

Why Financial Intermediaries Buy Put Options from Companies*

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Abstract

In the 90s, firms collected billions of dollars from the sale of put options written on their own stock. We formulate two hypotheses about the motivation of financial intermediaries to purchase such options from the issuing companies. The first hypothesis states that the intermediaries intend to exploit executive overoptimism by offering to buy put options at lower premium. Under the other hypothesis, which we develop in a theoretical model, the intermediaries agree to trade with companies with superior information and willingly lose on such trades. Because these trades are not publicly disclosed, the financial intermediaries gain valuable information about the future performance of the put issuers and can earn profits on this information. We document in a sample of 53 firms that have sold put options on their own stock that the vast majority of issued put options expire without being exercised. The sample firms experience large positive abnormal stock and operating performance after the put option sale. These results suggest that the buyers of these options, most of which are financial intermediaries, lose money, which contradicts the executive overconfidence hypothesis and is consistent with our theoretical explanation that financial intermediaries gain non-public information in these deals. Based on our analysis we conclude that current lack of disclosure of put option trades by companies may allow them together with financial intermediaries to earn profits by informed trading.

1. Introduction

In February 1991, the Securities and Exchange Commission (SEC) issued a ruling in favor of a request submitted by the Chicago Board Options Exchange (CBOE) that effectively allowed publicly-traded firms to sell put options written on their own stock. One of the first companies to do so was IBM, which subsequently realized profits in 1992 of more than two million dollars from its put option sales (University of Virginia, Darden Case Study UVA- F-1009). The IBM example was followed on a much larger scale by companies like Microsoft. Microsoft, over a seven-year period, beginning in 1993, received over two billion dollars in total premiums from sales of puts including \$766 million in 1999 alone. Premiums from issuer-sold puts are treated as adjustments to retained earnings and are tax exempt. In almost all cases, the premiums are used by firms to repurchase shares in an ongoing stock repurchase program.

Although the original spirit of SEC ruling was to allow companies to issue put options publicly on an organized exchange like the CBOE, most issuers place their options privately with financial intermediaries such as investment banks and other qualified institutional buyers. Selling puts directly to financial institutions avoids the limitations set by CBOE on the maximum number of outstanding contracts allowed for issuing firms. Moreover, it is not uncommon for institutional investors to broach the firm with their interest in purchasing put options that the firm is willing to write. Strictly speaking, the transaction is a zero-sum game in which the two parties bet on the direction and magnitude of future stock price changes. And the outcomes appear strongly skewed in favor of the issuing firms, as almost all firm-written put options we examine have

expired out of the money. Therefore, it begs the question of why financial intermediaries are willingly participating in these transactions and even solicit them.

In this paper, we investigate the merits of two possible explanations. The first explanation argues that financial intermediaries are more sophisticated in pricing illiquid options than company managers. Corporate decisions can be influenced by executive overconfidence (Heaton (2002), Malmendier and Tate (2004)). Managers are more likely to sell put options when they are confident about the firm's future performance. Accordingly, intermediaries exploit any over-confidence company executives have for the future prospects of their firms and expect to make money on the firm's put options by winning the bet on the future stock price.

The second explanation posits that company managers possess private information regarding the future prospects of their companies and will sell put options only when they have favorable information. Therefore, sophisticated investors know that investing in the firm's put options is a losing proposition. Nevertheless, the willingness of managers to sell put options communicates private information, which a financial intermediary can exploit in the market if given a window of opportunity. Therefore, the firm's put options are initiated and transacted in private and not immediately announced to other market participants. The option premium tendered to the firm implicitly buys the intermediary the needed window of opportunity.

We test which of the two explanations better describes the motivation of financial intermediaries to purchase put options using a sample of 53 firms that sold put options on their own stock in the period from 1994 to 1999. Based on our empirical analysis we reject the executive overconfidence hypotheses. Our evidence suggests that financial

intermediaries knowingly lose money in put option deals in order to gain information about firm prospects and trade profitably on it.

Our results indicate that the lack of disclosure that is currently allowed by the U.S. regulations could allow not only companies, but also financial intermediaries to profit from trading in company issued derivatives at the expense of the broad market participants. In the spirit of recent trends to improve company disclosure, one easy solution to the incentive problem for financial intermediaries is to mandate full and immediate disclosure of all put option trades done by companies.

The remainder of the paper is structured as follows. The theoretical explanations why financial intermediaries participate in such deals are outlined in Section 2. Section 3 describes our sample and provides summary statistics. The results from empirical tests are in Section 4. Section 5 concludes.

2. Financial Intermediaries and Firm Written Put Options

The Chicago Board of Options Exchange was one of the main proponents of allowing companies to write put options on organized exchanges. Discussions between CBOE and SEC resulted in the commission issuing a ‘no action’ letter in February 1991, which allowed companies to sell put options under certain conditions. The SEC was originally reluctant to allow such practice because it was concerned that firms could take advantage of their private information by selling puts only when they expect superior future performance. In order to reduce opportunities for informed trading, the SEC mandated that all put options should be issued out of the money. The CBOE also added several other constraints to reduce the impact of option issuance on market liquidity. A

company could not have more than 8,000 contracts (representing 800,000 shares) open at any given time on the CBOE.

