Why Do Financial Intermediaries Buy Put Options from Companies?*

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Abstract

In the 1990s, companies collected billions in premiums from peculiarly structured put options written on their own stock while almost all of these puts expired worthless. Buyers of these options, primarily financial intermediaries, lost money as a result. Although these losses might seem puzzling, by offering to buy put options from better informed parties, intermediaries receive private information about the issuing company. We find that magnitude of changes and structural breaks in the stocks' price trends and volumes around the put sales indicate that the intermediaries were indeed acting on this information and potentially made hundreds of billions of dollars.

In February 1991, the Securities and Exchange Commission (SEC) issued a ruling that allowed publicly-traded companies to sell put options written on their own stock. This practice began modestly with IBM, which realized profits in 1992 in excess of $2 million from its put-option sales.[1] The practice quickly spread to companies such as Microsoft, which over a seven-year period beginning in 1993, received over $2 billion in total premiums from sales of puts including $766 million in 1999 alone.[2] While bringing in such significant revenues, company-written put options expired out of the money in almost all cases.

Although the original spirit of the SEC ruling was to allow companies to issue put options publicly on an organized exchange like the Chicago Board Options Exchange (CBOE), most companies placed their options privately with financial intermediaries such as investment banks and other qualified institutional buyers.[3] The writing of a put option is a zero-sum game in which the two parties bet on the direction and magnitude of future stock price changes. Presumably, the manager of a company is better informed about the company's stock outlook than the outside intermediary. Yet, despite the asymmetric information between intermediaries and the company's managers, these sophisticated financial intermediaries bet against better informed parties. In *Guys and Dolls*, Sky Masterson gives the following advice:

> "One of these days in your travels, a guy is going to show you a brand-new deck of cards on which the seal is not yet broken. Then this guy is going to offer to bet

[1] University of Virginia, Darden Case Study UVA- F-1009 (1992).

[2] For a detailed Microsoft case study refer to Gyoshev et al. (2012).

[3] The initial ruling to allow the sale of put options was in fact made in favour of a request submitted by the CBOE.

> you that he can make the jack of spades jump out of this brand-new deck of cards and squirt cider in your ear. But, son, do not accept this bet, because as sure as you stand there, you are going to wind up with an ear full of cider."

The financial intermediaries appear to be ignoring this advice. Furthermore, institutional investors commonly approach issuing companies about purchasing such put options.[4] Thus, they are actively seeking an investment that should be disadvantageous to them; "a sucker bet" as Sky Masterson might say. Also intriguing, in most cases including Microsoft, these peculiarly structured options are exercisable by the purchaser only at maturity but the issuing company has the option at any time to settle in cash or stock.[5]

Three plausible explanations exist for this behavior. First, the financial intermediaries are hedging against declines in the stock market. Supporting this idea is that these transactions occurred between 1992 and 2000, which was a period in the midst of a prolonged bull market. Second, managers show overconfidence about their company's future prospects.[6] This overconfidence could cause managers to underprice the options, which can be exploited by the financial intermediaries. Third, the financial intermediaries, while losing on the purchase of the put options, are profiting from knowing that the companies are willing to sell them the put options. This willingness reflects the positive outlook of company insiders and can be exploited by the intermediary by buying shares that are likely

[4] For example, Tom Pratt (1994) cites Paul Mazzilli at Morgan Stanley & Co. as stating that "a large portion of the companies that do programs with me have been introduced to [selling put derivatives], and use the strategy."

[5] As stated in the companies' 10-Q or 10-K statements, for example in Microsoft's June 30, 1995 10-K filing: Puts "are exercisable only at maturity, and are settleable in cash at Microsoft's option."

[6] See Hirshleifer, Low, and Teoh (2012) for both an overview and a reason why managerial overconfidence as a characteristic could be beneficial to the company.

to increase in value. This informational advantage is long-lived since, on average, the time from the date of the put-option trade to the date that it is disclosed to the public is more than six months.

Let us examine the first explanation in more detail. Although giving a company an option to buy back the put limits the company's exposure, it also limits the protection of the intermediary. Thus, their use as insurance by financial intermediaries is questionable. We see this explicitly in the case of Microsoft. When the largest amount of put options per quarter was issued by Microsoft (February 2000 was most likely the last month of issue), the stock price suffered the black swan event of both the dot-com crash (starting March 2000) and the Supreme Court ruling against Microsoft (April 3, 2000). During this tumultuous time, the intermediary allowed Microsoft to repurchase the put options at a loss of $1.4 billion (in the 2001 fiscal year). While substantial, this amount is in stark contrast to what might have happened without this repurchase option. The per-share stock price fell from $111.87 in March 23, 2000, to $41.50 on December 20, 2000. Thus, out of the $12.2 billion potential repurchase obligation, Microsoft could have paid as much as $5.7 billion in the worst case or $2.4 billion using average stock prices.[7] Given that Microsoft obtained a $667 million profit overall despite the most adverse events, we can conclude that insurance could

[7]Microsoft 2000 Annual Report for the fiscal year ending on June 30, 2000, stated that "On June 30, 2000, warrants to put 157 million shares were outstanding with strike prices ranging from $70 to $78 per share. The put warrants expire between September 2000 and December 2002." Using average stock price for this period of $58.85 and the mean strike price of $74, if the options were allowed to expire, Microsoft would have lost $2.4 billion. In the worst case scenario, using a strike price of $78 and a share price of $41.50, Microsoft would have lost $5.7 billion.

not be the reason why financial intermediaries buy put options.

Moving to the second explanation of whether the company's managers suffer from overconfidence, we examine the abnormal stock performance. If the stock price abnormally goes down after the sale of the put options, then this decrease could be a sign of overconfidence. In contrast, if the stock price abnormally goes up (or stays the same) after the sale of the stock options, then overconfidence of the company's managers can be ruled out as an explanation for the transaction. We perform this test on a sample of 18 companies selling put options and find that after the initial sale, there is a 60-day cumulative abnormal (risk-adjusted) return of 10.4%. See Figure 1 for a graph of the cumulative abnormal returns. Jenter, Lewellen, and Warner (2011) perform a similar analysis on a larger sample of companies selling put options (137 versus 53 companies) by using both initial and subsequent put sales and find corroborative evidence. Therefore, we rule out the explanation that intermediaries exploit manager's overconfidence. In addition, most of the options expired worthless as shown in Table 1. If the companies' overconfident managers were being exploited, this would not be the case.

<< Insert Figure 1 here >>

The third explanation postulates that intermediaries buy information not put options; that is, managers possess private information regarding the company's future prospects and sell put options only when they have favorable information. The financial intermediaries lose money on the put options, but acquire valuable information about the company's future stock performance. We postulate that these transactions create a separating equilibrium in which only managers with positive outlooks sell the put options.

