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# Catering for security types: the case of warrants

John S. Howe
*Finance Department, University of Missouri, Columbia, Missouri, USA, and*
Biljana Nikolic
*Finance Department, University of San Diego, San Diego, California, USA*

## Abstract

**Purpose** – The purpose of this paper is to assess whether the decision to issue warrants in an initial public offering (IPO) is subject to catering influences.
**Design/methodology/approach** – The approach used was to measure the market "warrant premium" and assess whether it relates to the probability of firms including warrants in their IPOs.
**Findings** – The evidence is strongly supportive of a catering influence on the firm's decision to include warrants in its IPO.
**Practical implications** – Sentiment is a factor in the selection of what securities a firm sells at its IPO. The findings lend further credence to the pervasiveness of catering.
**Originality/value** – No prior study has examined the role that catering plays in the selection of types of securities to sell.

**Keywords** Catering, Sentiment, Warrants, Initial public offering, IPO, Securities
**Paper type** Research paper

## 1. Introduction

The existence of investor sentiment in the capital markets has been widely investigated since the seminal paper of Delong *et al.* (1990). The literature defines sentiment as investors' beliefs about future cash flows and investment risks that are not justified by available information (Baker and Wurgler, 2007). While there is no unique or ideal measure of investor sentiment, there is wide consensus about its existence.

Recent research has focussed on corporate managers' responses to sentiment. In two important papers, Baker and Wurgler (2004a, b) demonstrate that the propensity to pay dividends depends on the dividend premium in stock prices. Li and Lie (2006) show that the level of dividends is also responsive to the dividend premium. Polk and Sapienza (2008) extend the concept of catering to the investment side of balance sheet. They find a positive relation between corporate investment and a number of proxies for mispricing, suggesting that overpriced (underpriced) firms tend to overinvest (underinvest). Baker *et al.* (2008) find the evidence of catering through the level of nominal share prices. Yet, to our knowledge, no one has investigated catering for different types of securities.

The research question we explore is whether there are catering effects that influence the choice of securities offered by firms when raising money. Specifically, we examine whether investor preferences for a particular security type have an impact on the managerial choice of security type by focussing on warrants. In the USA, firms typically issue warrants with some other instrument. Many warrants in the market come from "unit" initial public offerings (IPOs), offerings of stock and warrants, and this is the laboratory in which we investigate catering for security types.

Review of Behavioral Finance
Vol. 4 No. 1, 2012
pp. 28-45

1940-5979
DOI 10.1108/19405971211261092

A warrant is a levered equity instrument. As such, it has risk and return characteristics that are subject to potentially time-varying sentiment. Buying a warrant is a straightforward way to take a levered position in the underlying equity. Such an investment is free from the complications of actually maintaining a levered position in the equity. For example, warrants are not subject to margin calls and there is no interest payment on borrowed funds. Thus, at times, the warrant risk/return profile may be viewed as quite desirable (e.g. when aggregate risk aversion is low) while at other times, it will be less attractive.

This narrative leads directly to two predictions: first, there is time-varying sentiment for warrants; and second, this sentiment influences the number of IPOs that include warrants. There is substantial variation in the number of unit IPOs (NUI) during our sample period. Furthermore, there has been significant variation in the proportion of unit IPOs in all IPOs (PUI). Standard theories that explain inclusion of warrants in IPO, staged financing (Schultz, 1993) and signaling (Chemmanur and Fulghieri, 1997), do not well explain these changes (see How and Howe, 2001). We test whether the variation can be explained by catering, and conclude that catering is an important influence on the decision to include warrants in IPOs.

We follow the Baker and Wurgler (2004a) empirical approach, with adjustments to accommodate for differences between payout policy and security issuance. Our measure of managerial catering is the NUI as a proportion of total number of IPOs[1]. We regress our catering measure on measures of investor preference for warrants, which we explain in detail in Section 2.

The phenomenon we explore is catering, not market timing. Market timing involves the issuance of overvalued securities. We do not measure the price or valuation of warrants. If we did, then examining the issuance of warrants would be a market timing study. Instead, we measure the valuation of other firms' common equity and then examine the decision to issue warrants when we find that (already trading) warrant-issuing firms' equity is overvalued. The decision to issue warrants when equity of other warrant-issuing firms is overvalued is motivated by desire to boost short-term equity price. Hence, by the Baker *et al.* (2007) definition, it is a catering decision.

We find that the warrant premium (WP), measured by the difference in market-to-book (M/B) ratios of warrant and non-warrant firms, has a significant impact on the NUI in the subsequent period. Evidence on the influence of the relative underpricing of unit to shares-only IPOs (UND) (an alternative measure of investor sentiment for warrants) is not as strong but is still consistent with catering. The future returns of warrant firms are significantly negative, indicating the existence of overvaluation, also supportive of catering. In sum, all three measures of investor preference for warrants have an economically and statistically significant influence on the decision to include warrants in IPOs.

We next investigate other possible explanations for the observed patterns in IPOs. One possibility is that the variation in the share of unit IPOs in the total number of IPOs is attributable to the hot market phenomenon (Ritter, 1984). However, our evidence suggests that the WP remains significant after controlling for the hot market phenomenon. We also present evidence that neither the staged financing nor the signaling theories of unit IPOs explain the time variation in unit IPOs.

Another possibility is that firm characteristics such as industry determine the type of the IPO. However, we find no evidence of differences in industry clustering between years with high and low WP. Furthermore, the proportions of unit and shares-only IPOs are similar across different industries.

We make three contributions to the literature. First, we show that investor preferences play an important role in corporate decisions beyond payout policy and investment. Our evidence suggests that managers also cater to investor preferences when making decisions about what type of security to issue when going public. Second, we provide evidence in support of catering theory. The evidence from our analysis strongly supports the notion that managers cater to investor preferences. Third, we offer an alternative explanation for the decision to issue warrants with shares.

## 2. Previous research

Two streams of research are relevant to our paper. First, starting with the analysis of Delong *et al.* (1990), a growing body of literature examines the importance of investor sentiment for managerial decisions. Baker and Wurgler (2004a, b) suggest that for either psychological or institutional reasons, some investors have an uninformed and time-varying demand for dividend-paying stocks. Investor preferences for (against) dividend-paying stocks lead to a market premium (discount) on such stocks. Further, the authors document that managers rationally cater to such preferences by initiating (or continuing) dividends when the demand for dividend payers is high and by discontinuing (or not initiating) dividends when the demand for dividend payers is low.