Following the SEC ruling, IBM pioneered the use of issuer written put options in stock repurchase programs and later sold the concept and software to implement it to other firms and investment banks. Several investment banks started to actively solicit firms and purchase put options from them. Paul Mazzilli, a principal in equity capital markets at Morgan Stanley & Co., is cited to say that "A large portion of the companies that do [share repurchase] programs with us have been introduced to it, and use the strategy from time to time." Tyler Dickson, a VP in equity capital markets at Salomon Brothers noted that: "This year [1994], put warrants have come of age," and also that: "Companies are much more familiar with them as an enhancing vehicle to share repurchases." He added that Salomon has purchased put warrants from three Fortune 500 companies in the last two weeks alone.¹

In discussion below, we examine theoretical explanations as to why financial intermediaries promote the issuance of put options by firms and, in most cases, willingly serve as the opposite party to the put option trade.

2.1. Information Signaling

Gibson and Singh (2000) propose a theoretical model that analyses the use of put options by firms. In their model, firms that need to raise new capital use put options to signal their quality and thereby reduce their financing costs by fetching a better price for their newly offered securities. The model is not applicable to the option issuing firms that

¹ All quotes are cited in Pratt (1994)

we have examined on a number of points. We find that almost all firms issue puts in conjunction with stock repurchase programs and are clearly not in need of new capital.

The Gibson and Singh model is a signaling model, and, therefore, the firms make the initiating move. However, there is substantial anecdotal evidence that financial intermediaries, such as investment banks, initiate the transactions by contacting firms with ongoing stock buybacks and offering to purchase put options from them that will “enhance” their stock repurchases. Lastly, most firm written put options are privately placed with financial intermediaries and are rarely publicly announced at the time of issue. Market participants are commonly informed of the issue months later in the firm’s 10K and 10Q reports; therefore, they cannot be intended as timely signals.

But, more fundamentally, the model does not explain why sophisticated investors like financial intermediaries would purchase put options written by the firm on its own stock. Therefore, we do not pursue this explanation further.

2.2. Information Screening

Several papers like Seyhun (1986) and Piotroski and Roulstone (2004) show that managers have superior information about their company future stock return and operating performance. There is also some evidence provided by studies like Brown, Crabb, and Haushalter (2003) that companies can be successful at selective hedging, which suggests that companies may have better information than other participants in derivative trades. We develop a theoretical model that can explain why financial intermediaries willingly participate in such deals even when the issuer firms have superior information about their future stock performance that will lead to negative expected profits for the buyer of put options.

Our model is similar to the screening models used in the insurance, banking and industrial organization literature where an uninformed firm proposes different contracts to various types of informed customers and, by their choice of optimal contracts, manages to separate the customers based on their type.² In our case, uninformed financial intermediaries offer to buy long-term put options from corporations. By setting optimally the premium of the options, the intermediaries learn which corporations have positive and which corporations have negative private information about their future prospects. Later, based on this information the intermediaries can take long positions in publicly traded put options written on the stock of the companies with bad prospects, or take short positions in put options and long positions in call options written on the stocks of companies with good prospects.

In order to implement this scheme, the financial intermediaries use a surprisingly simple strategy. The only thing that they need to do is offer a put option premium to the issuing corporations that is equal to the fair premium computed using public information. As a consequence, only companies that have positive private information about the distribution of their future stock price will agree to sell the put options. The companies with bad prospects will refuse to participate in the trade because it has negative expected value for them. This assures the existence and uniqueness of the separating equilibrium. Note that through this screening scheme the financial intermediaries have acquired private information in a perfectly legal way. The details of the model are included in the Appendix.

² See for example the pioneering works of Rothschild and Stiglitz (1976) and Wilson (1977)

For the financial intermediary to practically exploit the acquired information, knowledge of the transaction must be kept from other market participants for a time. As most puts purchased by financial intermediaries are privately placed, unlike puts purchased on exchanges, the transactions are unobservable by outside parties. It is important to note that the SEC does not mandate that put option sales be publicly announced at the time of issue. Moreover, the SEC has decided that if the put option sale affects the financial situation of the firm in a non-material way, there is no legal requirement to disclose it. This implies that, potentially, some firms can choose not to disclose their put option trades at all. We find that many firms disclose their private placements of puts on the next 10-Q or 10-K statement, but a large subset of the firms in our sample report their put option trades much later. On average, for the firms we examine, the time from the date of the trade to the date that it is disclosed to the public is more than six months

In many cases, the financial intermediaries suggest that companies sell non-standard put option contracts. The options are often European and with longer maturities than one year. Even more strikingly most put options allow the issuer to settle them at any time before expiration. Such option to settle given to the option writer is unique. However, it can be desirable in an informational sense to the purchasing financial intermediary. Not only can the writing firms issue puts when they have positive information, but they can settle them before expiration when they have subsequent negative information about future prospects. In both cases, the purchasing financial intermediary loses on the puts, but gains information that the market does not have.

Based on the model we formulate our first hypothesis:

Hypothesis 1. Screening by financial intermediaries

Only managers with superior and positive information about their company future performance will agree to sell options to financial intermediaries. These options will generate positive profits for the issuing companies and losses for the buyers. Financial intermediaries agree to purchase these options because they gain valuable information about company performance that can generate profits in other trades.

