

## DO POISON PILLS INCREASE FIRM RISK?

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### Abstract

Management scholars have argued that an active takeover market discourages risk-taking by managers and that takeover defenses serve to counter the risk-reducing pressures of an active takeover market. This study employs the Black and Scholes Option Pricing Model to determine whether or not adoption of poison pill securities increases investor perceptions of firm risk. The results provide evidence that the Option-Implied Standard Deviations of common stock returns increase significantly on the poison pill adoption date, on average. Furthermore, the implied standard deviations remained significantly above pre-adoption levels for several days after the poison pill adoption, suggesting that the perceived increase in firm risk is permanent. These results suggest the poison pills may serve a more constructive role in the governance of publicly traded firms than is generally assumed.

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Many researchers have examined the impact of "Poison Pill" securities on firm value. The results of this research, which we summarize below, has been mixed. But few researchers have examined the impact of poison pills on risk taking. That is the research question this paper addresses. Specifically, we test the hypothesis that poison pills increase the risk of firms that adopt them.

Among the most controversial corporate governance issues is the continued wide-spread usage of poison pills. These special shareholder rights serve to impede takeovers and can be adopted by firms without shareholder approval. Consequently, institutional investors, shareholder activists, and corporate governance organizations view poison pill adoption as a particularly egregious disregard for shareholder welfare. For example, Institution Shareholder Services report that repealing poison pills is one of the top 5 issues for 2007 among the institutional investors they surveyed (Directorship, 2006).

The various high profile corporate scandals in the United States including Enron, WorldCom, Tyco, and most recently Broadcom have increased scrutiny of corporate boards. Sarbanes-Oxley and the rising influence of investor activist organization have led to more aggressive questioning of corporate governance practices in general, and poison pills in particular (Mills, 2004). The Wall Street Journal (2004) reports that firms are dropping poison pills and

other takeover defenses, not only due to this shareholder pressure, but to earn favorable ratings from organizations that evaluate corporate governance. This pressure has resulted in the percentage of S&P500 firms with poison pills dropping from over 60% in 2002 to 47% by 2005 (Jaffe, 2005). Repealing poison pills can be viewed as a favorable development if they are harmful to shareholder interests.

### The Case Against Poison Pills

A long list of researchers contend that poison pill adoption is, in fact, hostile to shareholder interests because it reduces the threat of takeovers (Davis, 1991; Field & Karpoff, 2002; Jensen, 1984; Malatesta & Walkling, 1988; Mallette & Fowler, 1992; Ryngaert, 1988). Researchers long ago documented gains to shareholders of takeover targets averaging 40% or more (Jensen & Ruback, 1983; Jarrell, Brickley & Netter, 1988). Consequently, any managerial action that reduces the probability of a takeover target being successfully acquired harms shareholders. Preliminary research suggests that poison pills represent one such managerial action. Ryngaert (1988), for example, found that firms with poison pills that received tender offers were almost 17% less likely to be successfully acquired than firms without poison pills.

By reducing the risk of takeovers, shareholders are potentially harmed in a variety of ways. First, they lose the bid premium from a possible takeover offer. Second, they lose a valuable tool for removing negligent executives that their board of directors will not act to remove. Finally, executives free from the threat of removal by a hostile acquirer can harm shareholders by over-diversifying (Amihud & Lev, 1981; Hoskisson & Turk 1992; Jensen 1984), retaining free cash flows (Jensen, 1986), or under-investing in research & development and other risky investments. These conclusions obtain for both established firms and IPOs (Field & Karpoff, 2002).

Malatesta and Walkling (1988) provided the first detailed empirical analysis of the impact of poison pills on shareholder wealth. They examined stock market reactions to the poison pill adoptions through March 1986. They found that shareholders lost a statistically significant .52% over the two days surrounding the poison pill adoption. Malatesta and Walkling also provide evidence of lower accounting measures of performance for firms adopting poison pills than for comparable firms without poison pills.

In addition to the threat of takeover, market-based incentives (executive stock ownership and options), independent boards of directors, and large outside investors can reduce the threat of persistent mis-management or other agency problems. Corporate governance scholars contend that, because poison pills harm shareholders, their adoption signals a breakdown in the internal governance structure of the firm and their adoption will be more prevalent in firms with problematic governance structures. Problematic corporate governance structures would include firms where top executives have small equity investments, ownership is diffuse and boards of directors lack independence.