Li and Lie (2006) extend Baker and Wurgler's (2004a, b) findings, showing that investor sentiment affects not only the decision to initiate (or omit) dividends, but also influences the decision to increase or decrease dividends. Using multinomial logistic regression, they test the proposition that managers cater to investor preferences by setting the dividend level. They find that firms are more likely to increase their dividends when the dividend premium is high and are more likely to decrease their dividends when the dividend premium is low (negative). Ferris *et al.* (2006) demonstrate that catering for dividends is not purely a US phenomenon – the level of dividend premium influences decisions to pay or not to pay in the UK as well.

Support for dividend catering is not unanimous, however. For example, Denis and Osobov (2008) find little evidence to support dividend catering in a sample of international firms. Hoberg and Prabhala (2009) argue that risk is the primary determinant of the propensity to pay dividends. Given the mixed nature of the evidence on dividend catering, studies of catering in other settings add to our understanding about the ubiquity of catering effects.

Polk and Sapienza (2008) examine the influence of investor sentiment on firms' investment decisions. They measure market valuation through discretionary accruals because there is no link between accruals and risk or investment opportunities of the firm. The authors find evidence that overpriced firms overinvest. Although theirs is a less direct test of catering, the results are consistent with catering.

A second stream of related research examines the issuance of warrants together with equity. Existing finance theory proposes two explanations for the inclusion of warrants in unit IPOs. Schultz (1993) argues that firms include warrants as a form of staged financing similar to the use of venture capital. His argument is that firms with higher agency costs use warrants as a bonding mechanism to induce managers to undertake only value-revealing investment and to disclose the true value of the projects. Only if the initial investment shows that the project is profitable will the share price rise above the warrant exercise price and provide additional funds to the firm via exercise of the warrants.

Chemmanur and Fulghieri (1997) develop a model in which good firms with relatively high risk issue warrants with common stock as a signal of their quality. Warrants are a costly signal because they dilute the insiders' ownership of the firm. However, they are a practicable signal because the sharing of firm value happens when the marginal utility of firm's cash flows for insiders is the lowest.

However, How and Howe (2001) demonstrate that neither of these theories satisfactorily explains the inclusion of warrants in IPOs. They report some support for certain aspects of each of the theories, but it is weak. We believe that catering is a viable alternative explanation for unit IPOs and, more broadly, an influence on the type of securities that firms choose to issue.

## 3. Data and methods

We start by identifying unit and shares-only IPO firms from the Thomson Financial SDC database. The initial sample encompasses the period from 1970 to 2004. However, the NUI in years prior to 1980 and after 2001 is very small, so we exclude the observations in those years from the sample[2]. The procedure yields a sample of 1,295 unit IPOs. We then compare this sample to the Daily Stock Price Record (DSPR). If the firm does not have a warrant or unit listed in the DSPR we delete it from the unit IPO sample. Next, we exclude all financial firms and regulated utility firms (SIC codes 6,000-6,999 and 4,900-4,949). We are left with a sample of 981 unit IPOs and 8,017 shares-only IPOs.

The dependent variable we examine is the PUI in a given year. We construct three measures of warrant demand: the log difference of M/B ratios of warrant and non-warrant firms (the WP); the relative UND; and the subsequent excess return on a portfolio of warrant firms over non-warrant firms.

The WP is the log difference of M/B ratios of warrant firms to non-warrant firms. A firm is defined as warrant firm in a given year if it has a warrant outstanding on and after December 27 of that year. The choice of cutoff is motivated by our measurement of the WP at year end. A non-warrant firm is a firm that went public using a shares-only IPO; it is in the non-warrant firm sample as long as it is on Compustat. After merging with Compustat, the warrant firm sample has 594 unique firms and 1,903 firm years; the non-warrant firm sample has 5,634 firms and 42,601 firm years.

We define the M/B ratio following Fama and French (2001). Market equity is end of calendar year stock price multiplied by the number of shares outstanding (Compustat Data 24 times Data 25). Book equity is stockholders' equity (Data 216) (or first available of common equity (60) plus preferred stock par value (130) or book assets (6) minus liabilities (181)) minus preferred stock liquidating value (10) (or first available of redemption value (56) or par value (130)), plus balance sheet deferred taxes and investment tax credit (35) if available and minus post-retirement assets (330) if available. We exclude all firms with negative book values. However, we do not employ the Fama and French (2001) book value cutoff of $500,000 because unit IPO firms are generally very small.

Our second measure of sentiment for warrants is the underpricing of unit IPOs relative to that of shares-only IPOs. We use relative underpricing as our second measure of sentiment because Baker and Wurgler (2007) identify the first day returns to IPOs as one possible measure of sentiment. Variation in relative underpricing would indicate the existence of time-varying preferences. Large (small) relative underpricing, as measured by a high (low) ratio of the underpricing in unit IPOs to the underpricing

in shares-only IPOs would suggest higher (lower) preference for warrants. To compute shares-only IPO underpricing we use Hanley (1993) approach:

$$R_1 = (P_1 - P_0)/P_0 \quad (1)$$

where $R_1$ is the first day underpricing, $P_1$ is the share closing price on the first day of trading and $P_0$ is the share offering price. We compute the unit IPO underpricing in the same manner, using unit prices. To collect unit prices, we use the DSPR, and for companies that do not have their units traded, we sum the share and warrant prices[3].

Our third measure is the excess return on the portfolio of warrant firms over non-warrant firms for subsequent periods. We compute simple returns for one, two and three years after the IPO. We compute subsequent returns as buy-and-hold returns. Following Helwege and Liang (2004), we use the price on the first day of the month following the IPO as our beginning of the period price, that is, we use event-time based portfolios. For example, if the firm went public on March 12, we use the price on the first trading day in April as the beginning of holding period price, and the first available price in April of the following year as the end of holding period price to compute the one-year-ahead return. In our analysis of subsequent returns we use both the raw returns of warrant firms as well as the difference in returns on warrant and non-warrant firms. We compute both equally (EW) and value-weighted (VW) averages.