2.3. Executive Overconfidence

We also consider an explanation that posits that financial intermediaries expect to profit from their purchases of put options from issuing firms. This explanation is based on potential executive overconfidence as in the pioneering paper by Roll (1986) and recent work by Heaton (2002) and Malmendier and Tate (2004). Drawing on studies in the psychology literature, Heaton (2002) and Malmendier and Tate (2004) argue that CEO's are particularly likely to display overconfidence for three reasons: individuals overestimate the likelihood of good outcomes in outcomes they believe are under their control (Weinstein, 1980); individuals are overconfident about outcomes to which they are highly committed (Weinstein 1980); overconfidence is most likely when the reference point is abstract (Alicke, Klotz, Breitenbecher, Yurak, et. al., 1982). The models show that optimistic managers overestimate the NPV of the projects they invest in while they also believe that capital markets undervalue their firm. Malmendier and Tate (2004) then document that many company CEOs show significant overconfidence about their company performance and such overconfidence results in overinvestment and suboptimal

personal portfolio decisions and significantly affects the correlation between corporate investment and cash flow.

Financial institutions may exploit the habitual overconfidence of company executives regarding the future stock performance of their firms. Based on the above arguments, executives are likely to be overconfident about the firm's future stock price because the price is the result of outcomes under their control, it represents a target to which they are committed, and it is an abstract reference point. Financial intermediaries can offer to buy put options at lower premia and expect that executives will agree to the deal because they underestimate the probability of the options to be in the money.

Based on this analysis we can formulate our second hypothesis:

Hypothesis 2. Managerial overconfidence

Overconfident (overoptimistic) managers may agree to sell put options at lower prices to financial intermediaries. These options will generate positive expected profits for the buyers and negative profits for the issuing companies

2.4. Testable Predictions

The two hypotheses why financial intermediaries participate in put option trades have very different implications about the expected profits for both parties in the trade. In the case of executive overconfidence, financial intermediaries should on average make profits from the put options and respectively companies will lose money. On the other hand, if managers have superior information, then companies will on average generate profits at the expense of financial intermediaries.

The disclosed information in the annual reports does not allow us to measure the exact financial outcome of the put option trades, except for in a couple of isolated cases

like Microsoft. But, we can measure the abnormal performance of the companies after the issuances of put options. If companies outperformed in risk or peer-adjusted terms, then it is likely that managers had superior information that was not publicly available at the time of the trade. Conversely, poor abnormal performance signifies that managers were overconfident and the financial intermediaries took advantage of their bias. This discussion suggests that the main empirical tests that could distinguish between the two explanations is to compute measures of abnormal performance after companies sell put options.

3. Data and Summary Statistics

We identify firms that sold put options on their own stock over the period from January 1992 through December 1999 by searching 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 1999. We search 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” or “rights to put.” We find 383 firms that include one of the key words in at least one of their financial reports. Of these we drop firms that sell put options on foreign exchange, interest rate, or debt securities. We are left with 53 firms that used their own stock as the underlying asset in the issue of put derivatives, most in connection with a stock repurchase program. These 53 firms came from 34 industries as indicated by their four-digit SIC codes. Most of these firms issued put options in conjunction with ongoing stock buybacks.

Only nine of the 53 firms report the exact date on which they have 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 of option expiration. Based on these references, we are able to infer an exact date for an additional eight firms. Similarly, 11 firms report the month when they sold put options, and we infer the month for an additional 16 firms. Four firms report only the quarter, while the remaining five firms report only the year when they first issued put options.

In order to measure abnormal performance, we examine the financial profiles and stock returns of the 53 firms in our sample in comparison with two sets of industry/size matched control firms. The first control set consists of firms with plain-vanilla stock repurchase programs because most of the put option issuers have also ongoing repurchase programs. Firms with ongoing share repurchase programs are identified using SDC Platinum. Firms without stock repurchase programs comprise the second set.

For each of the 53 firms in our sample, using COMPUSTAT, we construct a list of firms having the same 4-digit SIC code. Then, we find the three firms with plain-vanilla repurchase programs within the 4-digit SIC group closest in size to the sample firm.³ Likewise, we also find the three closest in size firms that have no repurchase programs. This procedure gives a control set consisting of 122 industry-and-size-matched firms that have ongoing stock repurchase programs and another control set with 122 industry-and-size-matched firms with no stock repurchase programs.⁴

³ The market value of equity, our measure of firm size, is calculated using data obtained from CRSP for the end of the quarter before the sample firms sell put options on their own stock.

⁴ The number of control firms is less than 159 because several of the synthetic repurchase firms share matched firms in common as they fall in the same 4-digit SIC industry and are very similar in size.

In Table 1, we report several summary statistics for the put options issued by our sample firms. The majority of companies, 32 of 53, issued European-style put options; only 11 issued American-style. As only American-style options can be traded on the CBOE, it seems that very few of the companies intend to place their put options publicly. This is directly confirmed by looking at the second column of Table 1 in which we report the type of buyers disclosed in the financial statements. Only one company discloses that it placed the put options publicly on an exchange. The rest have placed their options with private counter-parties. In most cases the identity of the buyer is not disclosed, and when it is disclosed it is 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.

We include descriptive statistics of the time till disclosure in the fourth column of Table 1. The median time from the date of the option sale to the date it is disclosed in the company 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 in our sample is a staggering 1561 days, or more than four years, after the deal had been transacted.