In this paper, we test the extent to which this third explanation accurately describes the motivation of financial intermediaries to purchase put options. We use a sample of 53 companies that sold put options on their own stock in the period from 1992 to 2000. We find evidence from observing structural breaks in the stock price that the put-option sales caused an endogenous change in price. Likewise, we study volume data and find additional support, this time that intermediaries might be trading slightly before the completion date until right after the structural break in the stock price. Our empirical evidence demonstrates that the financial intermediaries are wisely making use of their gained information by accumulating shares of the companies issuing the put options. Furthermore, we provide the example of Premisys for which the intermediary bought $1.75 million worth of put options and possibly gained more than $80 million by buying Premisys stock around the time of this transaction.

The paper is organized as follows. In the next section, we present a theoretical model that explains the informational content of put options. In Section II, we describe the data. In Section III, we analyze the risk-adjusted abnormal returns, abnormal volume, tests for structural breaks in both series, and the potential profits for the intermediaries. Section IV presents policy implications and the conclusion.

I Theoretical Model

The reason that financial intermediaries are willing to trade with better informed parties is that while they lose in the transaction, they gain private information from the companies. If true, this reasoning requires that depending on their information about their future value, companies make different decisions. In other words, the companies must be in a separating equilibrium. In this section, we demonstrate how this is possible. For simplicity we assume that the future value can be one of two types: high or low. The high-value company is willing to sell put options at a specified premium and strike price, while the low-value company is not willing to sell options under these conditions.

A Example

In this subsection, we provide a basic example of how the separating equilibrium occurs before proceeding to a more general two-type model with two possible outcomes. For completeness, we provide a two-type signaling model with a distribution of values in the Appendix.

A company has one project that has an uncertain value v. This is the entire worth of the company. The company receives a signal about the distribution of the value of the project. The signal can be h (high) or ℓ (low) with equal probability. If the signal is h, then there is a $\frac{4}{5}$ chance that the company is worth $\$200,000$ (a high value) and a $\frac{1}{5}$ chance it is worth $\$100,000$ (a low value). If the signal is ℓ then there is a $\frac{1}{5}$ chance the company is worth \$200,000 and a $\frac{4}{5}$ chance it is worth \$100,000. There are 1,000 shares of stock.

As is, the stock price is \$150. Now assume that the company sells 500 put options for a combined premium of \$10,000 with a strike price of \$150. As a function of value, the stock price must satisfy:

$$s = \frac{v + 10,000 - 500 \cdot \max\{150 - s, 0\}}{1000}. \tag{1}$$

If $v \geq 140,000$, then the equilibrium price is $s = \frac{v}{1000} + 10$. On the other hand, if $v \leq 140,000$, then $s = \frac{v}{1000} + 10 - 75 + \frac{s}{2}$. This last equation can be simplified to $s = \frac{v}{500} - 130$. Thus, with a high value the stock is worth $s = 210$ and with a low value the stock is worth $s = 70$.

A company with a signal of h has an expected stock price before the sale of $E[s] = \frac{4}{5}200 + \frac{1}{5}100 = 180$ and after the sale of $E[s] = \frac{4}{5}210 + \frac{1}{5}70 = 182$. Therefore, it is worthwhile to sell the put options. A company with a signal of ℓ has an expected stock price before the sale of $E[s] = \frac{1}{5}200 + \frac{4}{5}100 = 120$ and after the sale of $E[s] = \frac{1}{5}210 + \frac{4}{5}70 = 98$. Therefore, the options are not worth selling. See Appendix B for a graphical representation of this analysis.

Hence, we can have a separating equilibrium in which only companies that receive a high signal sell put options. In such an equilibrium, the company selling the put options, on average, makes a strict gain from the sale.

B Two-type Model with Two Outcomes

We now proceed to generalize the basic example into a two-type signaling model with two possible outcomes. Again, there is a company that has an uncertain value v. The company gets a signal, h (high) or ℓ (low), about the distribution of its value. If the signal is h, then there is a $\theta > 1/2$ chance the company is worth v_h (a high value), and a $(1-\theta)$ chance it is worth v_ℓ (a low value) where $v_h > v_\ell$. If the signal is ℓ then there is a $(1-\theta)$ chance the company is worth v_h, and a θ chance it is worth v_ℓ. There are N_s shares of stock.

If a company sells N_p put options for the premium price p each with a strike price of x where $p < x$, then as a function of value the stock price (if positive) must satisfy:

$$s = \frac{v + pN_p - N_p \max\{x - s, 0\}}{N_s}. \tag{2}$$

There is a cutoff value $v^* = xN_s - pN_p$ below which the option is in the money.

If $v \geq v^*$, then a price of $s = \frac{v+pN_p}{N_s}$ is an equilibrium price. On the other hand, if $v \leq v^*$ then

$$s = \frac{v}{N_s} + \frac{N_p}{N_s}(p - x + s) \tag{3}$$

Solving for s yields

$$s = \frac{v + N_p(p - x)}{N_s - N_p} \tag{4}$$

Thus, we can make the following assumptions:

Assumption A1: $v_\ell \leq xN_s - pN_p \leq v_h$ *(the cutoff is between the high and low values).*

This assumption avoids the trivial cases where the options are always out of the money and the investment bank would never want to buy them or always in the money and the company would never want to sell them. Thus, in a high state the stock is worth $s = \frac{v_h + pN_p}{N_s}$ and in a low state the stock is worth $s = \max\{\frac{v_\ell + N_p(p-x)}{N_s - N_p}, 0\}$.

Assumption A2: $xN_p \leq v_\ell + pN_p$ *(no bankruptcy in the low state).*

The ensures that the maximum liability for the put options is less than the value of the company in the low state including the premiums.

A company with a signal of h would then have an expected stock price before the sale of $\theta \frac{v_h}{N_s} + (1-\theta)\frac{v_\ell}{N_s}$ and after the sale of $\theta \frac{v_h + pN_p}{N_s} + (1-\theta)\frac{v_\ell + N_p(p-x)}{N_s - N_p}$. A company with a signal of ℓ before the sale of the put option might have an expected stock price of $(1-\theta)\frac{v_h}{N_s} + \theta \frac{v_\ell}{N_s}$ and after the sale of the put option of $(1-\theta)\frac{v_h + pN_p}{N_s} + \theta \frac{v_\ell + N_p(p-x)}{N_s - N_p}$. Hence, we can have signaling via a separating equilibrium if

$$\theta \frac{v_h}{N_s} + (1-\theta)\frac{v_\ell}{N_s} \leq \theta \frac{v_h + pN_p}{N_s} + (1-\theta)\frac{v_\ell + N_p(p-x)}{N_s - N_p}, \quad (5)$$

$$(1-\theta)\frac{v_h}{N_s} + \theta \frac{v_\ell}{N_s} \geq \theta \frac{v_h + pN_p}{N_s} + (1-\theta)\frac{v_\ell + N_p(p-x)}{N_s - N_p}. \quad (6)$$

These conditions can be simplified to

$$0 \leq \theta \cdot p + (1-\theta)\frac{v_\ell + N_s(p-x)}{N_s - N_p}, \quad (7)$$

$$0 \geq (1-\theta)p + \theta \frac{v_\ell + N_s(p-x)}{N_s - N_p}. \quad (8)$$

This discussion leads to the following proposition:

