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What we do and do not know about convertible bond financing ☆

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ABSTRACT

We review the literature on the issuance motives, shareholder wealth effects, and design of convertible bonds. Empirical studies on convertible debt issuance mainly focus on testing the predictions of four traditional theoretical models based on convertibles' potential to mitigate agency or adverse selection costs, and obtain mixed evidence. Recent studies on shareholder wealth effects of convertible bond issues highlight the need to control for arbitrage-related short selling and post-issuance risk changes. Studies on the determinants of convertible bond design uncover earnings management, as well as catering incentives to convertible arbitrage funds, as important determinants of innovations in convertible bond characteristics. Overall, our review indicates that recent empirical research on convertible debt provides valuable insights into issue motives and determinants of financial innovations, but also considers the broader question of how investor demand characteristics impact corporate finance decisions. We conclude with an overview of potential research questions to be addressed by future research on hybrid securities.

1. Introduction

Convertible bonds are debt instruments that can be converted into common equity at the investor's discretion. Convertibles represent an important source of financing for corporations, both on an absolute basis as well as relative to standard security offerings. For example, U.S. corporations raised a total of $510 billion with convertible debt issues over the period 2000 to 2011. This compares with $1146 billion raised with seasoned equity issues, and $6635 billion raised with straight bond issues.[1]

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[1] Convertibles are also an important financing source outside the U.S. More particularly, Western European firms raised $189 billion in convertible bonds over the period 2000 to 2011, and Japanese firms raised $112 billion in convertible bonds over that same window. We calculate these issuance volumes using samples of security offerings retrieved from Thomson One Banker's New Issues database. We only consider plain vanilla convertible bonds (i.e., we remove preferred stock, mandatory convertibles, etc.). We also remove seasoned equity offerings that only consist of secondary shares, as well as mortgage- and asset-backed bonds. We only consider issues made by publicly quoted corporations. Issuance volumes are converted into constant June 2011 U.S. dollars using the U.S. Consumer Price Index retrieved from Datastream.

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Evidence suggests that the investor base that purchases convertible debt, the market channels utilized to distribute convertible debt, and the design of various convertible debt security characteristics have substantially changed over recent years. Together, these changes have inspired a host of empirical studies on convertible bond financing, from both an issuer and an investor perspective. These recent empirical studies have in turn created new ideas and insights regarding issuers' motives for raising convertible financing. In addition, the changes in convertible bond markets create a unique laboratory for addressing broader questions through the lens of convertible bond issuance choices.

The main goal of this paper is to review this recent academic work on corporate convertible debt issuance. We begin with an overview of competing, although not necessarily mutually exclusive, theoretical explanations for convertible bond issuance decisions, and proceed with a discussion of the empirical literature. Empirical corporate finance studies of convertible bonds address three main issues. One group of studies focuses on the fundamental question of why firms issue convertible bonds instead of standard non-hybrid financing instruments. A second set of studies examines the shareholder wealth effects of convertible bond issues, both in the short-run and the long-run. A third broad strand addresses the determinants of convertible securities design. We structure our review of the empirical literature around these three central issues. However, it is important to note that these issues are interrelated. For example, by studying the determinants of convertible bond design, researchers also can indirectly obtain more insight into convertible bond issuance motives as well as share price reactions to issuance and design decisions. Some empirical studies address more than one of these questions, and may thus appear in several sections of the paper.

Since our primary emphasis throughout the paper is on corporate finance-related studies, we do not review the extensive literature on convertible bond underpricing.[2] For the same reason, we refrain from specifically discussing studies on convertible arbitrage hedge fund performance or the impact of convertible arbitrage activity on the underlying common equity.[3]

Our paper complements and extends three other review studies. Loncarski et al. (2006) review focuses on a comparison of the empirical predictions generated by theoretical rationales of convertible bond issuance. Eckbo et al. (2007) briefly mention convertible bonds among the “miscellaneous offering types” in their review paper of security offerings. Abdul Rahim et al. (forthcoming) provide a meta-analysis of event studies of the announcement effects of convertible bonds and straight bonds combined with warrants. Our paper differs from these studies by covering a broader range of corporate finance research topics related to convertible bonds (issuance motives, shareholder wealth effects, and security design decisions). Moreover, while our review covers studies published as early as the 1950s and 1960s, our key focus is on recent theoretical and empirical advances in this area, with “recent” being loosely defined as published post-2005 or in working paper status.

Our review generates two main conclusions. First, empirical studies of convertible issue motives mainly focus on testing the validity of four theoretical models: the risk shifting theory of Green (1984), the risk uncertainty theory of Brennan and Kraus (1987) and Brennan and Schwartz (1988), the backdoor-equity theory of Stein (1992), and the sequential financing theory of Mayers (1998). The empirical studies that test these four theories do not reveal a clear pattern of evidence either in favor of, or against any of these four models. This finding could be due to the fact that each of these theories is incomplete, or that the population of convertible debt issuers is heterogeneous (i.e., different issuers have different reasons for issuing convertible debt). Moreover, we also find that there is no clear relation between the empirical findings and the geographical focus of the studies. That is, we review not only the U.S. market results, but also evidence from issuance in Europe and Asia. Finally, there does not seem to be any clear difference between qualitative and quantitative studies, except that qualitative studies systematically reject the risk shifting theory of Green (1984).

The second main conclusion is that recent corporate finance research on convertible bonds is able to address much broader questions about corporate financing decisions than is possible with standard securities like straight debt or common equity. This result can be attributed to three specific features of recent innovations in the convertible offering market. First, whilst historically most convertibles were issued through the public markets, almost all recent convertibles issued in the U.S. are now placed with qualified investors under Rule 144A (Huang and Ramirez, 2010).[4] As such, it is relatively straightforward to identify their investors (see, e.g., Brown et al., 2012). This link between issuer and investor allows researchers the opportunity to conduct cleaner tests on the impact of investor demand on security issuance decisions, stockholder wealth effects, and design choices than is possible for straight debt and seasoned equity offerings. Second, whilst convertibles were traditionally held by buy-and-hold institutional investors, around 75% of recent convertible bond issues are purchased by convertible arbitrage hedge funds (Brown et al., 2012; Mitchell et al., 2007; Pulliam, 2004).[5] Recent studies of convertible bond issues are therefore able to provide more insight into the important interplay between corporate finance behavior and hedge fund activities. Research on hedge funds has long been largely confined to asset pricing studies that examine their profitability and their effects on pricing efficiency. Recent studies of convertible debt demonstrate conclusively that convertible bond issuers cater to the hedging needs of arbitrageurs, thereby obtaining more favorable terms for their offering. Third, the many novelties in convertible securities design (e.g., cash

[2] Recent studies of convertible bond underpricing include Chan and Chen (2007), Mitchell et al. (2007), Ammann et al. (2010), Henderson and Tookes (2012), and Zabolotnyuk et al. (2010).

[3] Examples of studies of convertible arbitrage fund performance include Fabozzi et al. (2009) and Agarwal et al. (2011). Choi et al. (2009) examine the impact of convertible arbitrage on the liquidity, volatility, and efficiency of the underlying stock.

[4] Rule 144A was issued in 1990 to improve the liquidity and efficiency of the private placement market by giving more freedom to institutional investors to trade securities. Securities issued under Rule 144A do not require registration with the Securities and Exchange Commission (SEC), but can be traded without restriction in the secondary market among qualified institutional buyers.

[5] Convertible arbitrage involves buying (underpriced) convertibles and short-selling the underlying stock in order to hedge the position against stock price movements. If the convertible debt is underpriced, the investor profits regardless of whether the stock price falls (the convertible debt becomes more bond-like and declines less than the share price) or rises (the convertible debt becomes more equity-like and the holder sells more shares).

settlement and dividend-protection clauses) provide an ideal laboratory for researchers to test general predictions on the determinants and consequences of security innovations formulated in studies such as Finnerty (1988) and Tufano (1989). As such, research on convertible debt can help address one of the ten most important unresolved issues in finance research listed by Brealey et al. (2011), i.e., "How Can We Explain the Success of New Securities and New Markets?"

The remainder of this paper is organized as follows. Section 2 reviews theoretical explanations of the convertible bond issuance decision. Sections 3 through 5 discuss empirical studies on the issuance motives, shareholder wealth effects, and design of convertible securities, respectively. The Appendix A provides a table summarizing the main findings of each empirical study discussed in these three sections. We believe that this table provides a useful "speed reading" tool for academics and practitioners who want to get a quick overview of the state of the art of empirical research on convertible bond issuance. Section 6 concludes with a discussion of what we do and do not know about convertible bond issuance, and highlights avenues for future research.

2. Theoretical rationales for convertible bond issuance decisions

Finance textbooks (e.g., Ross et al., 2013) generally distinguish between two types of motives for issuing convertible bonds: implausible and plausible motives. Implausible motives are also known as the free-lunch story. According to this line of reasoning, convertibles are simultaneously cheaper than straight debt, because they carry a lower coupon, and cheaper than common equity, because the conversion price is generally well above the stock price at the issuance date.