Last, we report the extent to which the options were exercised or expired. Most of the options expire out of the money. In only two cases companies state that all options were exercised, while in 32 cases all options expired out of the money. In additional six cases the issuers took advantage of the early settlement option, and in eight cases it is stated that some options are exercised and some expire.

4. Empirical Results

The summary description of the sample show that, in almost all cases, firms sell put options directly to buyers, the transactions are made known to the public only after a long time interval, and most options expire out of the money. Collectively these findings are consistent with information screening by financial intermediaries. In this section, we examine changes in operating performance for issuing firms as compared to that for benchmark firms. We also examine abnormal stock price performance following the issuance of put options.

4.1. Accounting performance

Table 2 reports mean earnings before interest & taxes (EBIT) for the issuing firms and the two sets of benchmark firms. Year 0 is defined as the year in which the issuing firms begin selling puts. We calculate the mean EBIT for each year over an 11-year period centered on Year 0. We test the statistical significance of the difference in means between the sets of firms. For each set, we also test the difference between the mean EBIT reported for Year -5 and Year 0 and between Year 0 and Year 5.

As shown in Table 2, the differences in the means of earnings between put issuing firms and plain-vanilla repurchase firms are not significantly different at the 0.05 level for the years preceding Year 0. However, the sample firms report significantly higher earnings following the initial put sale. Increases in earnings between Year -5 and Year 0 and between Year 0 and Year 5 are statistically significant for the put issuers. They are not statistically significant for plain-vanilla repurchase firms or for firms without repurchase programs.

The results in Table 2 indicate that firms that sell put options are associated with increased earnings over time and higher levels of earnings relative to the benchmark firms. These findings are not consistent with the managerial overconfidence hypothesis in which firms realized performance falls below management's overoptimistic expectations. On the contrary, the results support the alternative hypothesis that financial intermediaries buy put options to screen for firms with good future performance.

4.2. Stock performance

Table 3 reports cumulative abnormal returns (CARs) for those issuing firms with an identifiable date for their first put option sale. Even though as shown in Table 1 the put option sale is reported after more than six months on average, the CARs for a two or three-day window after the date of the sale are about 2%, which are statistically and economically significant. Moreover, the CARs for a longer 60-day window are higher than 10%. 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 options sale. Their abnormal trading is perhaps incorporated into the stock price and generates the positive abnormal returns in the short event windows.

It is interesting to note the significantly negative performance in the period before the put option sale. This result is consistent with Rozeff and Zaman (1998), who document that insiders buy shares when their firms that have been significantly undervalued by the market. It might be that the firms in our sample time their put option sales after a period of temporary negative stock performance. This conjecture is further supported by Figure 2 where we plot Cumulative Average Abnormal Returns for trading

days from -60 to +60 relative to the first put option sale.⁵ The U-shaped pattern of the CAARs is well pronounced, which suggests that the firms successfully time the market and issue put options very close to the 120-day low of their stock price.

5. Conclusion

In this paper we investigate the incentives of financial intermediaries to buy put options privately from companies, where the underlying security for the put is the company stock. We document that after the put option sale the issuing companies experience an increase in their earnings compared to two benchmark groups. They also have significantly positive abnormal returns of more than 10% after the event. These results reject the hypothesis that financial intermediaries purchase put options in order to exploit the overconfidence bias of company executives. Our descriptive statistics and performance results, together with anecdotal evidence, suggest that on average financial intermediaries lose from their option trades, while the issuers make money.

These findings support an alternative explanation that we develop with a theoretical model. We propose that financial intermediaries may willingly participate in deals with informed parties even when they expect to lose on these trades. If such trades are not disclosed publicly, the financial intermediaries can acquire valuable information about the future performance of the companies they trade with and then earn abnormal profits on this information at the expense of other market participants.

Our theoretical model and empirical results call attention to potential problems associated with the current regulations governing derivative trades of companies. The

⁵ We construct Figure 2 similarly to Figure 2 in Schwert (1996)

lack of sufficient disclosure of such trades, especially when the opposite parties are financial intermediaries or other sophisticated investors, leaves room for such investors to earn rents from uninformed traders. We conclude that one easy to way to protect the rest of the market participants is to mandate immediate or even advance disclosure of firm put option sales. Only mandatory disclosure will leave no room for earning rents on non-public information by trading in company-issued puts. Our conclusion is very much in the spirit of recent improvements in company disclosure associated with Regulation FD and upholds Fried (2004) who recommends that firms should disclose in advance their purchase orders associated with open market stock buybacks.

Appendix. A Theoretical Model of Screening by Financial Intermediaries through Put Option Trades

Consider one risk neutral financial intermediary denoted by I , and two types of firms.⁶ Type A firms have a positive signal about their future prospects, while type B firms have a negative or neutral signal about their future prospects.⁷

The order of moves is as follows. At time $t = 0$, Nature picks firm type A or B . At time $t = 1$, the financial intermediary, I offers each of the firms to buy from them at a pre-specified premium put options written on the firms' stock. At time $t = 2$, based on their type and the size of the premium, the firms agree or disagree to sell put options to the intermediary. Last, at time $t = 3$, I infers firm type from the actions of the firms at time $t = 2$, and trades on this legally acquired private information. The extensive form of the game between the intermediary I and the two types of firms A and B is shown in Figure 1.

