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Using Innovative Securities under Asymmetric Information: Why Do Some Firms Pay with Contingent Value Rights?

Sris Chatterjee and An Yan*

Abstract

This paper provides the first theoretical explanation and the first empirical analysis of contingent value rights (CVRs), which have been used as a means of payment in acquisitions, exchange offers, debt restructurings, Chapter 11 reorganizations, and lawsuit settlements. A CVR is a put option committing to pay additional cash or securities to CVR holders, contingent on the issuer's share price falling below a prespecified reference level. In this paper, we develop a model to show that CVRs can help a higher-intrinsic-value firm to reveal its firm type when the firm faces an asymmetric information problem. Our model predicts that i) when CVRs are offered along with cash or stock, the announcement period abnormal stock return is greater than that in stock offers, ii) firms facing more severe asymmetric information problems are more likely to offer CVRs to signal their firm type, and iii) firms that are relatively more cash-constrained are more likely to offer CVRs rather than cash. We test all three predictions using a sample of mergers and acquisitions. Our empirical results are consistent with the predictions of the model.

I. Introduction

A contingent value right (CVR) is a commitment by an issuing company to pay additional cash or securities to CVR holders if the share price of the issuing company falls below a prespecified reference price at some future date. For

*Chatterjee, chatterjee@fordham.edu and Yan, ayan@fordham.edu, Schools of Business, Fordham University, 113 W 60th St, New York, NY 10023. The earlier version of this paper was circulated under the title "Contingent Value Rights: Theory and Empirical Evidence." For helpful comments or discussions, we thank Hendrik Bessembinder (the editor), Tim Burch, Thomas Chemmanur, Michael Fishman, Murali Jagannathan, Yuri Khoroshilov, Srinivasan Krishnamurthy, Jinliang Li, Robert Mooradian, Lemma Senbet, Spencer Martin, Kristian Rydqvist, and Rajdeep Singh, as well as participants at the 2003 European Finance Association meetings, the 2003 Financial Management Association meetings, the 2004 Western Finance Association meetings, and seminars at SUNY Binghamton and Northeastern University. We also thank Pierre Hillion (the referee) for helpful suggestions. We alone are responsible for any errors or omissions.

example, in the acquisition of Paramount by Viacom in 1993, the CVR offered by Viacom would entitle the CVR holder to receive, at the end of the year, the difference between $48 and the closing price of Viacom B shares as long as the share price was less than $48. Thus, the Viacom CVR resembles a European put option. See Hietala, Kaplan and Robinson (2003) for more details of the Viacom CVR and Bruner (2004) for other examples of CVRs. While largely used in mergers and acquisitions (both in Europe and the U.S.), CVRs have also been used as a partial compensation in other circumstances, such as exchange offers, debt restructurings, Chapter 11 reorganizations, and lawsuit settlements.[1] Many practitioners argue that CVRs help to close a deal by guaranteeing a minimum value for the stock portion of the payment package, especially if these shares have significant downside risk. However, in a few cases, CVRs are used even when the acquiring firm is not paying with stock, which invalidates this guaranteed stock value argument. Further, since pure cash payments are not subject to any valuation disagreement, why does the firm choose to pay with CVRs instead of (or in addition to) paying with cash? The academic literature has not provided any analysis that would enable us to answer these questions.

This paper provides the first theoretical as well as the first empirical analysis of contingent value rights or CVRs. In this paper, we show that the practitioner's intuition can be interpreted as CVRs being a guarantee of firm quality. We provide a signaling explanation and empirically test some implications of our theory. In our model, we consider a firm acquiring an asset from outside investors (e.g., target shareholders in the case of a takeover, or bondholders in the case of an exchange offer) by offering a combination of stock, cash, and CVRs. The firm's insiders have private information about the firm's post-acquisition value while outside investors do not know this information. Thus, a higher-intrinsic-value firm has an incentive to separate itself from a lower-intrinsic-value firm in order to rectify the mispricing of its shares, as well as avoiding the mispricing of its payment package. Under this framework, we analyze and compare the signaling roles of debt-financed cash payment and CVRs.

From the perspective of the higher-value firm, both debt-financed cash payment and CVRs can be credible signals. Debt-financed cash payment raises the possibility of financial distress. When the financial distress is sufficiently costly, the lower-value firm will not mimic the higher-value firm by offering cash payment. Similarly, CVRs, if cash-settled, can also lead to financial distress. However, in addition to the financial distress cost, CVRs also impose a large potential contingent payment on the lower-value firm. This large payment burden on the lower-value firm arises from two critical features of CVRs. First, CVRs are put options by nature, so that the likelihood and the size of contingent payments are inversely related to the future underlying share price. Second, CVRs make contingent payments in the future after firm types are partially or fully revealed. These two features together imply that the lower-value firm is likely to trigger contingent payments more frequently and of a larger size, compared to

[1]For example, in 1999, Abraxas Petroleum Corporation offered CVRs, together with a new issuance of senior secured notes and shares of Abraxas common stock, in exchange for its senior notes outstanding at that time.

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the higher-value firm. This makes CVRs a more effective signal than cash payment, especially in the case of severe asymmetric information or in the case where a cash-constrained firm has to offer a relatively large amount of risky securities with uncertain payoffs.

Our model has several empirically testable implications. First, our model predicts that CVR payments (or cash payments) are offered by higher-value firms and all-stock payments are offered by lower-value firms. Second, it predicts that CVRs are more likely to be used when the issuing firm faces a more severe asymmetric information problem. Third, the model predicts that a firm with less internal capital is more likely to use CVRs instead of cash to signal its firm type. We test all three predictions using a comprehensive sample of mergers and acquisitions (M&As) in which CVRs are offered and CVR offering firms are listed in U.S. exchanges. We compare this sample with a control sample of M&As involving no CVRs. We test the first prediction based on the announcement effect of CVRs. We find that firms offering CVRs experience a significantly larger announcement period abnormal equity return than firms offering only stock. We test the second and third predictions by comparing the likelihoods of CVR offers and cash offers. We find that the likelihood of a firm offering CVRs rather than cash (or cash/stock) is greater when the firm faces a more severe asymmetric information problem or when the firm is more cash constrained. All of these results are consistent with our model predictions.

Our paper is related to the literature on securities innovation in the presence of asymmetric information.[2] It contributes to this literature by studying contingent value rights (which is a relatively new innovative security). Our theoretical framework is particularly related to Stein (1992), who suggests that, due to the possibility of financial distress, good quality firms can use debt or callable convertible securities to separate themselves from bad quality firms. This rationale, which is based on the financial distress cost alone, can be applied to explain some CVRs in our sample as well.[3] However, it is worth emphasizing that many CVRs in our sample are designed as a put-spread and some CVRs make the payment in common stock instead of cash. In these CVRs, the probability of default is minimized and the financial distress rationale may not be the only reason. Our paper differs from Stein (1992) in that we show how CVRs can be an effective signal even in the absence of the financial distress cost.[4]

[2]For example, Hillion and Vermaelen (2004) recently study floating-priced convertibles, a financial innovation often referred to as death spirals. For other examples, see Chemmanur and Fulghieri (1997) on the use of warrants in new equity issues, Constantinides and Grundy (1989) on the use of securities similar to (noncallable) convertible bonds to solve the adverse selection problem, Gibson and Singh (2001) on put warrants, and Cantale and Russino (2004) on putable common stock in the context of IPOs.

[3]We thank the referee for pointing out this possibility.

[4]Our model also has different empirical implications compared to Stein (1992), which suggests that convertibles, as a hybrid of stock and bond, are a weaker signal compared to straight bond. In fact, Stein (1992) shows that in equilibrium, a median quality firm issues convertibles and a high quality firm issues straight bond to separate themselves from bad quality firms. In comparison, our model predicts that CVRs could be a more effective signal than cash payment, especially in the case of severe asymmetric information or in the case where the firm has to offer a substantially large amount of securities with uncertain payoffs.

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Our empirical findings contribute to the vast literature on the mode of payment in M&As. Most of this literature focuses on the choice between cash and stock offers.[5] Recently, several papers have examined other innovative means of payment beyond cash and stock. For example, Kohers and Ang (2000) and Bruner (2001) examine the use of earnout payments (i.e., payments contingent on the target exceeding certain performance levels), which are call options in nature. Another closely related contractual feature is a collar (see Fuller (2003) and Officer (2004)). Similar to a CVR, a collar provides price protection to target shareholders in an acquisition. But a collar provides price protection only prior to the closing of a deal, while a CVR provides price protection after a deal closes. However, use of CVRs has not yet been analyzed in the literature either theoretically or empirically.

The rest of this paper is organized as follows: Section II describes the basic model; Section III characterizes the equilibria of the model and develops the empirical implications; Section IV describes the sample and variable constructions; Section V reports the empirical results; and Section VI concludes. All the proofs are confined to Appendix A.

II. The Model

The model has two dates ($t = 0, 1$). We consider an entrepreneur owning an all-equity firm that has available to it an amount of internal capital W. At $t = 0$, the firm makes a payment to outside investors ("outsiders" hereafter) in exchange for an asset owned by the outsiders.[6] The firm's internal capital W is insufficient to meet the acquisition need of the firm. We assume that the firm can choose any combination of three securities: common stock, contingent value rights, and cash. At $t = 1$, the cash flows of the firm are realized and distributed to the different stakeholders. Without loss of generality, we normalize the number of total shares of the firm's equity to be one, and the risk-free rate of return is assumed to be zero. We also assume that all the agents including the entrepreneur and the outsiders are risk-neutral.

A. Cash Flow and Information Structure

There are two types of firms: good (type G hereafter) or bad (type B hereafter). We assume that acquiring the asset is a positive NPV investment to both types of firms. Thus, both the type G and the type B firms are willing to undertake the investment. After the acquisition of the asset, each type of firms earns from the asset either a gross cash flow of x_h (the high cash flow), x_m (the medium cash

[5]For the theoretical literature, see Fishman (1989), Hansen (1987), and Eckbo, Giammarino, and Heinkel (1990). For the empirical literature, see, e.g., Martin (1996), Travlos (1987), Berkovitch and Narayanan (1989), Brown and Ryngaert (1991), and Ghosh and Ruland (1998).

[6]This investment can be viewed either as a bidder acquiring outstanding equity of a target from target shareholders, or a firm paying an amount to settle a lawsuit with plaintiffs. One can also view the investment as buying back an amount of outstanding debt from debtholders if we generalize the model to include both debt and equity in the firm's capital structure.

flow), or x_l (the low cash flow) at $l = 1$; $x_h > x_m > x_l$. The difference between the two types arises from the ex ante probabilities attached to the high, the medium, and the low cash flows. The ex ante (time 0) cash flow distribution of the type G is more upward-skewed than that of the type B. In particular, we assume that the type G can generate from the asset a high cash flow with a probability of ϕ_h, a medium cash flow with a probability of ϕ_m, and a low cash flow with a probability of ϕ_l; $\phi_h + \phi_m + \phi_l = 1$. On the other hand, the type B can generate from the asset a high cash flow with a probability of $\delta_h < \phi_h$, a medium cash flow with a probability of $\delta_m > \phi_m$, and a low cash flow with a probability of $\delta_l > \phi_l$; $\delta_h + \delta_m + \delta_l = 1$. Without loss of generality, we assume $\phi_l = 0$ and $x_l = 0$. Thus, the intrinsic value of the acquired asset to the type G firm is $V_G = \phi_h x_h + \phi_m x_m$, and the intrinsic value of the asset to the type B firm is $V_B = \delta_h x_h + \delta_m x_m$; $V_G > V_B$.[7] We define $a \equiv (V_G - V_B)/V_G$. Therefore, a is a scaled measure of the difference in intrinsic values between the type G and the type B firms.

The firm type is private information to the entrepreneur at $t = 0$. The outsiders know only a prior probability distribution over the firm type: at $t = 0$, the outsiders believe that the probabilities of any given firm being of a type G or B are γ and $1 - \gamma$, respectively. At $t = 1$, the asymmetric information between the outsiders and the entrepreneur is resolved.

For simplicity, we assume that the stand-alone value of the asset owned by the outsiders, V, is common knowledge to all the players in the market, where $V < x_m$.[8] In order to successfully acquire the asset, the firm must offer a payment worth at least the fair market price of the asset, V. In the paper, we will not analyze how the positive NPV of the acquisition (i.e., the synergy) is split between the acquiring firm and the outsiders, since it is not the focus of the paper. Instead, we assume that the minimum price paid by the firm only needs to capture the stand-alone value of the asset, V, and does not need to capture any share of the NPV arising from the synergy.[9] We also assume that $V < W$, so that the firm's internal capital is not sufficient to pay for the asset.

B. Methods of Payment

The entrepreneur can use one or any combination of three different means of payments to acquire the asset: cash, contingent value rights, and stock. The type G (or B) firm can choose to use cash to finance the acquisition of the asset. If the cash amount paid exceeds the amount of its internal capital, the type G (or the type B) firm has to borrow a cash amount D_G (or D_B) from debtholders at $t = 0$ by issuing zero-coupon straight debt maturing at $t = 1$. If the firm's cash flow at $t = 1$ is not sufficient to pay in full the promised payments to debtholders, the firm will be forced to declare bankruptcy. In this case, an exogenous and constant

[7] Note that the total intrinsic firm values of the type G and the type B firms are $V_G + W$ and $V_B + W$, respectively.