Proposition 1 *Under A1 and A2, a separating equilibrium exists if and only if*

$$\frac{\theta}{1-\theta} \geq \frac{N_s(p-x)-v_\ell}{(N_s-N_p)\,p} \geq \frac{1-\theta}{\theta}. \tag{9}$$

For a separating equilibrium to exist, we need $N_s > N_p$ (i.e., the number of put options sold should strictly be smaller than the number of shares outstanding). This is consistent with the way that the boards of directors authorize put-option sales for ongoing open market repurchase programs. Also higher premiums p might require a higher strike price x, in order to maintain the possibility of the separating equilibrium. This is clear because a company with a low signal would be more inclined to sell put options with a higher premium p and a higher strike price x may be necessary to deter them from doing so. Further, we see that a smaller value in the low state v_ℓ might require a higher premium p and/or lower strike price x in order to maintain the possibility of the separating equilibrium. A smaller value in the low state (when the option is in the money) would make the expected value of the option higher; hence, the option should command a higher premium (or be adjusted by a lower strike price).

This model shows that financially strong companies are rewarded for selling put options and certifying their quality, while financially weak companies choose not to participate because of large expected financial penalties. This is an unusual way of communicating information. In most examples of separating equilibria, a strong player must expend effort or spend cash in order to convey his or her strength. Here, the company communicates its strong financial future and at the same time it receives a cash flow for certifying its quality rather than enduring a cost from its action. Even with this reward to the strong company for issuing the put options, the financially weak company finds this issuance expensive to mimic.

II Data and Summary Statistics

A Data Sources

We search for all companies that sold put options from January 1988 through December 2000 by using 10-K and 10-Q statements available on the Lexis-Nexis® database for the whole period and on the SEC EDGAR filings database from January 1994 through December 2000.[8] We find 383 companies that had at least one of the key phrases in at least one of their financial reports. Of these, we drop companies that sold put options only on interest rate, foreign exchange, and/or debt securities. We are left with 53 companies that used their own stock as the underlying asset in the issuance of put derivatives. These 53 companies came from 34 industries as indicated by their four-digit SIC codes.

[8]The period encompasses the years over which companies are actively selling puts on their own stocks (see Gyoshev (2001), Gyoshev et al. (2012) and Jenter et al. (2011)). Therefore, we terminate our search period in 2000 because companies suspended their programs with the development of the prolonged bear market beginning in 2000. Although the Lexis-Nexis® database started collecting the 10-K and 10-Q statements in 1988, the first company with a put options sale that we found was IBM in 1992. On the other hand, the SEC EDGAR filings database stated from January 1994. We searched for the following phrases: "put derivative", "put option", "equity put", "put feature", "stock put", "put provision", "put the shares", "sale of put", "sold put", "put sold", "put warrants", or "rights to put."

B Transaction Dates

Only ten of the 53 companies reported the exact date on which they sold put options for the first time. In order to find the date in the remaining cases, we look through all 10-K and 10-Q statements for references to the option expiration. Based on these references, we were able to infer an exact date for an additional eight companies. Similarly, 11 companies reported the month when they sold put options, and we inferred the month for an additional 16 companies. Four companies reported only the quarter, while the remaining five companies reported only the year when they first issued put options.

The put contracts for which we know the exact date have the expiration date set 3, 6, 9, 12, 18, and 24 months after the sales. Using this knowledge, we are able to infer the date for other companies through combining information from different 10-Q and/or 10-K reports. For instance, the Clorox 10-Q report for the quarter ending on December 31, 1993, states that Clorox sold put options in the "first fiscal quarter of 1994" (between 7/1/93 and 9/30/93), while the Clorox 10-Q report for the quarter ending on March 31, 1994, states that "all put warrants expired unexercised by February 22, 1994." Therefore, we conclude that the date on which the contact was signed is six months prior to the expiration on August 22, 1993, since that is the only possible date that was within the specified dates and it fits one of the possible customary contract lengths.

This method allows us to infer the exact date for another eight companies. In addition, by using the 10-K and 10-Q reports for 20 companies, we are able to identify at least the quarter that the put-option sale was made. In 16 of those, we are able to accurately estimate the month by combining information form different 10-Q and 10-K reports in a manner similar to that described above.

C Summary Statistics

In Table I, we report several summary statistics for the put options issued by our sample companies. The majority of the companies, 32 of 53, issued European-style put options; only 11 issued American-style. Because only American-style options can be traded on the CBOE, it seems that very few of the companies intended to place their put options publicly. Supporting this conjecture, the ability of the companies to buy back the options also makes them nonstandard and hence not tradable on the CBOE. This is directly confirmed by looking at the second column of Table I in which we report the type of buyers disclosed in the financial statements. Only one company discloses that it sold the put options publicly on an exchange. The rest sold their options to private counter-parties. In most cases the identity of the buyer is not disclosed, but if disclosed, the buyer is usually either an investment bank or another institutional investor. More than 40% of the companies that disclose the maturity of the options issue long-term put options with maturities greater or equal to one year.

<< Insert Table I here >>

We report the descriptive statistics of the time until disclosure in the fourth column of Table I. The median time from the date of the option sale to the date it is disclosed in the companies' financial statements is 99 days, while the average is 186 days. Only one company announced its intent to sell put options in advance of the deal. The maximum time between deal transaction and announcement is a staggering 1,561 days, or more than four years.

Further, we report the extent to which the options are exercised or expired. Most of the options expired out of the money. In only two cases do companies state that all options were exercised, while in 32 cases all options expired out of the money. In eight cases, the issuers took advantage of the early settlement option (including Microsoft); and in two cases, some options were exercised and some expired. Five of the companies did not report the outcome, which indicates that the put options expired worthless as otherwise they would have been reported as material.

III Empirical Results

A Abnormal Stock Performance

Table II reports the average cumulative abnormal returns (CAR) for the issuing companies with an identifiable date for their first put-option sale. Even though as shown in Table I the put-option sale is reported after more than six months, the average CAR for a two-day window after the date of the sale is slightly more than 2%. (This is statistically significant at the 5% level despite the small sample size.) Moreover, the CAR for the 60-day window is 9.08% and is also statistically significant at the 5% level. Our findings of positive and large stock performance after the put-option sale are consistent with both companies expecting superior future performance and financial intermediaries trading on this information immediately after the put-option sales.[9]

<< Insert Table II here >>

Furthermore, a large negative performance exists in the 60-day period before the put-option sale. Our understating from speaking with practitioners is that the sale of put options is a long drawn-out process that takes between one and three months. As we indicated in the model section, the company managers engage in selling put options only if they feel the stock is undervalued. From the moment that negotiations of a put-option sale are initiated until just before the completion date, the random-walk nature of the stock prices gives us three basic scenarios: the stock could go up, down, or stay at the current price level. Once the sale is near completion, the managers still consider the sale only in the latter two scenarios. Hence, because the stock performance of those companies that have begun negotiations might go up during the negotiations, conditional on the sale, the stock's performance should be negative. This is a form of survivorship bias. This negative

[9] The one-year buy-and-hold abnormal return is computed by using the Lyon, Barber, and Tsai (1999) method and is 11.67% with a p-value of 0.03045.

stock performance is also consistent with Stephens and Weisbach (1998) who find that share repurchases are negatively related to prior stock-price performance.

