB, 3 Year Bond and 10 Year Bond futures. Panel A reports volumes for day trading sessions and Panel B reports volumes for night trading sessions. The final column in Table II tests if the difference between mean trading volumes in the pre- and post-periods is statistically significantly different from zero.

<INSERT TABLE II HERE>

In Panel A of Table II, average day session trading volumes decrease in the post-credit crisis period for all three contracts. The most notable difference occurs in the 90 Day BAB futures contract. Prior to the onset of the global credit crisis in June 2007, the average daily volume traded in 90 Day BAB futures was 44,200.91 contracts. In the post-credit crisis period average daily volume declined to 35,910.58 contracts – a decline of approximately 8,290.33 contracts (18.76 per cent). The decrease in average day session trading volume across all three contracts in Panel A of Table II is not statistically significant.

Interestingly, average volume increases in the night trading session for 3 and 10 Year Bond futures after the onset of the global credit crisis. Panel B of Table II shows volume traded in the night session increased by approximately 3,053.37 contracts for 3 Year Bond futures and 3,218.42 contracts for 10 Year Bond futures. Only the increase in 10 Year Bond futures volume is statistically significant. One possible explanation for this increase in trading activity is the additional volatility experienced by 3 and 10 Year Bond futures during overnight trading following the credit crisis. An

increase in volatility in futures markets creates profit opportunities, and is likely to have encouraged U.S. and European hedge funds to participate in the overnight market. Volatility is discussed in detail below.

Table III reports two measures of price volatility for the pre- and post- credit crisis periods. The first measure of price volatility, Volatility Range, is the difference between the daily high and low price for each contract. The second measure, Volatility Ticks, is the daily volatility range divided by the minimum tick for each contract. Price volatility is measured for both day trading sessions (Panel A) and night trading sessions (Panel B).

<INSERT TABLE III HERE>

As expected, the volatility of 90 Day BAB futures, 3 Year Bond futures, and 10 Year Bond futures increases in the post-credit crisis period. Volatility increases during day and night trading sessions, and this increase in volatility is statistically significantly different from zero at the 0.01 level for all three interest rate futures contracts. This increase in volatility reflects the increasing uncertainty in interest rate markets following the onset of the global credit crisis.

A comparison of Panel A and Panel B in Table III shows that volatility increases substantially more in the night trading session when compared with the day trading session. For example, average daily volatility for 3 Year Bond futures increases by 13.319 ticks in the day session and 15.620 ticks in the night session. This is most likely a result of the overlap of U.S. and European day trading with the Australian

overnight market. Important announcements concerning the credit crisis in the U.S. and European Union took place during their respective business hours, ensuring that the immediate price reaction and associated interest rate volatility is present in the Australian overnight trading session.

Table IV below reports the bid-ask spread for 90 Day BAB futures, 3 Year Bond futures, and 10 Year Bond futures in the pre- and post-credit crisis periods. Panel A reports bid-ask spreads during day session trading and Panel B reports bid-ask spreads during the night session.

<INSERT TABLE IV HERE>

The average bid-ask spread of all three interest rate futures contracts is wider during the post-credit crisis period. Table IV reports a positive and statistically significant difference between average spreads pre-and post- credit crisis for both day and night trading sessions. The widening of bid-ask spreads in response to the global credit crisis is consistent with information-based models of the bid-ask spread.⁴ The theory underpinning these models, originally proposed by Bagehot (1971), is that the market maker will set his bid-ask spread to ensure that any losses to informed traders are offset by gains from uninformed traders. That is, in the presence of information asymmetry, market makers will set wider bid-ask spreads to recoup their losses to informed traders. The information-based theory of bid-ask spreads is evident in Table IV. The onset of the global credit crisis greatly increased information asymmetry in interest rate markets – markets were awash with rumours regarding the exposure of

⁴ Copeland and Galai (1983), Glosten and Milgrom (1985) and Easley and O'Hara (1987) develop theoretical models of the bid-ask spread under information asymmetry.

individual banks to sub-prime securities. The widening of bid-ask spreads post-credit crisis reflects this increase in information asymmetry.

