

# **Do Social Networks Facilitate Informed Option Trading? Evidence from Alumni Reunion Networks**

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**Internet Appendix**

## **Internet Appendix A: Option Data Collection Process**

To construct the dataset for the sample hedge fund firms' option holdings, we take the following steps. First, we manually match the names of the hedge fund holding companies in the original BarclayHedge data set with institution names in the Thomson Reuters 13F data set through fuzzy matching. After careful data cleaning, we check the EDGAR website for the names of the holding companies that do not have a match from the initial step. Then, we rely on Form ADV from the SEC, internet sources (e.g., Businessweek/Bloomberg Private Company Information), and self-reported information on the fraction of the hedge fund assets to the total assets under management (AUM) provided by holding companies from BHFD. When the data from these sources are unavailable, we examine the holding companies' self-reported business descriptions on their websites and classify those with 50% or more of their funds classified as such as hedge fund firms. Because our study requires manual collection of the hedge fund managers' education background, we exclude large hedge fund firms with 200 or more employees and those operating under investment banks' umbrellas. From this process, we initially identify 517 hedge fund holding companies (for brevity, we simply refer to them as hedge funds) covering the 2007–2015 sample period. Next, we use each hedge fund's name to search for its raw quarterly 13F documents on EDGAR and download all of the filings reported during our sample period. Then, we go through each document and manually scrap and extract the option holdings information. This process yields 282 hedge funds with any 13F records of long stock option positions during the sample period.

Exhibit 1A shown below is an extract from the SEC 13F Form General Instructions. The item 11 on page 4 indicates that the option holdings-related information reported in the 13F filings, such as CUSIP (Column 3) and holdings size (Column 5), is based on the underlying stocks of the options, not the options themselves. These instructions are again highlighted in the separate Q&A page on the SEC website, as shown in Question 44 of Exhibit 1B. Despite these guidelines, there are variations in how the firms actually report their holdings. For example, some sample hedge funds report the option holdings using separate identifiers for the options instead of the CUSIPs of underlying stocks, as exemplified by the identifiers that

start with “99OB” for options in Exhibit 2. For these cases, we manually search for the underlying stocks’ CUSIPs using the firm name via the CRSP code search and replace the stock CUSIPs for the original option code reported by the hedge funds. Furthermore, some hedge funds identify option positions using the first six digits of the underlying stocks’ CUSIPs but replacing the 7th and 8th digits with “90” for call options and “95” for put options, as illustrated in Exhibit 3. For these cases, we replace the original code with the actual CUSIPs of the underlying stocks as well. None of the target and acquirer firms affected by the CUSIP related issues in our sample have multiclass stocks, and this feature makes the process of updating the CUSIP code less complicated. Additionally, we found numerous cases in which CUSIP code reported by some hedge funds contain typos, which would result in losses of observations unless corrected. We paid minute attention in finding such typos and replaced them with correct ones.

Finally, we follow the literature convention (e.g., Lowry, Rossi, and Zhu, 2018) and aggregate all of underlying share count for each unique CUSIP and option type to measure the total size of a hedge fund’s positions for a firm in the quarter for each stock option type. To construct the main option holdings variables (i.e., CALL\_RATIO, PUT\_RATIO, and NET\_CALL\_RATIO), we divide the underlying share count by the stock’s total number of shares outstanding reported by CRSP for the corresponding calendar-quarter end date.

## Exhibit 1A: Form 13-F General Instructions<sup>1</sup>

11. A Manager must report holdings of options only if the options themselves are Section 13(f) securities. For purposes of the \$100,000,000 reporting threshold, the Manager should consider only the value of such options, not the value of the

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underlying shares. The Manager must give the entries in Columns 1 through 5 and in Columns 7 and 8 of the Information Table, however, in terms of the securities underlying the options, not the options themselves. The Manager must answer Column 6 in terms of the discretion to exercise the option. The Manager must make a separate segregation in respect of securities underlying options for entries for each of the columns, coupled with a designation "PUT" or "CALL" following such segregated entries in Column 5, referring to securities subject respectively to put and call options. A Manager is not required to provide an entry in Column 8 for securities subject to reported call options.