This viewpoint can be illustrated using an example. In June 2009 Air France KLM sold 575 million euros of convertible bonds to fund its fleet and extend its existing debt maturity. The bonds were sold with a coupon of 4.97% and a conversion price of 11.80 euro. The actual stock price of Air France KLM around the issuance date was 9.27 euro, 27.3% below the conversion price. Around the same time, the company also sold straight bonds with the same priority and approximately the same maturity on which they paid a coupon of 6.75%. The free-lunch reasoning would hold that the convertible offers an attractive fund raising opportunity at lower cost than either straight debt or common equity, since the coupon on the convertible is 178 basis points lower than the coupon on the straight bonds ("cheap debt"), and the conversion price is well above the stock price prevailing on the issuance date ("cheap equity"). Of course, such reasoning is flawed, because the lower coupon on convertible debt hides the fact that the issuer has also sold the option to convert the bonds into equity when desirable for the investor. Also, the conversion price cannot be compared to the current stock price, because conversion will only take place in the future, and only if the then-prevailing stock price is above the conversion price.

The plausible motives for convertible debt issuance are formalized in a host of theoretical motivations offered by several different authors. These theories yield the common prediction that convertibles can mitigate a range of financing costs associated with the alternatives of raising straight debt or common equity financing. They differ from the free-lunch argument in that they acknowledge that convertible bonds do not dominate straight debt and common equity in all situations. In this sense, convertible debt acts as a substitute for straight debt and common equity when the costs of the latter are prohibitive enough to preclude their use.

The theoretical explanations differ on the specific type of financing problem they assume to be alleviated by convertible debt. A first group of studies perceive convertibles as a tool to reduce agency problems, while a second group of studies perceive convertibles as a tool to reduce adverse selection costs. While these rationales focus on supply-side motives for convertible debt issuance, several recent papers argue that convertibles are issued in response to rationing in the market for seasoned equity, or to heightened investor demand for hybrid financing.

2.1. Convertible debt as a financing mechanism to reduce agency costs

Several theories model convertibles as a funding instrument that reduces a variety of agency costs. The risk-shifting model of Green (1984) focuses on potential bondholder–stockholder conflicts of interest, arguing that a convertible bond mitigates shareholders' incentives to engage in high-risk, negative net present value projects. The idea behind this model is that shareholders will have to share any cash flows resulting from high-risk strategies with convertible bondholders, which will reduce their benefits (and hence their incentives) to engage in such an investment strategy in the first place.[6]

While Green (1984) considers agency problems between bondholders and shareholders, Mayers (1998) considers convertibles as a tool to reduce agency problems between management and shareholders in the special case where the company has a sequence of investment opportunities. His sequential-financing argument suggests that convertibles are more suitable than long-term straight bonds for financing real options, because convertibles can overcome overinvestment problems by redeeming bonds and returning cash to bondholders when the investment option turns out to be worthless. If the investment turns out to be valuable, the convertible debt converts to common equity. In this setting, convertibles are preferable to a sequence of short-term straight bonds, since rolling over short-term debt would entail higher issuance costs. Wang (2009) also models convertible bonds as a financing instrument that imposes an optimal investment policy on managers when funding real options.

Whilst the above models rest on the assumption that managers aim to maximize shareholder wealth, Isagawa (2002) argues that callable convertibles can help entrenched, inefficient managers to preserve their position within the firm. The Isagawa rationale requires that convertibles' design parameters are set in such way that the manager can always force conversion through

[6] Dorion et al. (2014-in this issue) develop a measure to quantify the magnitude of shareholders' incentives to increase risk.

calling the bonds when a new project is value-increasing, and never force conversion through calling the bonds when a new project is value-decreasing.[7] This design structure will incentivize the entrenched manager to never undertake a bad project, as this would force the firm into bankruptcy due to the debt not being eliminated. Managers' credible commitment not to undertake bad projects in turn increases the firm's ex ante value, thereby reducing the likelihood of a hostile takeover. Unlike straight debt, convertibles can therefore simultaneously reduce the risk of bankruptcy and the risk of a hostile takeover, even if it would be more beneficial for shareholders to see the firm being liquidated. The model yields the prediction of a negative stock price reaction upon convertible bond call announcements, since shareholders would be better off if the manager would be replaced.

Lyandres and Zhdanov (2014-in this issue) develop a model in which convertible bonds can mitigate the underinvestment problem of Myers (1977). While the debt-like features of a convertible debt contract may result in an incentive to underinvest, the presence of a conversion option gives rise to an accelerated investment incentive. Firms can achieve first-best investment outcomes by issuing the optimal combination of straight and convertible debt.

2.2. Convertible debt as a tool to reduce adverse selection costs

A large class of convertible debt theories model these securities as a device to reduce adverse selection costs resulting from asymmetric information between firm insiders and outsiders. The risk uncertainty rationales of Brennan and Kraus (1987) and Brennan and Schwartz (1988) assume that managers and stock market investors disagree on the risk of the firm.[8] In this case, high perceived levels of risk result in the firm having to pay a higher interest rate on straight debt than managers find reasonable. This problem is mitigated, however, by issuing convertible bonds, because higher perceived risk translates into a higher value of the conversion option. Thus, while the credit portion is undervalued, the conversion option is overvalued, resulting in a fairly priced security. Therefore, it is easier for managers and outside investors to agree on the value of a convertible bond than of a straight bond.

A second group of adverse selection models builds on the assumption of asymmetric information about firm value rather than firm risk. Probably the best-known example of these signaling models is the backdoor-equity model of Stein (1992). Stein's model relies on the Myers and Majluf (1984)-type adverse selection argument that, when there is asymmetric information about firm value, an equity offering announcement might signal to the market that the firm is overvalued. Since convertibles have a smaller equity component than an equivalent sized secondary equity offering, convertible issuance is less likely to be perceived as a signal of firm overvaluation, thereby reducing adverse selection costs. Firms therefore use callable convertible debt as a way to obtain delayed equity financing. Note, however, that this argument is not the same as the earlier mentioned free-lunch argument that convertibles can be used to issue equity at a higher price than the current stock price. While the free-lunch argument is based on a misconception about issuing equity at a premium, Stein's model is based on rational managers, who focus on the trade-off between the financial distress costs associated with straight bonds and the adverse selection costs associated with common equity.

Nyborg (1995) presents a related model. The difference between Nyborg's (1995) and Stein's (1992) rationale is that Nyborg's rationale assumes that calling convertible bonds sends a negative signal to the market. As such, the benefits of convertible debt, in terms of obtaining a more favorable shareholder reaction, only materialize if conversion is voluntary. Thus, there are clear differences between voluntary and forced call decisions with convertible debt. Constantinides and Grundy (1989) show that a signaling equilibrium can also be reached with non-callable convertible debt, by using part of the convertible bond issuance proceeds to repurchase common stock and part to finance investments. As such, their model has a clear implication on how proceeds must be used following the issuance of convertible debt.[9] Kim (1990) demonstrates that non-callable convertible debt can lead to a signaling equilibrium if firms set the conversion ratio to be decreasing in their expected future earnings. At the limit, firms that expect the highest earnings use straight debt financing, and firms that expect the lowest earnings use equity financing.

Chakraborty and Yilmaz (2011) present a "non-signaling" model in which they relax Stein's (1992) assumption that information asymmetry is resolved at the time of the convertible bond call. They show that, when the initial information asymmetry persists over time, managers can overcome adverse selection problems by issuing a convertible that can be called when the stock price exceeds a certain threshold value. The idea is as follows. Convertible bond investors own a valuable option to transform their convertible bonds into safer straight bonds (i.e., they can choose not to convert the bonds into equity). Managers interested in maximizing shareholders' residual claims would prefer to extinguish this valuable put option held by firm outsiders as soon as possible. However, the trigger price restriction on the call provision allows the manager to force conversion only when sufficiently favorable information about the firm reaches the market. Since the arrival of positive future news is positively correlated with the initial private information of the manager regarding the firm's prospects, he expects to be able to force early conversion through calling the bonds more often when he has favorable initial information. As a result, convertible bond investors

[7] The model also rests on fairly restrictive assumptions regarding the timing of convertible call decisions. More particularly, the call should take place after the new project's nature is publicly revealed, but before the firm's true return is revealed. The model does allow for convertibles to be call-protected for a restricted number of years, which is a feature often observed in practice (e.g., Chakraborty and Yilmaz, 2011).

[8] Brennan and Kraus (1987) present the risk uncertainty argument in model form and consider a wider range of securities that can lead to a fully revealing equilibrium when there is uncertainty about firm risk (e.g., bonds plus warrants), while Brennan and Schwartz (1988) focus on the intuition behind the risk uncertainty argument for convertible bond offerings in particular. Since the predictions yielded by both papers are the same, we do not further distinguish them in this review.