## 4. Empirical tests

There is significant variation in both the NUI and their share of all IPOs over the period from 1980 to 2001. This variation is visible in Figure 1. Table I gives the time series of the NUI and PUI for the period 1980-2002. For illustrative purposes we also present average proceeds raised by unit and shares-only IPOs as a percent of total firm assets. During our sample period, firms that go public issuing only shares raise a much larger proportion of their assets in the IPO process. The NUI starts low, goes up in the years between 1983 and 1987, and then decreases. It rises again in the period 1993-1996, and almost disappears at the end of the period.

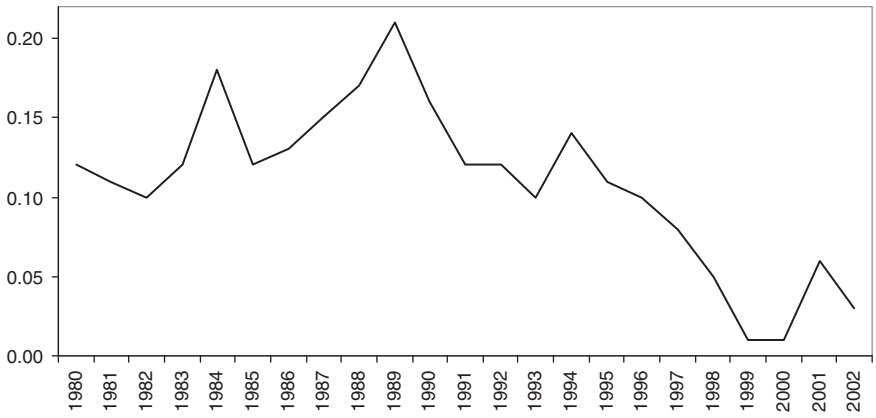



**Figure 1.**
Proportion of Unit IPOs in all IPOs, 1980-2002

**Note:** The figure depicts the trend in the proportion of unit IPOs in all IPOs (PUI) over our sample period

| Year | NUI | NSI | PUI | UnitPA | SharePA | UnitPA/SharePA |
|---|---|---|---|---|---|---|
| 1980 | 18 | 130 | 0.12 | 3.53 | 41.98 | 0.08 |
| 1981 | 41 | 322 | 0.11 | 15.19 | 112.24 | 0.14 |
| 1982 | 13 | 111 | 0.10 | 4.88 | 54.66 | 0.09 |
| 1983 | 79 | 578 | 0.12 | 59.37 | 224.69 | 0.26 |
| 1984 | 63 | 295 | 0.18 | 48.46 | 73.41 | 0.66 |
| 1985 | 36 | 263 | 0.12 | 19.04 | 76.68 | 0.25 |
| 1986 | 77 | 502 | 0.13 | 150.70 | 206.95 | 0.73 |
| 1987 | 73 | 410 | 0.15 | 66.95 | 140.09 | 0.48 |
| 1988 | 34 | 171 | 0.17 | 34.92 | 51.16 | 0.68 |
| 1989 | 49 | 189 | 0.21 | 38.75 | 50.20 | 0.77 |
| 1990 | 29 | 154 | 0.16 | 15.30 | 41.36 | 0.37 |
| 1991 | 42 | 322 | 0.12 | 28.60 | 128.41 | 0.22 |
| 1992 | 60 | 460 | 0.12 | 60.69 | 187.03 | 0.32 |
| 1993 | 65 | 587 | 0.10 | 69.08 | 311.62 | 0.22 |
| 1994 | 86 | 511 | 0.14 | 52.69 | 192.85 | 0.27 |
| 1995 | 62 | 523 | 0.11 | 44.02 | 257.20 | 0.17 |
| 1996 | 93 | 795 | 0.10 | 64.70 | 393.75 | 0.16 |
| 1997 | 46 | 546 | 0.08 | 27.04 | 233.30 | 0.12 |
| 1998 | 14 | 293 | 0.05 | 13.71 | 132.82 | 0.10 |
| 1999 | 7 | 464 | 0.01 | 4.12 | 252.90 | 0.02 |
| 2000 | 5 | 368 | 0.01 | 1.15 | 178.65 | 0.01 |
| 2001 | 5 | 81 | 0.06 | 2.30 | 37.67 | 0.06 |
| 2002 | 2 | 72 | 0.03 | 1.34 | 29.87 | 0.05 |
| Total | 981 | 8017 | | 3.53 | 3409.50 | |
| Mean | 42.65 | 348.57 | 0.11 | 15.19 | 148.24 | 0.27 |
| SD | 28.47 | 192.96 | 0.05 | 4.88 | 100.05 | 0.24 |

**Notes:** The table presents time series for variables of interest. NUI, the absolute number of unit IPOs; NSI, the absolute number of shares-only IPOs; PUI, the percent of unit IPOs in all IPO issues: NUI/(NUI + NSI); UnitPA, the average ratio of the IPO proceeds to total assets of the firm for firms issuing units; SharePA, the average ratio of the IPO proceeds to total assets of the firm for firms issuing shares only

**Table I.**
Number of unit IPOs as a share in total IPOs per year and proceeds from unit IPOs as a share of proceeds raised by shares-only IPOs

During the same time period there is considerable change in the M/B ratios of both warrant and non-warrant firms, as well as our WP measure. Table II presents these three series and we plot the EW series in Figure 2. The EW M/B ratios of warrant firms range from a low of 1.82 in 2000 to a high of 4.66 in 1982. The mean value of the EW M/B ratio for our sample period is 3.26. The VW average M/B ratio of warrant firms has a smaller range and lower variation. It starts at 1.40, which is its lowest value for our sample period, and then increases to the maximum value of 3.61 in 1991. By the end of the period it is low (1.80) with the exception of 1999 (3.04). The mean VW M/B ratio of warrant firms is 2.26.

The M/B ratio of non-warrant firms is generally smaller than the M/B ratio of warrant firms; however, due to two extreme observations 5.44 (in 1980) and 11.52 (in 1999) its overall mean for EW ratio is higher. The EW M/B ratio of non-warrant firms varies from a low 1.77 in 1987, to a high of 11.52 in 1999, with a mean value of 3.52. The VW M/B ratio of non-warrant firms goes from a low of 1.05 in 1987 to its highest value of 2.85 in 1999. The mean VW non-warrant firm M/B ratio is 1.77.