12. Furnish the Information Table using the table title, column headings and format provided. Provide column headings once at the beginning of the Information Table; repetition of column headings on subsequent pages is not required. Present the table in accordance with the column instructions provided in Special Instructions 12.b.i through 12.b.viii. Do not include any additional information in the Information Table. Begin the Information Table on a new page; do not include any portion of the Information Table on either the Cover Page or the Summary Page.

## Exhibit 1B: Additional Instructions<sup>2</sup>

### The Information Table – Columns 5–8

#### Question 44 *(Renumbered: October 10, 2013)*

##### **Q: What should I enter in Column 5, "Amount and Type of Security"?**

**A:** Generally, you will list the number of shares of a security here. For options, you will also enter either PUT or CALL, whichever is appropriate. Column 5 is where you actually indicate that the listing is an option because most of the column entries for an option refer to the underlying security, rather than to the option itself (*i.e.*, Columns 1-5 and 7-8). For example, in reporting an option position, you would enter COM in Column 2 and list the CUSIP number for the underlying stock in Column 3. See Special Instructions 11 and 12.b.v to Form 13F [Adobe Acrobat® (PDF) file].

#### Question 45

##### **Q: What is sole investment discretion?**

**A:** If you are the only entity managing the Section 13(f) securities reported on your Form 13F and you do not control (or are not controlled by) another reporting person, you have sole investment discretion. See Securities Exchange Act Section 3(a)(35), and Rule 13f-1(b). Enter the word SOLE in Column 6. See Special Instruction 12.b.vi to Form 13F [Adobe Acrobat® (PDF) file].

For example, if you are an investment advisory firm reporting your aggregate holdings for all accounts under your management, you have sole investment discretion (even though the accounts may be handled by different individuals within your firm).

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<sup>1</sup> The full instructions can be found here: <https://www.sec.gov/about/forms/form13f.pdf>

<sup>2</sup> The full Q&A session can be found here: <https://www.sec.gov/divisions/investment/13ffaq.htm>

