

# **Shorting the Bear: A test of anecdotal evidence of insider trading in early stages of the sub-prime market crisis**

## **Authors' Affiliations**

Dr Les Coleman  
Department of Finance  
The University of Melbourne  
Parkville, Victoria, 3010, Australia  
e-mail: les.coleman@unimelb.edu.au  
phone: +61413 901085

Associate Professor Adi Schnytzer  
Department of Economics  
Bar-Ilan University  
52900 Ramat-Gan, Israel  
e-mail: schnyta1@biu.013.net.il

## **Corresponding Author**

Dr Les Coleman  
Department of Finance  
The University of Melbourne  
Parkville, Victoria, 3010, Australia  
e-mail: les.coleman@unimelb.edu.au  
phone: +61413 901085

## **Running Title**

Shorting the Bear

## **Abstract**

This article uses trading data in the options market for shares in The Bear Sterns Companies (BSC) during the early stages of the US sub-prime crisis as a laboratory to examine the incidence of insider trading. We take the perspective of a regulator making use of hindsight to identify the most propitious periods for insider trades and to identify market activity indicative of insiders. Half the value of options traded were on 19 percent of the days, mostly in contracts in or close-to the money and near to expiry. We find persuasive evidence that insiders could have been active in trading Bear Sterns stock during this period.

**Keywords:** insider trading, forensic finance, Bear Sterns

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# **Shorting the Bear: A test of anecdotal evidence of insider trading in early stages of the sub-prime market crisis**

## **INTRODUCTION**

The US banking sector entered a bear market on 20 February 2007, with its Index losing over 20 percent in value by September, during what has become known as the sub-prime crisis. Whilst its most public aspect was a series of spectacular write-offs in the second half of 2007 and early 2008<sup>i</sup> and the collapse of Bear Stearns in March 2008, clear evidence of potential troubles had been gradually accumulating over the previous year, which – of course – is why the Banking Index fell.

This article is a test of anecdotal evidence that insiders actively traded in securities around the emergence of market-sensitive information during the first half of 2007 as the market went from downplaying problems to strong concern in the space of a few months. The intuition is that successful insiders leave a record of their activity in unusual price and volume patterns in the options markets of securities that were most affected. The research intent is to examine trading in put options on stock in The Bear Stearns Companies (hereafter BSC or Bear) for evidence of hypothesised patterns of illegal insider trading. The hypotheses have been developed from previously published studies of insider trading in wagering and conventional markets and have been applied here to a single firm, over a single set of events to keep the study manageable. The principle objective of the paper is to use public information to identify patterns that suggest insider trading.

In most economic transactions, one party knows more than the others (Camerer, Loewenstein and Weber, 1989). At the extreme this leads to Fama's (1970) 'strong' market inefficiency, which means that an investor can profit from information that is not available to the general public: this is illegal in most jurisdictions. A small, but compelling, number of studies have concluded that illegal insider trading is common, especially around major corporate actions, including Amin and Lee (1997), Cao, Chen and Griffin (2005) and Jayaraman, Mandelker and Shastri (1991).

Although quantifying the existence and level of insider activity is a longstanding analytical objective, most approaches have been narrow with a restrictive definition of insiders limited to "managers and members of the board of directors of publicly traded corporation" (Fidrmuc, Goergen and Renneboog, 2006: 2931). We look for guidance to studies that have applied techniques from forensic economics to study the activity of illegal insiders in wagering markets (Coleman, 2007 and Schnytzer and Shilony, 1995) and equity markets (e.g. Meulbroek, 1992), and in manipulation of markets (such as outcomes of basketball games: Wolfers, 2006).

We propose an innovation by combining concepts from behavioural finance with powerful databases to infer the level of the trading activity of these insiders. The approach follows analytical strategies that the authors have previously published in relation to insider trading in wagering markets and extends them to conventional markets, which has often been advocated (e.g. Thaler and Ziemba, 1988). Coleman (2007) developed hypotheses about what patterns would be observed in market(s) if insiders were active, and used a long term database to test for their presence. Schnytzer and Shilony (1995; and subsequent papers) captured live trading information from parallel pari-mutuel betting markets and used it to reveal wagering with monopoly information. We believe that this is one of the first papers to comprehensively extend techniques that have proven useful in wagering studies to conventional markets.

## **RESEARCH OBJECTIVE AND HYPOTHESES**

This analysis assumes markets are not strongly efficient and follows 'forensic economics'<sup>ii</sup> to identify periods when investors might have exploited monopoly information in the options market. These

securities provide high delta (that is, sensitivity of the investment to the price of the underlying share) and enable investors to trade on margin and match option maturity to the timing of anticipated information: they afford profit opportunities that are not practicable with most shares.