[8] This implies that the asymmetric information between the firm and the outsiders in our model is on either the stand-alone value of the firm or the synergy created in the acquisition.

[9] Our results will remain unchanged qualitatively, even if we assume that the minimum price paid by the firm captures both the stand-alone value of the asset and the value of the share of the synergy that the outsiders can obtain in the transaction.

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deadweight cost of c is imposed on the firm.[10] We assume that the deadweight cost of bankruptcy is sufficiently large and that $c > \omega(V - W) + (1 - \omega)V_G$, where ω is the relative weight of long-term equity value in the entrepreneur's utility function defined below.

In addition to cash, if the type G (or B) firm chooses to use stock, it pays a fraction n_G (n_B) of the firm's equity to the outsiders for their asset. Finally, the firm can also choose to offer a number of k contingent value rights to the outsiders. For each CVR, a "reference price" R is specified, so that if the firm's market share price P at $t = 1$ is below the reference price R, the holder of each CVR is entitled at $t = 1$ to receive from the firm an additional amount of payment equal to the difference between R and P.[11] In this case, the total amount of contingent payment $M = k(R - P)$. Otherwise, if the market price P at $t = 1$ exceeds the reference price R, the CVR will expire at that time without triggering any payments. We assume that CVRs are cash-settled, and if the firm cannot service the contingent payment at $t = 1$, it will incur an exogenous deadweight cost of c. We also assume that any firm paying with CVRs will incur a small exogenous marketing cost ε to sell CVRs to investors, which they do not need to incur if the security paid is equity or cash.[12]

In summary, at $t = 0$, the entrepreneur (the firm) chooses a combination of cash, stock, and CVRs to maximize his utility, which is equal to the weighted average of the expected long-term (time 1) and short-term (time 0) values of the equity held by the entrepreneur, net of the expected cost of bankruptcy and the marketing cost of CVRs. We assume that the weights assigned by the entrepreneur to the long-term and the short-term equity values are ω and $1 - \omega$, respectively.

III. The Equilibrium

Equilibrium strategies and beliefs in our model are defined as those constituting a Perfect Bayesian Equilibrium (PBE) satisfying the Cho-Kreps (1987) Intuitive Criterion.[13] Before going on to characterize the equilibrium of our model, we first illustrate the basic intuition underlying the signaling role of CVRs based on a numerical example.

[10] Our assumption of bankruptcy cost merely serves to capture the notion that there is a cost for the firm to use cash payment. In other words, assuming small internal capital $W < V$ and the existence of bankruptcy cost allows us to endogenize the cost of cash payment. A firm could incur other kinds of cost associated with cash payment, such as the cost of overpayment as in Fishman (1989) and Hansen (1987) or the opportunity cost of foregoing the other profitable investments. All our results go through if we introduce any one of these costs to our setting.

[11] Since the total number of the firm's shares is normalized to equal one in our model, the share price of the firm is the same as the total equity value of the firm, and the reference price can also be viewed on a total-value basis.

[12] The assumed marketing cost for new financial innovations like CVRs is meant to capture the notion that a firm is unlikely to issue innovative securities if it is as well off by issuing conventional securities such as equity or debt. There is some evidence that firms (or investment banks acting on their behalf) incur such marketing costs when they introduce innovative securities in practice. For example, Ross (1989) states that "the less familiar and the more esoteric the instrument, the more costly it is to sell it" (see also Tufano (1989), (2002)). In the setting of our model, all conclusions remain unchanged even if such marketing costs are extremely small.

[13] Fudenberg and Tirole (1991) provide a formal definition of a PBE.

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A. A Numerical Example

Consider an entrepreneur who needs to pay \$2 to acquire the asset at $t = 0$. For simplicity, we assume here that the firm's internal capital $W = 0$. The post-acquisition payoff at $t = 1$ can be high ($x_h = \$24$), medium ($x_m = \$8$), or low ($x_l = 0$). The type G (good) firm has a probability $\phi_h = 75\%$ of realizing x_h, $\phi_m = 25\%$ of realizing x_m, and $\phi_l = 0$ of realizing x_l, while the type B (bad) firm has a probability $\delta_h = 25\%$ of realizing x_h, $\delta_m = 50\%$ of realizing x_m, and $\delta_l = 25\%$ of realizing x_l. The firm's type is private information to the firm itself. In this example, we temporarily assume $c = 0$ to simplify the calculation and to focus on the intuition underlying the signaling role of CVRs other than the cost of bankruptcy. We relax this assumption and assume $c > 0$ in the full model.

To exchange for the asset, the type B firm offers an equity share of $\frac{1}{5}$; and the type G firm offers an equity share of $\frac{1}{19}$ plus a CVR that promises a contingent payment of \$4 if the firm's payoff at $t = 1$ is less than \$2. The type B firm finds that it is not optimal to offer the payment with CVR, since the payment would cost the type B $\$\frac{46}{19}$ (a 50% chance to pay the \$4 contingent payment plus $\frac{1}{19}$ share of its equity worth \$8 net of the expected contingent payment). On the other hand, the type G finds that it is not optimal to offer the kind of stock payment paid by the type B, since such a stock payment would cost the type G \$4. Consequently, a separating equilibrium is attained where the type B firm offers only equity and the type G firm offers equity plus CVR.[14,15]

In the above example, CVR is a feasible signal, since CVR imposes a larger burden of expected contingent payment on the type B firm than on the type G firm. In the following model, we formally analyze the signaling role of CVR and compare it with the signaling role of cash payment.

B. Analysis of Firms' Choice of Payment

The type G firm has an incentive to design its payment package in a way that the type B firm finds nonoptimal to offer. The type G can do so by either offering a debt-financed cash payment or a CVR payment. The intuition for a debt-financed cash payment to be a feasible signal is similar to that in Stein (1992). The type B firm has less incentive to issue debt-financed cash payment compared to the type G firm, since if the type B did so, it would be more likely to incur financial distress cost. When the expected financial distress cost is substantially large, it exceeds the benefit to the type B firm from mimicking the type G (i.e., the benefit arising from the overpricing of the type B's securities).

[14] In this example, the type G firm issues more CVRs than stock, which results from our simplified assumption $c = 0$. In order for a payment package to work as a signal, the total cost of the package to the type B firm must be higher in the bad state than in the good state. This condition could be satisfied by either the cost of financial distress or the CVR contingent payment or both. When the cost of financial distress is absent, as in the numerical example, the number of CVRs must be higher than the number of stock offered so that the contingent payment plus the value of the stock is higher in the bad state than in the good state. However, when the total cost includes the payment on the CVR and financial distress cost, as in our model in the next section, it can be shown that the type G firm could issue a lower or equal number of CVRs compared to the number of stock.

[15] We thank Michael Fishman for suggesting this example.

A CVR can also achieve the same goal for the type G firm. The type B firm has less incentive to issue cash-settled CVR than the type G firm, since by offering the CVR, the type B firm would not only be more likely to incur the financial distress cost, but also more likely to trigger a contingent payment. In particular, the type G firm can set the reference price R of its CVR in such a way that a contingent payment will be triggered if the issuing firm earns either x_l or x_m at $t = 1$. If the type B firm mimicked the type G by issuing the same CVR, the type B would face a probability $\delta_l + \delta_m$ of triggering the contingent payment at $t = 1$.[16] In addition, if the type B firm cannot service the contingent payment, it would also incur the bankruptcy cost at $t = 1$. Thus, when the expected contingent payment, together with the expected cost of bankruptcy, is prohibitively costly, the type B would be discouraged from offering a CVR.

Denote Π_i, $i \in \{G, B\}$, as the expected payoff to the entrepreneur if the firm is of type i and is perceived by the outsiders as its true type i at $t = 0$. Also denote by $\Pi_{i(j)}$ the type i firm's expected payoff if it is perceived by the outsiders as a type j, where $i, j \in \{G, B\}$; $i \neq \leq j$. Then, the type G firm's objective is to maximize expected payoff Π_G by offering a combination of a cash amount $D_G + W$, an equity stake n_G, a number of CVRs k, and a reference price R:[17]

$$(1) \qquad \max_{n_G, D_G, R, k} \Pi_G = (1 - n_G)[V_G + W - (D_G + W) - \phi_m M] - I(k > 0)\varepsilon,$$

subject to the incentive compatibility (IC) constraint that ensures the type B will not mimic the type G:

$$(2) \qquad \Pi_B \geq \Pi_{B(G)} = (1 - \omega)\Pi_G + \omega(1 - n_G)[V_B - \delta_h D_G - \delta_m(D_G + M)] - I(k > 0)\varepsilon - I(k > 0 \text{ or } D_G > 0)\delta_l c,$$

where I is an indicator function. $I(k > 0)$ equals one if the type G firm includes CVRs in its payment package, and zero otherwise. Similarly, $I(k > 0 \text{ or } D_G > 0)$ equals one if the type G firm includes either CVRs or debt-financed cash in its payment, and zero otherwise. Note that in the case where $k > 0$ or $D_G > 0$, a firm will have no ability to service any debt payment or contingent payment at $t = 1$ when it earns a low cash flow $x_l = 0$. M is the contingent payment when the issuing firm earns x_m at $t = 1$:

$$(3) \qquad M = k[R - (x_m - M - D_G)].$$

[16] Similar to the type B firm, the type G firm could also incur a contingent payment at $t = 1$. However, the expected amount of contingent payment and thus the value of the CVR are decreasing with an increase in the firm's future performance, given the "put option" nature of the CVR. Thus, a contingent payment that is fairly priced to the type G firm would be too costly for the type B firm to offer.

[17] Thus, we assume here that the type G firm first uses its internal capital (riskfree cash flows) to pay for the asset, followed by securities with uncertain cash flows whose values are affected by information asymmetry. In our setting, the type G firm always has incentive to use internal capital first, since otherwise keeping internal capital unused would generate zero NPV to the firm. This assumption is also consistent with the pecking order of financing in the literature on an under-valued firm (such as the type G firm before the acquisition in our setting).

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Here, the calculation of M is based on the fact that, when a firm earns x_m at $t = 1$, investors rationally anticipate a debt payment D_G and a potential contingent payment M to be paid by the firm, so that the firm's equity value at that time is $x_m - M - D_G$. Note that the contingent payment is zero when the firm earns x_h at $t = 1$, and it is kR when the firm earns x_l at $t = 1$.

Further, in the above maximization problem, Π_G takes into consideration that the type G's firm type is revealed at $t = 0$ in equilibrium, which implies that the short-term (time 0) and the long-term (time 1) equity values of the type G firm are the same. $\Pi_{B(G)}$ is calculated as the weighted average of the short-term and the long-term values of the type B firm's equity held by the entrepreneur, net of the potential cost of marketing the CVRs and the expected cost of bankruptcy. Π_B is defined in the appendix. In this paper, we study only the case where the type G firm designs its CVR so that the type G itself will have enough cash flow to service the contingent payment M, i.e.,

$$x_m \geq M + D_G. \tag{4}$$

This condition will be satisfied trivially in our separating equilibrium discussed below, given our assumption that $x_m > V$.[18]

Finally, the following individual rationality (IR) constraints must be satisfied in equilibrium to ensure that the outsiders at least break even in the transaction:

$$V - W \leq n_G(V_G - D_G - \phi_m M) + D_G + \phi_m M, \tag{5}$$

and to ensure that CVRs are designed such that contingent payment is triggered when the issuing firm earns x_m or x_l at $t = 1$, but not when it earns x_h:[19]

$$x_h - D_G > R \geq x_m - D_G. \tag{6}$$

The type B firm's problem is trivial. The type B firm is not concerned about distinguishing itself from the type G firm: the type G has no incentive to mimic the type B. Further, given the equilibrium choice made by the type G firm, the type B firm is always worse off mimicking the type G compared to the case if it follows its full information equilibrium strategy.

C. CVRs versus No CVRs

In the following, we characterize the equilibria where various combinations of securities are offered in the acquisition. We first consider the case where no

[18] Our model can also be generalized to the case where $x_m < V$, but the proofs and derivations will be more tedious and complex. The intuition of the equilibrium in this generalized case would still be similar.

[19] If the CVRs are designed such that a contingent payment will be triggered only at x_l, i.e., $x_l = 0 \leq R < x_m - D_G$, then the CVR is equivalent to a debt-financed cash payment in our setting. The CVR could also be designed such that a contingent payment will never be triggered, i.e., $R < x_l - D_G$ in a more generalized model where $x_l > 0$. In this case, a package of CVR and stock is equivalent to a stock payment. Neither kind of CVRs discussed above will be offered in equilibrium due to the extra cost of marketing CVRs compared to the case of a payment with only cash or stock. It can also be shown that CVRs with $R \geq x_h - D_G$ are less effective in signaling compared to the CVRs discussed in the paper.

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CVRs are issued in a separating equilibrium. Proposition 1 characterizes the equilibrium.

Proposition 1 (*Equilibrium with no CVRs).* If the difference in the intrinsic values between the type G and B firms is such that $a \leq \underline{\alpha}$, then the equilibrium is separating and involves the following:[20]

The type G firm. It pays a fraction n_G^1 of its equity and a cash amount $D_G^1 + W$ to the outsiders in exchange for their asset; $n_G^1 \geq 0$ and $D_G^1 > 0$.

The type B firm. It pays a fraction $V/(V_B + W)$ of its equity for the outsiders' asset.