[9] The stock repurchase in their model explicitly excludes buying stock from the management of the firm, in order to make sure that the repurchase gives the right signal. In that sense the stock repurchase is different from a cash dividend in that a cash dividend is paid to all shareholders, including management.

are less likely to end up holding a valuable put option when the firm is more valuable, and more likely to end up holding such option when the firm is less valuable. This trade-off allows the value of initial claims sold to be independent of the manager's initial private information, thereby completely resolving the adverse selection problems described by Myers and Majluf (1984) and Stein (1992).

2.3. Convertible debt as a response to investor demand considerations

Lewis et al. (2001) argue that rationing in the seasoned equity market precludes some issuers (e.g., firms with a high level of information asymmetry about their value) from raising equity financing. This equity rationing argument is similar in nature to arguments on credit rationing (e.g., Stiglitz and Weiss, 1981). It differs from Stein (1992)-type backdoor-equity arguments in that firms do not issue convertibles to signal their true value, but simply because they cannot access common equity financing.

Brown et al. (2012) further develop the equity rationing rationale for convertible bond issuance by linking it to the prevalence of convertible arbitrageurs as the most important convertible bond investors in today's markets. They argue that convertible arbitrage hedge funds' expertise and sophisticated investment strategies allow them to distribute equity risk to well-diversified (institutional) shareholders. The large presence of convertible arbitrage hedge funds as investors in convertible bond markets thus enables firms to raise financing when equity is very costly or not available at any price.

A related explanation for convertible bond issuance focuses on fluctuations in investor demand for convertible securities. This argument holds that, even without financing constraints in other markets, firms may opportunistically respond to heightened investor demand in the convertible bond market by issuing convertibles instead of other financing instruments, and by setting a higher price for their offering. Temporal fluctuations in investor demand for convertible bond securities may be driven by the typical payoff patterns of these securities (which may be more valuable, for example, in times of heightened investor risk aversion), or by irrational investor hypes (De Jong et al., 2013).

3. Empirical studies of convertible bond issuance motives

Perhaps the most fundamental question to be addressed by empirical research is why firms issue convertibles instead of standard non-hybrid financing instruments. A substantial number of studies attempt to provide empirical evidence on firms' motives to raise convertible bond financing. The very early literature on this topic, which emerged before the development of any formal theory on convertible bond issuance, is qualitative in nature and consists of survey analyses asking corporate managers why they issue convertible bonds (Brigham, 1966; Hoffmeister, 1977; Pilcher, 1955). The overriding message from these surveys is that the majority of managers issue convertibles in the hope of eventually converting them into equity. However, the survey analysis of Billingsley and Smith (1996) shows a decreasing reliance on convertible bonds as a way to obtain backdoor-equity financing. Instead, the questionnaire responses suggest that most managers use convertible bonds as a way to obtain cheaper coupons on bond financing.

These early surveys of convertible issue motives have been followed by a range of quantitative studies that formally test the predictions generated by the various theoretical models of convertible bond issuance. Mayers (1998) provides empirical evidence for his own sequential-financing rationale by documenting that convertible bond issuers increase their investment activity in the years following conversion-forcing convertible bond calls. He also finds that, during these years, convertible bond issuers are more likely to attract additional financing, primarily in the form of long-term debt instruments. He argues that this evidence is consistent with the rationale that convertibles facilitate the future financing of valuable real investment options. Chang et al. (2004) find that most convertible bond issuers do not raise net new financing over the life of the convertible. This finding is consistent with Mayers (1998) prediction that convertibles are useful devices in reducing the transaction costs of raising new financing.

A number of other quantitative studies simultaneously test the validity of several convertible bond rationales by comparing the characteristics of convertible bond issuers with those of other firms. Consistent with the risk-shifting model of Green (1984), Lewis et al. (1999) find that convertible bond issuers have a higher potential for risk-shifting behavior than straight bond issuers. Further, as predicted by the backdoor-equity model of Stein (1992), Lewis et al. (1999) also find that convertible bond issuers have a higher potential for adverse selection problems than common equity issuers. Dutordoir and Van de Gucht (2009) replicate the approach of Lewis et al. (1999) in a Western European setting and find that European convertibles mainly serve to reduce debt-related financing costs. Lewis et al. (2003) compare convertible bond issuers to industry-matched non-issuers. Consistent with agency- and adverse selection-costs based rationales, their results indicate that convertible bonds serve to address multi-dimensional financing problems related to both straight bond and equity issuance. Krishnaswami and Yaman (2008) find that firms' propensity to issue convertibles instead of straight bonds is affected by agency costs, adverse selection costs, and expected financial distress costs. Dutordoir et al. (2014-in this issue) find that weaker firm- and country-specific corporate governance quality increases firms' likelihood to issue convertible debt instead of straight debt or equity.

As argued by Dutordoir and Van de Gucht (2009), one problem with the above security choice models is that, while each of the rationales considers different financing costs, the empirical proxies that can be used to measure these costs are largely similar. For example, market-to-book ratio, a common proxy used in empirical security choice models, can capture a range of external financing costs. This makes it hard to disentangle which theoretical model best fits the data.

Perhaps due to this methodological problem, a number of studies have reverted to a qualitative approach for examining convertible bond issuance motives. In their survey paper on corporate finance policies, Graham and Harvey (2001) ask corporate CFOs

whether they have seriously considered issuing convertible bonds, and if so, which factors guide their issuance decision. They conclude that CFOs' answers provide strong evidence for Stein's (1992) backdoor-equity rationale, mixed evidence for Brennan and Kraus (1987) and Brennan and Schwartz (1988) risk uncertainty rationales and for Mayers (1998) sequential-financing rationale, and virtually no evidence for Green's (1984) risk-shifting rationale. Bancel and Mittoo (2004a, 2004b) focus on the motivations behind Western European convertible debt offerings. Bancel and Mittoo (2004a) survey managers whose firms have issued convertible debt, and obtain mixed support for the "Big Four" rationales on convertible bonds (Brennan and Kraus, 1987; Brennan and Schwartz, 1988 and Green, 1984; Mayers, 1998; Stein, 1992). Bancel and Mittoo (2004b) survey companies that have seriously considered issuing convertible debt over the previous ten years. Similar to Graham and Harvey (2001), their findings are mainly consistent with Stein's (1992) model. Brounen et al.'s (2006) questionnaire results on convertible bond issuance motives of Western European firms are also consistent with those of Graham and Harvey (2001).

Dong et al. (2013) argue that interviews with managers responsible for making convertible bond issuance decisions may yield more accurate insights into convertible bond issue motives than managers' answers to questionnaires. The reason is that survey statements are usually very concise, therefore abstracting from the specific assumptions of the different academic rationales on convertibles. Their in-depth interviews with convertible bond issuers provide strong evidence for risk-uncertainty rationales for convertible debt, weak evidence for the backdoor-equity viewpoint, and no evidence for the risk-shifting and sequential-financing rationales. Inconsistent with the free-lunch argument on convertible bond issuance, Dong et al. (2013) conclude that corporate managers responsible for recent convertible offerings seem to be well aware of the true costs associated with these securities.

A number of recent studies test the impact of investor demand on firms' likelihood to issue convertible debt. In support of the equity rationing rationale, Brown et al. (2012) find that convertible bond issuers have high costs of attracting seasoned equity. Also consistent with this rationale, they document that convertible bond issuers have characteristics that make their stock attractive for convertible arbitrageurs' shorting purposes. Together, these findings confirm that hedge funds' strong involvement in recent convertible bond issues allows would-be equity issuers to obtain funds sooner and cheaper than would be the case in the seasoned equity market.

Choi et al. (2010) estimate a simultaneous-equations time-series analysis of supply and demand determinants of aggregate convertible bond issuance volumes. They find that convertible bond volumes increase following positive shocks to the capital available to convertible arbitrageurs, which act as the primary source of demand for recent convertible bond issues. They also document a substantial decline in aggregate convertible issue volumes during the short-sales bans of 2008. Since the ability to short the underlying stock is an essential component of a convertible arbitrage strategy, this finding further corroborates the strong impact of convertible arbitrageurs on recent convertible bond issuance activity. De Jong et al. (2013) examine the impact of a wider range of proxies for fluctuations in investor demand for convertible bonds (e.g., risk aversion and demand for option-type payoffs) on convertible bond issuance activity. They find evidence of a positive impact of these proxies on firms' propensity to issue convertibles instead of straight debt or equity. Importantly, the impact of investor demand proxies is orthogonal to that of firm-specific and macroeconomic determinants of the corporate supply of convertible bonds. They also document that investor demand affects convertible issuance volume both directly and indirectly through reduced underpricing. Dong et al.'s (2013) interview study confirms that investor demand for convertible bonds plays a crucial role in explaining convertible bond issuance. Interviewees' answers also suggest that convertible bond issuers have ambiguous feelings towards convertible arbitrageurs. They appreciate the liquidity-providing services and fast buying decisions of these players, but find it hard to deal with the uncertainties brought about by arbitrageurs' short-selling of their stock.[10]

4. Empirical studies on shareholder wealth effects of convertible bond issues

Finance textbooks generally argue that the primary goal of every corporate Chief Financial Officer should be shareholder wealth maximization (see, for example, Brealey et al., 2011). It is therefore critical to obtain an understanding of the likely shareholder wealth effects of convertible bond issues. Empirical studies in this area fall into two broad categories. By far the largest group of studies focuses on the short-term stock price effects of convertible bond announcements and issuance. A second, smaller group of studies analyses the long-term stock price effects of convertible bond issues. In the remainder of this section, we discuss the findings in each of these two areas.