B Abnormal Stock Trading Volumes

Abnormal trading volumes perhaps positively influence the stock price and generate the positive abnormal returns in the short event windows. Figure 2 is generated by taking each company's daily volume and dividing it by the daily volume on day -60. This method normalizes the average volume across this time period to one. We then take the average of these adjusted volumes over all 18 companies. This method is a crude way to examine trading volume while treating each company equally independent of its size. The graph shows volume increasing before the transaction date and staying relatively high until about ten days after the transaction date before drifting down further. Consequently, we surmise that most of the increased volume occurs before stock price starts increasing. This increased volume could be a sign that intermediaries are accumulating shares as the transaction is becoming more likely and doing so to a large extent without revealing their hand.

<< Insert Figure 2 here >>

The cumulative abnormal relative volume in Table III shows a similar story.[10] Although overall volume significantly decreases from days -60 to -1, the volume is abnormally high

[10] See Ajinkya and Jain (1989), Campbell and Wasley (1996) and Cready and Ramanan (1991) for how abnormal trading volume is computed.

from (-10,-1). It remains high between 0 and 10 days. The overall abnormal volume does not remain statistically significant if we extend it from 10 to 30 days.

<< Insert Table III here >>

C Structural Breaks in Stock Prices

We test if a structural break exists, that is, a sharp unexpected directional change in the trend of the stock prices. Such a structural break will be an indication that there is endogenous change produced by the sale of the put options. Therefore, in this subsection, we follow Andrews (1993) and Andrews and Ploberger (1994) to test for an endogenous structural break in stock prices. We compute the bootstrapped p-value following Hansen (2000).

We start by testing for a structural break in the average abnormal returns of the 18 companies on the exact date of the put-option sales. As reported in Panel A of Table IV, the Chow (1960) breakpoint test rejects the null hypothesis that no structural break exists at the exact date at the 1% level ($p = 0.0022$).

<< Insert Table IV here >>

To better understand the nature of this structural break, we try to find the most likely structural break point over the range from days -25 to 25 making use of stock prices from days -60 to 60 (under the assumption of at most one structural break). Panel B in Table IV reports our finding that the structural break is seven days after the sale of the put options. The p-values for the SupF statistics (Andrews (1993)) as well as for the ExpF and AveF statistics (Andrews and Ploberger (1994)) are statistically significant at the 5% level. Hence, we conclude that the financial intermediary is not only trading on information, but doing it skillfully and not making it immediately transparent to the market.

For robustness, we test for a structural break in Panels C and D of Table IV for the ten companies with reported sales dates only and also find that the break remains seven days afterwards (but it is not statistically significant). When we test for a structural break in the eight remaining companies with inferred transaction dates, we find the structural break is at the day of the sale and is significant at the 5% level. This gives us confidence in our technique for inferring transaction dates.

Overall, the timing and the statistical significance of the structural break confirms a sharp unexpected directional change in the trend of the stock prices. Jenter et al. (2011) suggest instead that the market upswing is exogenous and that the company managers are using insider information to correctly time this upswing. The location of our structural break indicates that their timing seems to indeed be impeccable especially in the face of potentially long-lasting negotiations. However, another plausible explanation has the causality reversed. Rather than put sales being placed right before the upswing, the upswing is coming right after the put sale. The only source of such an upswing in this causality direction (given that the sales of the put options are still secret) is the financial intermediary that bought the put options is actively buying the stock. This finding supports our explanation that the reason why the financial intermediary participates is to gain and trade on information.

Furthermore, Jenter at al. (2011) state that "discussions with market participants suggest that such offers were extended to all large companies with share repurchase programs and high stock market liquidity." This statement points toward the timing being chosen by the financial intermediary rather than the put-selling company.

D Structural Breaks in Stock Trading Volumes

An analysis of trading volume around the event day most likely demonstrates in retrospect the extent to which an abnormal activity exists as a result of the private information of more informed financial intermediaries. As with stock prices, we test for structural breaks in trading volumes. Using similar techniques to those used for stock prices in subsection C, we test for a structural break in the stock volumes at the event day. We make adjustments for our sample companies by accounting for market volume and report three analyses for patterns of relative trading volumes.

Panel A of Table V reports a structural break, which is statistically significant at the 1% level with $p = 0.0001$ (for all methods we use). Panel B of the same Table shows the results of tests for structural breaks in the stock volumes for any day between -25 and 25 around the event day. We find that the most likely structural break is at day -19, which is statistically significant at the 1% level with $p < 0.0001$ (for all methods we use). In Panel B of Table V, we report a second structural break in the time frame of -19 to 60 at day

12, which is statistically significant at the 5% level with p = 0.0176 (for all methods we use). As explained above the put-sale negotiation process is a one to three month long process. The statistical results indicate that the financial intermediary starts trading on the information 19 days before the transaction is completed. This skillful trading does not change the trend of the stock price until seven days after the put-option sale where the stock price's structural break occurs. Shortly thereafter, the intermediary reduces purchases as indicated by the structural break in the volume at day 12 after the sale.

<< Insert Table V here >>

Overall these results support the existence of both an abnormal stock price and trading volume activity surrounding events of put-option sales to intermediaries.

E Potential Realized Profits from Trading on Information.

We have now shown that there was a structural break in stock prices and two structural breaks in volume (an increase followed by a decrease). We postulate that a financial intermediary might be making use of its private information gained from the purchase of the put option to accumulate shares of the underlying stock. Naturally, if indeed such an action is taking place, then what are the profits of the perpetrator? Of our 18 companies (out of the 53) for which we have accurate completion date information, 15 have increases in volume (around the transaction date) and three have decreases in volume. Of these 15 companies with increases in volume, 11 have price increases while four have price decreases.

As an example, one of the companies that has both an increase in volume and an increase in price is Premisys Communications Inc. Premisys disclosed its put transaction of September 15, 1999 on September 24, 1998 in their 10-K for the fiscal year ending on June 26, 1998. It was the only company that we are aware of that disclosed the precise number of put contracts. This disclosure allows us to compute the following example. Premisys sold 10,000 contracts of put options for $1.75 million at a strike price of $10.625 per share for 100 shares of their common stock "PRMS." If one entity accounted for the abnormal volume, then that entity would have made around $80 million.[11] If this entity was the financial intermediary that bought the options from Premisys, then it would have paid only $1.75 million for the information leading to this gain.