As with volatility, bid-ask spreads widen substantially more in the night session. For example, the bid-ask spread for 3 Year Bond futures increases by 0.00004 yield points p.a. in the day session and 0.00031 yield points p.a. in the night session. This difference is also likely to result from the overlap of the U.S. and EU day trading session and the Australian night trading session.

Table V reports depth at the best bid and offer pre- and post- credit crisis for 90 Day BAB futures, 3 Year Bond futures, and 10 Year Bond futures. As in previous Tables, Panel A reports day trading and Panel B reports overnight trading.

<INSERT TABLE V HERE>

Average depth at the best bid and offer is considerably lower in the post-credit crisis period for all interest rate futures contracts, and the reduction in depth is statistically significant at the 0.01 level. Panel A of Table V shows that average depth during day trading decreased from 9,353.17 contracts to 2,755.42 contracts for 90 Day BAB futures – a 70.54 per cent decline. Average depth during the day session also decreased for 3 and 10 Year Bond futures. 3 Year Bond futures experienced a fall in average depth from 2,624.66 contracts to 1,372.12 contracts (a 47.92 per cent decline) and 10 Year Bond futures experienced a fall in average depth from 654.91 contracts to 482.05 contracts (a 29.24 per cent decline). Results are similar for the night trading session in Panel B.

Given the uncertainty and volatility created by the global credit crisis, the reaction of market depth is unsurprising. In times of high volatility and uncertainty, traders are less willing to provide liquidity as there is an increased risk of adverse market movements. It is important to note that while the reduction in average depth in the post-credit crisis period appears extreme, the level of remaining depth is more than sufficient to accommodate very large trades in these contracts.

4. Conclusions

The global credit crisis has had a relatively large impact on Australian interest rate futures. The fear and uncertainty that resulted from the crisis produced significantly lower day session volumes, higher volatility, wider bid-ask spreads and reduced depth at the best bid and offer for 90 Day BAB futures, 3 Year Bond futures, and 10 Year Bond futures contracts. Interestingly, night session volumes increased substantially for 3 and 10 Year Bond futures. This is likely a result of the large increase in volatility and hence profit opportunities during overnight trading.

Bibliography

- Bagehot, W., [pseud.] 1971, The Only Game in Town, *Financial Analysts Journal* 27, 12-14, 22.
- Berkman, H., T. Brailsford, and A. Frino, 2005, A note on execution costs for stock index futures: Information versus liquidity effects, *Journal of Banking and Finance* 29, 565-577.
- Copeland, T., and D. Galai, 1983, Information Effects and the Bid-Ask Spread, *Journal of Finance* 38, 1457-1469.
- Easley, D., and M. O'Hara, 1987, Price, Trade Size, and Information in Securities Markets, *Journal of Financial Economics* 19, 69-90.
- Frino, A., and M. McKenzie, 2002, The pricing of stock index futures spreads at contract expiration, *Journal of Futures Markets* 22, 451-469.
- Glosten, L., and P. Milgrom, 1985, Bid, Ask, and Transaction Prices in a Specialise Market with Heterogeneously Informed Traders, *Journal of Financial Economics* 13, 71-100.

Table I
Variable Definition

This table contains a description of the variables analysed in this paper. Those variables include volume, volatility, the bid-ask spread, and depth at the best bid and ask. Each variable is measured separately for the day trading session and the night trading session.

Variable	Definition
Volume	Day: Number of contracts traded during the day trading session Night: Number of contracts traded during the night trading session
Volatility Range	Day: (Daily high price – Daily low price) Night: (Night high price – Night low price)
Volatility Ticks	Volatility Range / Minimum tick
Bid-Ask Spread	Best Ask Price – Best Bid Price
Depth	Best Ask Volume + Best Bid Volume

Table II
Day and night session volume: Pre- and post- credit crisis

This table reports the volume traded in 90 Day BAB futures, 3 Year Bond futures, and 10 Year Bond futures for two sub-periods; the pre-credit crisis period and the post-credit crisis period. The pre-credit crisis period encompasses trades executed between 11 January, 2007 and 11 July, 2007, while the post-credit crisis period encompasses trades executed between 13 July, 2007 and 13 January, 2008. Volume is measured as the total number of contracts traded per trading session. Panel A reports volume traded in the day trading session and Panel B reports volume traded in the night trading session. The mean difference between pre- and post- credit crisis volumes is reported in the final column. T-statistics for this test are reported in parentheses.