At time $t = 0$, the intermediary has no private information about the future stock price of the firms. In other words, I cannot distinguish firm type. At time $t = 0$, type A firms have private information that their stock price will go up. In general, type A firms are more optimistic than the other market participants, including the financial

⁶ The assumption that the firms are facing a single investment bank for that deal is reasonable for two reasons. First, there is usually a long-term relationship between the investment bank and the firm. It is costly for both of them to build a new relationship. Second, as evident in Table 1 the option contracts are privately negotiated with non-standard features like long maturity and European style exercise. These types of options are not traded on organized exchanges.

⁷ The results of this paper can be easily extended for a continuum of firm types. For expositional simplicity we focus only on two firm types.

intermediary, about their future performance. Or, the firms know that they are less risky than the market expects given the available public information. Type B firms, on the other hand, have a private signal that their future price will go down or that they are more risky than the market expectations. At time $t = 2$, if I has proposed the optimal premium offer and has ensured the existence of a separating equilibrium, the intermediary infers firm type and learns which firms will have a stock increase (or are less risky) and which will not.

The payoffs for the firms from participating in the game are denoted by P_A for firm A , and P_B for firm B , where the following is true:

$$P_A = \max[0, \text{Premium} - (\text{Value}_{\text{put}} | \text{Type} = A)] \quad (1)$$

$$P_B = \max[0, \text{Premium} - (\text{Value}_{\text{put}} | \text{Type} = B)] \quad (2)$$

Both firms will get 0 if they don't agree to sell put options to the financial intermediary. Therefore, the firms will agree to the terms of the financial intermediary only if the premium they will get is larger than the value of the put option computed given their private information.

The payoff for the intermediary is denoted by P_I , where the following is true:

$$P_I = \min[0, \text{Premium} - E(\text{Value}_{\text{put}})] + E(V_I | \text{separating_equilibrium}) \quad (3)$$

The first term of the financial intermediary payoff is the negative of the payoffs for the firms, because the sale of put options is a zero sum game. The nature of the second term underlines the main contribution of our model. This is the value of information that I can infer about firm type if there is a unique separating equilibrium in the game. If there is a pooling equilibrium in the game, the intermediary cannot infer firm type. The second term then is equal to 0, and the model reduces to the classical adverse selection model of

Akerlof (1970), where the intermediary as an uninformed party will be facing negative expected profits from participating in the trade. The monetary gains V_I from acquiring private information can potentially be very large. If I knows what firms have a positive signal about their future prospects, the intermediary can purchase call options on these firms' stock, sell put options, or buy their stock that is currently undervalued. In Section III.C., we illustrate the potential value of private information V_I with two numerical examples.

Resulting equilibrium

The intermediary will engage in the put option sale only if it assures the existence and uniqueness of a separating equilibrium, where firms of type A accept the conditions of the sale, and firms of type B reject the contract. If the separating equilibrium exists and it is unique, then I acquires private information about firm types and the second term, V_I in (3) is positive. If the derivatives or stock markets of the firms are liquid enough, the value of V_I will dominate over the negative adverse selection term, and the intermediary will earn positive profits from the transaction. Below we construct a feasible strategy for the financial intermediary that ensures a unique separating equilibrium.

Let's assume that the following condition about firm type is true for any price > 0 :

$$\int_0^{price} f_A(price) dprice < \int_0^{price} f_P(price) dprice < \int_0^{price} f_B(price) dprice \quad (4)$$

Where $f_A(price)$ and $f_B(price)$ are the probability distribution functions (p.d.f) of the prices of firms type A and firms type B , and $f_P(price)$ is the unconditional p.d.f. of the price of the average firm, given that the public cannot distinguish firm types. The

interpretation of this assumption is that the firms of type A are with better than average prospects and it is more likely for them to have higher stock prices in the future than firms of type B . The type of the firm is private information. The rest of the market has an unconditional cumulative distribution of the future stock price of the average firm that in a stochastic sense is dominated by the distribution of the firm type A , and dominates the distribution of firm type B .

Consider the following strategy for I at time $t = 1$:

Propose to every firm that has a highly liquid market in derivatives to buy European-style out-of-the money put options with a long maturity for a put premium that is equal to:

$$Put _ premium = \int_0^{Strike} (Strike - price) * f_p(price) dprice \quad (5)$$

The interpretation of equation (5) is that financial intermediary offers a fair price for the put options given the public information that all market participants have about the future distribution of stock prices.

Necessary conditions for a separating equilibrium

We have to show that the above-proposed strategy of the intermediary leads to a unique separating equilibrium. In order for a separating equilibrium to exist and be unique, the following sets of individual rationality and incentive compatibility constraints have to be satisfied for both firm types:

$$IR(A): P_A \geq 0$$

$$IR(B): P_B \geq 0$$

$$IC(A): P_A \geq \text{The payoff for a type A firm if it pretends to be a type B firm}$$

$$IC(B): P_B \geq \text{The payoff for a type B firm if it pretends to be a type A firm}$$

Given the stochastic dominance condition (4), it turns out that:

A) The individual rationality constraint for firm type A coincides with the incentive compatibility constraint for firm type A , and both reduce to the following inequality:

$$Put_premium \geq \int_0^{Strike} (Strike - price) * f_A(price) dprice \quad (6)$$

This condition directly follows from the description of I 's strategy (5), and condition (4).