For all 11 companies with volume and price increases, the total potential profit is $717 million. For the three companies with volume increases and price decreases, the total potential loss is $70 million. Thus, a hypothetical intermediary could have made $647 million on these initial put purchases (net of put costs this should be close to 98% of the sum). While these are all on the initial put transactions, Gyoshev et al. (2012) show that in the case of Microsoft, the total expense paid on the put options on Microsoft increased more than 15 times form $49 million for the first sale to the $766 for the last sale for a total

[11] We compute the abnormal trading activity by multiplying the abnormal volume by the number of days of abnormal volume by the potential profit. We estimate the potential profit as the difference between the average stock price around the sale and the average stock price from 50 to 60 days after the sale. For Premisys, the average volume before the structural break was 595,934 per day the average volume around the put option sale between the two structural breaks in the volume series was 1,098,285, which gives as an abnormal volume of 502,351 for 31 days between the two structural breaks. The average price between the structural breaks was $9.27 and the average price between days 50 and 60 days after the sale was $14.34. So the difference is $5.07, which gives as abnormal profit of around $80 million.

of around $2 billion, indicating very high potential profits. Microsoft stock is more liquid than the Premisys stock implying the intermediaries should have been able to realize higher returns (which was 40 times the put premiums for Premisys). Thus, it is not unreasonably to estimate the intermediary profits in the hundreds of billions of dollars over the 137 companies that sold put options reported by Jenter et al. (2011).

IV Policy implications and concluding remarks.

Jenter et al. (2011) offer an explanation for why put sales are right before stock-price increases. Namely, that the managers are excellent at timing their put sales. We offer another plausible explanation: the put sales provide signaling and the financial intermediaries are making use of this information to purchase stocks thus increasing the stock price. In other words, the causation is in a different direction. We support the idea that put-option sales trigger stock price increases and trading volume increases, instead of stock prices causing the initiation of the put sales. We develop a theoretical model that explains how this triggering effect can occur and find empirical evidence in support of its explanation. Our results are robust even after adjusting stock prices for market risk and trading volume for market volume.

A financial intermediary that uses option purchases appears to bypass the illegal aspect from gaining insider information. Theoretically, a trader wants to gain insider information because this information allows the trader to predict stock-price movements and realize abnormal profits. In put-option purchases, intermediaries do not directly gain any insider performance information, but they do indirectly gain the view of the company's management on the future stock-price performance. Only the managers with positive outlooks are willing to sell put options to the intermediaries. Furthermore, these financial intermediaries have such information exclusively in their possession on average for more than six months, as per the current disclosure regulations.

Hence, from the policy perspective our results shed light on that absence of disclosure currently allowed in the US markets. The lack of regulations has allowed not only companies, but also financial intermediaries to profit from trading in company-issued derivatives at the expense of broad market participants. In the spirit of recent trends to improve company disclosure, one clear solution to the incentive problem for financial intermediaries is to mandate full and immediate disclosure of all put-option sales pursued by companies.

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Appendix A. Two-type model with continuous distribution of outcomes

The value of the company is distributed according to the distribution F_i where the information i is either ℓ or h. The number of shares is N_s. The number of put options is N_p. We must have $N_p < N_s$. The strike price is x. The premiums that the company receives for the sale of the options is $p \cdot N_p$. For each realized value, the share price (if positive) satisfies

$$s = \frac{v + pN_p - N_p \max\{x - s, 0\}}{N_s}. \tag{A1}$$

The cutoff value v^* is such that companies with values below v^* have put options in the money. The cutoff value satisfies:

$$x = \frac{v^* + pN_p}{N_s}. \tag{A2}$$

This implies $v^* = xN_s - pN_p$. The value v^* must be positive since $N_s > N_p$ and $p \leq x$ (one cannot sell put options for more than their maximum possible value).

Therefore, the share price with options $s_p(v)$ as a function of value is

$$s_p(v) = \begin{cases} \max\{\frac{v-(x-p)N_p}{N_s-N_p}, 0\} & \text{if } v < v^*, \\ \frac{v+pN_p}{N_s} & \text{otherwise.} \end{cases} \tag{A3}$$

Proposition 2 *A separating equilibrium exists if and only if* $E[s_p(v)|i=h] \geq E[\frac{v}{N_s}|i=h]$ *and* $E[s_p(v)|i=\ell] \leq E[\frac{v}{N_s}|i=\ell]$.

This is equivalent to the following two conditions:

$$\int_{N_p(x-p)}^{xN_s-pN_p} \frac{v+N_p(p-x)}{N_s-N_p} dF_h + \int_{xN_s-pN_p}^{\infty} \frac{v+pN_p}{N_s} dF_h \geq \int_0^{\infty} \frac{v}{N_s} dF_h \tag{A4}$$

$$\int_{N_p(x-p)}^{xN_s-pN_p} \frac{v+N_p(p-x)}{N_s-N_p} dF_\ell + \int_{xN_s-pN_p}^{\infty} \frac{v+pN_p}{N_s} dF_\ell \leq \int_0^{\infty} \frac{v}{N_s} dF_\ell \tag{A5}$$

or

$$\int_{N_p(x-p)}^{xN_s-pN_p} \frac{N_p v+N_sN_p(p-x)}{(N_s-N_p)\,N_s} dF_h + \int_{xN_s-pN_p}^{\infty} \frac{pN_p}{N_s} dF_h \geq \int_0^{N_p(x-p)} \frac{v}{N_s} dF_h \tag{A6}$$

$$\int_{N_p(x-p)}^{xN_s-pN_p} \frac{N_p v+N_sN_p(p-x)}{(N_s-N_p)\,N_s} dF_\ell + \int_{xN_s-pN_p}^{\infty} \frac{pN_p}{N_s} dF_\ell \leq \int_0^{N_p(x-p)} \frac{v}{N_s} dF_h \tag{A7}$$