Several studies have provided empirical evidence that weak internal governance typifies firms adopting poison pills. For example, CEOs of firms adopting poison pills own less equity in their firms than CEOs of firms without poison pills (Davis, 1991; Heron & Lie, 2006; Malatesta & Walkling, 1988; Mallette & Fowler, 1992). Davis found that firms with poison pills have more diffuse share ownership than firms without poison pills (Davis, 1991). Other researchers have noted that poison pills are typically adopted by firms with board structures that provide more discretion to management to engage in potentially self-serving behavior. Mallette and Fowler (1992) observed that firms with poison pills have dual leadership structures for their boards relatively infrequently. Heron and Lie (2006) found evidence that firms with staggered boards were more likely to adopt poison pills than firms that do not.

### Poison Pills Reconsidered

Although poison pills have come under scrutiny from academics and practitioners alike, poison pills continue to be one of the most utilized defense mechanisms

among Standard and Poor's 500 companies and their numbers are on the rise in small and mid-cap companies (Murti, 2005). This may be the result of the current heightened hostile merger and acquisition environment and may indicate that poison pills serve a constructive role for shareholders. For example, poison pills may provide shareholders with more bargaining power in a takeover attempt than they otherwise would have.

In a tender offer with one bidder making an offer to diffuse shareholders, the would-be acquirer enjoys a monopsony. A poison pill that requires negotiation with target firm management, creates a bi-lateral monopoly, thereby increasing management bargaining power. Target firms with concentrated ownership (including large management stock holdings) would not receive this benefit from poison pills because a the tender offer bidding process would already be similar to a bi-lateral monopoly. As noted above, researchers have observed that firms adopting poison pills do not tend to have concentrated ownership or top executives with large equity holdings. Rather than providing evidence of weak internal governance, this result is consistent with the argument that the primary role of poison pills is to increase bargaining power in the context of a tender offer.

To the extent the poison pill delays resolution of the takeover battle, other potential acquirers may enter the takeover contest, creating a competitive market for the target firm (Turk, 1992). Consistent with this, Heron and Lie (2006) provide evidence that poison pills are associated with higher takeover premiums and higher shareholder value. Consequently, this has caused many boards to reconsider their decision to rescind their poison pills and has left shareholders wondering whether the protective benefits of a poison pill outweigh the risk of managerial misconduct. A growing number of researchers are more directly questioning the empirical evidence indicating that poison pills generally harm shareholders. Ryngaert found evidence of significant declines in firm value, but for only selected subsets of his sample, whereas Brickley, Coles, and Terry (1994), Strong and Meyer (1990), Turk, Zardkoohi, Hoskisson, Harrison, and Johnson (1994), and Loh (1992) found no evidence of significant declines in firm value associated with poison pill adoption. Studies by Bhagat and Jeffries (2005) and Coates (2000) suggest that econometric problems with previous research led to the mistaken conclusion that poison pills reduce firm market value. Similarly, Turk, Goh, and Ybarra (2007) found no significant relationship between poison pill adoption and the long and short-term earnings forecasts by security analysts. Studies considering accounting measures of performance also found no relationship between poison pill adoption and decreased performance (Brickley, Coles & Terry, 1992; Davis, 1991; Hebb & MacLean, 2006, Mallette & Fowler, 1992). A more recent study even provides evidence that poison pill adoption is associated with improved

operating performance (Danielson and Karpoff, 2006).

Finally, some researchers have argued that there is no fundamental economic rationale leading to the adoption of poison pills. Rather firms adopt these takeover defenses because they are "fashionable" (Soule & Strang 1998) or they have been adopted by firms on whose board the top management sits (Haunschild 1993). Consequently, these researchers argue that poison pills hold little significance for shareholder interests.

The research stream reviewed above provides little evidence that poison pills generally harm shareholders. Consequently, shareholder activist groups, corporate governance ratings organizations, and institutional investors pressuring boards to rescind poison pills, may be over-reacting to the preliminary theory and research from the 1980s regarding poison pills. In the next section we describe a rationale whereby poison pills perform a more constructive role.

### Poison Pills, Employment Risk, and Firm Strategy

Whereas most scholars agree that threat of takeovers places pressure on management, financial economists have traditionally argued that the pressure an active takeover market provides stimulates efficiency and concern for shareholder interests. Others have argued that pressure from active takeover markets, rather than stimulating efficiency, stimulates risk aversion and excessive concern about short-term accounting performance (Drucker, 1984; Hill, Hitt, & Hoskisson 1988; Lipton, 1985; Pugh, Page & Jahera, 1992; Scherer, 1988; Stein, 1988). To the extent that poison pills reduce the threat of hostile takeovers, they should encourage risk taking, according to these scholars.