In comparing warrant and non-warrant M/B ratios, note the inverse relationship between the two series. Warrant firm M/B ratios are low at the beginning and the end

| Year | Warrant firm EW M/B | Warrant firm VW M/B | Non-warrant firm EW M/B | Non-warrant firm VW M/B | Warrant premium EW | Warrant premium VW |
|---|---|---|---|---|---|---|
| 1980 | 2.07 | 1.40 | 5.44 | 2.15 | −0.97 | −0.43 |
| 1981 | 2.82 | 1.58 | 3.76 | 2.03 | −0.29 | −0.25 |
| 1982 | 4.66 | 2.96 | 5.13 | 2.56 | −0.10 | 0.14 |
| 1983 | 3.43 | 1.79 | 3.48 | 1.52 | −0.02 | 0.16 |
| 1984 | 3.01 | 1.51 | 2.25 | 1.33 | 0.29 | 0.13 |
| 1985 | 3.54 | 2.47 | 2.34 | 1.85 | 0.41 | 0.29 |
| 1986 | 4.38 | 1.71 | 2.71 | 2.10 | 0.48 | −0.20 |
| 1987 | 2.71 | 2.19 | 1.77 | 1.05 | 0.43 | 0.74 |
| 1988 | 3.55 | 2.35 | 2.79 | 1.51 | 0.24 | 0.44 |
| 1989 | 4.64 | 2.66 | 2.60 | 1.42 | 0.58 | 0.63 |
| 1990 | 3.48 | 2.47 | 1.96 | 1.51 | 0.57 | 0.49 |
| 1991 | 4.34 | 3.61 | 3.33 | 1.71 | 0.27 | 0.75 |
| 1992 | 3.51 | 2.83 | 2.98 | 1.61 | 0.16 | 0.57 |
| 1993 | 3.65 | 2.87 | 2.82 | 1.94 | 0.26 | 0.39 |
| 1994 | 2.59 | 1.97 | 2.61 | 1.47 | −0.01 | 0.29 |
| 1995 | 3.71 | 2.09 | 3.50 | 1.41 | 0.06 | 0.39 |
| 1996 | 2.88 | 2.26 | 3.16 | 1.56 | −0.09 | 0.37 |
| 1997 | 2.49 | 2.18 | 2.90 | 1.91 | −0.15 | 0.13 |
| 1998 | 2.39 | 2.05 | 4.41 | 1.82 | −0.61 | 0.12 |
| 1999 | 3.60 | 3.04 | 11.52 | 2.85 | −1.16 | 0.07 |
| 2000 | 1.82 | 1.97 | 3.10 | 1.92 | −0.53 | 0.03 |
| 2001 | 2.45 | 1.80 | 2.83 | 1.62 | −0.15 | 0.10 |
| Mean | 3.26 | 2.26 | 3.52 | 1.77 | −0.02 | 0.24 |
| SD | 0.81 | 0.56 | 2.01 | 0.41 | 0.47 | 0.31 |

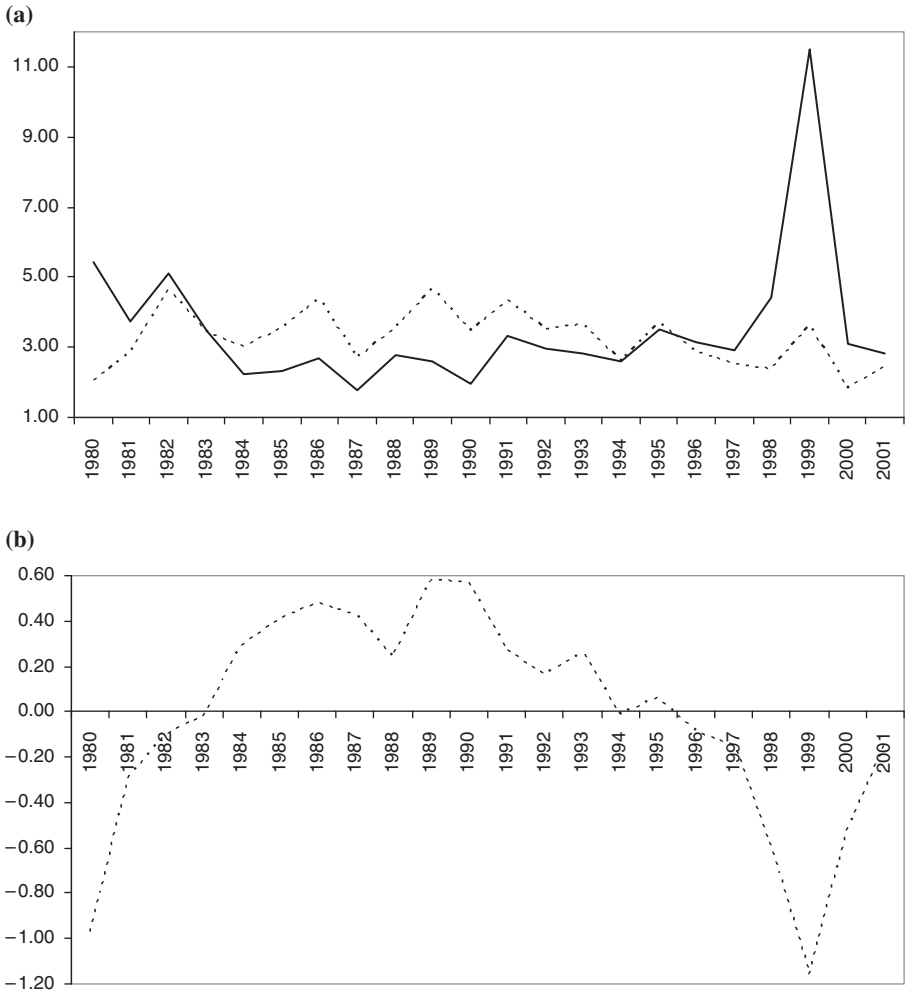
**Notes:** The market valuation of warrant and non-warrant firms. A firm is defined as a warrant firm in a given year if it has a warrant outstanding on and after December 27 of that year. A non-warrant firm is a firm that went public using shares-only IPO; it is in a non-warrant firm sample as long as it is on Compustat. The market-to-book ratio is the ratio of the market value of the firm to its book value. Market value is equal to the number of shares outstanding multiplied by the price at calendar year end (Data 24 times Data 25) plus book debt (Data 6 minus book equity). Book equity is defined as stockholders equity (usually Data 216, with the exceptions as noted in the text). The market-to-book ratio is an equally weighted (EW) or value weighted (VW) average, by book value of assets of sample firms. Warrant premium is the log of the ratio of warrant firms' average market-to-book to non-warrant firms' average market-to-book ratios