Appendix B. Figure Visualizing the Model

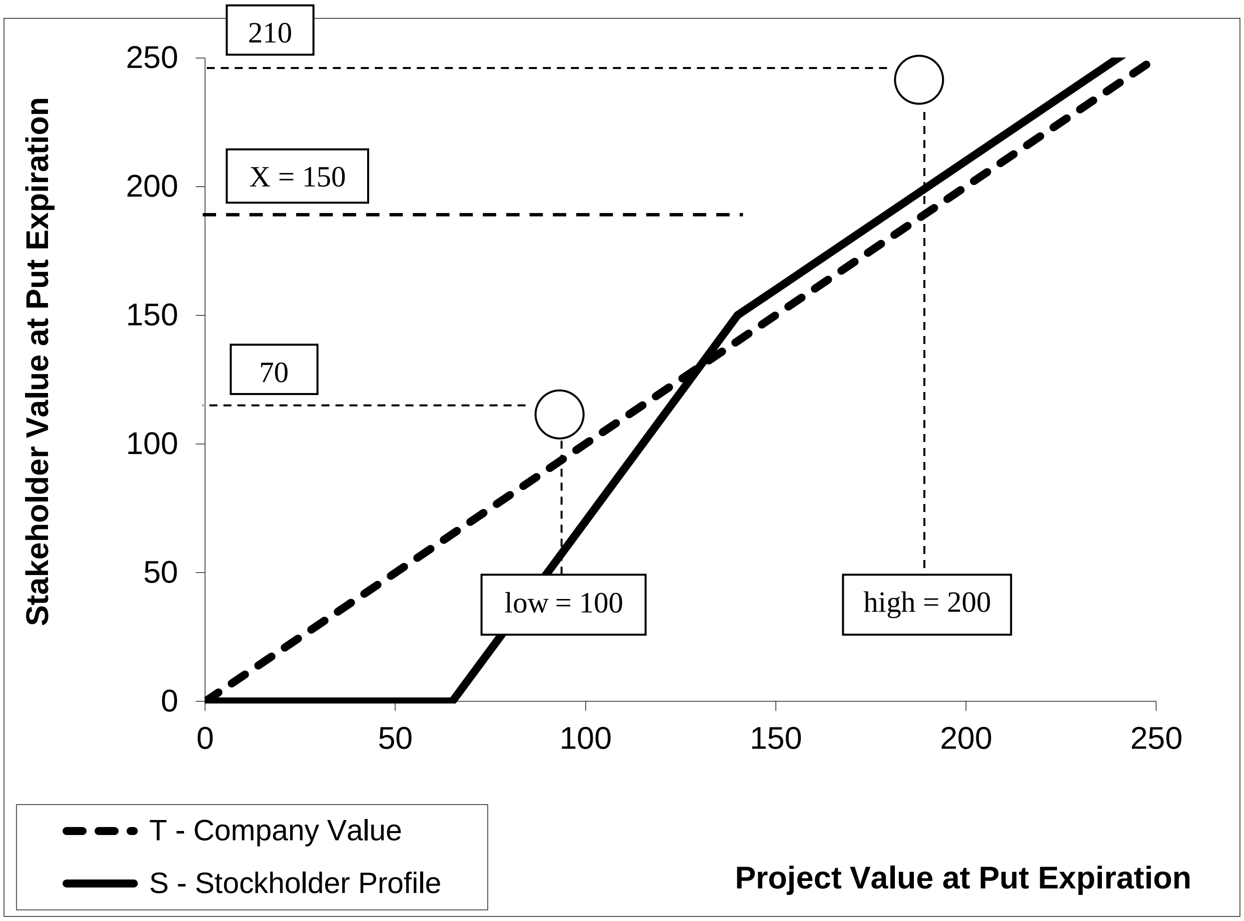

Figure Visualizing the Model: Stakeholder value at put expiration. Stakeholder Value at Put Expiration is the value accorded to each stakeholder at put expiration; Project Value at Put Expiration is the value that the only project of the company will have at the time of put expiration; T -- Company Value is the value accorded to a stockholder if the company does not sell put options; S -- Stockholder Profile is the outcome profile for a stockholder of a company that has sold put options on its own stock.

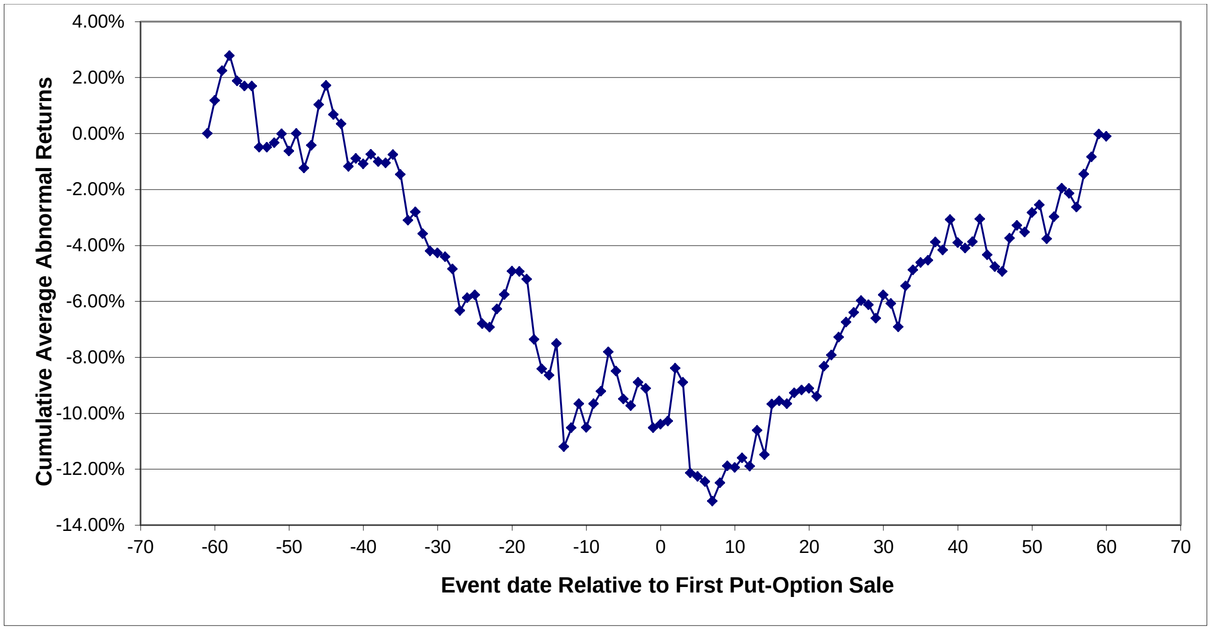

Figure 1. Cumulative average abnormal returns for put-option issuers from trading days –60 to +60 relative to the first put-option sale. We compute the cumulative average abnormal returns using the market model. The market model parameters are estimated using a window from 180 to 61 days before the event date, which is the day of the put-option sale. We use the CRSP value-weighted portfolio as our proxy for the market. We include only the ten companies that disclose the exact date when they sold put options for the first time and the eight companies for which the date can be inferred as explained in the data section.