Proponents of an active takeover market argue that exactly the opposite result will obtain. To the extent that poison pills reduce the threat of hostile takeovers, they should encourage top executives to engage in self-serving behavior. Given that shareholders can own diversified portfolios of stock, but top executives do not work for a diversified portfolio of firms, agency theorists argue that top executives will be more risk averse than shareholders (Amihud & Lev, 1981; Jensen, 1986). Therefore, self-serving managers will forego long term and high risk investments (Jensen, 1986; Jarrell, Brickley & Netter, 1988). Poison pills and other takeover defenses that insulate top management from the threat of takeover should have the opposite effect and should be associated with reduced risk taking.

Research has long demonstrated that reducing research and development and other risky or long term investments reduces shareholder wealth (McConnell & Muscarella, 1985; Woolridge & Snow, 1990). Market efficiency dictates that firms committing resources to research and development

and other risky investments could not possibly be persistently and systematically under-valued in the marketplace. Thus, managers that are overly risk averse in response to an active takeover market will reduce the value the firms they manage in the short run and increase the threat of a hostile takeover. Therefore, the threat of takeover should lead self-serving managers to be *less risk-averse*.

The presence of noise in market valuations, however, implies that the threat of takeover may increase managerial aversion to risky investments *even if* the market does not systematically undervalue such investments. An acquiring firm gains from an acquisition if the cost of the acquisition is less than the post-acquisition value of the target firm (Barney, 1988). If the market value of a firm falls below the potential post-acquisition value of the firm by more than the cost of the acquisition, including any takeover premium offered and other transactions costs, the firm becomes an attractive takeover target. Thus, the market value of a firm must fall significantly below its potential value to face a serious threat of takeover. If investors value firms without error (that is, capital markets are perfect), then the market value of the firm can only fall significantly below its potential value if the management of the firm is inefficiently administering its resources.

Capital markets are, of course, imperfect (Black, 1986). Financial economists are clear to note that market efficiency does not imply that firms are priced accurately, but rather that security prices are an unbiased estimate of the future value of the firm. That is, stock prices are neither too high nor too low on average (Brown, Harlow & Tinic, 1988). Stock prices represent "the market's collective estimate-although a 'noisy' estimate, to be sure- of the present value of the firm's future risky cash flows" (Brown, Harlow & Tinic, 1988). As Black (1986) notes, "all estimates of value are noisy" (pg. 533) and noise in capital markets facilitates liquidity by creating the opportunity to trade profitably (French & Roll, 1985).

An implication of noise trading in capital markets is that "the short term volatility of price will be greater than the short term volatility of value" (Black, 1986; pg. 533). This suggests that noise may cause a firm's stock price to trade significantly below its potential value as perceived by potential acquirers, for reasons other than ineffective management (Stein, 1988). Underestimates by the market or overestimates by potential acquirers pose the threat of takeover to firms that are managed effectively (Roll, 1986). This conclusion does not depend on any systematic bias in stock prices. Noise in stock prices increases the probability that a firm will be both significantly over-priced and significantly under-priced, even if it is valued accurately on average. It also increases the probability that a would-be acquirer will significantly over-value or under-value the target. Only significant under-pricing by the market or over-valuing by the acquirer increases the threat of

takeover and raises the employment risk of the top executives.

This line of reasoning suggests that in efficient, but noisy markets, any investments that increase noise in security prices will increase the employment risk for top management- even if those investments benefit shareholders, on average. High risk investments are those for which the costs and benefits are highly uncertain at the time of the investment decision and would lead to more subjective estimates of future cash flows. This increases the probability of both over- and under-valuing the firm, increasing the probability of becoming a takeover target. Low risk investments are those for which the costs and benefits are relatively easy for the firm estimate at the time of the investment decision and would lead to more precise estimates of future cash flows. This decreases the probability of both over- and under-valuing the firm, decreasing the probability of becoming a takeover target. Excessive diversification (Amihud & Lev, 1981; Hoskisson & Turk, 1990), excessive retention of free cash flows (Jensen, 1986), and under-investment in R&D (Stein, 1988) have all been proposed as ways managers may harm shareholders by reducing firm risk.

Where the risk to management employment is high, agency theorists argue that top management will make investment decisions to reduce that risk. Self serving managers would be expected to forego high risk investments in the face of an active takeover market. In this study, we attempt to extend previous research by testing the hypothesis that insulation from the threat of takeover through poison pill adoption increases firm risk.