Although conventional wisdom has long held that insiders in the options market will buy out-of-the-money options (e.g. Black, 1975), we believe that this leaves them vulnerable to detection by regulators (and herding by uninformed investors) because most trading by value is relatively close to the money. Thus we expect insiders will trade close to the money; and they will buy near to expiry options, which give greatest leverage and also have high volumes. For our test of anecdotal evidence that investors traded using market-sensitive monopoly information, we rely on four hypotheses.

#### *i. Options Volatility*

The implied volatility of an option quantifies its relative attractiveness after taking into account measurable market factors (the stock's price, interest rates, and option characteristics such as strike price and time to maturity). The assumption here is that illegal insiders exploit their information by buying options and hence bid up the price (and thus implied volatility) of put options ahead of the release of bad news. To control for overall market conditions, we standardise implied volatility by VIX, which is the Chicago Board Options Exchange (CBOE) Volatility Index. Our hypotheses are that implied volatility and implied volatility divided by VIX will rise when insiders are active in the market.

#### *ii. Option Bid-Offer Spread*

A number of papers have hypothesised that bid-ask spreads are a measure of information asymmetry in securities markets (e.g. Seyhun, 1986). The intuition is that investors protect themselves against counterparties with superior knowledge by widening the bid-ask spread. Our hypothesis is that option spreads will widen when insiders are in the market.

#### *iii. Option Price -Volume Patterns*

Basic microeconomics suggests that prices and volumes are correlated: price rises occur on relatively large volumes and price falls occur on relatively small volumes. In addition, the value of options traded places an obvious constraint on the ability of illegal inside traders to disguise their activity. Our hypothesis is that elevated traded value signals greater information flow and suggests insider activity.

#### *iv. Put:Call ratio*

The put:call ratio is a common indicator of activity in the options markets and is the ratio of the value of put options traded to call options traded: it indicates the balance between investments anticipating a market fall and those anticipating a rise. The value changes with market sentiment (rising in bear markets and *vice versa*) but a high ratio is consistent with insider belief that a particular stock will fall.

A serendipitous benefit of using these tests is to avoid the joint hypothesis problem in which the analysis incorporates an uncertain theory (such as the market model).

The study is not an open-ended evaluation of insider trading in general, but a focused search for possible illegal insider trading in one firm during a narrow window in the first six months of 2007. Choice of this period and firm were stimulated by a Reuters report of 21 December 2007 which said that the United States Securities and Exchange Commission (SEC) was investigating 36 companies in relation to the subprime market collapse. This and other press reports named a number of rumoured targets of the investigations for insider trading, and Bear Sterns was prominent in each.

Data come from OptionMetrics daily data on exchange traded options. We use five filters to identify evidence of insider trading in BSC put options:

- i. Implied volatility: average IV of BSC put options traded each day weighted by daily traded values
- ii. IV Relative to VIX: Value of Implied Volatility divided by VIX.

- iii. Spread: average of offer price minus bid price as a percentage of bid price, weighted by daily traded value
- iv. Traded value: Value of put options traded by day
- v. Put:Call Ratio: value of BSC put options traded divided by the value of call options traded.

## ANALYSIS AND CONCLUSIONS

This analysis is unashamedly retrospective: we adopt the perspective of a regulator seeking evidence of insider trading and use two sets of clues. The first is events that became public knowledge and in retrospect appear to have been opportunities to trade using inside knowledge. In the case of Bear Sterns, for instance, it reported a reduced quarterly profit on 14 June and the stock price fell in virtually a straight line for the following nine months.

The second clue comes from trading activity. We hypothesise that insider activity will be indicated by the five filters, and identified days with the ten highest values. Consideration was given to following conventional event analysis and identifying days that were (say) in the top one percent based on the previous 200 days. However, trading activity was much higher in 2007 than 2006 and made this approach moot.

Combining these two clues produces table 1. Out of the 124 trading days during January to June 2007, 41 trigger one of the clues. After assembling the table, we used the Dow Jones news service *Factiva* and other on-line resources to identify events that might be price-sensitive for BSC's stock price.

[Insert table 1 here]

Whilst interpretation of the table involves some subjectivity, two periods are most suggestive of insider activity:

1. During the five trading days 10-16 April, volatilities, spreads and trading values were high. BSC rallied during April, but losses in its two hedge funds that soon failed spectacularly (High-Grade Structured Credit Strategies and its Enhanced Leverage twin) rose from 4 to 23 percent for the year.
2. BSC announced on 22 June that it would lend \$3 billion to the two hedge funds. Information on the seriousness of this issue had been emerging since suspension of fund redemptions on 7 June and liquidation of assets from before 13 June. Volatilities and volumes were high during 6-22 June, with heavy volume on June 6 which was the day before hedge fund redemptions were suspended.