**Exhibit 2: Form 13F Example from Galleon Management, L.P. for the Calendar Quarter Ended on December 31, 2008**

<PAGE>  
<TABLE>

FORM 13F INFORMATION TABLE

NAME OF ISSUER	TITLE OF CLASS	CUSIP	VALUE x(\$1000)	SHARES/ PRN AMT	SH/ PRN	PUT/ CALL	INVSTMT DISCRETN	OTHER MANAGERS	VOTING AUTHORITY		
									SOLE	SH-OTH	NONE
D ACME PACKET	COMMON STOCK	004764106	526	100000	SH		SH-OTH		0	100000	0
D ADC TELECOMMUNICATIO NS INC CO	COMMON STOCK	000886309	821	150000	SH		SH-OTH		0	150000	0
D ADOBE SYS INC COM STK	COMMON STOCK	00724F101	1065	50000	SH		SH-OTH		0	50000	0
D ADVANCE AUTO PTS INC COM STK	COMMON STOCK	00751Y106	2524	75000	SH		SH-OTH		0	75000	0
D ADVANCED ANALOGIC TECHNOLOGIES	COMMON STOCK	00752J108	906	300000	SH		SH-OTH		0	300000	0
D AK STEEL HOLDING COR P COM STK	COMMON STOCK	001547108	5406	580000	SH		SH-OTH		0	580000	0
D AK STEEL HOLDING COR P COM STK	OPTIONS - CALLS	990803265	2703	290000	SH		CALL SH-OTH		0	290000	0
D AKAMAI TECHNOLOGIES INC COM ST	COMMON STOCK	00971T101	1628	107870	SH		SH-OTH		0	107870	0
D AKAMAI TECHNOLOGIES INC COM ST	OPTIONS - PUTS	99083YFN9	3244	215000	SH		PUT SH-OTH		0	215000	0
D ALCOA INC COM STK	OPTIONS - CALLS	99080QV53	1971	175000	SH		CALL SH-OTH		0	175000	0
D ALLIANCE DATA SYS CO RP COM ST	OPTIONS - PUTS	99086L3P2	8375	180000	SH		PUT SH-OTH		0	180000	0
D ALLIANCE ONE INTERNA TIONAL IN	COMMON STOCK	018772103	353	120000	SH		SH-OTH		0	120000	0
D ALTERNATIVE ASSET MANAGEMENT A	WARRANTS	02149U119	244	3481000	SH		SH-OTH		0	3481000	0
D AMAG PHARMACEUTICALS COM STK	COMMON STOCK	00163U106	16670	465000	SH		SH-OTH		0	465000	0
D AMAG PHARMACEUTICALS COM STK	OPTIONS - CALLS	99083PV86	7170	200000	SH		CALL SH-OTH		0	200000	0
D AMBAC FINANCIAL GROU P INC COM	OPTIONS - CALLS	990835651	143	110000	SH		CALL SH-OTH		0	110000	0
D AMD SER B SR UNS CONV 5.75%	CONVRT BONDS	007903AN7	24922	72500000	SH		SH-OTH		0	72500000	0
D AMD SER B SR UNS CONV 6%	CONVRT BONDS	007903AL1	2644	7500000	SH		SH-OTH		0	7500000	0
D AMER INTL GROUP INC COM	OPTIONS - CALLS	9908BHB15	157	100000	SH		CALL SH-OTH		0	100000	0
D AMERICA MOVIL SAB DE CV	ADRS STOCKS	02364W105	5113	165000	SH		SH-OTH		0	165000	0
D AMERICA MOVIL SAB DE CV	OPTIONS - PUTS	99083PM18	9297	300000	SH		PUT SH-OTH		0	300000	0
D AMERICA MOVIL SAB DE CV	OPTIONS - PUTS	99083PM26	9297	300000	SH		PUT SH-OTH		0	300000	0
D AMERICAN EAGLE OUTFI TTERS INC	COMMON STOCK	02553E106	7254	775000	SH		SH-OTH		0	775000	0
D AMPHENOL CORPORATION (NEW) CL	COMMON STOCK	032095101	4713	196549	SH		SH-OTH		0	196549	0
D AMR CORP COM STK	COMMON STOCK	001765106	3201	300000	SH		SH-OTH		0	300000	0
D AMR CORP COM STK	OPTIONS - CALLS	990844263	4268	400000	SH		CALL SH-OTH		0	400000	0
D ANADARKO PETE CORP COM STK	COMMON STOCK	032511107	1928	50000	SH		SH-OTH		0	50000	0
D APOLLO GROUP INC CL A COM STK	COMMON STOCK	037604105	4597	60000	SH		SH-OTH		0	60000	0
D APPLE INC COM STK	COMMON STOCK	037833100	19793	231900	SH		SH-OTH		0	231900	0
D APPLE INC COM STK	OPTIONS - CALLS	99AG22034	8535	100000	SH		CALL SH-OTH		0	100000	0
D APPLIED ENERGETICS I NC COM ST	COMMON STOCK	03819M106	2382	7443438	SH		SH-OTH		0	7443438	0
D APPLIED ENERGETICS I NC COM ST	OPTIONS - CALLS	99081MWN6	136	425000	SH		CALL SH-OTH		0	425000	0
D APPLIED ENERGETICS I NC COM ST	OPTIONS - CALLS	99081MWS5	272	850000	SH		CALL SH-OTH		0	850000	0
D APPLIED MATLS INC COM STK	COMMON STOCK	038222105	7786	768594	SH		SH-OTH		0	768594	0
D ARCH COAL INC COM STK	COMMON STOCK	039380100	1140	70000	SH		SH-OTH		0	70000	0
D ASCENT MEDIA CORP	COMMON STOCK	043632108	3276	150000	SH		SH-OTH		0	150000	0
D ASML HOLDING NV ADR	OPTIONS - PUTS	99081T2N6	13553	750000	SH		PUT SH-OTH		0	750000	0
D AT&T INC COM	COMMON STOCK	00206R102	4275	150000	SH		SH-OTH		0	150000	0
D ATMEL CORP COM STK	COMMON STOCK	049513104	19719	6300000	SH		SH-OTH		0	6300000	0
D AXCELIS TECHNOLOGIES INC COM	COMMON STOCK	054540109	204	400000	SH		SH-OTH		0	400000	0
D BAIDU ADR	OPTIONS - CALLS	99085VF31	6529	50000	SH		CALL SH-OTH		0	50000	0
D BANK OF AMERICA CORP COM STK	OPTIONS - CALLS	9908LBN59	24992	1775000	SH		CALL SH-OTH		0	1775000	0
D BARE ESSENTIALS INC	COMMON STOCK	067511105	131	25000	SH		SH-OTH		0	25000	0
D BB&T CORP COM STK	COMMON STOCK	054937107	2883	105000	SH		SH-OTH		0	105000	0
D BB&T CORP COM STK	OPTIONS - PUTS	99085Y920	5492	200000	SH		PUT SH-OTH		0	200000	0
D BEST BUY INC COM STK	OPTIONS - PUTS	9908DWL34	7028	250000	SH		PUT SH-OTH		0	250000	0