Outsiders. If a firm offers a cash amount in its payments in either an all-cash payment or a mixed payment of partially cash and partially stock, they infer that the firm is of a type G with probability 1. If a firm offers an all-stock payment, they infer that the firm is of type B with probability 1.

This proposition states that, when the value difference between the firm types is sufficiently small, the type G firm finds it optimal to distinguish itself from the type B firm by offering debt-financed cash payment. The type B firm, on the other hand, does not mimic the type G firm in equilibrium by offering similar securities, since for the type B, the expected financial distress cost associated with the cash payment exceeds the benefit from mimicking the type G (arising from the overpricing of the type B's securities). Note that, in this case, CVR is also a feasible signal for the type G firm. However, given the marketing cost for such a relatively new financial innovation, CVR is a more costly signal than cash payment. Thus, CVR will not be offered whenever cash payment is sufficient to attain separation for the type G firm.

Proposition 2 (*Equilibrium with CVRs).* If the difference in the intrinsic values between the type G and B firms is such that $\underline{\alpha} < a \leq \overline{\alpha}$, then the equilibrium is separating and involves the following:

The type G firm. It pays a fraction n_G^2 of its equity, a number k_2 of contingent value rights, and a cash amount $D_G^2 + W$ to the outsiders in exchange for their asset; $n_G^2 \geq 0$, $D_G^2 \geq 0$, and $k_2 > 0$. Each CVR has a reference price R_2, and is obligated to pay to its holder any difference between R_2 and the firm's share price at $t = 1$ if the share price at that time falls below R_2.

The type B firm. It pays a fraction $V/(V_B + W)$ of its equity for the outsiders' asset.

Outsiders. If a firm offers CVRs as part of its payments in combination with cash, stock, or cash and stock, they infer that the firm is of a type G with probability 1. If a firm does not offer CVRs, they infer that the firm is of type B with probability 1.

When the value difference between the firm types is sufficiently large, the type B firm can benefit substantially from mimicking the type G firm. In this case, cash payment is infeasible for the type G firm to reveal its type, and the

[20]We will define explicitly the parameters in the equilibrium constraints, such as $\underline{\alpha}$, $\overline{\alpha}$, and the equilibrium choices, such as D_G^1, n_G^1, D_G^2, n_G^2, k_2, and R_2, only in Appendix A, together with the proof of the equilibria.

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CVR payment as characterized in the above proposition is the equilibrium choice for the type G firm.

Further, $\underline{\alpha}$ in the above equilibrium is increasing in the amount of internal capital W and the deadweight cost of bankruptcy c. Thus, the above equilibrium also states that, when internal capital or bankruptcy cost is sufficiently small, the type G firm is more likely to offer a CVR payment in its acquisition of the asset. The intuition is as follows: when the type G firm has less internal capital, it has to pay a larger amount in the securities with uncertain cash flows such as stock, CVR, and debt. Unlike internal capital, which is unaffected by information asymmetry, these securities with uncertain cash flows would be mispriced if the higher-quality firm pools with the lower-quality firm under the presence of information asymmetry. As a result, the type B firm would benefit more from mimicking the type G firm, and the type G firm needs a stronger signal to distinguish itself from the type B. Similarly, when the cost of bankruptcy facing the type B firm is small, the bankruptcy cost alone is no longer enough to deter the type B from mimicking the type G. In both cases, cash payment is infeasible for the type G firm to signal its firm type, and CVR is a feasible signal for the type G firm.

D. Discussions

1. Design of CVR Payment

In this section, we discuss the design of the payment in the equilibrium that we characterized in Proposition 2. Proposition 2 states that the type G firm can offer a payment package including CVRs to signal its firm type. Such a payment package could be either a combination of cash and CVRs ($n_G^2 = 0$, $D_G^2 + W > 0$, and $k_2 > 0$) or a combination of equity, cash, and CVRs ($n_G^2 > 0$, $D_G^2 + W > 0$, and $k_2 > 0$). It could also be a combination of equity and CVRs only, with no cash ($n_G^2 > 0$, $D_G^2 + W = 0$, and $k_2 > 0$) if the firm's internal capital $W = 0$.[21]

The intuition behind this flexibility in designing the package is as follows. In the equilibrium characterized in Proposition 2, the signaling role can be completely satisfied by the CVR, with no additional signaling provided by cash or stock. The only requirement about the quantity/amount of CVR in the payment package is that the CVR would impose a large enough contingent payment on the type B firm in order to prevent it from offering the same CVR payment. But cash and/or stock is still needed by the type G firm to make up the rest of the payment package because the value of CVRs that are needed for signaling will not generally equal the value of the asset being acquired. Once the sufficient amount of CVR is chosen, the type G firm is free to choose any combination of cash and stock to make up the remainder of the required cost of the asset being acquired.

The type G firm has two degrees of freedom in designing a CVR: the number of CVRs k and the reference price R. Specifically, the type G firm could set either a large k or a large R or both to ensure that the contingent payment M on the mimicking type B would be prohibitively large. Thus, while our model predicts

[21] In a more generalized model where internal capital carries an opportunity cost (e.g., when the firm needs internal capital for an existing positive NPV project), the payment could be a combination of equity and CVRs even if the firm's internal capital $W > 0$.

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that k and R together can serve as a signal through their impacts on the expected contingent payment, our model also indicates that outsiders cannot tell a firm's type from either reference price R alone or from the number of CVRs k alone.

However, the reference price cannot be too high or too low in equilibrium. Our model suggests that the type G firm should set reference price R so that constraint (6) is satisfied. In this way, CVR at $t = 1$ will trigger contingent payments when a firm earns lower cash flows, i.e., at x_l and x_m, but not when a firm earns a higher cash flow, i.e., at x_h. Given that the type B firm has a higher likelihood of earning lower cash flows than the type G firm does, such a CVR would impose a larger cost on the type B firm, thereby preventing it from offering the same CVR as the type G does. In this sense, our model suggests that only certain reference prices (satisfying (6)) will be observed in equilibrium.

Finally, our result that CVR is a feasible and stronger signal than cash payment does not depend on the form of the contingent payment or settlement. Even if CVR is stock-settled, the fact that the type B firm is more likely to trigger an extra stock payment would still discourage it from mimicking the type G firm. Thus, CVRs in our setting can be either cash-settled or stock-settled.

2. Complexities in CVR Options

CVRs have a wide variety of complex option features (see Appendix B for a detailed discussion). Some of these real-life CVR features are not explicitly captured by our model, since our model emphasizes the signaling role of CVRs in a parsimonious manner. However, adding these features would not change our intuition behind the choice of CVRs. Here, we discuss how some features have been captured by our model or could be captured by an extension of our model.

For example, some CVRs are designed as a European put spread, thus putting a ceiling on the contingent payment. One can argue that this feature is motivated by the type G firm's desire to avoid or limit the bankruptcy cost for itself. In our setting, the type G firm designs its CVRs to ensure that the maximum contingent payment will not exceed the cash flow available when the asset earns a cash flow x_m at time 1. Such a design can be viewed as the type G implicitly setting a ceiling for the contingent payment.

CVR issuers may also set different maturities for their CVRs and may even include the maturity extension options in their CVRs. There are two possible reasons for these maturity features of CVRs. First, the type G firm may set different maturities to match its expected time for the revelation of asymmetric information. According to our theory, a CVR could be an effective signal only if the maturity of the CVR is set at a future time when the asymmetric information on firm type is (at least partially) resolved. Also, the type G firm may use maturity extension options to address the uncertainty of the time for the revelation of asymmetric information.

Second, maturity can serve as a signaling device as well. For example, Flannery (1986) suggests that a low-quality firm prefers to issue long-term debt rather than short-term debt, since otherwise it would have to pay a high rate in future in rolling over short-term debt. In contrast, a high-quality firm does not face such a high rate, since the market will most likely receive positive information on the firm before it rolls over its short-term debt. As a result, the high-quality firm can

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issue short-term debt to separate itself from the low-quality firm. This signaling rationale on debt maturity can also be applied to CVR maturities. Consider CVRs with different maturities in a conceptualized two-period model. The rationale behind Flannery (1986) would predict that a short-term CVR can provide a stronger signal than a long-term CVR. In sum, the choice of CVR maturity will depend upon the rationale in Flannery (1986) and the timing of information revelation.[22]

3. Impact of Leverage on CVR Offers

In our model, we assume an all-equity firm. In the following, we discuss intuitively the impact of leverage on the likelihood of CVR offers. If we assume that both the type G and the type B firm have outstanding risky debt before they make offers for their acquisitions, our model will be affected in two ways. On the one hand, the existence of leverage will increase the probability of financial distress for the type B firm, thereby reducing the type B's incentive to mimic the type G by offering debt-financed cash payment. As a result, compared to the case when the type B has no leverage, debt-financed cash payment in the leverage case would be a more effective signaling device and the likelihood of CVR offers would be reduced. On the other hand, the existence of leverage will also increase the probability of financial distress for the type G firm, thereby increasing the signaling cost of debt-financed cash payment to the type G firm. In this case, the type G could be more willing to offer CVRs rather than cash payment as a signal, since CVRs, especially stock-settled CVRs, will not trigger financial distress for the type G firm. Overall, if we consider the above two impacts of leverage, it is ambiguous whether or not an increase in leverage would increase the likelihood of a CVR payment.

E. Implications of the Model

In this section, we will discuss two empirical implications of our model: the announcement effect of contingent value rights and the choice of contingent value rights.

Implication 1: Announcement effect of contingent value rights. Proposition 2 states that, given the existence of asymmetric information, a higher-intrinsic-value firm offers a payment package with CVRs, while a lower-intrinsic-value firm offers a stock payment without CVRs. Since a firm's intrinsic value is unobservable prior to the acquisition, we cannot directly test this implication. Instead, we test this implication based on the announcement effects of various payment packages. In particular, a firm's abnormal equity return upon the announcement of its payment package captures the change in the market's belief (about the firm's value) around this announcement. Prior to the announcement, the market is unaware of the firm type and values the firm at the average of the values of the higher-intrinsic-value and the lower-intrinsic-value firms. When the firm announces that it will offer CVRs as part of its payment, the market believes that the firm is of

[22] It is worth noting that the possibility of the signaling role of maturity does not change our argument that CVR is a stronger signal than cash. Given the same maturities, CVR is still a stronger signal than a debt-financed cash payment.

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higher intrinsic value, and therefore revises the firm's value upward accordingly to incorporate such a change in belief. On the other hand, when the firm announces that it will offer an all-stock payment, the market believes that the firm is of lower intrinsic value and revises the firm's value downward accordingly. Thus, Proposition 2 predicts that the abnormal equity return upon the announcement of a CVR offer is positive and greater than the announcement period abnormal return of an all-stock offer. This prediction is our first testable hypothesis (H1).

Implication 2: Choice of contingent value rights. The difference in the intrinsic values between a higher-intrinsic-value firm and a lower-intrinsic-value firm, i.e., α, can proxy for the extent of asymmetric information in the market. A higher-intrinsic-value firm facing a larger α is more affected by the asymmetric information between outsiders and itself. Thus, Proposition 1 suggests that a higher-intrinsic-value firm prefers to offer a payment package with a sufficient amount of cash payment but no CVRs when its asymmetric information problem is less severe. In comparison, Proposition 2 suggests that a higher-intrinsic-value firm prefers to offer a payment package with CVRs when its asymmetric information problem is more severe. Thus, we predict that higher quality firms facing a greater extent of information asymmetry are more likely to offer CVRs in their payments, rather than a cash payment without CVRs. This prediction is our second testable hypothesis (H2). Further, we predict that firms are more likely to use CVRs when they have less internal capital available to them, which is our third hypothesis (H3). This prediction again follows Propositions 1 and 2.

IV. Sample Selection and Variable Construction

We test the three hypotheses discussed above using a sample of mergers and acquisitions where CVRs are offered.

A. The CVR Sample

We identify our initial sample of CVRs from keyword searches of all the business news published in *The Wall Street Journal Index* and *Lexis-Nexis*. We first select those securities that are either described as contingent value rights or resemble contingent value rights or include features similar to contingent value rights, such as "contingent value preferred stock," "put rights," and "variable common rights." Then, we exclude from our initial sample the CVRs in which the underlying stocks are not listed in the U.S. exchanges and those that are not associated with M&As. We carefully read the announcement statements and the proxy statements of the remaining CVRs in our sample to ensure that each CVR included in our final sample provides a put option in the long term, i.e., each CVR should promise an additional payment if the share price falls short of a reference price at a certain future date beyond the completion date of the acquisition.[23]

[23] Although most CVRs are put options, some CVRs provide a call option enabling the receiving investors to benefit from the better performance of the issuing firm in the future, rather than a put option outlined in the paper. For example, in the acquisition of Indigo by Hewlett-Packard (HP) in

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Finally, we extract financial statement information for the firms in our CVR sample from Standard & Poor's Compustat database. Data on stock prices are taken from the CRSP tapes, and data on financial analysts' earnings forecasts come from the IBES database.

Our final CVR sample includes announcements of 24 contingent value rights, two contingent value preferred stocks, two variable common rights, and one put right. Among these 29 announcements, 23 were completed and six were not. In the failed cases, CVRs are first announced to be offered, but later are cancelled either because the corresponding acquisitions fail or because CVRs are replaced with other securities in later offers. We list the M&A CVRs in Panel A of Table 1. We also summarize CVR option features in Panel B of Table 1.