Table 2 gives further granularity with details of principal option trades during the two possible insider trading periods of 10-16 April and 6-22 June. This shows that trading is highly concentrated: two thirds of the value of trades was in just four and nine contracts (Expiry Date X Strike Price), respectively, in the two periods. Two points stand out about the popular contracts: the strike prices are relatively close-to or just in-the-money; and the expiry dates are within two months. If these do represent insider trades, then the insiders are behaving logically and burying their activity in the high volume contracts close-to-the-money and near expiry.

[Insert table 2 here]

Stories of insider trading confirm the worst suspicions of many investors and allegations are easy to make: reports are a media staple. Even though illegal insider trading is hard to prove and easy to dismiss, it seems all too prevalent: for example, Cornell and Sirri (1992) obtained detailed records of trading in a takeover firm during the month before its acquisition and found insiders bought 29 percent of the stock sold.

Our analysis indicates several periods during the first half of 2007 when trading in options on Bear Sterns shares strongly suggests activity by insiders.

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Table 1

This table shows the 41 trading days (out of 124 during January-June 2007) that recorded one of the ten most extreme values in value-weighted Implied Volatility, IV standardised by VIX, and bid-ask spread; traded value of put options; and Put:Call ratio. Extreme is noted by \*. Associated events are obtained by searching *Factiva* around dates.

	Associated Events	Bear Stern Share Price: \$	Change in Bank Index: %	Change in Bear Sterns Share Price %	Implied Volatility	IV Relative to VIX	Spread (percent)	Traded value (\$ K)	Put:Call ratio
Mean					0.2850	0.0219	5.39	3 213	1.24
Std Devn					0.0394	0.0013	1.70	4 084	1.11
3 January		162.8	0.00	0.03	0.2334	0.0194	5.89	1,076	3.40*
5 January		162.3	-0.98	-0.20	0.2379	0.0196	9.60*	607	0.98
16 January	12 January: BSC shares peak at \$172	170.6	0.26	-0.52	0.2632	0.0245	14.12*	257	0.41
23 January		166.5	0.02	-1.60	0.2472	0.0239	10.03*	379	0.19
24 January		169.9	0.54	2.01	0.2572	0.0260	11.13*	181	0.11
25 January		164.7	-1.12	-3.02*	0.2420	0.0216	2.26	783	0.26
29 January		162.1	-0.56	-1.23	0.2672	0.0233	4.40	5,117	4.03*
1 February		165.3	0.17	0.26	0.2785	0.0270*	6.05	2,038	0.85
5 February		165.1	0.09	-0.78	0.2593	0.0246	8.20*	249	0.41
9 February		159.7	-0.83	-2.45*	0.2668	0.0240	5.40	3 623	0.29
20 February		169.4	0.36	1.34	0.2879	0.0281*	5.46	938	0.51
21 February		168.1	-0.25	-0.77	0.2920	0.0286*	7.68*	901	1.28
22 February	HSBC fires head of mortgage lending	166.1	-0.12	-1.21	0.2971	0.0292*	4.16	1,909	1.42
23 February		161.3	-0.74	-2.88*	0.3089	0.0292*	4.09	9 431	2.56
26 February		158.2	0.00	0.03	0.2710	0.0290*	4.68	4 792	3.11*
27 February		152.3	-3.29*	-3.74*	0.3321	0.0147	7.77*	17 142*	2.66*
28 February	SEC charges BSC analysts with insider trading	152.2	0.26	-0.05	0.3278	0.0176	5.40	13 588*	2.44
2 March	BSC hedge fund manager removes own money from funds	147.5	-1.11	-2.79*	0.2379	0.0176	4.20	9 100	3.48*
5 March	New Century Financial shares drop 69 percent	144.5	-1.47*	-2.03	0.3719*	0.0189	3.69	10 863*	6.66*
12 March	Shares of New Century suspended	153.2	0.03	0.77	0.4257*	0.0304*	7.09	3 951	1.07
13 March		143.0	-3.24*	-6.65*	0.4156*	0.0229	5.79	30 619*	6.55*
14 March		145.3	0.7	1.62	0.4135*	0.0239	6.02	13 333*	0.76