**Table II.**
The warrant premium, 1980-2001

of the sample period and high in the middle. Non-warrant firm M/B ratios exhibit the opposite behavior; they start high, decrease in the middle of the sample period, only to rebound again toward the end.

Accordingly, we find that VW (equally) WP is negative in the first 2(4) years of the sample, then turns positive and reaches its maximum of 0.75 in 1991 (0.57 in 1990) and then drops off to become very low (negative) in the last few years of the sample period. The mean VW WP is 0.24; the mean EW WP is −0.02. The negative average value for the EW WP is influenced by the −1.16 value in 1999.

Byoun and Moore (2003), in their study of seasoned equity offerings (SEOs) with warrants, note that a positive relation between M/B and the choice of units would be consistent with the sequential financing theory of warrant issue. Our results from Table II do not support this prediction. Although there are periods when warrant firms have higher M/B ratios than non-warrant firms, this is true only in about half the years. The evidence is Table II is thus not supportive of the sequential financing hypothesis.




**Notes:** Panel A plots the equally weighted market-to-book ratio of warrant firms (dashed line) and non-warrant firms (solid line). Panel B shows warrant premium, log of the difference in average market-to-book ratios. A firm is defined as a warrant firm in a given year if it has a warrant outstanding on and after December 27 of that year. A non-warrant firm is a firm that went public using shares-only IPO; it is in a non-warrant firm sample as long as it is on Compustat. The market-to-book ratio is the ratio of the market value of the firm to its book value. Market value is equal to the number of shares outstanding multiplied by the price at calendar year end (Data 24 times Data 25) plus book debt (Data 6 minus book equity). Book equity is defined as stockholders equity (usually Data 216, with the exceptions as noted in the text) Panel A: average market-to-book ratio of warrant firms (dashed line) and non-warrant firms (solid line) Panel B: the warrant premium %

**Figure 2.**
Valuation of warrant and non-warrant firms and the warrant premium, 1980-2001

Table III reports correlations. We associate the measures of sentiment, WP and UND, in year $t$ with warrant firm returns $r_{wt+1}$ and excess returns of warrant over non-warrant firms $r_{wt+1}-r_{nwt+1}$ in year $t+1$. The future returns are buy-and-hold annual returns for portfolios of firms that have (or do not have, for warrant firms) warrants outstanding on December 27 of a given year. To the extent that our sentiment measures are good proxies, we expect positive correlations among them. In addition, if catering theory is correct, we expect the correlations between sentiment measures and future returns to be negative.

Results from Table III confirm our expectations for all variables with exception of the VW WP, which is only significantly correlated with the EW WP and the EW excess return. This result suggests that the EW WP is a better proxy for sentiment. The VW WP, because of its construction, suffers from reduced information content. Namely, we use lagged book value to weight observations, which automatically excludes warrant firms at the end of their IPO year. The correlation between the EW and VW WP is only 61 percent while the correlations between returns surpass 90 percent. The correlation coefficients between EW WP and returns are mostly over −50 percent, while the correlations of UND are only significant with raw returns.

In Table IV we examine how well the catering argument explains the variation in the PUI. We test the relation between this year's WP and the proportion of the unit IPOs in total number of IPOs in the next year with the following regression model:

$$\mathrm{PUI}_t = \alpha + \beta_1 \mathrm{WP}_{t-1} + \beta_2 \mathrm{UND}_{t-1} + u_t \tag{2}$$

where PUI is the proportion of the unit IPOs in the total number of IPOs; WP is the WP, the log difference of average M/B ratios of warrant and non-warrant firms; UND is the

| | $\rho$ | VW WP | EW WP | UND | EW $r_{wt+1}$ | VW $r_{wt+1}$ | EW $r_{wt+1}-r_{nwt+1}$ | VW $r_{wt+1}-r_{nwt+1}$ |
|---|---|---|---|---|---|---|---|---|
| VW WP | 0.45 | 1.00 | | | | | | |
| | (0.02) | | | | | | | |
| EW WP | 0.68 | 0.61 | 1.00 | | | | | |
| | (0.00) | (0.00) | | | | | | |
| UND | 0.22 | −0.21 | 0.18 | 1.00 | | | | |
| | (0.34) | (0.34) | (0.43) | | | | | |
| EW $r_{wt+1}$ | | −0.12 | −0.56 | −0.54 | 1.00 | | | |
| | | (0.59) | (0.01) | (0.01) | | | | |
| VW $r_{wt+1}$ | | −0.03 | −0.41 | −0.64 | 0.94 | 1.00 | | |
| | | (0.88) | (0.06) | (0.00) | (0.00) | | | |
| EW $r_{wt+1}-r_{nwt+1}$ | 0.67 | −0.44 | −0.73 | −0.21 | 0.87 | 0.74 | 1.00 | |
| | (0.00) | (0.04) | (0.00) | (0.36) | (0.00) | (0.00) | | |
| VW $r_{wt+1}-r_{nwt+1}$ | 0.64 | −0.35 | −0.58 | −0.32 | 0.90 | 0.87 | 0.92 | 1.00 |
| | (0.00) | (0.12) | (0.01) | (0.15) | (0.00) | (0.00) | (0.00) | |

**Notes:** The first column presents autocorrelation coefficients and the other columns show correlation coefficients. UND, first-day underpricing of the unit IPOs relative to shares-only IPOs; EW (VW) WP, log difference of equally (value-) weighted average market-to-book ratio of warrant and non-warrant firms; EW (VW) $r^{w}_{t+1}$, equally (value-) weighted return on the portfolio of warrant firms one year ahead; EW (VW), excess $r^{w-nw}_{t+1}$, equally (value-) weighted excess return on the portfolio of warrant firms over return on the portfolio of non-warrant (share-only IPO) firms one year ahead. $p$-values are in parentheses

**Table III.**
The correlation matrix

relative first day UND. Table IV reports $p$-values based on standard errors that are robust to heteroskedasticity only (in parentheses), as well as Newey and West (1987) standard errors (in square brackets).