4.1. Short-term stock price impact of convertible bond announcements and issuance

Convertible bond rationales based on asymmetric information about firm value (e.g., Kim, 1990; Stein, 1992) yield the common prediction that the stock price effects of convertible debt announcements are intermediate in size between those of straight bond and common equity announcements. A similar hypothesis can be derived from the more general adverse selection framework of Myers and Majluf (1984).[11] Consistent with these predictions, Eckbo et al. (2007) report that the average convertible bond announcement return found by four event studies of convertible debt is −1.82% (significantly negative),

[10] According to Henderson and Zhao (2014-in this issue), convertible bond issuers sometimes initiate share lending agreements through which they ensure convertible arbitrageurs' access to their shares, thereby facilitating the setup of their hedging transactions.

[11] The model of Chakraborty and Yilmaz (2011) predicts no significant announcement effect for convertible bond offerings, since convertibles can be designed so that their value is independent of managers' beliefs regarding future firm value. Agency costs-based rationales and explanations based on investor demand yield no clear prediction on the magnitude of convertible bond announcement returns relative to those of other security types.

compared with a significantly negative return of −2.22% on average obtained by event studies of seasoned equity offerings and a non-significant return of −0.22% on average obtained by event studies of straight bond offerings. Abdul Rahim et al. (forthcoming) calculate that the average abnormal stock return detected by 35 different event studies of convertible bond announcement effects is −1.14%. Importantly, the finding of a negative announcement effect does not hold for all countries.[12] For example, Japanese and Taiwanese convertible announcements induce a significant positive announcement effect (Chang et al., 2004; Kang and Stulz, 1996), and Dutch convertibles induce a non-significant announcement effect (De Roon and Veld, 1998).

Some studies attempt to explain cross-sectional differences in the magnitude of convertible bond announcement returns (e.g., Ammann et al., 2006; Billingsley and Smith, 1996; Burlacu, 2000; Davidson et al., 1995). In line with signaling models mentioned earlier, regression results consistently indicate that announcement returns are more negative for convertibles designed to have a larger equity component. Other results on cross-sectional determinants of convertible bond announcement returns are mixed. Some examples of significant abnormal return determinants reported in the literature are the following. Using a sample of Taiwanese convertible bond issues, Chang et al. (2004) find that stockholders react more favorably when the announcement is made by an issuer with focused activities. This result is consistent with the sequential-financing theory of Mayers (1998), which implies that convertibles are more useful in reducing security issue costs and controlling the overinvestment problem when values of the initial project and the future investment option have a strong positive correlation. Dutordoir and Van de Gucht (2007) find that Western European convertibles issued during periods with high convertible bond issuance volume are associated with more favorable announcement returns, and that firm-specific characteristics have a weaker impact on announcement returns during these hot periods. They attribute this finding to irrational investor optimism about convertible bonds during hot issue markets. Using a sample of U.S. convertibles, Lewis et al. (2003) find more favorable announcement returns and a weaker impact of firm-specific characteristics during hot equity markets. They attribute this result to the fact that economy-wide information asymmetries may be lower during hot equity markets (as argued by Bayless and Chaplinsky, 1996), leading investors to pay less attention to firm-specific information to screen issuers. Overall, the explanatory power of regressions seeking to explain cross-sectional variations in convertible bond announcement returns tends to be very low, as is also the case for other security types (Eckbo et al., 2007).

Recent event studies mainly focus on the impact of convertible arbitrageurs as convertible bond investors on the short-term stock price effects of convertible bond issues. The adverse stock price impact of arbitrageurs' short-selling activities should in theory be observed on the issue date rather than on the announcement date, since arbitrageurs cannot buy the convertibles prior to their issuance. In line with this prediction, Loncarski et al. (2009) document that convertible arbitrage activities induce downward stock price pressure around convertible bond issue dates. However, as outlined earlier, most recent U.S. convertibles are issued under Rule 144A (Huang and Ramirez, 2010). The lack of registration requirements for such placements implies that they can be brought to the market very quickly, resulting in a strong overlap between their announcement and issue dates. Recent convertibles' announcement returns may therefore reflect downward price pressure resulting from convertible arbitrage short-selling activities. In line with this hypothesis, Duca et al. (2012) report a strong decrease in convertible bond announcement returns (average announcement effect of −4.59%) for convertibles announced over the period January 2000–September 2008. Consistent with an arbitrage-based explanation, they find that the difference in the announcement returns between this period and the preceding period with much weaker involvement of convertible arbitrageurs (1984–1999) disappears when controlling for measures of the intensity of arbitrage-related short selling associated with an offering. De Jong et al. (2012) use differences in short-sale constraints for a global sample of convertible bond offerings as a proxy for convertible arbitrage-related stock price pressure. Their measure for short-sale constraints varies both across countries and across time, since some countries imposed temporary short-sale bans during the Global Financial Crisis. They find that convertibles for which short-selling is constrained are associated with significantly less negative stock price effects. Together, the results of the latter two studies suggest that event studies of recent convertible bond offerings should control for the stock price pressure resulting from convertible arbitrage activities. If not, they risk drawing biased (i.e., overly negative) conclusions on the signaling content of convertible bond issues.

4.2. Long-term stock price impact of convertible bond offerings

Short-term stock returns around convertible bond announcements may not capture the full shareholder wealth impact of convertible bond issues, since stock prices are known to under-react to some types of company-specific news. Consistent with this reasoning, Lee and Loughran (1998), Spiess and Affleck-Graves (1999), and Lewis et al. (2001) find that convertible bond issuers' stock significantly underperforms that of matching non-issuers over the years following issuance. Lee and Loughran (1998) and Lewis et al. (2001) also provide evidence of declines in issuers' operating performance following convertible bond issuance. These results are inconsistent with rationales arguing that convertible bond issuance improves issuers' investment incentives (e.g., Green, 1984; Mayers, 1998; Lyandres and Zhdanov, 2014-in this issue). As argued by Lewis et al. (2001),

[12] U.S. studies generally find negative announcement returns. We do not discuss these studies individually since there are so many of them (see Table 1 of Abdul Rahim et al., forthcoming, for a detailed overview). An interesting exception is the study of Fields and Mais (1991), who find that private convertible debt placements in the U.S. are associated with positive wealth effects, possibly due to the benefits of monitoring. Private convertible bond placements are very rare nowadays, as most issues take place under Rule 144A.

convertible bond issuers' underperformance could be explained by an equity rationing argument, in which firms that cannot access seasoned equity markets due to their poor predicted performance may instead resort to convertible bond markets.

However, Zeidler et al. (2012) challenge the consensus that convertible bond offerings lead to negative abnormal stock price performance. They document that convertible bond issuers experience a decrease in their systematic risk after the offering. They argue that this pattern is consistent with Carlson et al.'s (2004) argument that external financing might serve to extinguish risky real options.[13] After controlling for this decrease in systematic risk, convertible bond issuers' long-term stock price performance is similar to that of their matched peers. Lewis et al. (2002) also demonstrate that systematic risk declines after convertible bond issuances.[14] Overall, this evidence suggests that it is crucial to control for changes in systematic risk when analyzing long-term stock price performance following convertible bond issuance.

More research on this topic will be necessary to reach an unequivocal conclusion on the long-term performance of convertible bond issuers. Such research could also shield light on the effect of increased hedge fund participation on long-term performance.

5. Empirical studies on the design of convertible securities

A substantial amount of the recent academic work on convertible bond issues focuses on the determinants of the design of convertible securities. Empirical studies in this area roughly fall in two categories. A first group of articles relies on the assumption that convertible bond design choices may be indicative of underlying issuer motives. These studies typically derive predictions regarding convertible bond design from theoretical convertible bond rationales, and test these predictions on samples of "plain vanilla" convertibles. A second group of studies examines the determinants of innovations in the design of convertible securities. The remainder of this section discusses each of these two streams in the convertible securities design literature in more detail.

5.1. Validity of theoretical rationales for convertible bonds

Unlike straight bonds and equity, convertibles offer the issuer considerable flexibility in the design of their offering. By appropriately setting convertible debt design parameters such as callability, conversion premium, and maturity, issuers can tailor their offering to their desired level of equity-likeness. A number of empirical studies rely on the premise that convertible bond design choices may tell us something about the validity of theoretical rationales for convertible bond issuance. Convertible bond rationales based on asymmetric information about firm value (e.g., Stein, 1992) and the equity rationing rationale predict that convertibles will have an equity-like structure, since the ultimate goal of the issuers is to obtain equity financing. Conversely, rationales based on agency costs (e.g., Green, 1984; Mayers, 1998) and on uncertainty about firm risk (Brennan and Kraus, 1987; Brennan and Schwartz, 1988) imply that convertibles serve as an alternative to straight debt for issuers that have ruled out equity in an earlier step of their decision process, and should as such have a debt-like structure.