B) The individual rationality constraint for firm type B coincides with the incentive compatibility constraint for firm type B , and both reduce to the following inequality:

$$Put_premium < \int_0^{Strike} (Strike - price) * f_B(price) dprice \quad (7)$$

Similar to A) this condition directly follows from the description of I 's strategy (5), and condition (4).

The strategy of the intermediary to propose a take it or leave it offer to buy put options for a premium equal to the expression in (5) assures that only firms of type A will agree to sell options to intermediary. Firms of type A have positive private information about their future performance. The true value of the put options computed using their private information is lower than the premium proposed by I . Therefore, firms of type A will accept the proposal by the intermediary and earn positive profits. On the other hand, firms of type B have private information that their performance will be less than average. The value of the put option computed using their private information will be higher than the premium proposed by I and all firms of type B will not accept the terms of the financial intermediary. As a consequence, the separating equilibrium of the game exists and it is unique. When the intermediary sees that a firm accepts its terms, the

intermediary can immediately update its beliefs that this firm is a firm of type *A*, and later use this information to earn profits trading in other options of the same firm.

Numerical Example

To illustrate the screening model we developed above we provide the following numerical example. The example uses a binomial option-pricing model to show the value of information about future price changes of the stocks of the two firms.⁸ Suppose there are only two future states of nature, a good and a bad state. Let type *A* firms have a payoff of 120 in the good state and a payoff of 60 in the bad state. Type *B* firms have a payoff of 100 in the good state and a payoff of 40 in the bad state. If we assume for simplicity that there is an equal number of firms of both types, then the expected payoff of a firm of unknown type is 110 in the good state and 50 in the bad state. Let the stock price of the average firm to be 80, and the rate on T-bills (the risk-free security) to be 5%.

Now, *I* offers to each firm to buy put options with a strike of 65. The payoff of this put option given the public information is 0 in the good state and 15 in the bad state. The put option price computed using only public information is then \$6.19.⁹ Both firms know their type and therefore they know for sure the true value of the put option for them. The value of the put for firm type *A* is \$2.86, while the value of the put for firm type *B* is \$6.35. As a result, only firms of type *A* will agree to sell put options and the

⁸ See Lo and Wang (1995) for a sophisticated option pricing model that incorporates information about future returns.

⁹ See, for example, page 662 of Bodie, Kane, and Marcus (1999) for an exposition how to price options using the binomial pricing model

intermediary will lose on this trade \$3.49 per option. After the losing trade, the intermediary learns what firms are type *A*, and what firms are type *B*. After acquiring this private information that the rest of the market does not have, the intermediary buys a call option with a strike of 100, written on the stock of a type *A* firm. The true value of this call option is \$7.62, while the intermediary can buy it from an uninformed investor for only \$5.40 (the fair price given public information). The intermediary makes a profit of \$2.22 per option. In order to make positive profits from the whole transaction, the intermediary needs to make sure that it buys at least 1.57 times more call options from the market than the number of put options that it bought from the issuing firms. For example if the intermediary proposes to buy 100 put option contracts (10,000 options) from one firms, and the firm agrees. Then, the intermediary can buy 200 call option contracts from the market, and make a total profit of:

$$20,000 * 2.22 - 10,000 * 3.49 = \$9500$$

The financial intermediary can continue buying additional call options until the rest of the market participants detect the abnormal trading, and update their information about firm type. At this point the call option price will rise to its fair value of \$7.62, and the informational rents for the financial intermediary will disappear.