Whereas several studies have examined the impact of strategic events on the market value of a firm, few have examined the impact of strategic events on firm risk, Ferreira and Laux (2007) examined the impact of takeover defenses on idiosyncratic risk. In their study, they lump all takeover defenses together, although previous research has shown that many takeover defenses clearly benefit shareholders (Turk, 1992; Walkling & Long, 1984). In addition, these authors controlled for factors that affect firm risk, whereas we propose that poison pill adoption will be associated with investments and other strategic decisions that affect risk.

Methodological problems have traditionally plagued efforts to associate particular events with changes in risk. Most estimates of risk require data measured over intervals during which a number of confounding events may occur. Ferreira and Laux (2007), for example, estimated the idiosyncratic risk of a firm one year after adopting a poison pill. No adjustment for confounding events was made in their sample. Indeed it would be rather impractical to do so.

An examination of options prices, however, provides an opportunity to estimate daily changes in investor perceptions of risk. In this paper we test the hypothesis that poison pills increase investor

perceptions of firm risk by estimating changes in the Option-Implied Standard Deviation of common stock returns during the days surrounding the adoption of poison pills. In doing so, we apply the methodology that Levy and Yoder (1993) used to associate changes in firm risk with takeover announcements. Although previous research has examined the relationship between antitakeover charter amendments and investment decisions (Malette, 1991), this study provides a more direct test of the hypothesis that takeover defenses encourage risk taking.

The model most widely used by academics and investors for valuing options is a variation of the Black and Scholes option pricing model (Black & Scholes, 1973). In this paper, we use the Black-Scholes model modified for dividends as suggested by Merton (1973). The Black and Scholes model values options as a function of their exercise price, the price of the underlying stock, time to expiration, the rate of return on risk free securities, and the volatility of the underlying stock. Since all of these variables except volatility are known, changes in the standard deviation of the underlying security can be estimated from changes in options prices. Changes in this "implied standard deviation" (ISD) can be measured during the days surrounding a strategic event to provide an estimate of the change in firm risk associated with that event. Beckers (1981) has found ISDs to be better predictors of future stock return volatility than those estimated from time series of past stock returns and strongly suggests that ISDs do reflect a firm's risk. This approach has been used in the finance literature to estimate the change in risk associated with a number of events, including stock splits (French & Dufresne, 1986; Sheikh, 1989), mergers (Levy & Yoder, 1993), and earnings announcements (Patell & Wolfson, 1981).

## Methodology

To test the hypothesis described above we assembled a sample consisting of all firms adopting poison pills before January 1, 1987. The firms were identified through the Corporate Control Alert, a legal news letter that identifies all firms receiving poison pills and the date of their adoption. We rely on this source to maintain consistency with other studies of poison pills (Brickley, Coles & Terry, 1992; Loh, 1992; Malatesta & Walkling, 1988; Ryngaert, 1988; Strong & Meyer, 1990; Turk, et al. 1994). Each of these previous studies also focused on adoption of poison pills prior to 1987. Thus our choice of sample maintains comparability with previous research on poison pills. Of these firms, we identified all firms with options traded on either the CBOE, American Exchange, Philadelphia Exchange, or Pacific Exchange. To be included in the sample, a firm must have an option trading near-the-money with an expiration date more than 35 days after the event period.

The restrictions on option exercise price and maturity mitigate problems associated with the Black-Scholes model. MacBeth and Merville (1979) found that the Black-Scholes model is less accurate for deep in-the-money and deep out-of-the-money options. MacBeth and Merville also show that the Black-Scholes formula is sensitive to its underlying assumptions for options near their expiration date. Thus, we included the option for each firm with the exercise price closest to the stock price on forty days before the poison pill adoption (benchmark date). For inclusion in the sample, the option expiration date must be at least 35 days after the end of the event period (4 days after the pill adoption). These selection criteria resulted in a final sample of 57 firms.

To test the hypothesis that poison pill adoptions are associated with an increase in Option-Implied Standard Deviations, we compare the estimated ISDs during the days surrounding the poison pill adoption with a benchmark ISD estimated forty days prior to the adoption. The benchmark ISD is estimated forty days before the adoption to mitigate problems associated with potential information leakage. Specifically, we estimate:

$$\Delta \text{ISD}_t = \text{ISD}_{jt} - \text{ISD}_{bj}, \quad (1)$$

where

$\Delta \text{ISD}_t$  = change in ISD from the base period for firm j on day t (t=-4 to +4),

$\text{ISD}_{jt}$  = ISD for firm j on day t, and

$\text{ISD}_{bj}$  = ISD for firm j on day t -40, the benchmark ISD.