Lewis et al. (1998) examine the determinants of post-conversion equity ownership, maturity, and length of the call protection period to test the validity of the rationales of Green (1984), Brennan and Kraus (1987) and Brennan and Schwartz (1988), and Stein (1992). The results of their simultaneous equations model provide strong evidence for Green (1984) and Stein (1992). Evidence for the risk uncertainty rationale for convertible debt, in contrast, is very limited.

Lewis et al. (1999) use the issue-date conversion probability (measured as in the option pricing model of Black and Scholes, 1973) to subdivide the convertible bond universe into debt-like convertibles (with a conversion probability smaller than 50%) and equity-like convertibles. The advantage of this measure is that it simultaneously takes into account several convertible bond design parameters. They argue that debt-like convertibles are likely to serve as tools to reduce risk-shifting behavior, while equity-like convertibles are likely to serve as backdoor-equity financing. Consistent with these predictions, they find evidence for the rationale of Green (1984) for the subset of debt-like convertibles, and for the rationale of Stein (1992) for the subset of equity-like convertibles. Dutordoir and Van de Gucht (2009) find that the conversion probability of Western European convertibles tends to be much lower than that of their U.S. counterparts. Consistent with the debt-like design of European convertibles, their security choice model results indicate that these issues mainly serve as sweetened debt. They argue that the differences in the design of European and U.S. convertibles could be attributable to both supply- and demand-side factors. On the supply side, European quoted firms tend to be larger and more mature than their U.S. counterparts, potentially resulting in a larger capacity to issue debt-like securities. On the demand side, European convertible bond investors tend to perceive the convertibles market as an extension to the bond market, while many U.S. investors have an equity background.

Lewis et al. (2003) further refine Lewis et al.'s (1999) convertible design classification by distinguishing between debt-like offerings, hedge-like offerings (with an intermediate conversion probability), and equity-like offerings. They argue that hedge-like offerings may provide the kind of hedge against risk uncertainty predicted by Brennan and Kraus (1987) and Brennan and Schwartz (1988). They find strong evidence of differences in the issuer characteristics and in the announcement return

[13] Zeidler et al. (2012) do not mention any specific sequential-financing rationale (e.g., Mayers, 1998) to explain their results.

[14] In addition, Lewis et al. (2002) find that idiosyncratic risk increases following convertible bond issuance. When viewed in the context of the reduced operating performance documented in Lewis et al. (2001), the evidence is consistent with the interpretation that the efficient investment choices predicted by theory are not achieved in practice.

determinants between the three design types, with most of their results being consistent with the hypothesized differences in issue motives for these offerings.

Overall, the results of these security choice models suggest that convertible bond issues should not be considered a homogeneous security class. Distinguishing between debt-like and equity-like convertible debt designs, even using a rather rudimentary measure such as issue-date conversion probabilities, can substantially improve the power of tests on the validity of theoretical convertible bond rationales.

Korkeamaki and Moore (2004) analyze the validity of Mayers (1998) sequential-financing rationale by examining convertible bond call features. They hypothesize that, if convertibles effectively serve to finance real options, issuers expecting their options to mature sooner should set weaker call protection terms (i.e., no or soft callability instead of hard callability).[15] As a measure of firms' real option financing behavior, they study capital expenditures over the five years following issuance. Their findings strongly confirm the Mayers (1998) rationale.

Korkeamaki (2005) examines the determinants of convertible bond call protection terms using an international sample of convertibles. His main hypothesis is that in countries with weak shareholder protection and strong creditor protection, convertible bond investors should feel more threatened by issuers' ability to make a conversion-forcing call, and therefore prefer convertibles with stronger call protection. Provided that firms cater to these investor preferences, we should observe a negative (positive) impact of country-specific proxies for the level of shareholder (creditor) protection on convertibles' call protection strength. Korkeamaki's (2005) evidence strongly confirms this prediction. While not a direct test of any theoretical convertible bond rationale, his results corroborate the notion that issuers set the design of their offering in response to investor demand.

Krishnaswami and Yaman (2008) examine the impact of firm-specific and macroeconomic proxies for external financing costs suggested by different convertible bond rationales on the conversion probability of convertible bonds. They conclude that convertible bond design decisions are mainly influenced by financial distress costs, which they interpret as evidence for the model of Stein (1992).

Finally, some recent studies examine the impact of investor demand on the design of convertible issues. If hedge funds act as last-resort buyers for issuers rationed out of the equity market, as hypothesized by the equity rationing perspective on convertible debt, we expect these issuers to adapt their offering to hedge funds' design preferences. In support of this prediction, Brown et al. (2012) document that issuers cater to hedge funds' preferences when setting the call provisions in their convertible bond issues. However, De Jong et al. (2013) find that, except for call features, convertible bond design features are not significantly influenced by investor demand forces.

5.2. Determinants of innovations in the design of convertible securities

Compared with other security markets, the convertible bond market is characterized by a rapid rate of design innovation (Lewis and Verwijmeren, 2011).[16] Academics have used new convertible debt designs to examine the importance of a range of potential determinants of securities innovation.

Hillion and Vermaelen (2004) study firms' motives for issuing floating-priced convertibles, a financial innovation introduced in the second half of the 1990s. A floating-priced convertible is a convertible bond or preferred stock that allows the holder to convert at a discount from a reference price based on recent stock prices. In theory, floating-priced convertibles are a very attractive financing vehicle, since they allow the issuer to completely avoid the adverse selection problems associated with common equity and fixed-priced convertible financing. However, Hillion and Vermaelen's (2004) results suggest that, instead of being a preferred financing vehicle, floating-priced convertibles are used as a last-resort financing tool by companies close to bankruptcy that are too overvalued to raise common equity or fixed-priced convertibles. The results are therefore consistent with the equity rationing perspective on convertible securities. Hillion and Vermaelen also find some evidence that the design features of floating-priced convertibles encourage short selling by the convertible bondholders, who want to push the stock price below fair value prior to conversion, and by professional short sellers. This short-selling activity tends to have a long-lived negative impact on the issuers' stock price.

Marquardt and Wiedman (2005) analyze firms' motives for issuing contingent convertibles (COCOs). COCOs are convertible bonds that can only be converted into shares of common stock if a prespecified stock price is reached. Following the first appearance of a COCO in 2000, this financing vehicle quickly became very popular, with more than 300 firms issuing COCOs in the first half of 2004. Marquardt and Wiedman find that firms' main motive for using COCOs instead of ordinary convertibles is to inflate their reported earnings per shares (EPS). Until 2004, financial accounting standards allowed COCO issuers to exclude the effects of these convertible bonds from reported EPS until the necessary conditions for conversion were satisfied, resulting in a less dilutive impact on EPS than for ordinary convertibles. In 2004, the Financial Accounting Standards Board (FASB) eliminated the favorable accounting treatment of COCOs. As documented by Marquardt and Wiedman (2007), this FASB decision resulted in widespread cash redemptions, in costly changes in the contract terms of outstanding COCOs, and in negative abnormal stock

[15] Soft callable convertibles can only be called by the issuer if the stock price exceeds a certain threshold during a certain time period.
[16] The Investment Dealers' Digest states that convertibles are “reinvented more times than Madonna” (O'Connor, 2006).

returns. Overall, this evidence suggests that firms not only view diluted EPS as an important performance measure, but are even willing to incur substantial costs to report a higher EPS figure.

Lewis and Verwijmeren (2011) analyze issuers' motives to include cash settlement features in their convertible bond issues. Cash settlement features allow convertibles to be partly or completely settled in cash. These provisions first appeared around the year 2000, and quickly became the preferred payment method for convertible bond issues. In 2002, around the start of the huge surge in popularity of cash settlements, the FASB permitted firms that pay the accreted value of the fixed income claim in cash to exclude convertible shares from diluted EPS calculations. Lewis and Verwijmeren's key hypothesis is therefore that issuers use cash settlement features as EPS management devices. Consistent with this hypothesis, they find that the use of cash settlement features is more likely for issuers that would otherwise have suffered a strong decrease in their diluted EPS. They also document that cash settlement provisions are often used in combination with other earnings management innovations, such as call spread overlays.[17] In 2008, the FASB decided to eliminate the favorable accounting treatment of cash settlements. Lewis and Verwijmeren (2014-in this issue) document that shareholders of firms with outstanding cash-settled convertibles reacted negatively to this accounting change, with the average value decrease per company in the order of $100 million.