In the univariate regressions, we find that the coefficient on the VW WP is positive and marginally significant, while the EW premium coefficient is positive and significant. The EW WP explains 43.91 percent of the variance in the dependent variable. It is also economically significant: a one standard deviation increase in the premium leads to a 3.40 percentage point increase in the proportion of unit IPOs in the following year. This impact is close to the impact Baker and Wurgler (2004a) report for dividend premium on dividend initiation rates (3.90 percentage points). However, relative underpricing is not significant in the univariate analysis and is only marginally significant in most multivariate specifications.

We find that the EW WP is positive and statistically significant in the multivariate specification as well. The VW WP also becomes significant at the 10 percent level when we include relative underpricing. The evidence is consistent with the existence of catering for warrants by firms that go public.

To provide further evidence that the patterns observed in WP and proportion of unit IPOs are attributable to catering, we examine the subsequent returns of warrant and non-warrant firms. Presumably, catering leads to higher stock prices of firms that cater, which implies that subsequent returns should be lower. Therefore, we expect that subsequent one-, two-, and three-year buy-and-hold returns on warrant firms

| | Dependent variable: PUI | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| VW $WP_{t-1}$ | 0.02 | | | 0.03 | |
| | (0.10) | | | (0.09) | |
| | [0.15] | | | [0.08] | |
| EW $WP_{t-1}$ | | 0.03 | | | 0.03 |
| | | (0.00) | | | (0.00) |
| | | [0.00] | | | [0.00] |
| $UND_{t-1}$ | | | 0.02 | 0.02 | 0.01 |
| | | | (0.16) | (0.05) | (0.11) |
| | | | [0.24] | [0.12] | [0.17] |
| $N$ | 22 | 22 | 22 | 22 | 22 |
| Adjusted $R^2$ | 9.26 | 43.91 | 10.34 | 24.92 | 48.18 |

**Notes:** Regression of the proportion of unit IPOs in total IPOs on measures of the warrant premium. The proportion of unit IPOs in total IPOs is modeled as:

$$\mathrm{PUI}_t = \alpha + \beta_1 \mathrm{WP}_{t-1} + \beta_2 \mathrm{UND}_{t-1} + u_t,$$

where $\mathrm{PUI}_t$ is the number of unit IPOs divided buy the total number of IPOs. The warrant premium WP is the difference between the logs of VW and EW market-to-book ratios of warrant and non-warrant firms. Relative underpricing, UND, is the ratio of the average first day underpricing of the unit IPOs to the average first day underpricing of shares-only IPOs. All variables are standardized to have 0 mean and unit variance. $p$-values are based on standard errors that are robust to heteroskedasticity (in parentheses), and heteroskedasticity and serial correlation up to one lag (in square brackets)

**Source:** Newey and West (1987)

**Table IV.**
Unit IPO share and demand for warrants: basic relationships, 1980-2001

will be negatively related to the PUI in year 0. In addition, the excess subsequent one-, two-, and three-year buy-and-hold returns on warrant over non-warrant firms will have a negative relation with the PUI.

Table V presents results of the predictive regression of PUI for returns. Because our sample size is small – 21 to 23 annual observations – we estimate the small sample bias in the OLS coefficients, following Stambaugh (1999). We report bias-adjusted coefficients in the table. In panel A, we use the excess returns of warrant firms over non-warrant firms, and the coefficients are all negative as expected. The coefficients are significant in all specifications for both EW and VW returns and we generally observe a decreasing magnitude as we move from one-year-ahead to three-year-ahead returns. The magnitudes of the coefficients are slightly lower when we weight returns by firm asset values, indicating that the result is more pronounced for smaller firms. However, the effect is present even for the largest warrant firms.

Panel B reports the results for warrant firms' raw returns. The coefficients have similar magnitudes and significance levels as in panel A, but the difference between the EW and VW returns is more pronounced than for excess returns. VW returns go from −6.32 percentage points one year ahead to −3.75 percentage points three years ahead. EW returns increase from −12.32 percentage points one year ahead to −9.84 percentage points three years ahead.

In sum, our results to this point indicate strong support for catering for security type. Investors do exhibit time-varying preference for warrants, as documented by variation in the WP. And companies respond to that preference when choosing which securities to issue when they go public. In addition, there is a negative relation between the proportion of firms that issue warrants and their subsequent returns, consistent with catering.

## 5. Alternative explanations and robustness tests

### *A. The hot market phenomenon*

It is possible that the variation in the proportion of unit to shares-only IPOs is attributable to the variation in the number of IPOs during hot markets. Ritter (1984)

| | VW | | | | | EW | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $N$ | OLS | BA | $p$-val | $R^2$ | | $N$ | OLS | BA | $p$-val | $R^2$ |
| *Panel A: relative returns* | | | | | | | | | | | |
| $r_{wt+1}-r_{nwt+1}$ | 23 | −6.67 | −7.06 | 0.00 | 29.41 | $r_{wt+1}-r_{nwt+1}$ | 23 | −7.86 | −8.62 | 0.00 | 37.21 |
| $r_{wt+2}-r_{nwt+2}$ | 22 | −5.91 | −6.12 | 0.00 | 19.30 | $r_{wt+2}-r_{nwt+2}$ | 22 | −8.05 | −8.53 | 0.00 | 28.96 |
| $r_{wt+3}-r_{nwt+3}$ | 21 | −4.61 | −4.96 | 0.00 | 12.88 | $r_{wt+3}-r_{nwt+3}$ | 21 | −6.47 | −7.12 | 0.00 | 16.63 |
| *Panel B: returns of warrant firms* | | | | | | | | | | | |
| $r_{wt+1}$ | 23 | −6.32 | −6.83 | 0.02 | 22.47 | $r_{wt+1}$ | 23 | −12.32 | −13.49 | 0.01 | 39.00 |
| $r_{wt+2}$ | 22 | −4.96 | −5.50 | 0.00 | 13.13 | $r_{wt+2}$ | 22 | −12.17 | −12.92 | 0.00 | 28.25 |
| $r_{wt+3}$ | 21 | −3.75 | −4.23 | 0.00 | 9.08 | $r_{wt+3}$ | 21 | −9.84 | −10.88 | 0.00 | 16.24 |