Our sample shows that CVRs are offered in both tender offers and nontender-offer acquisitions. In particular, around 21% (six cases) of the CVRs in our sample are offered in tender offers, while a majority (79%) of the CVRs are not. Further, most CVRs are offered together with either common stock or preferred stock, with only two exceptions in which CVRs are offered without any stock directly involved. Both exceptions occur in tender offers. Finally, most CVRs in our sample are offered in the first round of bidding in acquisitions. Only about 21% in our sample (six cases) are offered in later revised bids.

CVRs in our sample can be grouped into three different categories, depending on which entity (i.e., acquirer or target) offers the CVRs and which entity serves as the underlying security for the put option. In the first category (comprising 21 cases), an acquirer takes over a target, and a new joint firm is formed under the control of the acquirer. CVRs, in this case, are offered by the acquirer to original target shareholders, compensating them with an extra amount if the equity value of the joint firm declines in the future after the acquisition. In the second category (three cases), an acquirer obtains voting control of a target through newly issued shares of the target. However, the target remains an independent public firm after the acquisition, and original target shareholders maintain their original equity holdings in the target. In this case, CVRs are offered by the acquirer to the target shareholders, entitling them to a payment if the share price of the target fails to reach a certain level after the acquisition. Finally, in the third category (five cases), an acquirer acquires a fraction of a target's equity that is not sufficient to ensure its complete control of the target. In this case, the target firm remains an independent public firm after the acquisition, and CVRs are offered by the target to the acquirer, compensating the acquirer with an extra amount if the target's equity value declines in the future after the acquisition.

Although CVRs in the above three categories are offered in different scenarios, they share the same two characteristics: all the CVRs are offered as part of considerations to shareholders who are outsiders to the offering firm, and the value of CVRs is based on the share price of the offering firm in the future, no

2002, HP's CVRs entitled Indigo shareholders to receive "between $0 to $4.50 in cash in 2005 to the extent that HP achieves certain cumulative revenue milestones during the three-year period after the completion of the offer" (*HP News Release*, February 21, 2002). In this case, HP's CVRs resemble a call option instead of a put option. We exclude these call option CVRs from our sample.

TABLE 1

Lists of CVR Offers

Panel A. Companies That Have Offered Continsent Value Rights in M&As

Issuer	Ann. Date of CVRs	Ann. Date of M&As	Acquirer	Target	Considerations Offered	Form of M&A
General Mills	17-Jul-00	17-Jul-00	General Mills	Pillsbury (Diageo)	Cash, Stock, CVR	takeover
Markel	26-Jan-00	16-Aug-99	Markel	Terra Nova	Cash, Stock, CVR	takeover
Vector Group	3-Dec-90	3-Dec-90	Brooke Group	Brooke Partners	Convertible Preferred, CVR	takeover
Quintiles Transnational	15-Dec-98	15-Dec-98	Quintiles	Pharmaceutical Marketing Service	Stock, CVR	takeover
Sicor Inc.	16-Jun-95	16-Jun-95	Gensia	Aramed	Cash, Stock, CVR	takeover
PSINet	23-Jul-97	23-Jul-97	PSINet	IXC Communications	Stock, CVR	takeover
Cytogen	29-Jul-94	24-May-94	Cytogen	CytoRad	Stock, Warrant, CVR	takeover
Verizon Wireless	8-Apr-96	8-Apr-96	Airtouch	Cellular Communication	Cash, Contingent Preferred	takeover
Viacom	10-Jan-94	10-Jan-94	Viacom	Blockbuster Entertainment	Stock, VCR	takeover
Signal Apparel	18-Apr-91	30-Oct-90	Signal Apparel	Shirt Shed	Stock, CVR	takeover
Bel Fuse	20-Apr-95	14-Oct-94	Bel Fuse	Pulse Engineering	Stock, CVR	takeover
World Access	20-Dec-99	20-Dec-99	World Access	Star Telecommunication	Stock, CVR	takeover
France Telecom	20-Nov-00	20-Nov-00	France Telecom	Equant	Stock, CVR	takeover
AXA Group	5-May-98	05-May-98	AXA Group	Royale Belge	Cash, Stock, CVR	takeover
Carolco Pictures	10-Jun-91	10-Jun-91	Carolco Pictures	Live Entertainment	Stock, CVR	takeover
Crown Central Petroleum	17-Jul-00	11-Nov-99	Apex Oil	Crown Central Petroleum	Stock, CVR	takeover
Viacom	18-Jan-94	9-Sep-93	Viacom	Paramount Communications	Cash, Stock, CVR, Convertible	tender offer
Rhone-Poulenc Rorer	19-Jan-90	15-Jan-90	Rhone Poulenc	Rorer	Cash, CVR	tender offer
Regency Cruises	16-Sep-92	16-Sep-92	Castle Harlan	Regency Cruises	Cash, Warrants, CVR	tender offer
Metrocall	16-May-96	16-May-96	Metrocall	A+ Network	Cash, Stock, VCR	tender offer
Hilton	27-Jan-97	27-Jan-97	Hilton	ITT	Cash, Stock, Contingent Preferred	tender offer
Dow Chemical	18-Jul-89	18-Jul-89	Dow Chemical	Marion Merrell Dow	Cash, Stock, CVR	tender offer
Nationwide Cellular	12-Jan-90	12-Jan-90	Private investor	Nationwide Cellular Service	CVR, Convt. Preferred, Warrants	partial acquisition
Konover Property	25-Feb-98	25-Feb-98	Prometheus Southeast	Fac Realty	Stock, CVR	partial acquisition
Immulogic Pharmaceutical	13-Jan-00	13-Jan-00	Carl Icahn	Immulogic Pharmaceutical	Stock, CVR	partial acquisition
EchoStar	12-Dec-01	12-Dec-01	Vivendi Universal	EchoStar	Stock, CVR	partial acquisition
Abraxas	17-May-96	17-May-96	Private investor	Abraxas	Stock, CVR	partial acquisition
Dreyer's Grand Ice Cream	17-Jun-02	17-Jun-02	Nestle	Dreyer's Grand Ice Cream	Stock, Put Right	takeover
Monogram Biosciences	1-Jun-04	1-Jun-04	ViroLogic	Aclara Biosciences	Stock, CVR	takeover

(continued on next page)

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TABLE 1 (continued)

Lists of CVR Offers

Panel B. Option Features of Contingent Value Right Offered in M&As

Issuer	Maturity	Extendible	Moneyness	Option Type	Payment Mode	Outcome
General Mills	18 months	No	In the money	European Put Spread	Cash	Exercised
Markel	30 months	No	In the money	European Put Spread	Cash or Shares	Expired
Vector Group	3 years	No	In the money	European Put	Cash	Exercised
Quintiles Transnational	75 days	No	At the money	Up & Out Barrier Option	Shares	Expired
Sicor Inc.	1 year	No	In the money	European Put Spread	Shares	Exercised
PSINet	1 year	No	In the money	European Put	Cash or Shares	Expired
Cytogen	3 years	No	In the money	Up & Out Barrier Option	Cash	Expired
Verizon Wireless	3 months	No	In the money	European Put	Cash or Shares	N.A
Viacom	1 year	No	In the money	European Put Spread	Shares	Exercised
Signal Apparel	16 months	No	In the money	European Put	Shares	Expired
Bel Fuse	3 years	No	In the money	European Put	N.A	Cancelled
World Access	N.A	N.A	Out the money	European Put	N.A	Cancelled
France Telecom	3 years	No	In the money	European Put Spread	Cash	Expired
AXA Group	3 years	No	N.A	Up & Out Barrier Option	Cash	Cancelled
Carolco Pictures	6 months	No	In the money	Up & Out Barrier Option	N.A	Cancelled
Crown Central Petroleum	1 year	No	In the money	European Put	Cash	Cancelled
Viacom	1 year	Yes	In the money	European Put Spread	Shares	Exercised
Rhone-Poulenc Rorer	3 years	Yes	In the money	European Put Spread	Cash	Exercised
Regency Cruises	18 to 66 months	No	In the money	Up & Out Barrier Option	Cash	Cancelled
Metrocall	1 year	No	Out the money	European Put Spread	Cash or Shares	Expired
Hilton	1 year	No	In the money	European Put Spread	Shares	Cancelled
Dow Chemical	10 months	Yes	In the money	European Put	Cash	Exercised
Nationwide Cellular	5 years	No	In the money	European Put Spread	Cash or Shares	Exercised
Konover Property	6 years	No	In the money	European Put Spread	Cash or Shares	Exchanged for shares in a merger
Immulogic Pharmaceutical	18 months	No	Out the money	European Put Spread	N.A	N.A.
EchoStar	30 or 36 months	No	Out the money	European Put Spread	Cash	Expired
Abraxas	6 or 12 months	Yes	In the money	European Put Spread	Shares	Exercised
Dreyer's Grand Ice Cream	3 years	No	In the money	European Put	Cash	Exercised
Monogram Biosciences	12 months	No	In the money	European Put	Cash	Exercised

Panel C. Selected Companies That Have Issued CVRs in Scenaries Other than M&As

Issuer	Details of the Issue	Ann. Date
Abraxas	CVRs were issued as part of the considerations to exchange for Abraxas senior notes.	18-Nov-99
Dominion Bridge	CVRs were proposed by the Committee to Revitalize Dominion Bridge as part of the corporate restructuring plan.	2-Jul-97
Riviera	CVRs were issued by Rivera as part of the escrow after Riviera terminated its merger with R&E Gaming Corporation.	29-May-98
California Micro Devices	CVRs were issued as part of the payment to settle a lawsuit against CMD.	16-Sep-96
LTV	CVRs were issued by LTV to pension Benefit Guaranty as part of LTV's plan to reorganize from Chapter 11.	25-Jun-93

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matter whether the offering firm is a target or an acquirer. Our theoretical model is motivated by and consistent with the CVRs in the first category. However, the intuition and the implications of our model will remain unchanged even if we modify our model to be consistent with the other two categories, since the only crucial assumption we need in our model is that the offering firm has private information on its post-acquisition value while outsiders who receive CVRs do not know this private information. In this section, we provide sample statistics for the entire CVR sample consisting of all three categories of CVRs. In our empirical tests in the next section, we focus on the first category of CVRs to maintain consistency between our theoretical and empirical studies.[24]

B. The Control Sample

Our control sample consists of those firms involved in acquisitions where CVRs are not offered. In particular, we draw the initial control sample from the Securities Data Corporation (SDC) database. We include in our control sample both "takeovers" (where an acquirer gets a controlling stake in the combined firm or the target firm) and "partial acquisitions" (where an acquirer acquires a noncontrolling fraction of a target's equity). We use takeovers and partial acquisitions to control for the different categories of CVR offers. Then, we select our final control sample based on the following criteria: i) the acquisition must be announced between 1989 and 2004 to be consistent with the sample period of our CVR sample; ii) at least one firm involved in the acquisition should have data available from CRSP, Compustat, and IBES; iii) either cash or stock or both are offered in the acquisition; and iv) firms in the control sample should operate in the industries to which firms offering CVRs belong. We define industries based on the first two digits of SIC codes. Our last selection criterion is intended to control for possible industry effects.

Thus, our final control sample includes firms from 1,008 takeovers and 261 partial acquisitions, consisting of 285 all-cash offers, 608 all-stock offers, 115 mixed offers with partially cash and partially stock, 247 all-cash partial acquisitions, and 14 all-stock partial acquisitions. Table 2 provides an overview of the control sample broken down by year and by method of payment.[25]

C. Variable Construction

We construct proxies for information asymmetry using financial analysts' consensus earnings forecasts in the month prior to the announcement date.[26] The

[24]Our results would remain quantitatively unchanged even if we used all three categories of CVRs in our empirical tests. The detailed results based on this expanded sample are available upon request from the authors.

[25]Note that our control sample has a small number of partial acquisitions where stock is the only means of payment and it does not have any partial acquisitions where both cash and stock are offered. However, the small sample size in these two kinds of partial acquisitions does not affect our empirical tests, since our tests will not rely on these partial acquisitions.

[26]The proxies of asymmetric information in the paper are similar to those used in Thomas (2002) and Krishnaswami and Subramaniam (1999).

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TABLE 2

Control Sample Distribution

Table 2 reports the number of takeover offers and partial acquisition offers in our control sample by year between 1989 and 2004, grouped by the medium of payment. We define takeovers as those offers where an acquirer plans to acquire a controlling stake in the combined firm or the target firm and partial acquisitions as those where an acquirer plans to acquire a noncontrolling fraction of a target's equity. We select into the control sample only those offers where bidders operate in the same industries as those of the firms in the CVR sample.