Chemmanur and Simonyan (2010) examine convertible issuers' rationale for including a put option in their offerings. The put option enables investors to sell back the bonds to the issuers at prespecified prices on prespecified dates. While the popularity of this convertible design innovation was quite modest in the 1980s and 1990s, in the 2000s more money was raised through putable convertibles than through ordinary convertibles. Chemmanur and Simonyan obtain evidence that put options are included in the context of tax savings strategies. Moreover, they find that issuers including a put option in their convertibles are more likely to be currently undervalued by the market, leading managers to assign a low probability to the effective exercise of the option. In contrast, they find no evidence that put options serve to enable investors to obtain a "money back" guarantee in case the firm engages in risk-shifting behavior.

De Jong et al. (2011) examine convertible bond issuers' motives to combine their offering with a stock repurchase. Combinations of convertibles with stock repurchases, often labeled "Happy Meals" among finance practitioners, first appeared in 2000 and made up approximately one-third of all issues by 2006. De Jong et al. hypothesize that issuers use these combined transactions to help convertible arbitrageurs in setting up their short position. In particular, arbitrageurs hedge their position by borrowing shares of the issuer and selling them to the issuer (via an underwriter) at a pre-agreed price. To the arbitrageur, the transaction offers the advantage that it instantaneously provides a hedged position that does not expose him to the uncertainty associated with open-market short selling. To convertible bond issuers, the transaction offers the advantages that the convertibles are less underpriced, and that their stock price is less affected by short selling around the issuance date. Consistent with this hypothesis, De Jong et al. find that convertible arbitrage explains both the size and speed of execution of the associated stock repurchases, and that combined offerings have lower offering discounts and less negative shareholder wealth effects than ordinary convertibles.

Grundy and Verwijmeren (2012) examine yet another innovation in the design of recent convertibles, i.e., dividend protection provisions. Most convertible bonds issued after 2002 are dividend-protected, which implies that the underlying shares are immunized from all but a liquidating dividend payment. Grundy and Verwijmeren (2012) show that, unlike their unprotected counterparts (Ingersoll, 1977), dividend-protected convertibles are called virtually without delay. They argue that part of the popularity of dividend protection clauses can be explained by their accelerating impact on issuers' call incentives. Convertible arbitrageurs prefer a predictable call policy, which is more likely for dividend-protected than for unprotected convertibles.[18]

Henderson and Zhao (2014-in this issue) document that over 60% of recent (post-2005) convertible bond offerings are combined with other transactions such as call option purchases, seasoned equity offerings, and share lending agreements. They find that capital supply, measured as flows to convertible arbitrage hedge funds, is a significant determinant of the issuers' choice of concurrent transactions.

6. Summary and topics for future research

To summarize, what do we know and not know about convertible bond issues from the existing corporate finance literature? Quantitative and qualitative studies that directly examine *issuer motives* provide a very mixed picture on the validity of theoretical convertible bond rationales. A common limitation of existing studies on issuer motives is their almost exclusive focus on the models of Green (1984), Brennan and Kraus (1987) and Brennan and Schwartz (1988), Stein (1992), and Mayers (1998). So far, there is virtually no empirical evidence on the validity of other convertible bond rationales than these "Big Four". More work is needed in this area.

Another limitation is that empirical studies tend to focus on convertibles issued by non-financial corporations. Financial firms are often excluded from research samples, as is common in corporate finance research. Financials account for a substantial portion

[17] Call spread overlays use derivative securities to raise the effective conversion price. Since reported interest expense is based on the stated rather than the effective conversion price, issuing a convertible with a lower conversion price reduces reported interest expense, thereby inflating reported EPS.

[18] Grundy et al. (2014-in this issue) find that, even though calls of dividend-protected convertibles are predictable, a negative stock market reaction is observed. However, this stock market reaction can be explained by price pressure rather than by signaling.

of U.S. hybrid securities issuance: 15.5% of all issues over the period 1990 to 2009 were made by firms with a main SIC code ranging from 6000 to 6999).[19] It would be interesting to examine whether these firms' choice for convertible securities is merely driven by regulatory concerns or can also be explained by the mitigation of financing costs suggested by convertible bond rationales.

While evidence on the impact of supply-side (i.e., issuer-specific) determinants on convertible issuance is mixed, recent studies uniformly find a strong influence of investor demand (both in seasoned equity and convertible bond markets) on convertible bond issuance. There is much room for additional empirical work in this area. For example, it would be interesting to conduct an interview study of buyers' viewpoints on convertible bond issues. What makes a particular convertible bond issue attractive to them? How much power do they have in their negotiations with issuers about the terms of the offering? Moreover, little is known about the drivers of fluctuations in investor demand for convertible securities. De Jong et al. (2013) find that macroeconomic variables explain only a small part of investor demand fluctuations. If so, why are investors keener to buy convertibles in certain periods than in other periods?

Another gap in the literature is that it mainly focuses on the impact of investor demand on plain vanilla convertible bond issues. Approximately one-third of all convertible securities issues are preferred stock (Choi et al., 2010), and this preferred stock is mainly taken up by mutual funds rather than hedge funds. It would be interesting to examine the impact of shocks to capital available to mutual funds on convertible preferred stock issuance.

Studies on the *shareholder wealth effects* of convertible bond issues tend to find that convertibles induce negative stock returns of intermediate size relative to those of straight debt and equity announcements. There is room for additional analysis of the determinants of cross-sectional differences in these returns. Moreover, little is known about why convertible bond announcements made in countries like Japan and The Netherlands provoke non-negative stock reactions. Recent event studies highlight the need to control for hedging-induced price pressure when analyzing convertible announcement returns. With regards to long-term stock price effects, some recent articles show that controlling for changes in systematic risk leads to less pessimistic conclusions on stock return performance following convertible bond issuance.

Studies examining the *design of plain vanilla convertibles* to obtain more insight into different convertible bond rationales again provide a mixed picture. Once again, these studies tend to focus on the classic "Big Four" convertible bond rationales. More empirical work is needed to test the implications of more recent theories of convertible bond issuance for convertible debt design. For example, the rationale of Chakraborty and Yilmaz (2011) implies that security issuers can completely mitigate adverse selection problems by choosing either plain vanilla convertibles with appropriately call features, or by choosing more exotic convertible bond designs (i.e., floating-priced convertible bonds, convertible preferred stock, or mandatory convertibles). They predict that the latter two financing vehicles are chosen by issuers that face high costs of financial distress. It would be interesting to test these predictions.

Articles on *design innovations* for convertible securities uncover several drivers behind those changes. A number of studies find a strong impact of loopholes in accounting regulations allowing issuers to obtain favorable reported diluted EPS on security design decisions. A second important driver of recent convertible design innovations is the large presence of convertible arbitrageurs as investors in convertible bond issues. Several studies find that issuers adapt the design of their offerings to cater to the hedging needs of these investors.

Following the Global Financial Crisis starting in 2008, the average convertible arbitrage fund lost one-third of its market value. The remaining hedge funds are much less levered, and realize higher profits thanks to the reduction in competition from other funds (Agnew, 2011). Moreover, a substantial fraction of convertible arbitrage activity now happens within funds with a multi-strategy framework, since investors are reluctant to put money into dedicated convertible arbitrage funds. These changes in the convertible bond investor base will likely generate new questions for research papers. Recent business press articles also provide anecdotal evidence of the potentially detrimental impact of arbitrage-induced short selling associated with "Happy Meal" convertible bond issues on issuers' long-term prospects (Rothfeld and McGinty, 2013; Rothfeld, 2013). It would be interesting to examine the long-term consequences of convertible bond design innovations in a more systematic way. Future research could also address who reaps the main benefits of the introduction of innovations in convertible design. Is it the issuers, the investors, or the underwriters? And, relatedly, how large is the first-mover advantage associated with introducing a new convertible design type?

Finally, the findings of convertible bond studies may have implications for finance research in general. In particular, the result that investors have a substantial impact on firms' security choice and security design decisions may be a topic worthy of investigation in other areas of corporate finance. For example, it would be interesting to investigate whether acquirers' choice of financing for mergers and acquisitions is influenced by the actions of merger arbitrage funds.[20]

[19] Source: our own calculations, based on hybrid securities offering data obtained from Thomson One Banker's New Issues database. It should be noted that convertibles issued by financial firms often have special design characteristics, such as mandatory conversion features. Koziol and Lawrenz (2012) provide a theoretical model on the use of mandatory conversion features by banks. Utility companies (with main SIC code starting with 49) are also routinely excluded from studies examining convertible bond issue motives. However, compared with financials, utilities account for a much smaller portion of hybrid securities issuance (2.4% of all U.S. issues made over the period 1990 to 2009, according to our calculations).

[20] Mitchell et al. (2004) document the impact of merger arbitrage fund short-selling on acquiring-firm announcement returns, but do not examine its impact on payment method.