**Notes:** Univariate regression of future returns of warrant firms over non-warrant firms on the proportion of unit IPOs in total number of IPOs. In panel A the dependent variable is the excess return of warrant firms ($r_w$) over non-warrant firms ($r_{nw}$). In the panel B the dependent variable is the future return on warrant firms ($r_w$). OLS, standard OLS coefficient; BA, bias adjusted coefficient. $p$-val is bootstrapped $p$-value for the two-tailed test of the null hypothesis of no predictability (i.e. OLS = 0). The details of the computation of the bias-adjusted coefficient and bootstrapped $p$-values are in Appendix

**Table V.**
Unit IPOs and demand for warrants: predicting returns, 1980-2005

finds evidence that during hot IPO markets the number of shares-only IPOs is high, while the NUI drops significantly. Conversely, in the cold periods there are few shares-only IPOs and relatively more unit IPOs. Therefore, the hot market phenomenon could explain the observed variation in the proportion of unit IPOs in total IPOs if periods of high WP coincide with periods of cold IPO markets.

We test for this possibility by using an indicator variable for hot markets. We use the hot market period classification from Helwege and Liang (2004). However, their hot market periods are in months, while our data are yearly. We define as a hot year one that has at least six months of hot IPO market and no cold IPO market months. Our indicator variable, HOT, takes the value of 1 in hot years and 0 otherwise. If catering is the primary determinant of unit IPOs, we expect the HOT indicator variable to be insignificant.

Table VI reports the results of our regression model when we include HOT as a control variable. The coefficient on HOT is insignificant in all specifications. Most of the other results are unchanged and both EW and VW WP are still positive and statistically significant. The hot IPO market phenomenon, while causing variation in the number of shares-only IPOs, does not explain variation in the unit IPOs or the fraction of unit IPOs in the total number of IPOs.

The results in Table VI are also evidence about the signaling hypothesis of unit IPOs. According to Byoun and Moore (2003), "[…]HOT is expected to be negatively associated with the probability of a unit offering[…]." Our results do not support this hypothesis: the coefficient on the HOT variable is never statistically significant ($p$-values are above 0.24).

| | Dependent variable: PUI | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| VW $WP_{t-1}$ | 0.02 | 0.03 | | | |
| | (0.06) | (0.07) | | | |
| | [0.11] | [0.07] | | | |
| EW $WP_{t-1}$ | | | 0.03 | 0.03 | |
| | | | (0.00) | 0.00 | |
| | | | [0.00] | [0.00] | |
| $UND_{t-1}$ | | 0.02 | | 0.01 | 0.02 |
| | | (0.07) | | (0.21) | (0.20) |
| | | [0.16] | | [0.26] | [0.28] |
| HOT | −0.02 | −0.01 | −0.02 | −0.01 | −0.00 |
| | (0.36) | (0.57) | (0.32) | (0.51) | (0.83) |
| | [0.30] | [0.52] | [0.24] | [0.45] | [0.83] |
| $N$ | 22 | 22 | 22 | 22 | 22 |
| Adjusted $R^2$ | 25.96 | 30.42 | 49.11 | 30.11 | 10.52 |

**Notes:** This table presents the relation between the proportion of unit IPOs in the total number of IPOs and the 1-year lagged warrant premium controlling for hot markets. VW $WP_{t-1}$, log difference between the value-weighted yearly M/B ratios of warrant and non-warrant firms; EW $WP_{t-1}$, log difference between the equally weighted yearly M/B ratios of warrant and non-warrant firms; $UND_{t-1}$, relative first day underpricing of unit IPOs relative to shares-only IPOs; HOT, indicator variable that takes values of one if the year belongs to a hot market period and 0 otherwise. $p$-values are based on standard errors that are robust to heteroskedasticity (in parentheses), and heteroskedasticity and serial correlation up to one lag (in square brackets)

**Source:** Newey and West (1987)

**Table VI.** Relation between the proportion of unit IPOs in the total number of IPOs and 1-year lagged warrant premium controlling for hot markets

*B. Technological innovation and industry*

A second possibility is that industry determines whether a firm chooses to go public using a unit IPO. For example, if warrants are a "sweetener" for the deal, then presumably we should observe more unit IPOs in industries with lower growth opportunities, and almost none in fast growing industries, especially in times of high sentiment.

Table VII reports the industry distribution of unit and shares-only IPOs over our sample period. We define industry as two-digit SIC code, because using four-digit industry codes segregates the unit IPO data into too many, lightly populated, categories. The industry with the highest concentration for both IPO types is computer software (SIC 73). For unit IPOs, it is followed by advanced medical equipment (SIC 38) and chemicals (SIC 28). The next two industries for shares-only IPOs are computer hardware (SIC 36) and retailing (SIC 52-59). Results of a paired *t*-test indicate that there is no significant difference between the average proportions of unit and shares-only IPOs across industries.