	Takeover			Partial Acquisition	
Year	Cash	Cash/Common Stock	Common Stock	Cash	Common Stock
1989	16	3	20	11	1
1990	5	2	11	13	0
1991	2	3	14	12	1
1992	3	0	12	16	2
1993	15	1	13	18	3
1994	18	3	45	17	2
1995	15	7	40	25	0
1996	14	12	38	26	0
1997	16	11	60	18	0
1998	31	6	77	20	1
1999	37	9	86	36	3
2000	17	13	77	18	0
2001	25	11	48	5	0
2002	24	9	28	4	0
2003	23	16	25	6	0
2004	24	9	14	2	1
Total	285	115	608	247	14

first proxy we use for information asymmetry is NUMBER, which is calculated as the number of analysts following the firm. This proxy measures the supply of information about a firm. More analyst followings indicate lower information asymmetry. The second proxy is forecast error, ERR. It is calculated as the absolute difference between the actual earnings per share (EPS) and the average EPS forecast multiplied by 100, scaled by the market price five trading days prior to the announcement date. Firms facing greater information asymmetry are expected to have larger forecast errors. We set a firm's ERR as missing if the firm has only one financial analyst following it. Our third proxy DISP is the dispersion among analysts' forecasts. This variable is constructed as the standard deviation of earnings forecasts multiplied by 100, scaled by the share price five days prior to the takeover announcement date. Since dispersion among earnings forecasts could result from a lack of information about a firm, a greater dispersion suggests a more severe asymmetric information problem. We measure a firm's availability of internal capital by the firm's operating performance, OPRATIO, and its cash flow, CF. We calculate OPRATIO as operating income before interest, taxes, depreciation, and amortization, scaled by the book value of assets, and we calculate CF as the sum of net income and depreciation expenses scaled by the book value of assets. Both CF and OPRATIO are calculated from the information at the latest fiscal year-end prior to the announcement date. A firm with an inferior operating income or low cash flow has less internal capital available to itself.

We also construct the following control variables. First, we calculate firm size, SIZE, as the log of the market value of total assets, where the market value of assets is calculated as the book value of assets minus the book value of common equity plus the market value of common equity. Second, we calculate market-to-book ratio (MTOB) to measure a firm's investment opportunity set. MTOB is the ratio of the market value to the book value of total assets. A firm with

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a high market-to-book ratio has more growth options. Market-to-book ratio can also serve as a proxy for overvaluation. A firm with a small market-to-book ratio is more likely to be undervalued. Third, we calculate long-term debt ratio (LDR) to measure a firm's debt burden. LDR is the ratio of the amount of long-term liabilities to the book value of assets. Finally, we also include a dummy variable for cash dividends (DIVD) and a dummy variable for tax carry-forwards (TAXLOSS). DIVD is equal to one if a firm pays cash dividends to its shareholders and zero otherwise. TAXLOSS is equal to one if a firm has any tax-loss carry-forwards and zero otherwise. We calculate all the control variables at the end of the fiscal year prior to takeover announcements.[27]

We present the summary statistics of all the variables, including the information asymmetry variables, the internal capital variables, and the control variables, in Table 3, with Panel A based on the CVR sample and Panel B based on the control sample. In Panel A, we present statistics for both the whole sample of CVRs and the first category of CVRs (i.e., bidders offering CVRs). In Panel B, we present statistics for both all-stock bidders and cash bidders, where cash bidders consist of bidders in both all-cash and mixed offers. We further present in Table 4 the pairwise correlations among all the variables in a sample of firms that either offer CVRs as part of their payment or offer cash but no CVRs as part of payment. We also show the correlation between these variables and the dummy variable ISSUE, where ISSUE is equal to one for CVR offers and zero for cash offers.

Table 3 shows that there are noticeable differences between the CVR sample and the control sample, especially regarding NUMBER, ERR, DISP, CF, and OPRATIO. In particular, CVR bidders have fewer financial analysts following than both stock bidders and cash bidders. They also face larger forecast error and a higher degree of disagreement on their earnings. Further, CVR bidders have worse operating performance than stock bidders and cash bidders, and they have less cash flow than cash bidders. The correlations presented in Table 4 further show that the dummy of CVR offers, ISSUE, is negatively correlated with the internal capital variables CF and OPRATIO, and is positively correlated with the asymmetric information variables ERR and DISP. All these correlations are significant at the 1% level. The correlation between ISSUE and NUMBER is negative, though it is insignificant. These correlations, as well as the above comparison of the sample statistics between cash and CVR bidders, provide preliminary support to our hypotheses (H2) and (H3), suggesting that firms offering CVRs have more severe asymmetric information problems and less internal capital compared to firms offering cash payments with no CVRs.

However, the significant differences between the CVR sample and the control sample suggest that our control sample may not be the most relevant group for comparison in our study on the long-term operating performance of CVR bidders. Thus, in Section V.A.1 (where we study the long-term operating performance

[27]We have also tried to control for the business cycle variables proposed in Martin (1996), such as the logarithm of [SP(−1)/SP(−12)], where −1 and −12 refer to one month and 12 months, respectively, prior to the announcement month, and SP refers to the Standard and Poor's 500 Index. Our results with the control for these additional variables are similar to those without such a control.

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TABLE 3

Summary Statistics

Panel A shows the summary statistics for the entire CVR sample, as well as bidders in takeover CVR sample. The entire CVR sample consists of both bidders making takeovers and targets being acquired in partial acquisitions. Panel B is for control sample, where cash bidders consist of related bidders in both all-cash offers and cash/stock offers. Related bidders are those that operate in the same industries as CVR bidders. Stock bidders consist of related bidders that offer only stock. Panel C is for CVR bidders in completed takeovers and their matching firms selected from all-stock bidders. A matching firm is selected for each CVR bidder following the propensity score method in Hillion and Vermaelen (2004). We calculate NUMBER as the number of analysts following the firm; DISP as the standard deviation of analysts' earnings forecasts scaled by price/100; ERR as the absolute difference between mean earnings forecast and actual earnings per share scaled by price/100; OPRATIO as EBITDA divided by the book value of assets; CF as the sum of net income and depreciation and amortizations, divided by the book value of assets; SIZE as the log of the market value of assets; MTOB as the ratio of the market value to the book value of assets; LDR as the ratio of long-term debt to the book value of assets; DIVD as the dividend dummy for firms paying cash dividends; TAXLOSS as the tax dummy for firms with any taxloss carryforwards; and TENDER as the dummy variable for tender offers.

Variables	N	Mean	Median	N	Mean	Median
Panel A. CVR Sample						
	Entire CVR Sample			Takeover CVR Sample		
Number of Analysts Following (NUMBER)	23	9.609	8	20	10.050	8
Forecast Error (ERR)	23	10.684	0.604	20	12.195	0.566
Dispersion of Analysts' Forecasts (DISP)	22	2.494	0.339	19	2.844	0.426
Cash Flow (CF)	28	−0.004	0.042	21	−0.005	0.044
Operating Performance (OPRATIO)	27	0.031	0.074	21	0.031	0.076
Market-to-Book Ratio (MTOB)	29	2.180	1.702	21	2.268	1.702
Firm Size (SIZE)	29	7.155	6.505	21	7.657	7.822
Long-Term Debt Ratio (LDR)	29	0.245	0.213	21	0.230	0.213
Dummy of Cash Dividends (DIVD)	29	0.586	1	21	0.571	1
Dummy of Taxloss Carryforward (TAXLOSS)	29	0.379	0	21	0.476	0
Dummy of Tender Offer (TENDER)	29	0.207	0	21	0.238	0
Panel B. Control Sample, Bidders Grouped by Means of Payment						
	Stock Bidders			Cash Bidders		
Number of Analysts Following (NUMBER)	536	11.560	9	368	13.155	10
Forecast Error (ERR)	507	1.778	0.239	353	1.133	0.231
Dispersion of Analysts' Forecasts (DISP)	486	0.486	0.087	332	0.301	0.109
Cash Flow (CF)	397	0.005	0.072	305	0.080	0.099
Operating Performance (OPRATIO)	397	0.067	0.110	299	0.139	0.151
Market-to-Book Ratio (MTOB)	418	4.863	2.717	319	2.554	1.912
Firm Size (SIZE)	418	7.129	7.016	319	7.970	8.035
Long-Term Debt Ratio (LDR)	414	0.215	0.130	317	0.250	0.205
Dummy of Cash Dividends (DIVD)	418	0.323	0	319	0.498	0
Dummy of Taxloss Carryforward (TAXLOSS)	418	0.335	0	319	0.301	0
Dummy of Tender Offer (TENDER)	608	0.025	0	400	0.388	0
Panel C. Samples Used in the Study of Long-term Operating Performance: CVR Bidders in Completed Takeovers and Their Matching Firms Selected From the Control Sample of Stock Bidders						
	CVR Bidders			Matching Firms		
Cash Flow (CF)	17	−0.024	0.041	17	−0.068	0.104
Operating Performance (OPRATIO)	17	0.005	0.074	17	−0.004	0.147
Market-to-Book Ratio (MTOB)	17	2.489	1.739	17	3.264	2.024
Firm Size (SIZE)	17	7.886	7.936	17	7.852	8.585
Long-Term Debt Ratio (LDR)	17	0.223	0.206	17	0.175	0.130

of CVR bidders), we select a matching firm for each CVR bidder following the propensity score matching algorithm in Hillion and Vamealen (2004). In this way, we attempt to alleviate the bias due to systematic differences between the CVR sample and the comparison sample. In particular, we first run a logit regression for each industry separately on a dummy variable of CVR offers. The sample of the regression consists of the CVR bidders in completed takeovers (excluding failed takeovers) and all-stock and cash bidders in the control samples. The independent variables consist of CF, MTOB, SIZE, LDR, and the dummy variable of cash offers. After the logit regression, we estimate the propensity to offer CVR for

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TABLE 4

Correlation among CVR Issue Dummy, Information Asymmetry Variables, Internal Capital Variables, and Control Variables

The sample consists of bidders offering CVRs and/or cash as the means of payment. ISSUE is equal to one for firms offering CVRs and zero for firms not offering CVRs; NUMBER is the number of analysts following the firm; DISP is the standard deviation of analysts' earnings forecasts scaled by price/100; ERR is the absolute difference between mean earnings forecast and actual earnings per share scaled by price/100; OPRATIO is 100 times EBITDA divided by the book value of assets; CF is 100 times the sum of net income and depreciation and amortizations, divided by the book value of assets; SIZE is the log of the market value of assets; MTOB is the ratio of the market value to the book value of assets; LDR is the ratio of long-term debt to the book value of assets; DIVD is a dummy equal to one if a firm pays cash dividends; TAXLOSS is a dummy equal to one if a firm has any taxloss carryforwards; and TENDER is the dummy variable for tender offers *p*-values are provided in brackets.

	ISSUE	SIZE	LDR	MTOB	TENDER	DIVD	TAXLOSS	CF	OPRATIO	NUMBER	ERR	DISP
ISSUE	1											
SIZE	−0.037	1										
	(0.493)											
LDR	0.122	0.056	1									
	(0.023)	(0.302)										
MTOB	−0.036	0.328	−0.262	1								
	(0.509)	(0.000)	(0.000)									
TENDER	−0.070	0.141	−0.012	0.030	1							
	(0.143)	(0.008)	(0.822)	(0.578)								
DIVD	0.070	0.324	0.002	−0.071	0.068	1						
	(0.192)	(0.000)	(0.978)	(0.184)	(0.207)							
TAXLOSS	0.080	−0.157	0.005	−0.005	−0.021	−0.226	1					
	(0.138)	(0.003)	(0.929)	(0.926)	(0.690)	(0.000)						
CF	−0.192	0.271	−0.083	0.215	0.168	0.188	−0.126	1				
	(0.000)	(0.000)	(0.133)	(0.000)	(0.002)	(0.001)	(0 021)					
OPRATIO	−0.234	0.307	−0.003	0.232	0.181	0.163	−0.174	0.869	1			
	(0.000)	(0.000)	(0.958)	(0.000)	(0.001)	(0.003)	(0.002)	(0.000)				
NUMBER	−0.075	0.732	−0.076	0.356	0.171	0.181	−0.053	0.280	0.277	1		
	0.139	(0.000)	(0.174)	(0.000)	(0.001)	(0.001)	(0.344)	(0.000)	(0.000)			
ERR	0.320	−0.183	0.041	−0.048	−0.065	−0.019	0.105	−0.285	−0.312	−0.145	1	
	(0.000)	(0.001)	(0.466)	(0.393)	(0.211)	(0.741)	(0.069)	(0.000)	(0.000)	(0.005)		
DISP	0.292	−0.212	−0.004	−0.036	−0.057	−0.073	0.116	−0.502	−0.542	−0.146	0.769	1
	(0.000)	(0.000)	(0.949)	(0.541)	(0.289)	(0.212)	(0.044)	(0.000)	(0.000)	(0.006)	(0.000)	

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each firm. We then match each CVR bidder to the single non-CVR stock bidder that operates in the same industry and has the closest propensity score compared to the CVR bidder. We define the selected non-CVR stock bidder as the matching firm of the corresponding CVR bidder. We present in Panel C of Table 3 the sample statistics of selected variables on both the CVR bidders in completed takeovers and their matching firms. Panel C shows that the matching firms created by the propensity score algorithm are comparable to the CVR bidders. According to the *t*-test and nonparametric Wilcoxon tests (not reported in the paper), the pairwise differences in CF, OPRATIO, MTOB, SIZE, and LDR are insignificant between the CVR bidders in completed takeovers and their matching firms.