The data required to estimate ISDs include: a) the poison pill adoption date; b) the option price; c) the option exercise price; d) the current stock price; e) the option expiration date; and f) the risk free rate. As with most previous studies on poison pills, the poison pill adoption date was obtained from Corporate Control Alert. Data on the option price, exercise price, expiration date, and stock prices were all obtained from the Wall Street Journal. Finally, the risk free rate was estimated by calculating the yield on the U.S. Treasury bill maturing closest to the option. Bid-Ask rates for estimating the yield on T-bills were obtained from the Wall Street Journal.

We calculated ISDs each day from four days prior to the pill adoption through four days following the pill adoption. The event period begins four days before the pill adoption to control for the possibility that information regarding the adoption leaked to financial markets. We extend the analysis for four days after the announcement to assess whether or not any observed change in ISD is temporary. A T-test is used to estimate the statistical significance of changes in ISD relative to the benchmark. Specifically, the T-statistic is calculated as:

$$T_t = \frac{\Delta \text{ISD}_t}{(\text{ISD}_t / n)^{0.5}}, \quad (2)$$

where

$$\Delta \text{ISD}_t = \frac{\sum_{j=1}^n \Delta \text{ISD}_{jt}}{n},$$

$$\Delta \text{ISD}_t = \frac{\sum_{j=1}^n \Delta \text{ISD}_{jt}}{n},$$

$$S_t = \frac{\sum_{j=1}^n (\Delta \text{ISD}_{jt} - \Delta \text{ISD}_t)^2}{(n-1)}, \text{ and}$$

n = number of firms.

## Results

Table 1 displays the estimated mean difference between the benchmark ISD and the event period ISDs and the statistical significance of that difference. The results presented in Table 1 offer support for the hypothesis that poison pill adoptions are associated with an increase Option-Implied Standard Deviations, on average. Prior to the poison pill adoption date, there is no statistically significant increase in mean ISD relative to the mean benchmark ISD. On the poison pill adoption date, mean ISD is a statistically significant .0559 higher than the mean benchmark ISD (t=2.561). Mean ISD continues to rise slightly during the days following the poison pill adoption. For days +1 through +4, mean increase in ISD relative to the benchmark ISD remains statistically significant with t-statistics ranging from 3.48 to 3.92 (p<.01). This suggests that the rise in ISD is not a temporary phenomenon but represents a shift in investor perceptions of firm risk following the adoption of poison pills. On day +4, mean ISD is approximately 30% higher than the mean benchmark ISD (t=3.784).

**Insert Table 1 about here**

## Conclusion

Critics of poison pills argue that the threat of takeover spurs efficiency and stimulates strategic change. Other scholars have argued that the pressures of the takeover market stimulate risk aversion and short-sightedness, rather than efficiency. This latter argument implies that takeover defenses, such as poison pills, may induce top executives to approve risky investment that they may have foregone in the absence of the takeover protection.

In this paper, we provide evidence that supports the hypothesis that investors associate poison pill adoptions with an increase in firm risk. Investor perceptions of firm risk, as measured by Option-Implied Standard Deviations, rose a statistically significant 30% following the adoption of poison pills. This statistically significant increase in Implied Standard Deviation continues to persist four days after the poison pill adoption. This suggests that changes in implied standard deviations following poison pill adoption are not a temporary phenomenon but represent a significant change in investor perceptions of future firm risk.

Note that no systematic biases in capital markets are necessary to generate this result. Rather, noise in

capital market valuations discourages investment in any area that significantly increases the degree of noise. Thus, evidence of market efficiency in no way implies that takeovers do not lead rational managers to alter investment decisions. This result is consistent with both agency theory and existing evidence on capital market behavior.

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## Appendices

**Table 1.** Mean Change in Option-Implied Standard Deviation Between the Event Period and the Benchmark Period

This table provides the mean difference between Option-Implied Standard Deviations (ISDs) around the announcement of poison pill adoption and the benchmark ISDs prevailing forty days prior to the adoption.

Day	Mean Change in ISD	T-Statistic
-4	0.0215	1.337
-3	0.0195	1.358
-2	0.0248	1.582
-1	0.0293	1.887
Poison Pill	0.0559	2.561 **
+1	0.0708	3.553 **
+2	0.0767	3.481 **
+3	0.0873	3.921 **
+4	0.0851	3.784 **

\* p<.05

\*\* p<.01