**Exhibit 3: Form 13F Example from AM Investment Partners, LLC for the Calendar Quarter Ended on March 31, 2011**

NAME	TITLE	CUSIP	VALUE (x\$1000)	SHARES/ PRN AMT	SH/ PRN	PUT/ CALL	INVT DISTN	OTHER MGRS	VOTING SOLE	AUTHORITY SHARED	NONE
NUMBER OF OTHER MANAGERS									0		
FORM 13F INFORMATION TABLE ENTRY TOTAL									142		
FORM 13F INFORMATION TABLE VALUE TOTAL									184,516		
									(x\$1000)		
<TABLE>											
FORM 13F INFORMATION TABLE											
<S>	<C>	<C>	<C>	<C>	<C>	<C>	<C>	<C>	<C>	<C>	<C>
AIRTRAN HLDGS INC	COM	00949P108	1081	145100	SH		SOLE	NONE	145100	0	0
AIRTRAN HLDGS INC	NOTE 5.25% 11/0	00949PAD0	9409	6500000	PRN		SOLE	NONE	6500000	0	0
ABINGTON BANCORP INC	COM	00350L109	252	20636	SH		SOLE	NONE	20636	0	0
ALCON INC	COM	H01301102	910	5500	SH		SOLE	NONE	5500	0	0
ALBERTO CULVER CO	COM	013078100	634	17000	SH		SOLE	NONE	17000	0	0
ALLOS THERAPEUTICS INC	COM	019777901	24	161000	SH	C	SOLE	NONE	161000	0	0
ATHEROS COMMUNICATIONS INC	COM	04743P108	670	15000	SH		SOLE	NONE	15000	0	0
AMARIN CORP PLC	COM	023111906	195	231200	SH	C	SOLE	NONE	231200	0	0
ANSWERS CORP	COM	03662X100	499	48000	SH		SOLE	NONE	48000	0	0
BECKMAN COULTER INC	COM	075811109	498	6000	SH		SOLE	NONE	6000	0	0
BJS WHOLESALE CLUB INC	COM	05548J106	293	6000	SH		SOLE	NONE	6000	0	0
BRISTOL MYERS SQUIBB CO	COM	110122908	36	200000	SH	C	SOLE	NONE	200000	0	0
BRISTOL MYERS SQUIBB CO	COM	110122958	243	300000	SH	P	SOLE	NONE	300000	0	0
BENIHANA INC	CL A	082047200	120	14185	SH		SOLE	NONE	14185	0	0
BUCYRUS INTL INC NEW	COM	118759109	686	7500	SH		SOLE	NONE	7500	0	0
CALIX INC	COM	13100M509	208	10237	SH		SOLE	NONE	10237	0	0
CAMERON INTERNATIONAL CORP	NOTE 2.50% 6/1	13342BAB1	8906	5500000	PRN		SOLE	NONE	5500000	0	0
CEPHALON INC	COM	156708909	73	50000	SH	C	SOLE	NONE	50000	0	0
CENTRAL EUROPEAN MEDIA ENTRP	COM	G20045952	30	226600	SH	P	SOLE	NONE	226600	0	0
CAPITAL GOLD CORP	COM	14018Y205	1034	160779	SH		SOLE	NONE	160779	0	0
CIENA CORP	COM	171779959	106	502700	SH	P	SOLE	NONE	502700	0	0
CARACO PHARMACEUTICAL LABS L	COM	14075T107	173	33300	SH		SOLE	NONE	33300	0	0
CHINA MED TECHNOLOGIES INC	NOTE 4.00% 8/1	169483AC8	5412	6000000	PRN		SOLE	NONE	6000000	0	0
CHINA MED TECHNOLOGIES INC	NOTE 6.25% 12/1	169483AE4	1069	1000000	PRN		SOLE	NONE	1000000	0	0
CHINA MED TECHNOLOGIES INC	COM	169483954	171	488200	SH	P	SOLE	NONE	488200	0	0
CELERA CORP	COM	15100E106	101	12500	SH		SOLE	NONE	12500	0	0
CAPITALSOURCE INC	COM	14055X902	141	20000	SH		SOLE	NONE	20000	0	0
CEMEX SAB DE CV	COM	151290959	121	900000	SH	P	SOLE	NONE	900000	0	0
COGENT COMM GROUP INC	COM	19239V302	1822	127852	SH		SOLE	NONE	127852	0	0
COGENT COMM GROUP INC	COM	19239V952	50	252200	SH	P	SOLE	NONE	252200	0	0
COMPUCREDIT HLDGS CORP	COM	20478T107	65	10000	SH		SOLE	NONE	10000	0	0
CELGENE CORP	RIGHT 12/31/2011	151020112	42	17000	SH		SOLE	NONE	17000	0	0
CONEXANT SYSTEMS INC	COM	207142308	665	278300	SH		SOLE	NONE	278300	0	0
CNA SURETY CORP	COM	12612L108	366	14500	SH		SOLE	NONE	14500	0	0
DISCOVERY COMMUNICATNS NEW	COM SER C	25470F302	352	10000	SH		SOLE	NONE	10000	0	0
DOLLAR THRIFTY AUTOMOTIVE GP	COM	256743105	834	12500	SH		SOLE	NONE	12500	0	0
EMERGENCY MEDICAL SVCS CORP	COM	29100P102	986	15500	SH		SOLE	NONE	15500	0	0
EBIX INC	COM	278715206	526	22258	SH		SOLE	NONE	22258	0	0