Appendix A. Overview of empirical evidence related to convertible bond issue motives, shareholder wealth effects, and design

This table provides a summary of the empirical papers discussed in this review paper. The papers are placed in alphabetical order. "Methodology" indicates whether the research methodology used is qualitative or quantitative in nature. "Scope" indicates the country or countries examined in the study. As discussed in our paper, the empirical literature on convertible bonds addresses three key questions: why do firms issue convertibles ("motives"), what is the stock price effect of convertible debt offerings ("shareholder wealth") and which determinants affect the design of convertibles ("design"). The column "Primary research topics" mentions which of these questions the article addresses. We mention the topics in the order of their weight in the paper. For example, Billingsley and Smith (1996) mainly focus on issue motives but also briefly examine shareholder wealth effects. Hence, we first mention "motives" for that article, followed by "shareholder wealth". The column "Main finding(s)" summarizes the key empirical results of the paper. The column "Link with theory/Interpretation" outlines the relation between the findings in the preceding column and convertible bond rationales or general theories on capital structure. Importantly, we only provide the theories explicitly mentioned by the paper's authors. For example, while the findings of Zeidler et al. (2012) are consistent with Mayers (1998), we do not mention this relation as it is not provided by the authors. This approach also explains why the main findings of some papers are similar, but the authors' interpretation of these findings is quite different. For example, Lee and Loughran (1998) and Lewis et al. (2001) obtain very similar results on the long-term stock price and operating performance of convertible bond issuers, yet explain these results in different ways. In some cases the authors do not provide any theoretical explanation for their findings, which we mention accordingly. In some cases the authors only provide an interpretation for their findings, but no link with any theory (e.g., they mention that "this result is consistent with the large influence of convertible arbitrage"). We then mention this interpretation of the findings.

Paper	Methodology	Scope	Primary research topic(s)	Main finding(s)	Link with theory/interpretation
Ammann et al. (2006)	Quantitative	Germany, Switzerland	Shareholder wealth	Stock returns around convertible bond announcements are negatively affected by the offering's equity component size.	Evidence for Myers and Majluf (1984)
Bancel and Mittoo (2004a)	Qualitative	Western Europe	Motives	Survey respondents mainly view convertibles as delayed equity.	Evidence for Stein (1992)
				However, the sweetened debt viewpoint is almost equally popular.	Evidence for Mayers (1998)
				Only few respondents consider attracting investors unsure about the firm's riskiness an important motive.	Limited evidence for Brennan and Kraus (1987) and Brennan and Schwartz (1988)
				Almost no respondents consider protecting bondholders against risk-shifting an important convertible issue motive.	Inconsistent with Green (1984)
Bancel and Mittoo (2004b)	Qualitative	Western Europe	Motives	Survey respondents highly value convertible debt as an inexpensive way to issue delayed common stock, and for the ability to call or force conversion.	Evidence for asymmetric information theories (no specific theories mentioned)
				Few respondents issue convertible debt because it is less expensive than straight debt, or to attract investors who are unsure about the riskiness of the firm.	No link with theories provided
				Protecting bondholders against the actions of stockholders is considered unimportant.	Inconsistent with agency theories (no specific theories mentioned)
Billingsley and Smith (1996)	Qualitative Quantitative	U.S.	Motives	Survey respondents mainly perceive convertibles as sweetened debt.	No link with theories provided
			Shareholder wealth	Stock returns around convertible bond announcements are negatively influenced by the level of equity dilution implied by the offering.	
Brigham (1966)	Qualitative	U.S.	Motives	Survey respondents mainly perceive convertibles as delayed equity.	None (no theories developed yet)
Brounen et al. (2006)	Qualitative	France, Germany, The Netherlands, U.K.	Motives	Most survey respondents view convertibles as an inexpensive way to issue delayed common stock.	Evidence for Stein (1992)
				A moderate fraction of the respondents issue convertibles to attract investors unsure about the riskiness of the company. The importance of this answer differs across countries.	Moderate evidence for Brennan and Kraus (1987)
				A moderate fraction of the respondents find callability and/or the ability to force conversion into equity an important	No link with theories provided

Appendix A. (*continued*)

Paper	Methodology	Scope	Primary research topic(s)	Main finding(s)	Link with theory/interpretation
				feature of convertibles. The importance of this answer differs across countries.	
				Almost no respondents consider protecting bondholders against risk-shifting an important convertible issue motive.	Inconsistent with Green(1984)
Brown et al. (2012)	Quantitative	U.S.	Motives	Convertibles purchased by hedge funds are issued by firms for which seasoned equity would be very costly.	Evidence for investor demand rationale (convertible issuance driven by equity market rationing)
				Convertible bond issuers tend to have lower shorting selling costs than seasoned equity issuers.	
			Design	Convertible bond issues with strong hedge fund involvement are less likely to be callable, and more likely to be combined with a stock repurchase.	Evidence for investor demand rationale (design terms set in response to investor preferences)
Burlacu (2000)	Quantitative	France	Shareholder wealth	Stock returns around convertible bond announcements are negatively affected by the offering's equity component size.	Evidence for Myers and Majluf (1984)
Chang et al. (2004)	Quantitative	Taiwan	Motives	Stock market responds more favorably to announcements of convertible offerings by focused firms than to those by diversified firms.	Evidence for Mayers (1998)
				Issuers' net new financing is not significantly different from zero over the life of the convertible debt.	Evidence for Mayers (1998)
			Shareholder wealth	Stock returns around convertible bond announcements are significantly negative.	No link with theories provided
Chemmanur and Simonyan (2010)	Quantitative	U.S.	Design	Firms include put options in their convertible bond offerings for tax savings purposes, as well as because they consider themselves undervalued.	Consistent with an extension of the Stein (1992) model (developed by the authors)
				The reduction of investor concerns about risk shifting plays no significant role in explaining the inclusion of put options.	Inconsistent with Green (1984)
Choi et al. (2010)	Quantitative	U.S.	Motives	Aggregate convertible issuance volumes are positively influenced by the availability of capital from convertible arbitrageurs.	Evidence for investor demand rationale (convertible issuance driven by fluctuations in demand for convertibles)
				Aggregate convertible issuance volumes are lower during the 2008 short-sale ban	
Davidson et al. (1995)	Quantitative	U.S.	Shareholder wealth	Stock returns around convertible bond announcements are positively affected by the offering's expected time to be at the money.	Evidence for Kim (1990) and Stein (1992)
De Jong et al. (2011)	Quantitative	U.S.	Design	Combinations of convertibles and stock repurchases serve to facilitate the hedging needs of convertible arbitrageurs.	Evidence for investor demand rationale (design terms set in response to investor preferences).
De Jong et al. (2013)	Quantitative	U.S.	Motives, design	Firms are more likely to issue convertibles instead of straight debt or equity when investor demand for convertibles is higher. Only limited evidence that investor demand influences convertible bond design.	Evidence for investor demand rationale (convertible issuance driven by fluctuations in investor demand for convertibles)
De Jong et al. (2012)	Quantitative	Global	Shareholder wealth	Stock returns around convertible bond announcements are less negative for convertibles issued in short-sale constrained countries and time periods.	Consistent with convertible arbitrage activity
Dong et al. (2013)	Qualitative	Australia, Canada, U.K., U.S.	Motives	Interview answers indicate that convertibles serve as a "sweet spot" of valuation for firms that combine high uncertainty about their risk with (perceived) undervalued equity.	Evidence for Brennan and Kraus (1987) and Brennan and Schwartz (1988)
				Other theoretical explanations for convertible bonds receive limited to no support from the interviewees.	Limited evidence for Stein (1992) No evidence for Green (1984) and Mayers (1998)
				Investor demand for convertible securities plays a very important role in explaining the choice for convertible bonds (market has to be "open").	Evidence for investor demand rationale (convertible issuance driven by fluctuations in demand for convertibles)

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Appendix A. (*continued*)