		Volume (Lots)		
		Pre-credit crisis	Post-credit crisis	Mean Difference
<i>Panel A: Day trading session</i>				
90 Day BAB futures	Mean	44,200.91	35,910.58	-8,290.32
	Median	29,844.00	31,189.50	(-1.58)
	Std Dev	45,159.22	22,984.64	
3 Year Bond futures	Mean	64,353.07	56,575.19	-7,777.89
	Median	52,885.00	50,730.00	(-1.50)
	Std Dev	40,264.19	29,204.01	
10 Year Bond futures	Mean	31,639.89	30,781.99	-857.90
	Median	26,184.00	26,968.50	(-0.24)
	Std Dev	30,516.33	14,026.90	
<i>Panel B: Night trading session</i>				
90 Day BAB futures	Mean	11,868.60	10,518.91	-1,349.70
	Median	9,710.00	8,376.00	(-1.00)
	Std Dev	9,919.28	8,465.81	
3 Year Bond futures	Mean	23,667.64	26,721.01	3,053.37
	Median	22,288.50	24,048.00	(1.73)
	Std Dev	11,339.68	12,479.58	
10 Year Bond futures	Mean	13,274.20	16,492.63	3,218.42
	Median	12,425.50	15,913.50	(2.74)
	Std Dev	6,746.00	8,848.76	

Table III**Day and night session price volatility: Pre- and post- credit crisis**

This table reports the price volatility of 90 Day BAB futures, 3 Year Bond futures, and 10 Year Bond futures for two sub-periods; the pre-credit crisis period and the post-credit crisis period. The pre-credit crisis period encompasses trades executed between 11 January, 2007 and 11 July, 2007, while the post-credit crisis period encompasses trades executed between 13 July, 2007 and 13 January, 2008. *Volatility Range* is the difference between the session high price and the session low price, and is measure in yield points p.a. *Volatility Ticks* is the volatility range divided by the minimum tick for each contract, and is measured in ticks. Panel A reports volatility in the day trading session and Panel B reports volatility in the night trading session. The mean difference between pre- and post- credit crisis volatilities is reported in the final column. T-statistics for this test are reported in parentheses.

		Volatility Range (yield points p.a.)			Volatility Ticks (ticks)		
		Pre-credit crisis	Post-credit crisis	Mean Difference	Pre-credit crisis	Post-credit crisis	Mean Difference
<i>Panel A: Day trading session</i>							
90 Day BAB futures	Mean	0.053	0.054	0.001	5.266	5.382	0.115
	Median	0.030	0.050	(3.54)	3.000	5.000	(3.54)
	Std Dev	0.051	0.034		5.128	3.436	
3 Year Bond futures	Mean	0.050	0.067	0.016	10.098	13.319	3.221
	Median	0.035	0.055	(65.72)	7.000	11.000	(65.72)
	Std Dev	0.039	0.058		7.776	11.528	
10 Year Bond futures	Mean	0.043	0.058	0.015	8.602	11.504	2.902
	Median	0.040	0.055	(135.98)	8.000	11.000	(135.98)
	Std Dev	0.022	0.028		4.350	5.513	
<i>Panel B: Night trading session</i>							
90 Day BAB futures	Mean	0.037	0.045	0.009	3.679	4.536	0.857
	Median	0.030	0.040	(21.16)	3.000	4.000	(21.16)
	Std Dev	0.034	0.025		3.369	2.548	
3 Year Bond futures	Mean	0.052	0.078	0.026	10.454	15.620	5.166
	Median	0.045	0.075	(112.97)	9.000	15.000	(112.97)
	Std Dev	0.031	0.034		6.189	6.777	
10 Year Bond futures	Mean	0.057	0.084	0.027	11.454	16.766	5.312
	Median	0.050	0.075	(135.42)	10.000	15.000	(135.42)
	Std Dev	0.031	0.037		6.102	7.484	