## Internet Appendix B: Process for Generating Sample Merger Deals

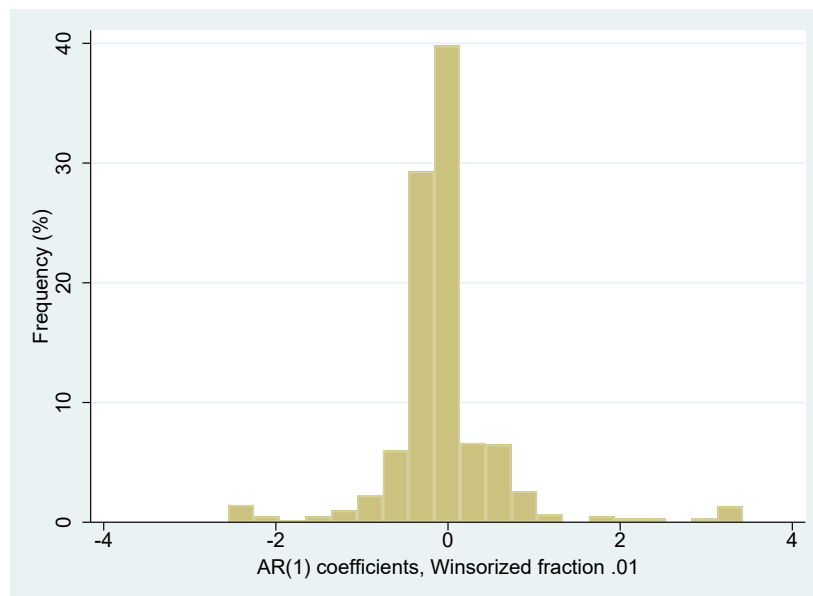
This table describes the data procedure taken to generate the sample of 223 unique merger deals for our study.