28 March	16 March: BSC reports 8% quarterly profit increase	147.6	-1.19*	-0.87	0.2771	0.0185	3.62	1,533	0.93
2 April		148.4	-1.15*	-1.27	0.2875	0.0198	4.40	2,772	1.53
10 April		147.5	0.47	-1.04	0.3765*	0.0396*	2.24	8 669	4.44*
12 April		148.3	-0.15	0.32	0.2742	0.0216	7.62*	396	0.01
16 April		153.8	2.00	4.33	0.3741*	0.0313*	3.09	7,459	2.11
19 April	Through April, YTD losses on hedge funds rise from 4 to 23 percent	157.4	-0.30	0.22	0.2773	0.0221	8.93*	765	0.20
1 May	25 April: BSC peaks at \$159; hedge fund investors falsely told of slight loss	155.8	0.40	0.08	0.2850	0.0211	7.80*	1,264	0.79
10 May		153.5	-1.66*	-1.30	0.2805	0.0206	5.34	941	0.80
15 May	May 16-17: BSC stocks downgraded	150.6	0.04	-2.14	0.2743	0.0196	5.39	2,814	3.48*
24 May	Goldman downgrades BSC	147.6	-0.59	-3.15*	0.2855	0.0203	4.59	2 790	0.76
7 June	7 June: two failing BSC hedge funds report losses and halt redemptions	144.4	-1.35*	-2.90*	0.3148	0.0185	5.21	3,126	1.42
11 June		148.4	0.22	0.39	0.4454*	0.0303*	6.71	1 803	0.56
12 June	12-13 June: BSC hedge funds liquidating \$4 billion of assets	146.0	-1.33*	-1.61	0.3646*	0.0219	4.22	4,797	1.27
13 June	14 June: BSC reports profit fall	149.5	1.63*	2.39	0.3618*	0.0246	7.47	3,332	1.16
20 June		143.2	-1.58*	-2.45	0.2631	0.0179	3.60	9 770*	3.16*
22 June	BSC lends \$3bill to hedge funds	143.8	-1.85*	-1.41	0.3146	0.0200	5.85	9 616*	1.99
25 June		139.1	-0.46	-3.23*	0.3581*	0.0215	4.98	18 338*	1.57
26 June		139.4	-0.19	0.18	0.3248	0.0172	4.31	11 887*	1.16
29 June	BSC fires head of asset management	140.0	-0.79	-2.78*	0.3171	0.0195	4.21	9 285	2.21

Table 2

This table covers the two possible insider trading periods and shows the traded values in \$K of the most active contracts.

Expiry date Strike	BSC share price	21 April					19 May				21 July				All Other	TOTAL
		145	150	155	160	165	145	150	155	160	145	150	155	160		
10 April	147.5	48	403	38	169	6294	103	309	63	0	7	13	2	791	429	8,669
11 April	147.8	23	255	38	17		27	57	23	13	8	43	1	12	555	1,072
12 April	148.3	32	36	14			10	41	9		9	28	28	4	185	396
13 April	147.4	31	104				2	129	45		11				140	462
16 April	153.8	5	109	106	59	3046	31	162	44	10	6	57	25	3	3,796	7,459
TOTAL		139	907	196	245	9340	173	698	184	23	41	141	56	810	5,105	18,058

Expiry date Strike	BSC share price	16 June					21 July							All Other	TOTAL
		140	145	150	155	160	130	135	140	145	150	155	160		
6 June	148.7	28	64	111	163	250	21	9	9	19	442	37	384	970	2 507
7 June	144.4	56	1 082	173	153		6	18	70	148	173	20	134	768	3,126
8 June	147.8	30	282	153	451	14	52	5	200	192	507	24	29	952	3,332
11 June	148.4	43	506	716	28	2	3	9	13	57	32	30	3	307	1,803
12 June	146.0	26	482	1 023	95		3	15	163	202	61	150	82	1,509	4,797
13 June	149.5	42	348	539	74		9	60	251	494	169	48	13	712	3,332
14 June	149.6		27	350			4	45	84	232	384	53	1	770	2,753
15 June	150.1						6	25	122	157	222	45	19	529	1,197
18 June	148.0						5	32	393	287	697	81	26	422	2,319
19 June	146.8						4	36	449	168	138	9	24	835	1,822
20 June	143.2						113	414	1 546	856	608	1 952	69	2,064	9,770
21 June	145.8						211	153	250	161	66	29	99	192	9,617
22 June	143.8						237	441	2 390	1 147	1 199	148	66	1,778	9,616
TOTAL		237	2847	3364	1030	298	682	1297	6033	4209	5202	715	980	11,808	53,483



## Footnotes

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<sup>i</sup> Merrill Lynch and Citigroup, for instance, each ultimately wrote-off more than \$20 billion against mortgage loans after the second half of 2007 and lost their Chief Executive. UBS, Morgan Stanley, HSBC, and American International Group each wrote off more than \$10 billion.

<sup>ii</sup> Using its definition from Wolfers (2006: 279) which is “applying price-theoretic models to uncover evidence of corruption in domains previously outside the purview of economists”

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