V. Empirical Evidence

In this section, we test the three hypotheses discussed in Section III.E. To ensure consistency with the theory, we use only the first category of CVRs in this section, i.e., our empirical tests are based on bidders that offer CVRs as part of their payments to pay for their targets.[28]

A. Announcement Effects: CVR Offers versus All-Stock Offers

We calculate announcement period abnormal equity returns using the standard event-study methodology. We first estimate the market model parameters for each firm, based on a period of 200 days ending 15 days prior to the announcement of the acquisition. Then, we use those parameters to estimate the cumulative abnormal return for each firm in four event windows: (0), (−1, 1), (−3, 3), and (−5, 5), where date 0 denotes the announcement date, date 1 denotes one day after the announcement date, etc. As we discussed earlier, in most cases, CVRs are offered on the date when the acquisition is announced, while, in some cases, CVRs are proposed at a later date, after the acquisition is announced. For the same-date announcement, we identify event windows around the announcement of each acquisition. In the latter cases, we first calculate separately the abnormal return upon the announcement of CVRs and the abnormal return upon the announcement of the corresponding acquisition, and then add these two abnormal returns as if the CVRs in these cases were announced together with the announcement of the acquisition. By doing so, we intend to ensure the consistency of our calculation of abnormal returns across the whole CVR sample. We provide in Column (1) of Panel A, Table 5, the statistics on the announcement effect of CVR offers, which consist of both CVR bidders in takeovers and targets in partial acquisitions. We present in Column (2) the statistics based on CVR bidders.

[28]We also try to test our hypotheses based on all three categories of CVRs by comparing CVRs in the entire CVR sample with their matching firms. We select matching firms for each CVR based on i) whether stock, cash, or both stock and cash are offered together with CVRs in each CVR offer, ii) whether the CVR firm is a bidder or a target, since a target typically experiences a larger announcement effect than a bidder, iii) whether the CVR transaction is a takeover or a partial acquisition, and iv) the industry of the CVR firm (i.e., the first two digits of the firm's SIC code). Our results in these tests support our hypotheses as well. These results are available in the working paper version of the article.

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TABLE 5

Comparison of Announcement Effects Between CVR Bidders and All-Stock Bidders

Panel A reports the announcement period abnormal equity returns of CVR offers for the entire CVR sample including bidders in takeovers and targets in partial acquisitions, as well as for CVR bidders. Panel B reports the announcement effect of the all-stock bidders that operate in the same industries as the industries of CVR bidders, as well as the difference in announcement effect between CVR bidders and the all-stock bidders. Panel C reports the announcement effect of matching firms and the difference in announcement effect between CVR bidders and their matching firms. A matching firm is constructed for each CVR bidder following the propensity score method in Hillion and Vermaelen (2004). Panel D reports target returns for the entire CVR sample and the difference in target returns between CVR sample and non-CVR matching offers. Panel E reports the difference in announcement effect between CVR/stdck bidders and the all-stock bidders operating in the same industries as those of CVR/stock bidders, as well as the difference between CVR/stock bidders and the matching firms selected from all-stock bidders. Event window (0) stands for announcement date t; $(-1, 1)$ stands for a period from $t - 1$ to $t + 1$; etc. The statistical significance of means and medians is determined using t-tests and Wilcoxon signed-rank tests, respectively.

Event Windows	N	Mean	Median	N	Mean	Median
Panel A. Announcement Effect of CVR Sample						
	(1) Entire CVR Sample			(2) CVR Bidders		
(0)	29	0.072**	0.015	21	0.018	–0.011
(–1,1)	29	0.053	0.021	21	0.006	0.004
(–3,3)	29	0.083**	0.027	21	0.036	–0.003
(–5,5)	29	0.089**	0.033	21	0.050	0.026
Panel B. Difference in Announcement Effect between CVR Bidders and All-Stock Bidders						
	(1) All-Stock Bidders			(2) CVR Bidders—All-Stock Bidders		
(0)	546	−0.022***	−0.015***	567	0.040***	0.004
(–1,1)	546	−0.038***	−0.032***	567	0.043***	0.036
(–3,3)	546	−0.038***	−0.037***	567	0.074***	0.034**
(–5,5)	546	−0.042***	−0.039***	566	0.091***	0.065*
Panel C. Differences in Announcement Effect between CVR Bidders and Their Matching Firms Selected Using Propensity Score Algorithm						
	(1) Matching Firms			(2) CVR Bidders—Matching Firms		
(0)	21	−0.030**	−0.014**	21	0.048*	0.036*
(–1,1)	21	−0.038**	−0.023**	21	0.044	0.045
(–3,3)	21	−0.070***	−0.048***	21	0.106***	0.059**
(–5,5)	21	−0.078***	−0.089***	21	0.128***	0.102**
Panel D. Differences in Announcement Effect between Targets in the Entire CVR Sample and Their Matching Firms						
	(1) Target Return			(2) Targets—Matching Firms		
(0)	24	0.144***	0.063***	24	0.053	–0.002
(–1,1)	24	0.161***	0.140***	24	0.042	0.008
(–3,3)	24	0.191***	0.159***	24	0.066	0.034
(–5,5)	24	0.186***	0.141***	24	0.073	0.012
Panel E. Difference in Announcement Effect between CVR/Stock Bidders and Their Matching Firms						
	(1) CVR/Stock Bidders—All Stock Bidders			(2) CVR/Stock Bidders—Matching Firms		
(0)	512	0.028	–0.001	11	0.044	0.052
(–1,1)	512	0.026	0.045	11	0.045	0.054
(–3,3)	512	0.085**	0.037	11	0.145**	0.129**
(–5,5)	512	0.102***	0.074*	11	0.174**	0.150**

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

In the following, we describe the test of hypothesis (H1). Hypothesis (H1) predicts that firms offering CVRs (together with any combination of cash and stock) should experience larger announcement period abnormal returns compared to firms offering only stock. In this test, we do not distinguish between CVR/cash/stock bidders and CVR/stock bidders and cluster them as CVR bidders. We first test the difference in announcement effect between CVR bidders and all-stock bidders. We present the results from this test in Column (2) of Panel B,

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Table 5. Our results show that CVR bidders experience a larger announcement period abnormal equity return than all-stock bidders. For example, the difference is on average 4.0% on the announcement date, 4.3% in event window $(-1, 1)$, 7.4% in event window $(-3, 3)$, and 9.1% in event window $(-5, 5)$. All differences are significant according to t-tests. The differences in event windows $(-3, 3)$ and $(-5, 5)$ are also significant according to Wilcoxon tests. Thus, our results here support hypothesis (H1).

We also compare the pairwise difference in announcement effects between CVR bidders and their matching firms. We select a matching firm for each CVR bidder, following the propensity score matching algorithm in Hillion and Vamealen (2004). We present the announcement effect of matching firms in Column (1) of Panel C, Table 5, and the difference between CVR bidders and their matching firms in Column (2) of Panel C. Again, our results support hypothesis (H1). We find that the announcement effect of CVR bidders is larger than that of their matching firms. The differences in most event windows are significant in both t-tests and Wilcoxon tests, except the difference in event window $(-1, 1)$.

Finally, we provide in Panel D, Table 5, the summary statistics on the announcement period abnormal return of the targets in CVR offers, with Column (1) on the target return of CVR offers and Column (2) on the difference in target return between CVR offers and their non-CVR matching offers. We select the matching offers based on the means of payment other than CVRs, the industry of target (i.e., the first two digits of the target's SIC code), and whether the CVR transaction is a takeover or a partial acquisition. In general, we find that the difference in target returns between CVR offers and non-CVR matching offers is insignificant. Note that target return is a function of the premium (or discount) the bidder offers to the target's shareholders and the perceived probability of success of the takeover. Thus, our results on the insignificant difference suggest that both the takeover premium and the perceived probability of success in CVR offers may not be different from those in comparable non-CVR offers.

1. Robustness Check

One concern on the above test is that CVRs in some cases are issued together with cash. Typically, investors respond more favorably to offers with cash than to offers with no cash. Thus, the results in Panel B could be driven by the positive announcement effect associated with cash rather than the positive announcement effect associated with CVRs. To address this concern, in the first robustness check, we compare the announcement effect between bidders that offer CVR and stock but no cash (11 bidders) and bidders that offer only stock and operate in the same industries as the industries of CVR/stock bidders. The results are presented in Column (1) of Panel E, Table 5. We also select a single matching firm for each CVR/stock bidder following the propensity score method, and test the difference between CVR/stock bidders and their matching firms. We present the results on this difference in Column (2) of Panel E, Table 5. In general, we find that bidders in CVR/stock offers generally experience a larger announcement effect than all-stock bidders or their matching firms. For example, the difference in announcement effect between CVR/stock bidders and all-stock bidders is on average 8.5% in event window $(-3, 3)$ and 10.2% in event window $(-5, 5)$. The difference in

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announcement effect between CVR/stock bidders and their matching firms is on average 14.5% in event window (−3, 3) and 17.4% in event window (−5, 5). The differences in these two event windows are significant according to t tests. The differences in event window (0) and (−1, 1) are positive as well, though they are not significant, probably due to the small sample size in this test. Thus, our results in this robustness check are consistent with hypothesis (H1). They confirm the robustness of the results presented in Panel B.

In the second robustness check, we study the long-term operating performance of CVR bidders and compare it with the long-term operating performance of all-stock bidders. Our signaling explanation for CVR offers in Proposition 2 also suggests that CVR bidders could experience better post-issue operating performance than all-stock bidders. In this study, we consider only completed deals (23 deals). We measure operating performance by operating income to assets ratio (OPRATIO) and the market value relative to the book value of assets (MTOB).[29] We present in Panel A of Table 6 the means and the medians of both ratios, based on the whole sample of CVR issuers (including CVR bidders in takeovers and the targets offering CVRs in partial acquisitions). We also present in Panel B the statistics on the long-term operating performance of all-stock bidders. In all panels, we calculate the values of long-term operating performance measures from the completion year t to year $t + 4$, as well as the difference between the years after completion and the completion year. We find that firms issuing CVRs experience an increase in their operating performance in the four years after takeovers are completed. In contrast, bidders in the control sample of all-stock takeovers experience a decline in their operating performance in the long term.

However, to check the robustness of our results on the test of (H1), we need to study the difference in operating performance between CVR bidders and non-CVR stock bidders. Thus, we exclude from our CVR sample the targets offering CVRs in partial acquisitions and keep only CVR bidders in takeovers. We then select a matching firm for each CVR bidder using the propensity score matching algorithm. Panels C and D of Table 6 present the results on the change in the post-merger operating performance for CVR bidders and their matching firms, respectively. Panel E presents the results on the difference in the change in post-merger operating performance between CVR bidders and their matching firms. We again find that CVR bidders experience an increase in post-merger operating performance, although the increase is insignificant. The matching firms experience a significant decrease in post-merger operating performance. We also find that CVR bidders experience a more positive increase in their post-merger operating performance than the matching firms. Thus, our results on the long-term operating performance are consistent with hypothesis (H1). They suggest that the long-term operating performance of a bidder offering CVRs as part of its payment is better than that of a bidder offering an all-stock payment.

[29] We construct these two measures, following Loughran and Ritter (1997). We have also tried other measures in Loughran and Ritter (1997), such as operating income relative to sales. Our results using these alternative measures are similar to the results presented in the paper.

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TABLE 6

Long-Term Operating Performance and Market-to-Book Ratio: CVR Bidder versus All-Stock Bidder

Panel A consists of the entire CVR sample in completed deals, consisting of both bidders making takeovers and targets being acquired in partial acquisitions. Panel B consists of bidders from the control sample of all-stock takeovers. Panel C consists of bidders in CVR takeover sample. Panel D consists of matching firms of CVR bidders, created following the propensity score method in Hillion and Vermaelen (2004). Panel E shows the difference between CVR bidders and their matching firms. We define OPRATIO as EBITDA divided by the book value of assets and MTOB as the ratio of the market value to the book value of assets. The statistical significance of means and medians is determined using *t*-tests and Wilcoxon tests, respectively.