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0. Nature picks type A or B

1. Intermediary offers to buy Puts

2. Firms decide to agree or not

3. Intermediary decides whether to trade on Information

4. Payoffs

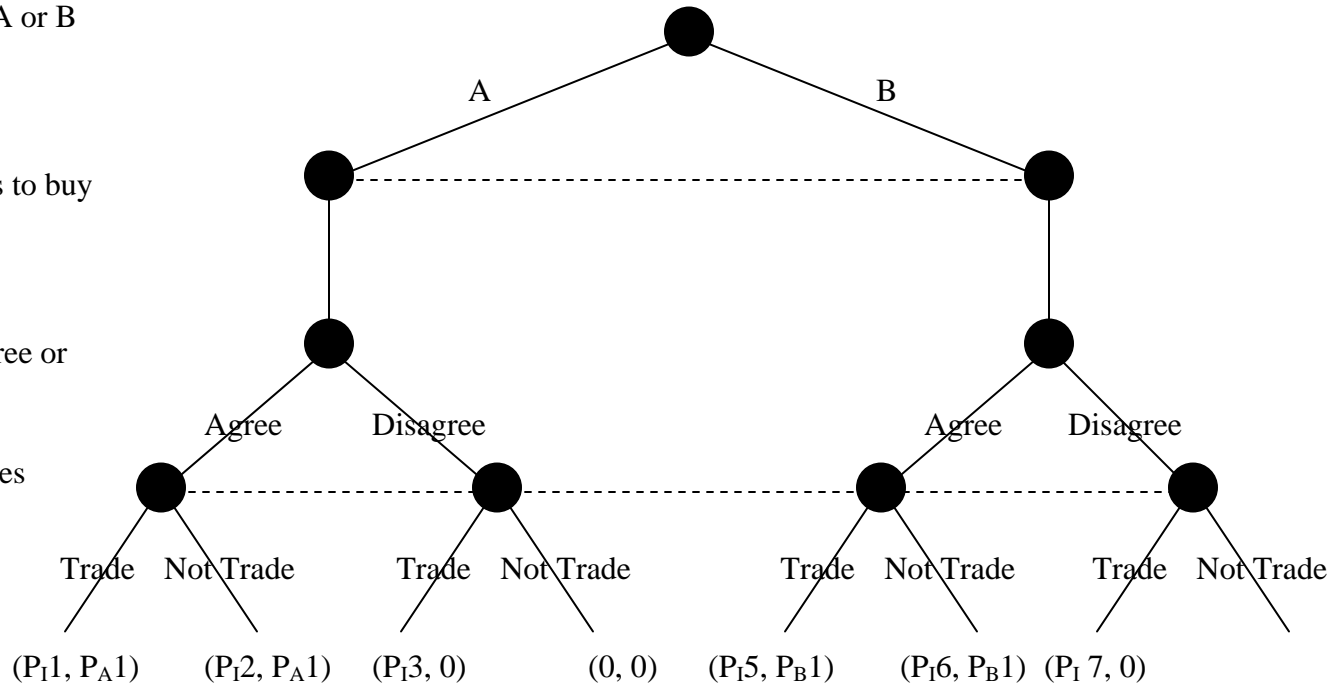


Figure 1. Extensive Form of the Game Played by the Financial Intermediary and the Firms Repurchasing Stocks

The description of the information, players and payoffs is in the Appendix. From inequality (4) and equation (5) follows that $P_{A1} > 0$, and $P_{B1} < 0$. This ensures that firms of type B will always disagree, while firms of type A will always agree to sell put options to the financial intermediary. Because this separating equilibrium is unique, the intermediary acquires private information about firm type, and then the payoffs for the intermediary that matter P_{I1} , P_{I7} are both greater than 0.

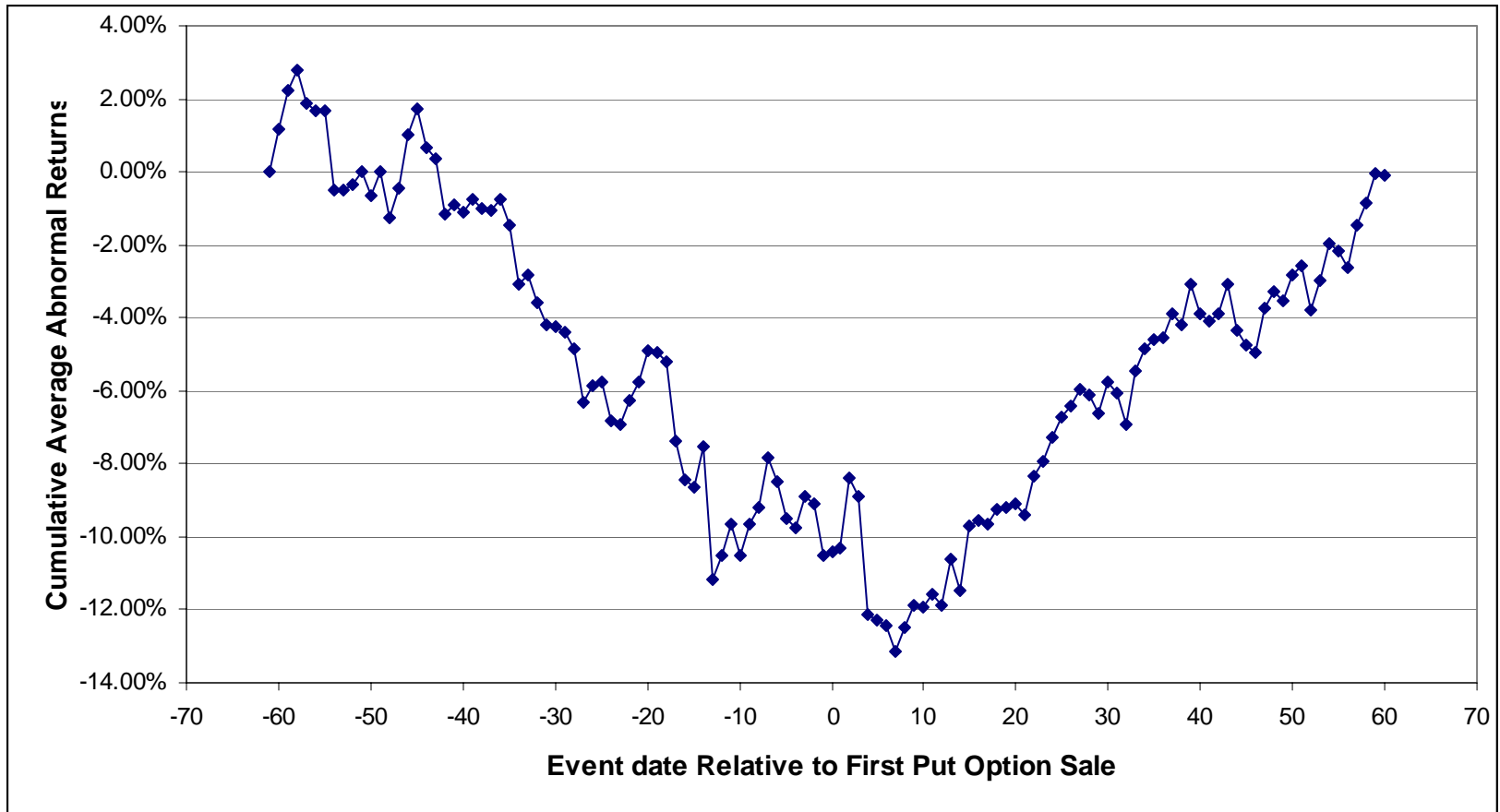


Figure 2. Cumulative Average Abnormal Returns for Put Option Issuers from Trading Day -60 to +60 Relative to First Put Option Sale