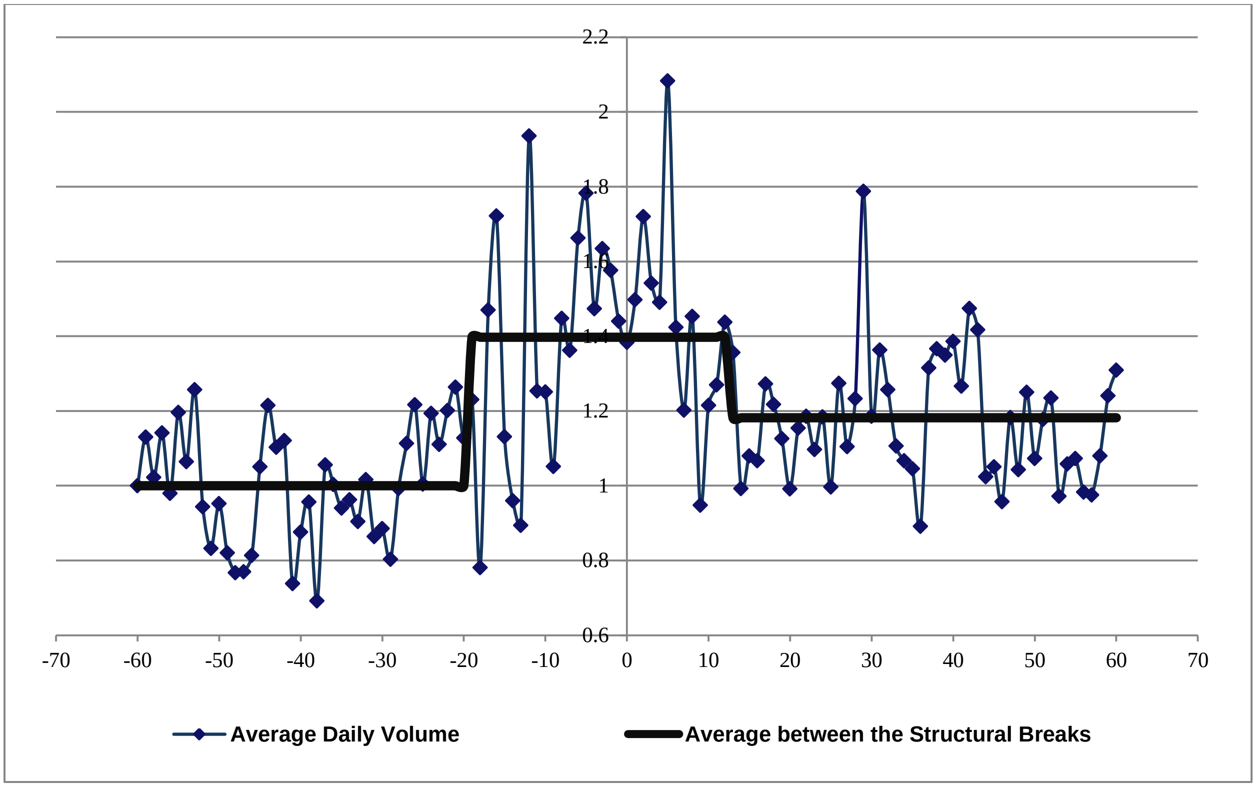

Figure 2. Trading volumes for put-option issuers from –60 to +60 days relative to the put-option sale date. The event date, day 0, is the day of the put-option sale. All volumes are normalized by taking each company's daily volume and dividing it by the daily volume at day -60. The "Average Daily Volume" is the adjusted volumes over all 18 companies (ten companies with the exact put sales date and eight companies for which the date can be inferred). The "Average between the Structural Breaks" is the average weighted volume over the periods separated by the structural breaks in the volume series at days -19 and 12.

Table I
Summary Statistics of the Put-Option Contracts

The IB with ID denotes the cases in which the exact identity of an investment bank is reported as a buyer. The IB no ID denotes the cases where the companies only state that the buyer is an investment bank. Only ten of the 53 companies report the exact date on which they have sold put options for the first time. Based on references to option expiration in other 10-Q and/or 10-K forms, we are able to infer an exact date for an additional eight companies. Eleven companies report only the month when they sold put options, and we infer the month for an additional 16 companies. In order to compute the number of days till disclosure, we assume in these cases that the date is in the middle of the month. Four companies report only the quarter. For these companies we assume that the date is the middle of the quarter. The remaining five companies report only the year when they first issued put options, and we report these as N/A.

For the whole program						For the first put option sale			
Option Type # of companies		Buyer Type # of companies		Option Outcome # of companies		Option Maturity # of companies		Days till Disclosure # of days	
European	32	IB with ID	5	Expired Worthless	32	Below six months	13	Average	186
American	11	IB no ID	1	Last Tranche Settled	6	Between six month and one year	13	Median	99
Both A & E	1	Financial Intermediary	1	Last Tranche Exercised	8	Exactly one year	9	Minimum	-5
Exotic	1	Independent third party	14	All Exercised	2	Greater than one year	11	Maximum	1,561
N/A	8	Private placement	16	N/A	5	N/A	7	N/A	5
		N/A	14						
		Open market	1						
		Investment Trust	1						

Table II
Cumulative Abnormal Returns around the Put-Option Sale

The CAR denotes the cumulative abnormal returns. We compute the CARs by using a market model. The market model parameters are estimated using a window from 180 to 61 days before the event date, which is the day of the put-option sale. We use the CRSP value-weighted portfolio as our proxy for the market. We include only 18 companies (ten companies with the exact put sales date and eight companies for which the date can be inferred). We report the CARs for ten different event windows: from 60 days to one day before the put-option sale, i.e., (-60, -1); from 30 days to one day before the put-option sale (-30, -1); from 10 days to one day before the put-option sale (-10, -1); from the day of the sale to one day after (0, 1); from the day of the sale to two days after (0, 2); from the day of the sale to three days after (0, 3); from the day of the sale to ten days after (0, 10); from the day of the sale to 20 days after (0, 20); from the day of the sale to 30 days after (0, 30); and from day 0 to 60 days after (0, 60). The *p*-value for the *t*-test that the average CAR equals zero and a Wilcoxon Rank test for the median are in parenthesis. The % Positive (Negative) is the percentage of companies with positive (negative) CARs during the corresponding event window.

Event Window	Average CAR %	Median CAR %	% Negative	% Positive
(-60,-1)	-9.21*** (0.0034)	-7.65** (0.0494)	66.7	33.3
(-30,-1)	-5.00** (0.0131)	-3.18 (0.1846)	55.6	44.4
(-10,-1)	-0.41 (0.1410)	-0.94 (0.3994)	50.0	50.0
(0,1)	0.29 (0.1488)	1.14 (0.2212)	27.8	72.2
(0,2)	2.01** (0.0198)	2.12 (0.0269)	33.3	66.7
(0,3)	1.49* (0.0646)	1.66 (0.1061)	33.3	66.7
(0,10)	-1.39 (0.4301)	3.48 (0.1144)	33.3	66.7
(0,20)	1.98 (0.1155)	4.88** (0.0770)	38.9	61.1
(0,30)	4.3 (0.1131)	4.58* (0.0649)	33.3	66.7
(0,60)	9.08** (0.0441)	3.40* (0.0649)	33.3	66.7

Table III
Cumulative Abnormal Relative Volume around the Put-Option Sale

The CARV denotes the cumulative abnormal relative volume for only the 18 companies (ten companies with the exact put sales date and eight companies for which the date can be inferred). We compute the abnormal trading volume by following Ajinkya and Jain (1989), Campbell and Wasley (1996) and Cready and Ramanan (1991). We report the CARVs for the same ten event windows as in Table II plus 3 additional windows corresponding to the windows defined by the structural breaks in Table 5. The *p*-value for the *t*-test that the average CARV equals zero and a Wilcoxon Rank test for the median are in parenthesis. The % Positive (Negative) is the percentage of companies with positive (negative) CARs during the corresponding event window.