Table IV**Day and night session bid-ask spreads: Pre- and post- credit crisis**

This table reports the bid-ask spread for 90 Day BAB futures, 3 Year Bond futures, and 10 Year Bond futures for two sub-periods; the pre-credit crisis period and the post-credit crisis period. The pre-credit crisis period encompasses trades executed between 11 January, 2007 and 11 July, 2007, while the post-credit crisis period encompasses trades executed between 13 July, 2007 and 13 January, 2008. The bid-ask spread is measured as the difference between the best ask price and best bid price immediately prior to each trade, and is measured in yield point p.a. Panel A reports the bid-ask spread in the day trading session and Panel B reports the bid-ask spread in the night trading session. The mean difference between pre- and post- credit crisis bid-ask spreads is reported in the final column. T-statistics for this test are reported in parentheses.

		Bid-ask spread (yield points p.a.)		
		Pre-credit crisis	Post-credit crisis	Mean Difference
<i>Panel A: Day trading session</i>				
90 Day BAB futures	Mean	0.0101	0.0103	0.00023
	Median	0.0100	0.0100	(12.86)
	Std Dev	0.0014	0.0035	
3 Year Bond futures	Mean	0.0051	0.0051	0.00004
	Median	0.0050	0.0050	(5.13)
	Std Dev	0.0010	0.0021	
10 Year Bond futures	Mean	0.0051	0.0051	0.00003
	Median	0.0050	0.0050	(6.31)
	Std Dev	0.0009	0.0011	
<i>Panel B: Night trading session</i>				
90 Day BAB futures	Mean	0.0105	0.0113	0.00081
	Median	0.0100	0.0100	(18.89)
	Std Dev	0.0020	0.0044	
3 Year Bond futures	Mean	0.0053	0.0056	0.00031
	Median	0.0050	0.0050	(24.01)
	Std Dev	0.0015	0.0022	
10 Year Bond futures	Mean	0.0054	0.0056	0.00015
	Median	0.0050	0.0050	(14.47)
	Std Dev	0.0017	0.0019	

Table V
Day and night session depth: Pre- and post- credit crisis

This table reports depth at the best quotes for 90 Day BAB futures, 3 Year Bond futures, and 10 Year Bond futures for two sub-periods; the pre-credit crisis period and the post-credit crisis period. The pre-credit crisis period encompasses trades executed between 11 January, 2007 and 11 July, 2007, while the post-credit crisis period encompasses trades executed between 13 July, 2007 and 13 January, 2008. Depth is measured as the sum of the volume at the best bid price and the volume at the best ask price immediately prior to each trade. Panel A reports depth during the day trading session and Panel B reports depth during the night trading session. The mean difference between pre- and post- credit crisis depth is reported in the final column. T-statistics for this test are reported in parentheses.

		Bid-ask spread (yield points p.a.)		
		Pre-credit crisis	Post-credit crisis	Mean Difference
<i>Panel A: Day trading session</i>				
90 Day BAB futures	Mean	9,353.17	2,755.42	-6,597.74
	Median	7,612.00	1,915.00	(-166.87)
	Std Dev	6,772.72	2,634.08	
3 Year Bond futures	Mean	2,634.66	1,372.12	-1,262.54
	Median	2,269.00	1,162.00	(-173.59)
	Std Dev	1,724.98	966.20	
10 Year Bond futures	Mean	984.83	696.71	-288.13
	Median	838.00	584.00	(-110.95)
	Std Dev	654.91	482.05	
<hr/>				
90 Day BAB futures	Mean	5,437.26	1,406.63	-4,030.63
	Median	3,932.00	933.00	(-72.59)
	Std Dev	5,303.88	1,549.38	
3 Year Bond futures	Mean	1,095.49	562.22	-533.27
	Median	832.00	405.00	(-91.10)
	Std Dev	992.44	521.79	
10 Year Bond futures	Mean	323.34	249.28	-74.06
	Median	259.00	193.00	(-52.42)
	Std Dev	259.35	216.89	