	Filters	Remaining deal count
1	Start with all completed public firm mergers	853
2	Keep solicited deals if the CRSP share codes for both acquirers and targets are 10 or 11	650
3	Drop deals with deal value less than 1% of the market value of acquirer equity	600
4	Keep the deals with both acquirer and target having Boardex data	573
5	Keep the deals with targets having any option trading records in OptionMetrics and 13-F filings by the sample hedge funds throughout six quarters prior to the merger announcement	229
6	Drop if any key variables have missing values	223

## Internet Appendix C: Diagnostic Tests on Sample Data

The high coefficient on the lagged dependent variable ( $\sim 0.40$ ) and somewhat low  $R^2$ s reported in Table 3 may indicate that the results are driven by outliers.<sup>3</sup> An additional diagnostic test shows that (1) the main dataset, which is organized in a panel structure, contains hedge fund-target time series with sudden changes in holdings (i.e., outliers), and (2) our baseline results still hold even after removing these outliers.

First, we fit an AR(1) model on NET\_CALL\_RATIO for each hedge fund-target firm time series. We find that the mean and the standard deviation of the distribution for the AR(1) coefficients, after winsorizing the coefficients at the 1st and 99th percentiles, are -0.052 and 0.694, respectively (histogram of the AR(1) coefficients below). We further perform a t-test to check if the mean value is statistically different from 0 and the result rejects the null hypothesis at the 10% level.



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<sup>3</sup> We thank the anonymous referee for directing our attention to the possibility and also for recommending this particular diagnostic test.



This low average AR(1) coefficient stems from the fact that there are (1) many hedge fund-target pairs in which the hedge funds' holdings exhibit a "sawtooth" like time series consisting of extreme variations, and (2) a series of zero holdings followed by a sudden jump in holding size, especially right before the merger announcement. We argue that these patterns found in our dataset are the product of our sample hedge funds' concentrated information-driven option trading. Some studies in the literature, such as Lowry, Rossi, and Zhu (2018), use samples that contain investment banks that typically manage broad option portfolios to fulfill various purposes ranging from market-making to proprietary trading. Our sample solely comprises stand-alone hedge funds that carry concentrated option holdings to pursue their own speculative trading strategies. Thus, we expect the sample hedge funds to implement the most cost effective informed option trading strategy possible to maximize their return, in which they increase their holdings only when so doing matters; i.e., right before the merger announcement.

Nevertheless, to ensure that our baseline results in the study are not solely driven by the structure of the data, we remove all of the hedge fund-target pair observations where the AR(1) coefficients from the previous test are less than or equal to 0. The mean and the standard deviation of the distribution for the remaining AR(1) coefficients are 0.702 and 0.858, respectively, and the mean is statistically different from 0 at the 0.1% level (consistent with the literature). Then we estimate our baseline model in Eq.(4) in the main text with hedge funds, calendar quarters, and targets fixed effects on this dataset using REUNION\_COHORTS as the main connection variable. Note that, by only keeping hedge fund-target observations with positive AR(1) coefficients, we also remove the observations where the hedge funds decided not to hold options in the target firms when they *could have*. Consistent with the baseline results reported in Table 3, we find that the coefficient on the interaction term between QTR\_1 and REUNION\_COHORTS continues to be

statistically significant at the 5% level. Importantly, the model fit indicated by the adjusted  $R^2$  improves to 33.5%. Finally, we further remove all observations with zero holdings from the dataset and estimate the same model. The fixed effects included in the model further removes outliers from any remaining hedge fund-target observations with a single non-zero holding. We find that the adjusted  $R^2$  improves to 45% while the key interaction term remains significantly positive. In aggregate, these additional analyses confirm that our baseline results in the manuscript are not dependent on the outliers.