	(1) Operating Performance (OPRATIO)			(2) Market to Book Ratio (MTOB)		
Variables	N	Mean	Median	N	Mean	Median
Panel A. Entire CVR Sample in Completed Deals: Bidders in Takeovers and Targets in Partial Acquisitions						
Completion year (*t*)	21	0.002	0.029	23	1.945	1.703
Year *t* + 1	21	0.007	0.064	23	2.061	1.721
Year *t* + 2	19	0.047	0.087	20	1.874	1.662
Year *t* + 3	16	0.042	0.093	17	1.954	1.463
Year *t* + 4	15	0.061	0.088	15	2.621	1.640
Year *t* + 1 – Year *t*	21	0.005	0.025	23	0.117	0.0005
Year *t* + 2 – Year *t*	19	0.042**	0.032**	20	−0.008	0.003
Year *t* + 3 – Year *t*	16	0.050**	0.032**	17	0.074	−0.044
Year *t* + 4 – Year *t*	15	0.075	0.040*	15	0.665*	0.341**
Panel B. A Sample of Bidders from the Control Sample that Offer Only Stock						
Completion year (*t*)	366	0.063	0.094	378	3.603	2.181
Year *t* + 1 – Year *t*	326	−0.017***	−0.004*	338	−0.981***	−0.092***
Year *t* + 2 – Year *t*	292	−0.019***	−0.007***	300	−1.115***	−0.315***
Year *t* + 3 – Year *t*	255	−0.006	−0.004	262	−1.554***	−0.354***
Year *t* + 4 – Year *t*	223	−0.005	−0.010	230	−1.675***	−1.675***
Panel C. A Sample of Bidders Offering CVRs in Completed Takeovers						
Completion year (*t*)	17	−0.031	0.050	17	2.143	1.671
Year *t* + 1 – Year *t*	17	0.020	−0.010	17	0.004	0.059
Year *t* + 2 – Year *t*	16	0.061	0.033	16	−0.195	−0.037
Year *t* + 3 – Year *t*	14	0.052	−0.006	14	−0.217	−0.101
Year *t* + 4 – Year *t*	13	0.094	−0.003	13	0.618	0.008
Panel D. A Sample of Their Matching Firms in Completed Takeovers						
Completion year (*t*)	17	0.131	0.134	17	4.449	2.725
Year *t* + 1 – Year *t*	17	−0.072*	−0.003**	17	−1.673**	−0.278***
Year *t* + 2 – Year *t*	17	−0.072***	−0.052**	17	−1.806**	−0.711***
Year *t* + 3 – Year *t*	17	−0.157**	0.088***	17	−1.535**	−0.607**
Year *t* + 4 – Year *t*	16	−0.094**	−0.061**	16	−1.098	−0.465*
Panel E. Pair-Wise Difference of Change in OPRATIO and MB Between CVR Bidders and Their Matching Firms						
Year *t* + 1 – Year *t*	17	0.091	0.012	17	1.677**	0.363
Year *t* + 2 – Year *t*	16	0.121**	0.066	16	1.696*	0.551
Year *t* + 3 – Year *t*	14	0.156**	0.108	14	0.513	0.552
Year *t* + 4 – Year *t*	13	0.197*	0.147	13	1.102*	1.032

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

B. Firm's Choice of Offering CVRs Rather Than Cash

In this part, we test hypotheses (H2) and (H3). Hypotheses (H2) and (H3) predict that bidders are more likely to use CVRs rather than cash payment when they face more severe asymmetric information or when they have less internal capital available to them. Thus, our tests here are based on both CVR bidders in the CVR sample and cash bidders in the control sample. CVR bidders consist of CVR/stock, CVR/cash, and CVR/stock/cash bidders; and cash bidders consist of

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cash/stock and all-cash bidders that do not offer any CVR.[30] We run the following logistic regressions:

$$(7) \qquad \text{Log}\left[\frac{P(y=1)}{1-P(y=1)}\right] = \beta_0 + \beta_1 \text{INFO} + \beta_2 \text{CAPITAL} + \beta_3 X + \varepsilon,$$

where the dependent variable y takes a value of one if a firm offers CVRs in its acquisition, and zero if it does not. INFO refers to a proxy for asymmetric information, consisting of NUMBER, ERR, or DISP; CAPITAL refers to a proxy for the availability of internal capital, consisting of OPRATIO or CF; and X refers to a vector of control variables consisting of SIZE, MTOB, TAXLOSS, DIVD, and LDR. All the control variables are calculated at the latest fiscal year prior to the announcement date, i.e., at year $t-1$. We allow correlated residuals within each cross section of industry and conduct significance tests using heteroskedasticity-consistent standard errors following the Huber-White procedure. We present and discuss our results based on odds ratio $P(y=1)/P(y=0)$, the ratio of the probability of offering a CVR payment to the probability of offering a cash payment. Thus, to be consistent with hypothesis (H2), we expect β_1 to be greater than 1 for ERR and DISP and smaller than 1 for NUMBER. To be consistent with hypothesis (H3), we expect β_2 to be smaller than 1 for both CF and OPRATIO.

We present the results from the above regression in Table 7. In the first three columns, we introduce the three asymmetric information variables one by one. In Columns (4) and (5), we introduce the two internal capital variables separately. As expected, $\beta_1 > 1$ for asymmetric information variables ERR and DISP and $\beta_1 < 1$ for NUMBER. $\beta_2 < 1$ for both internal capital variables CF and OPRATIO. β_1 and β_2 are significant for most variables except for NUMBER. Next, we rerun regression (7), controlling for time effect. In particular, we keep in this new regression only those cash bidders whose offers occur in the same years as the years of CVR offers. We also include year dummies in the new regression. The results from this new regression are presented in Columns (6) to (10) in Table 7, with the three asymmetric information variables and the two internal capital variables introduced separately. Then, in Columns (11) to (13), we include the asymmetric information variable and the internal capital market variable together in the regression. We present in these three columns only the results with CF as the internal capital variable. We find that both β_1 and β_2 follow the level predicted by hypotheses (H2) and (H3) for all the asymmetric information variables and all the internal capital market variables. Both β_1 and β_2 are also significant for all the variables. For example, according to Column (8), an increase in DISP by one unit (0.43 of one standard deviation) would increase the odds of CVR offers by 2.16 times. According to Column (9), for one unit decrease in CF (0.08 of one

[30] It is worth noting that we do not distinguish between different CVR payment packages and between different cash payment packages to be consistent with our theory. Proposition 1 shows that when $a \leq \underline{\alpha}$, an undervalued bidder offers cash payment, which could be all cash or a combination of cash and stock as long as the payment includes a sufficiently large amount of cash. Proposition 2 shows that when $a > \underline{\alpha}$, an undervalued bidder offers CVR payment, which consists of a sufficiently large number of CVRs and any combination of cash and stock. Thus, in the tests on (H2) and (H3), we cluster CVR/stock, CVR/stock/cash, and CVR/cash bidders in the CVR sample as CVR bidders and cluster all-cash and cash/stock bidders in the control sample as cash bidders.

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TABLE 7

Logistic Regressions on the Likelihood of Offering CVRs Rather Than Cash in Acquisitions

The sample consists of bidders in the CVR takeover sample and bidders in the control sample of cash offers. The control sample of cash offers consists of bidders that operate in the same industries as CVR bidders and offer either all-cash or both cash and stock. The dependent variable is one for firms offering CVRs and zero for firms not offering CVRs. The independent variables include NUMBER, the number of analysts following the firm; DISP, the standard deviation of analysts' earnings forecasts scaled by price/100; ERR, the absolute difference between mean earnings forecast and actual earnings per share scaled by price/100; OPRATIO, 100 times EBITDA divided by the book value of assets; and CF, 100 times the sum of net income and depreciation and amortizations, divided by the book value of assets. We also control for SIZE, the log of the market value of assets; MTOB, the ratio of the market value to the book value of assets; LDR, the ratio of long-term debt to the book value of assets; TAXLOSS, the dummy variable for firms with any taxloss carryforwards; DIVD, the dummy variable for firms paying cash dividends; and TENDER, the dummy variable for tender offers. We report odds ratios in the table, together with *t*-statistics in brackets.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
SIZE	1.09	1.14	1.13	1.01	1.05	1.55*	1.31	1.31	1.23	1.24	1.58*	1.55*	1.37
	(0.24)	(0.57)	(0.77)	(0.04)	(0.30)	(1.65)	(0.86)	(1.09)	(0.92)	(1.02)	(1.74)	(1.76)	(1.32)
LDR	7.40***	14.21***	10.92***	5.48***	8.08***	4.28	10.89***	8.02**	4.81*	5.15*	3.77	4.41	6.31*
	(2.98)	(4.28)	(3.75)	(3.43)	(4.00)	(1.36)	(2.81)	(2.18)	(1.67)	(1.74)	(1.16)	(1.39)	(1.74)
MTOB	1.03	1.01	1.03	1	1	1.13	0.95	1	0.97	1.06	1.08	1.03	1.06
	(0.50)	(0.09)	(0.31)	(0.03)	(0.05)	(0.83)	(0.20)	(0.01)	(0.15)	(0.37)	(0.61)	(0.18)	(0.42)
DIVD	2.27	2.29	2.5	3.32	3.21	1.61	1.44	1.54	1.86	1.73	1.7	1.31	1.48
	(1.07)	(0.82)	(1.01)	(1.32)	(1.47)	(0.43)	(0.24)	(0.31)	(0.49)	(0.47)	(0.46)	(0.19)	(0.29)
TAXLOSS	2.29	1.89	1.5	2.54*	2.26	5.40**	3.32	2.14	3.54**	4.09**	3.97**	2.12	1.75
	(1.30)	(0.75)	(0.65)	(1.71)	(1.47)	(2.45)	(1.54)	(1.19)	(2.48)	(2.39)	(2.39)	(1.09)	(0.89)
TENDER	0.57	0.64	0.57	0.6	0.58	0.49	0.38*	0.36**	0.55	0.5	0.66	0.63	0.46
	(1.42)	(1.25)	(1.46)	(1.09)	(1.14)	(1.47)	(1.75)	(2.01)	(1.17)	(1.30)	(0.80)	(0.81)	(1.57)
NUMBER	0.95					0.90***					0.91***		
	(1.03)					(5.11)					(3.64)		
ERR		1.21***					1.22*					1.26**	
		(3.26)					(1.91)					(2.32)	
DISP			1.99***					2.16***					1.89***
			(5.07)					(4.71)					(3.41)
CF				0.97**					0.95***		0.96***	0.92***	0.96***
				(2.03)					(4.49)		(2.91)	(3.67)	(2.41)
OPRATIO					0.95***					0.93***			
					(3.18)					(3.66)			
Year Dummy	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Obs.	320	296	297	332	326	221	206	207	232	224	214	199	200
Pseudo R^2	0.08	0.18	0.17	0.11	0.14	0.18	0.22	0.21	0.19	0.23	0.21	0.29	0.23

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

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standard deviation), the odds of CVR offers would increase by 1.05 times. In sum, our results suggest that a bidder is more likely to offer a CVR payment rather than a cash payment when it faces more severe asymmetric information problem, e.g., when it has fewer financial analysts following or when financial analysts make more errors or disagree with each other more often in their forecasts on the bidder's earnings. Our results also suggest that a bidder is more likely to offer CVR payment when the bidder has a lower level of internal capital. Thus, our results here support hypotheses (H2) and (H3).

1. Robustness Check

Next, we perform three robustness checks. First, in our tests above, we do not distinguish between all-cash bidders and cash/stock bidders in the control sample. It is possible that bidders send a stronger signal to the capital market in making an all-cash offer rather than making an offer that is partially in cash and partially in stock. Thus, it is interesting to know whether or not CVR payments are still a stronger signal when compared with all-cash payments. In the first robustness check, we rerun regression (7), using a sample of CVR bidders and all-cash bidders. We control for time effect in the regression, and we introduce the asymmetric information variables and the internal capital variables one by one. The results from this robustness check are presented in Columns (1) to (5) in Table 8. They are similar to what we presented in Table 7. The coefficients of all three asymmetric information variables are significant and follow the levels predicted by hypothesis (H2). The coefficients of both internal capital variables are also significant and follow the level predicted by hypothesis (H3). Thus, the results here confirm the robustness of our earlier results, suggesting that CVR payments provide a stronger signal even compared to all-cash payments.

In the second robustness check, we study a bidder's choice between CVR/stock offers and cash offers. One concern on our earlier test of the signaling role of CVRs is that our earlier results could be driven by the signaling role of cash. To address this concern and exclude the cash effect, we keep only CVR/stock bidders (11 cases) in the CVR sample and rerun regression (7). We control for time effect in this new regression and we exclude the dummy variable of tender offer TENDER, since no CVR/stock offer is a tender offer. We present the results from this second robustness check in Columns (6) to (10) in Table 8. Again, the results here are similar to our earlier results presented in Table 7. Both the coefficients of the asymmetric information variables and the coefficients of the internal capital variables demonstrate the levels predicted by hypotheses (H2) and (H3). Most of these coefficients are also significant, except the coefficient of variable ERR. Thus, our results on the stronger signaling role of CVR payments are unlikely to be driven by the signaling role of cash in these CVR payments.