Paper	Methodology	Scope	Primary research topic(s)	Main finding(s)	Link with theory/interpretation
Duca et al. (2012)	Quantitative	U.S.	Shareholder wealth	Stock returns around convertible bond announcements are more than twice as negative in the period from 2000 to 2008 than in the period from 1984 to 1999. The difference disappears when controlling for differences in convertible arbitrage activity across both periods.	Consistent with convertible arbitrage activity
Dutordoir and Van de Gucht (2007)	Quantitative	Western Europe	Shareholder wealth	Stock returns around convertible bond announcements are more positive during hot convertible markets. During hot convertible markets, convertible bond announcement returns are less affected by firm-specific and issue-specific information.	Evidence for Bayless and Chaplinsky (1996)
Dutordoir and Van de Gucht (2009)	Quantitative	Western European	Motives, design	Issuers of debt-like convertibles have higher risk-shifting costs than straight bond issuers.	Evidence for Green (1984)
				Issuers of equity-like convertibles do not have higher adverse selection costs than common equity issuers.	Inconsistent with Stein (1992)
				European convertibles have a more debt-like structure than U.S. convertibles	Attributable to larger debt capacity of European issuers and/or to bond mentality of European investors (no theories mentioned)
Dutordoir et al. (2014-in this issue)	Quantitative	Western Europe	Motives	Weaker firm-specific and country-specific corporate governance quality increases firms' likelihood to issue convertible debt instead of straight debt or equity.	Results suggest that convertibles can substitute for strong corporate governance, by mitigating firms' agency and adverse selection costs.
			Shareholder wealth	Weaker firm-specific and country-specific corporate governance quality results in more favorable convertible bond announcement returns.	As such, the results are consistent with the "Big Four" rationales on convertible bonds.
Graham and Harvey (2001)	Qualitative	U.S.	Motives	Survey respondents mainly view convertibles as delayed equity.	Evidence for Stein (1992)
				A moderate fraction of the respondents issue convertibles to attract investors unsure about the riskiness of the company.	Moderate evidence for Brennan and Kraus (1987) and Brennan and Schwartz (1988)
				A moderate fraction of the respondents find callability and/or the ability to force conversion an important feature.	Moderate evidence for Mayers (1998)
				Almost no respondents consider protecting bondholders against risk-shifting an important convertible issue motive.	Inconsistent with Green (1984)
Grundy and Verwijmeren (2012)	Quantitative	U.S.	Design	Dividend-protected convertibles induce optimal call policies, i.e., they are called as soon as conversion can be forced.	Evidence for Ingersoll (1977)
				The popularity of dividend protection clauses might be explained by the large influence of convertible arbitrageurs as convertible bond investors.	Evidence for investor demand rationale (design terms set in response to investor preferences)
Henderson and Zhao (2014-in this issue)	Quantitative	U.S.	Shareholder wealth	Announcement returns are 2.5% higher when convertible bond issuers simultaneously repurchase shares or purchase call options. Announcement effects are 1.7% lower when issuers simultaneously sell seasoned equity. Indicators for share repurchases and seasoned equity issues are no longer significant whencontrolling for endogeneity.	Evidence for the importance of dilution and managerial private information in explaining convertible bond announcement returns.
			Design	Capital supply, measured as flows to convertible arbitrage hedge funds, is a significant determinant of issuers' choice of concurrent transactions.	Evidence for investor demand rationale.
Hillion and Vermaelen (2004)	Quantitative	U.S.	Design	Floating-priced convertibles are used as a last-resort financing tool by companies close to bankruptcy that are too	Evidence for investor demand rationale (convertible issuance driven by equity market rationing) (authors label this

Appendix A. (*continued*)

Paper	Methodology	Scope	Primary research topic(s)	Main finding(s)	Link with theory/interpretation
				overvalued to raise common equity or fixed-priced convertibles. Floating priced convertibles' design features induce short selling, which has a long-lived negative stock price effect.	the "last resort financing hypothesis") No link with theories provided
Hoffmeister (1977)	Qualitative	U.S.	Motives	Survey respondents mainly perceive convertibles as delayed equity.	None (no theories developed yet)
Korkeamaki (2005)	Quantitative	Global	Design	Firms from countries with weaker shareholder protection and stronger creditor protection issue convertibles with stronger call protection terms.	Evidence for investor demand rationale (design terms set in response to investor preferences)
Korkeamaki and Moore (2004)	Quantitative	U.S.	Design	Firms with investment options expected to expire sooner (later) offer weaker (stronger) call protection on their convertible bond issues. Actual capital expenditure levels during the five-year period following issuance are inversely related to the length of call-protection periods.	Evidence for Mayers (1998)
Krishnaswami and Yaman (2008)	Quantitative	U.S.	Motives	Firms' likelihood of issuing convertibles instead of straight debt is influenced by agency costs, adverse selection costs, and financial distress costs.	Evidence for Green (1984), Evidence for Brennan and Kraus (1987) and Brennan and Schwartz (1988), and for Stein (1992)
			Design	Convertibles' equity component size is mainly affected by financial distress costs, while other financing costs play only a minor role.	Evidence for Stein (1992). Inconsistent with Green (1984) and Brennan and Kraus (1987) and Brennan and Schwartz (1988)
Lee and Loughran (1998)	Quantitative	U.S.	Shareholder wealth	Convertible bond issuers significantly underperform their stock benchmarks in the long run. There is also a decline in the operating performance of convertible bond issuers in the years following the offering.	Consistent with firms raising convertible financing when their stock is overvalued, and with stock market underreaction to the news of the offering
Lewis et al. (1998)	Quantitative	U.S.	Design	Issuers set the design parameters of their offering to mitigate agency costs and/or to reduce adverse selection problems related to uncertainty about firm value.	Evidence for Green (1984) Evidence for Stein (1992)
				The reduction of adverse selection problems due to uncertainty about firm risk seems to play no role in explaining convertible bond design choices.	Inconsistent with Brennan and Kraus (1987) and Brennan and Schwartz (1988)
Lewis et al. (1999)	Quantitative	U.S.	Motives, design	Issuers of debt-like convertibles have higher risk-shifting costs than straight bond issuers.	Evidence for Green (1984)
				Issuers of equity-like convertibles have higher adverse selection costs than common equity issuers.	Evidence for Stein (1992)
Lewis et al. (2001)	Quantitative	U.S.	Shareholder wealth	Convertible bond issuers significantly underperform their stock benchmarks in the long run. There is also a decline in the operating performance of convertible bond issuers in the years following the offering.	Inconsistent with Green (1984), Stein (1992), and Mayers (1998). Might be evidence for investor demand rationale (convertible issuance driven by equity market rationing)
Lewis et al. (2002)	Quantitative	U.S.	Motives, shareholder wealth	Following the issuance of convertible debt systematic risk declines and idiosyncratic risk increases	Inconsistent with Green (1984), Stein (1992), and Mayers (1998). Might be evidence for investor demand rationale (convertible issuance driven by equity market rationing)
Lewis et al. (2003)	Quantitative	U.S.	Motives, design	Debt-like convertibles serve to alleviate debt-related financing costs, hedge-like convertibles serve to alleviate risk uncertainty costs, equity-like convertibles serve to alleviate equity-related adverse selection costs.	Evidence for Green (1984) Evidence for Brennan and Schwartz (1988) Evidence for Stein (1992)
			Shareholder wealth	Stock returns around convertible bond announcements are less affected by firm-specific financing costs proxies during hot equity markets than during normal and cold markets.	Evidence for Bayless and Chaplinsky (1996)

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Appendix A. (*continued*)

Paper	Methodology	Scope	Primary research topic(s)	Main finding(s)	Link with theory/interpretation
Lewis and Verwijmeren (2011)	Quantitative	U.S.	Design	The likelihood of firms issuing cash-settled convertibles, which can often be excluded from diluted earnings per share (EPS) calculations, is significantly associated with the reduction that would occur in diluted EPS if the bonds were traditionally structured. Cash settlements are often combined with call spread overlays, which also allow firms to inflate reported EPS.	Evidence for the importance of earnings management incentives in explaining convertible debt design
Lewis and Verwijmeren (2014-in this issue)	Quantitative	U.S.	Design	The removal of the favorable accounting treatment of cash-settled convertibles resulted in costly restructurings of outstanding cash-settled issues. Moreover, the announcement of these accounting changes and of the restructurings leads to negative stock price effects, but less so for callable convertibles.	Evidence for the importance of earnings management incentives in explaining convertible debt design
Loncarski et al. (2009)	Quantitative	Canada	Shareholder wealth	Stock returns around convertible bond issuance are negatively affected by the change in short interest around the issue date.	Consistent with convertible arbitrage activity
Marquardt and Wiedman (2005)	Quantitative	U.S.	Design	The likelihood of firms issuing contingent convertible bonds (COCOs), which can often be excluded from diluted earnings per share (EPS) calculations, is significantly associated with the reduction that would occur in diluted EPS if the bonds were traditionally structured. Firms' use of EPS-based compensation contracts significantly affects the likelihood of COCO issuance.	Evidence for the importance of earnings management incentives in explaining convertible debt design
Marquardt and Wiedman (2007)	Quantitative	U.S.	Design	The removal of the favorable accounting treatment of COCOs resulted in costly restructurings of outstanding COCOs. Moreover, the announcement of these accounting changes and of the restructurings leads to negative stock price effects.	Evidence for the importance of earnings management incentives in explaining convertible debt design
Mayers (1998)	Quantitative	U.S.	Motives	Issuers making conversion-forcing calls have higher investment and financing activity over subsequent years compared with a matched industry sample	Evidence for Mayers (1998)
Pilcher (1955)	Qualitative	U.S.	Motives	Survey respondents mainly perceive convertibles as delayed equity.	None (no theories developed yet)
Spiess and Affleck-Graves (1999)	Quantitative	U.S.	Shareholder wealth	Convertible bond issuers significantly underperform their stock benchmarks in the long run.	Consistent with theoretical models predicting a negative stock price reaction to security offerings, and with stock market underreaction to the news of the offering
Zeidler et al. (2012)	Quantitative	U.S.	Shareholder wealth	Convertible bond issuers experience a sharp increase in their systematic risk prior to issuance, and a sharp decrease after issuance. After controlling for this post-issuance risk decrease, there is no more evidence of long-term stock price underperformance for convertible bond issuers.	Risk change patterns are consistent with the Carlson et al. (2004) real option framework

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