Event Window	Average CARV %	Median CARV %	% Negative	% Positive
(-60,-1)	-828.19*** (0.0001)	-783.78 (0.1061)	61.1	38.9
(-30,-1)	-83.7 (0.388)	45.08 (0.4831)	50.0	50.0
(-10,-1)	136.88*** (0.0001)	126.22 (0.1323)	38.9	61.1
(0,1)	46.43*** (0.0034)	27.12* (0.0708)	33.3	66.7
(0,2)	64.54*** (0.0021)	55.22 (0.1231)	38.9	61.1
(0,3)	81.6*** (0.0018)	68.33 (0.1419)	44.4	55.6
(0,10)	130.32** (0.0165)	52.4 (0.2212)	44.4	55.6
(0,20)	120.35 (0.1012)	-45.44 (0.4661)	55.6	44.4
(0,30)	127.85* (0.0958)	-68.94 (0.383)	66.7	33.3
(0,60)	-94.1 (0.1862)	-242.95 (0.3669)	55.6	44.4
(-60,-19)	-929.07*** (0.0001)	-990.76*** (0.0069)	72.2	27.8
(-19,12)	218.20*** (0.0056)	148.97 (0.2899)	55.6	44.4
(12,60)	-240.56** (0.0165)	-533.48 (0.2475)	80.0	20.0

Table IV
Tests for a Structural Break in the Cumulative Abnormal Returns around the Put-Option Sale

The CAR denotes the cumulative abnormal returns. We compute the CARs by using a market model. The market model parameters are estimated using a window from 180 to 61 days before the event date, which is the day of the put-option sale. We use the CRSP value-weighted portfolio as our proxy for the market. We include only 18 companies (ten companies with the exact put sales date and eight companies for which the date can be inferred). We follow Andrews (1993) and Andrews and Ploberger (1994) to test for an endogenous structural break in stock prices. We compute the bootstrapped *p*-value following Hansen (2000). Panel A tests for a structural break in the average abnormal returns of the 18 companies on the exact date of the put-option sales. Panel B finds the most likely structural break point over the range from days -25 to 25 making use of stock prices from days -60 to 60 (under the assumption of at most one structural break). For robustness, in Panel C, we test for the structural break with only the ten companies with reported sales dates. Panel D tests for the structural break of the eight remaining companies with inferred transaction dates.

Panel A: Tests for a structural break at the event date in the cumulative abnormal returns around the put-option sale of the 18 companies

Null Hypothesis:	No breaks at specified breakpoints		
Chow Breakpoint Test:	0		
Equation Sample:	1,121		
Varying regressors:	All equation variables		
F-statistic	9.764534	Prob. F(1,119)	0.0022
Log likelihood ratio	9.542293	Prob. Chi-Square(1)	0.0020
Wald Statistic	9.764534	Prob. Chi-Square(1)	0.0018

Panel B: Tests for a structural break at any date during the event period in the CARs around the put-option sale of the 18 companies

Estimated Breakpoint (index): (Day 0 is the Event date)	7			
Percentage of Sample:	0.561983			
Bootstrap Replications:	5000			
	Test Statistic	Andrews *P*-value	Bootstrap *P*-value	Hetero-Corrected *P*-value
SupF	7.352160	0.050764	0.046600	0.040800
ExpF	2.252957	0.038070	0.036600	0.030200
AveF	3.881367	0.030671	0.029400	0.018200

Panel C: Tests for a structural break at any date during the event period in the CARs around the put-option sale of the ten companies with disclosed sale dates				
Estimated Breakpoint (index):		7		
(Day 0 is the Event date)				
Percentage of Sample:		0.561983		
Bootstrap Replications:		5000		
	Test Statistic	Andrews *P*-value	Bootstrap *P*-value	Hetero-Corrected *P*-value
SupF	3.747035	0.268700	0.251800	0.253800
ExpF	0.940642	0.194738	0.210000	0.196000
AveF	1.687371	0.170027	0.180800	0.155400

Panel D: Tests for a structural break at any date during the event period in the CARs around the put-option sale of the eight companies with inferred sale dates				
Estimated Breakpoint (index):		0		
(Day 0 is the Event date)				
Percentage of Sample:		0.504132		
Bootstrap Replications:		5000		
	Test Statistic	Andrews *P*-value	Bootstrap *P*-value	Hetero-Corrected *P*-value
SupF	6.133544	0.089607	0.0838	0.0654
ExpF	1.913732	0.056954	0.0590	0.0514
AveF	3.188776	0.051351	0.0532	0.0442

Table V
Tests for a Structural Break in the Cumulative Abnormal Relative Volumes around the Put-Option Sale

The CARV denotes the cumulative abnormal relative volume. We compute the abnormal trading volume following Ajinkya and Jain (1989), Campbell and Wasley (1996), and Cready and Ramanan (1991) for the 18 companies (ten companies with the exact put sales date and eight companies for which the date can be inferred). We follow Andrews (1993) and Andrews and Ploberger (1994) to test for an endogenous structural break in stock prices. We compute the bootstrapped *p*-value following Hansen (2000). Panel A tests for a structural break in the stock volumes at the event day. Panel B tests for a structural break in the stock volumes for any day between -25 and 25 around the event day. In Panel B, we find a structural break at day -19, which divided the whole sample into two subsamples: form days -60 to -20 and from days -19 to 60. In Panel C, we apply the structure break test on the second subsample of -19 to 60. We find a second structural break of the CARV around the put-option sale after the First Structural Break point on day 12.

Panel A: Tests for a structural break at the event date of the CARV around the put-option sale of the 18 companies

Null Hypothesis:	No breaks at specified breakpoints		
Chow Breakpoint Test:	0		
Equation Sample:	1,121		
Varying regressors:	All equation variables		
F-statistic	16.29990	Prob. F(1,119)	0.0001
Log likelihood ratio	15.53280	Prob. Chi-Square(1)	0.0001
Wald Statistic	16.29990	Prob. Chi-Square(1)	0.0001

Panel B: Tests for a structural break at any date of the CARV around the put-option sale of the 18 companies

Estimated Breakpoint (index): (Day 0 is the Event date)	-19			
Percentage of Sample:	0.347107			
Bootstrap Replications:	5000			
	Test Statistic	Andrews *P*-value	Bootstrap *P*-value	Hetero-Corrected *P*-value
SupF	66.440340	0.000000	0.000000	0.000000
ExpF	29.758617	0.000000	0.000000	0.000000
AveF	23.648257	0.000000	0.000000	0.000000

Panel C: Tests for a second structural break of the CARV around the put-option sale of the 18 companies at any date after the first structural break

Estimated Breakpoint (index):		12		
(Day 0 is the Event date)				
Percentage of Sample:		0.400000		
Bootstrap Replications:		5000		
	Test Statistic	Andrews P-Value	Bootstrap P-Value	Hetero-Corrected P-Value
SupF	15.539198	0.002301	0.002200	0.017600
ExpF	5.344512	0.000088	0.001200	0.009600
AveF	8.167059	0.000020	0.000400	0.000600