In the third robustness check, we drop CVR bidders that offer stock together with CVRs. As we discussed earlier, cash could also serve as a signal to reveal a firm's true value. Thus, in this robustness check, we intend to find whether CVRs provide any additional signaling role over cash in CVR/cash and CVR/cash/stock offers by studying the likelihood of a bidder offering CVR together with cash rather than cash with no CVRs. Again, we run regression (7) with the control of time effect. We present the results from this robustness check in Columns (11)

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TABLE 8

Robustness Check: Logistic Regressions on the Likelihood of Offering CVRs

The sample consists of bidders in the CVR takeover sample and bidders in the control sample of cash offers. We define the CVR sample and the control sample in each regression in the table. The dependent variable is one for firms offering CVRs and zero for firms not offering CVRs. The independent variables include NUMBER, the number of analysts following the firm; DISP, the standard deviation of analysts' earnings forecasts scaled by price/100; ERR, the absolute difference between mean earnings forecast and actual earnings per share scaled by price/100; OPRATIO, 100 times EBITDA, divided by the book value of assets; and CF, 100 times the sum of net income and depreciation and amortizations, divided by the book value of assets. We also control for SIZE, the log of the market value of assets; MTOB, the ratio of the market value to the book value of assets; LDR, the ratio of long-term debt to the book value of assets; DIVD, the dummy variable for firms paying cash dividends; TAXLOSS, the dummy variable for firms with any taxloss carryforwards; and TENDER, the dummy variable for tender offers. We report odds ratios in the table, together with t-statistics in brackets.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
SIZE	1.55***	1.29	1.26	1.25	1.27	1.58	0.87	0.78	0.78	0.83	2.31***	1.93**	2.25***	2.25***	2.12***
	(2.55)	(1.41)	(1.14)	(1.11)	(1.28)	(0.99)	(0.34)	(0.81)	(0.81)	(0.63)	(2.91)	(2.36)	(3.34)	(3.53)	(3.83)
LDR	8.03	37.96**	17.79**	8.55*	8.42	0.69	7.3	4.95	1.42	2.49	24.22**	22.76*	10.43	13	13.9
	(1.46)	(2.30)	(2.01)	(1.71)	(1.61)	(0.14)	(0.70)	(0.71)	(0.16)	(0.49)	(2.01)	(1.79)	(1.04)	(1.48)	(1.35)
MTOB	1.42	1.05	1.1	1.17	1.21	1.59***	1.36**	1.36***	1.26**	1.30**	0.45*	0.39*	0.45*	0.44	0.5
	(1.56)	(0.17)	(0.30)	(0.68)	(0.99)	(4.16)	(2.26)	(2.58)	(2.33)	(2.13)	(1.67)	(1.88)	(1.75)	(1.49)	(1.30)
DIVD	1.79	1.38	1.51	2.33	2.01	2.28	1.72	3.17	4.41	4.05	0.81	0.8	0.67	0.64	0.68
	(0.66)	(0.27)	(0.33)	(0.82)	(0.73)	(1.26)	(0.57)	(1.12)	(1.52)	(1.55)	(0.15)	(0.12)	(0.26)	(0.30)	(0.25)
TAXLOSS	5.56*	2.93	1.32	3.82**	4.12**	10.52***	3.53	2.18	4.64	5.14*	3.09	2.74	1.8	1.92	1.97
	(1.89)	(1.02)	(0.27)	(2.27)	(2.45)	(2.60)	(1.18)	(0.87)	(1.59)	(1.68)	(1.00)	(0.78)	(0.64)	(0.55)	(0.56)
TENDER	0.22***	0.14***	0.15***	0.28***	0.25***						1.28	1.05	1.13	2.25	2.13
	(2.77)	(3.17)	(3.05)	(2.79)	(2.71)						(0.43)	(0.07)	(0.19)	(1.15)	(1.01)
NUMBER	0.88***					0.76***					0.95**				
	(6.00)					(3.45)					(2.36)				
ERR		1.45**					1.24					1.16			
		(2.04)					(1.37)					(1.42)			
DISP			3.26***					1.89**					2.42**		
			(4.47)					(2.31)					(2.51)		
CF				0.89***					0.95***					0.91***	
OPRATIO				(7.15)					(3.21)					(2.77)	
					0.90***					0.93**					0.92***
					(4.70)					(2.00)					(2.83)
CVR Sample	Entire sample (CVR with stock and/or cash)						CVR/stock bidders				CVR/cash and CVR/cash/stock bidders				
Cash Sample	All-cash bidders						Entire sample of cash bidders including both all-cash and cash/stock bidders								
No. of Obs.	170	162	162	178	173	156	148	149	163	159	165	152	153	174	168
Pseudo R^2	0.24	0.28	0.28	0.3	0.31	0.37	0.33	0.25	0.28	0.31	0.23	0.22	0.29	0.27	0.27

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

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to (15) of Table 8. In general, the results here are similar to our earlier results. They suggest that CVR offers are more effective in solving severe asymmetric information problem than cash offers.

VI. Conclusion

This paper provides the first theoretical explanation and the first empirical test for the use of CVRs. The model shows that CVRs can signal firm type in the presence of information asymmetry regarding the offering firm's true value. We tested the empirical implications of the model based on a sample of CVRs involving M&As and found supporting evidence. First, we found that the announcement effect of the firms offering CVRs is greater than the announcement effect of the firms offering only stock. Second, we found that firms facing more severe asymmetric information problems are more likely to offer CVRs rather than offering cash but no CVRs. Third, we found that relatively more cash-constrained firms are likely to use CVRs rather than cash with no CVRs as their means of payment in M&As.

Appendix

A. Proofs of Propositions 1 and 2

In equilibrium, the type B firm offers a payment without CVRs to maximize its objective:

$$\text{(A1)} \qquad \underset{n_B, D_B}{\text{Max}} \quad \Pi_B = (1 - n_B)(V_B + W - D_B) - I(D_B > 0)\delta_l c,$$

subject to the type G firm's non-mimicry constraint and the outsiders' break-even constraint:

$$\text{(A2)} \qquad \Pi_G \geq \Pi_{G(B)} = (1 - \omega)(1 - n_B)(V_B + W - D_B) + \omega(1 - n_B)(V_G + W - D_B),$$

$$\text{(A3)} \qquad n_B(V_B + W - D_B) + D_B \geq V - W,$$

where IC constraint (A2) is trivially satisfied. Here, $I(D_B > 0)$ equals one if $D_B > x_l = 0$ and zero if $D_B = 0$. In equilibrium, the type B firm would design its package to avoid the bankruptcy cost c, i.e., $D_B^* = 0$, and offers a fraction of equity $n_B^* = V/(V_B + W)$ to pay for the asset. In this equilibrium, $\Pi_B^* = (V_B - V + W)$. Note here that the type B firm is indifferent between the all-stock payment and a cash/stock payment as long as the cash amount in the cash/stock payment is less than the amount of internal capital.

The type G firm's maximization problem is given in Section III.B. The type G prefers to achieve separation without incurring any overpayment for the asset. Thus, in equilibrium, constraint (5) is satisfied as an equality, i.e.,

$$\text{(A4)} \qquad V - W = n_G[V_G - D_G - \phi_m M] + D_G + \phi_m M.$$

First, we consider the case where $I(k > 0) = 0$ (i.e., no CVRs are offered) so that $M = 0$. Define $\{n_G^1, D_G^1\} \in \{n_G, D_G | V - W = n_G(V_G - D_G) + D_G$, and $D_G > 0\}$ and $\underline{\alpha} = \underset{\{n_G^1\}}{\max} \delta_l[c + \omega(W - V) + \omega n_G^1 V_G]/((1 - \omega)V_G + \omega n_G^1 V_G)$. Given $c > \omega(V - W) +$

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$(1-\omega)V_G$, the maximization function in $\underline{\alpha}$ is monotonically decreasing in n_G^1. Thus, $\underline{\alpha} \equiv \delta_l[c+\omega(W-V)]/((1-\omega)V_G)$. In this case, when $\alpha \equiv (V_G - V_B)/V_G \leq \underline{\alpha}$, IC constraint (2) is satisfied. It can also be shown that $\underline{\alpha}$ is increasing in internal capital W.

Second, consider the case where $I(k>0)=1$. In this case, for IC constraint (2) to be satisfied,

$$\text{(A5)} \qquad \omega(1-n_G)[(\delta_m-\phi_m)M-\delta_l D_G]+\varepsilon+\delta_l c \geq (1-\omega+n_G\omega)(V_G-V_B),$$

where M satisfies (3). Define $\{n_G^2, D_G^2, M_2\} \in \{n_G, D_G, M \mid \text{(A4) and (6)}\}$, $\{k_2, R_2\} \in \{k, R | M_2 = k[R-(x_m - M_2 - D_G^2)]\}$, and $\overline{\alpha} = \max_{\{n_G^2, D_G^2, M_2\}}\{(\omega(1-n_G^2)[(\delta_m-\phi_m)M_2 - \delta_l D_G^2] + \varepsilon + \delta_l c)/((1-\omega+\omega n_G^2)V_G)\}$. When $\alpha \leq \overline{\alpha}$, constraint (A5) is satisfied. Note that the maximization function in $\overline{\alpha}$ is increasing in M_2 and decreasing in D_G^2 and n_G^2. Thus, the function is maximized at the maximum $M_2 = V - W/\phi_m$ and both D_G^2 and n_G^2 equal to zero, i.e., $\overline{\alpha} \equiv (\omega(\delta_m-\phi_m)(V-W)+\phi_m\varepsilon+\phi_m\delta_l c)/(\phi_m(1-\omega)V_G)$; $\overline{\alpha} > \underline{\alpha}$.

Clearly, $\Pi_G(k=0) > \Pi_G(k>0)$, as long as the marketing cost $\varepsilon > 0$. Thus, when $\alpha \leq \underline{\alpha}$, the type G firm chooses not to offer CVRs in equilibrium, i.e., $k^* = 0$. This equilibrium is characterized in Proposition 1, where the type G's equilibrium choices of cash and stock are $\{n_G^*, D_G^*\} \in \{n_G^1, D_G^1\}$. Further, when $\underline{\alpha} < \alpha \leq \overline{\alpha}$, the type G firm chooses to offer CVRs in equilibrium, i.e., $k^* > 0$. This equilibrium is characterized in Proposition 2, where the type G firm's equilibrium choices are $\{n_G^*, D_G^*, k^*, R^*\} \in \{n_G^2, D_G^2, k_2, R_2\}$. Note here that when $\alpha = \overline{\alpha}$, the equilibrium choices $n_G^* = 0$, $D_G^* = 0$, and $\{k^*, R^*\}$ are such that $M_2^* = (V-W)/\phi_m$. When $\alpha < \overline{\alpha}$, the type G firm can choose $\{k^*, R^*\}$ so that $M_2^* \leq (V-W)/\phi_m$ as long as conditions (A4) and (6) are satisfied. In the case that $M_2^* < (V-W)/\phi_m$, n_G^* and D_G^* could be any positive amounts to satisfy the type G's IR constraint (A4).

Both the type G and B firms have no incentive to deviate from their equilibrium path given the IC constraints. Further, it can be shown that, under the circumstance characterized in Propositions 1 and 2, the type G firm's payoff when it pools with the type B firm is smaller than the payoffs in the separating equilibria. Thus, the Cho-Kreps intuitive criterion rules out the existence of a pooling equilibrium, and the separating equilibria described in Propositions 1 and 2 survive the intuitive criterion when $\alpha \leq \overline{\alpha}$. □

B. Description of CVRs

Contingent value rights generally compensate CVR holders for future declines in the issuer's stock price. Most CVRs are transferable securities, although there are exceptions. For example, when General Mills acquired Pillsbury from Diageo and paid for the acquisition with stock and CVRs, the CVRs were nontransferable.

Holders of CVRs can exercise their right at maturity; therefore CVRs resemble European put options. CVRs typically have a maturity of one to three years. At maturity, a contingent payment can be made either with cash or with securities. In most cases, the amount of contingent payment for each CVR equals the difference between the reference price and the market price of the issuer's stock at maturity if positive, and usually has a ceiling. This ceiling (or maximum amount) is defined by a "floor" price for the underlying stock: if the issuer's stock price drops below the floor, then the holder of each CVR will only get the difference between the reference price and the floor. In this case, a CVR with a floor resembles a European bearish put spread. However, in some cases, the contingent payment is specified as a fixed payment. For example, in the acquisition of CytoRad by Cytogen in November 1994, Cytogen's CVR would entitle the CVR holder half a Cytogen share if the aggregate value of its payment package for each CytoRad share averages less than $12 during 45 trading days ending in January 31, 1997.

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The design of CVRs can also be complicated in other ways. For example, the reference price of CVRs could have a growth rate, or the issuer may have an option to extend the maturity of its CVRs. For example, in the acquisition of Paramount by Viacom, Viacom had an option to extend the maturity by another year at the end of the first year, in which case the reference and floor prices would change from $48 and $36 on the first maturity date to $51 and $37, respectively.

Another complexity of CVRs is the limited redemption rights, which allow the issuer to redeem its CVRs for cash or stock at any time before the maturity of CVRs. For instance, in Markel's acquisition of Terra Nova, the Markel CVRs could be redeemed at any time for cash or stock with a value equal to the reference price less Markel's stock price at the date of redemption discounted at 6% from the maturity date. Similarly, CVRs may also include an "up and out" option, which causes the CVRs to expire automatically if the average market price of the underlying stock during a measurement period exceeds the reference price. The measurement period is usually long enough to eliminate the risk that an abrupt spike in the stock price will eliminate the CVRs.

CVRs are governed by an agreement that must qualify under the Trust Indenture Act of 1939. The agreement is between the issuer and a qualified trustee who acts on behalf of CVR holders. CVRs have both affirmative and negative covenants. The affirmative covenants are similar to those found in debt indentures. The negative covenants prohibit the issuer from amending CVRs without consent from CVR holders. They also prohibit the issue from purchasing the underlying stock during a valuation period. This prohibition protects CVR holders from an artificial increase in the underlying stock price and an artificial decrease in the CVR payout.

CVR holders are also protected when the issuing firm subdivides the number of outstanding shares, such as by stock split, stock dividends, etc., or when the issuing firm combines the outstanding shares, such as by reverse stock split, etc. For example, in Viacom's acquisition of Paramount, if Viacom subdivides or combines the number of outstanding Viacom shares, Viacom must correspondingly subdivide or combine the CVRs and appropriately adjust the Target Price (i.e., the reference price) and the Minimum Price (i.e., the floor price) (see, also, Markel/TerraNova 8k (February 3, 2000, p. 22), for a similar anti-dilution measure).

Upon issuance, CVRs are typically recorded at their market value as a liability, with subsequent price movements of the CVRs recorded in the issuer's income statement and balance sheet. At maturity, if the CVRs are in the money, then the payments paid to CVR holders are offset against the liability. In the event of the issuer disposing of all its assets or being acquired by a third party before the maturity of its CVRs, its CVR holders will get paid the present value of the reference price and the floor (unless the company acquiring the issuer has agreed to assume the CVR obligations).

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