Cumulative Average Abnormal Returns are computed using the market model. We compute CARs using a market model. The market model parameters are estimated using a window from 180 days 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 17 firms that disclose the exact date when they sold put options for the first time.

Table 1
Summary Statistics of the Put Option Contracts

IB with ID denotes cases where the exact identity of an investment bank is reported as a buyer. IB no ID denotes cases where the firms only state that the buyer is an investment bank. Only nine of the 53 firms report the exact date on which they have sold put options for the first time. Based on references to option expiration in other 10-K forms, we are able to infer an exact date for an additional eight firms. 11 firms report only the month when they sold put options, and we infer the month for an additional 16 firms. 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 firms report only the quarter. For these firms we assume that the date is the middle of the quarter. The remaining five firms report only the year when they first issued put options and we report these as N/A.

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

Table 2:
Earnings Before Interest & Taxes (EBIT) and the t-values for comparison within and between the SRP set and matching samples

Average (Earnings Before Interest & Taxes) is the mean of corresponding annual Earnings Before Interest & Taxes for parallel relative year for particular set; **RY** is year relative to the year the firm sold put options for the first time; **Matched Firms with Repurchase** is the comparison set of 122 industry-and-size-matched firms with stock repurchase program; (The number of control firms is less than 159 because several of the synthetic repurchase firms share matched firms as they fall in the same 4-digit SIC industry and are very similar in size); **Matched Firms without Repurchase** is the comparison set of 122 industry-and-size-matched firms without stock repurchase program; **p-value** is the computed p-value for the parallel relative year between the corresponding two portfolios; **p-value (-5,5)** is the computed p-value for the relative years - 5 and 5 for corresponding set; **p-value (-5,0)** is the computed p-value for the relative years - 5 and 0 for corresponding set; **p-value (0,5)** is the computed p-value for the relative years 0 and 5 for corresponding set.

RY	Average (EBIT)			Difference Between Portfolios		
	Put Issuing Firms	Matched Firms with Repurchase	Matched Firms without Repurchase	Put Issuing Firms & Matched Firms with Repurchase	Put Issuing Firms & Matched Firms without Repurchase	Matched Firms without Repurchase & Matched Firms with Repurchase
-5	\$164	\$158	\$92	\$5	\$72	\$66
-4	\$217	\$181	\$91	\$35	\$126 **	\$90 *
-3	\$249	\$198	\$116	\$51	\$134 **	\$82
-2	\$298	\$214	\$128	\$85	\$171 **	\$86
-1	\$381	\$218	\$127	\$163 **	\$255 ***	\$91 *
	\$471	\$235	\$128	\$236 ***	\$343 ***	\$107 *
1	\$539	\$214	\$88	\$325 ***	\$451 ***	\$126 **
2	\$641	\$222	\$44	\$419 ***	\$597 ***	\$178 ***
3	\$942	\$214	\$68	\$727 ***	\$874 ***	\$146 **
4	\$1,350	\$317	\$102	\$1,033 ***	\$1,247 ***	\$214 **
5	\$1,358	\$361	\$81	\$997 **	\$1,277 **	\$280 **
(-5,5)	\$1,194 ***	\$202 **	-\$11	} Test of Equality of Averages Across Years		
(-5,0)	\$307 **	\$77	\$36			
(0,5)	\$887 **	\$125	-\$48			

*** the p-value is statistically significant at the 0.01 level

** the p-value is statistically significant at the 0.05 level

* the p-value is statistically significant at the 0.10 level

Note: The calculations performed with the accounting variables normalized by total assets yield very similar results.

Table 3
Cumulative Abnormal Returns after the Put Option Sale

CAR denotes Cumulative Abnormal Returns. We compute CARs using a market model. The market model parameters are estimated using a window from 180 days 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 17 firms that disclose the exact date when they sold put options for the first time. We report CARs for five different event windows: from 60 days to one day before the put option sale i.e. (-60, -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); and from day 0 to 60 days after (0, 60). P-value for the t-test that the average CAR equal zero and a Wilcoxon Rank test for the median are in parenthesis. % Positive (Negative) is the percentage of firms with positive (negative) CARs during the corresponding event window.

Event Window	Average CAR %	Median CAR %	% Negative	% Positive
(-60,-1)	-10.522 (0.044)	-10.74 (0.028)	70.6	29.4
(0,1)	0.235 (0.810)	1.136 (0.246)	29.4	70.6
(0,2)	2.135 (0.056)	2.747 (0.025)	29.4	70.6
(0,3)	1.628 (0.213)	1.715 (0.096)	29.4	70.6
(0,60)	10.422 (0.112)	4.04 (0.038)	29.4	70.6