In addition, the literature on IPOs offers a variety of ideas on how hot and cold market firms might differ. Many of these theories are applicable to unit IPOs, and their common prediction is that hot markets are characterized by industry clustering for industries that have experienced technological innovation or a positive productivity shock. Therefore, technological innovation or a positive productivity shock in an

| 2-digit SIC | Shares-only IPO % per industry | Unit IPO % per industry |
|---|---|---|
| 01-12 | 1.07 | 1.13 |
| 13 | 2.63 | 1.82 |
| 14-19 | 1.29 | 0.78 |
| 20-27 | 5.75 | 5.72 |
| 28 | 6.66 | 8.49 |
| 30-34 | 3.46 | 3.03 |
| 35 | 6.72 | 8.06 |
| 36 | 9.23 | 7.28 |
| 37 | 1.61 | 0.95 |
| 38 | 7.03 | 9.19 |
| 39 | 1.35 | 1.91 |
| 40-47 | 2.86 | 2.08 |
| 48 | 5.27 | 3.55 |
| 50-51 | 4.39 | 6.67 |
| 52-59 | 8.94 | 7.02 |
| 70-72 | 1.19 | 0.95 |
| 73 | 20.63 | 12.48 |
| 74-79 | 2.11 | 6.07 |
| 80 | 3.84 | 4.77 |
| 81-86 | 0.67 | 1.13 |
| 87 | 3.29 | 6.93 |
| Paired *t*-test for difference in means *p*-value | | 99.86 |

**Table VII.**
Proportion of shares-only and unit IPOs in 2-digit SIC code industry groupings

**Notes:** Industry distribution of unit and shares-only IPOs over the sample period. Industry is defined as a 2-digit SIC code. Some 2-digit SIC codes are grouped to encompass similar industries (i.e. SIC 52-59 – retailing). *p*-value is the probability of the paired *t*-test for the differences in means between the shares-only and unit IPOs across industries

industry that has a preference for unit IPOs could explain the swings in the volume of unit IPOs.

To test this idea, Table VIII shows clustering of unit IPOs in hot and cold periods for unit IPOs. In defining hot and cold periods for unit IPOs we again follow the methodology of Helwege and Liang (2004). We only use yearly instead of monthly data, due to the infrequency of unit IPOs. We order all years based on the NUI in descending order. The top third presents hot unit IPO market periods while the bottom third presents cold periods.

There is no significant industry clustering during hot markets. Clustering is more present in cold markets. However, most of the cold periods have fewer than 20 IPOs and many have fewer than ten, which can explain clustering within a few industries.

*C. Out of sample test*

If our measures capture investor preference for warrants and if managers rationally cater to that preference, we should be able to predict warrant issuance in other settings. In this section, we test whether our warrant demand measures explain the variation in the proportion of unit SEOs in the total number of SEOs. We obtain the number of unit and shares-only SEOs from the Thomson Financial SDC database. The test is similar to the one performed in Tables IV and VI. The only difference is that our dependent variable is now the proportion of unit SEOs in total SEOs (PUS). Table IX presents the results.

The results in Table IX show a strikingly similar pattern to that seen in Tables IV and VI. The coefficients on both the EW and VW WP are positive and significant.

| | COLD | | | | | | | HOT | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2-digit SIC | 1980 | 1982 | 1990 | 1998 | 1999 | 2000 | 2001 | 1983 | 1984 | 1986 | 1987 | 1993 | 1994 | 1995 | 1996 |
| 01-12 | 4.55 | 5.26 | 0.00 | 0.00 | 0.00 | 0.00 | 16.67 | 1.08 | 0.00 | 1.02 | 1.12 | 0.00 | 1.16 | 0.00 | 0.00 |
| 13 | 22.73 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 16.67 | 2.15 | 1.20 | 0.00 | 1.12 | 2.63 | 0.00 | 0.00 | 0.00 |
| 14-19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.20 | 0.00 | 0.00 | 0.00 | 1.16 | 1.59 | 3.96 |
| 20-27 | 0.00 | 5.26 | 3.45 | 6.25 | 0.00 | 20.00 | 0.00 | 4.30 | 2.41 | 9.18 | 6.74 | 9.21 | 4.65 | 4.76 | 1.98 |
| 28 | 0.00 | 0.00 | 24.14 | 6.25 | 12.50 | 0.00 | 0.00 | 7.53 | 7.23 | 8.16 | 7.87 | 3.95 | 9.30 | 12.70 | 9.90 |
| 30-34 | 9.09 | 0.00 | 3.45 | 6.25 | 0.00 | 0.00 | 16.67 | 3.23 | 2.41 | 1.02 | 4.49 | 2.63 | 1.16 | 3.17 | 4.95 |
| 35 | 4.55 | 10.53 | 10.34 | 0.00 | 0.00 | 0.00 | 0.00 | 4.30 | 7.23 | 2.04 | 12.36 | 11.84 | 5.81 | 12.70 | 7.92 |
| 36 | 9.09 | 10.53 | 3.45 | 6.25 | 12.50 | 0.00 | 0.00 | 11.83 | 9.64 | 9.18 | 4.49 | 5.26 | 9.30 | 4.76 | 6.93 |
| 38 | 22.73 | 15.79 | 6.90 | 12.50 | 12.50 | 0.00 | 16.67 | 6.45 | 6.02 | 13.27 | 6.74 | 10.53 | 5.81 | 4.76 | 6.93 |
| 40-47 | 0.00 | 10.53 | 0.00 | 0.00 | 0.00 | 0.00 | 16.67 | 0.00 | 1.20 | 1.02 | 0.00 | 1.32 | 5.81 | 1.59 | 2.97 |
| 48 | 0.00 | 0.00 | 0.00 | 6.25 | 0.00 | 0.00 | 0.00 | 1.08 | 4.82 | 4.08 | 3.37 | 3.95 | 4.65 | 4.76 | 1.98 |
| 50-51 | 13.64 | 0.00 | 3.45 | 6.25 | 12.50 | 0.00 | 0.00 | 9.68 | 7.23 | 3.06 | 7.87 | 10.53 | 2.33 | 7.94 | 5.94 |
| 52-59 | 0.00 | 0.00 | 6.90 | 18.75 | 0.00 | 20.00 | 16.67 | 12.90 | 2.41 | 10.20 | 7.87 | 3.95 | 10.47 | 7.94 | 7.92 |
| 70-72 | 0.00 | 0.00 | 3.45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.12 | 5.26 | 1.16 | 0.00 | 0.00 |
| 73 | 4.55 | 5.26 | 3.45 | 25.00 | 37.50 | 20.00 | 0.00 | 11.83 | 12.05 | 9.18 | 13.48 | 14.47 | 13.95 | 17.46 | 22.77 |
| 74-79 | 0.00 | 21.05 | 13.79 | 0.00 | 0.00 | 0.00 | 0.00 | 7.53 | 6.02 | 6.12 | 6.74 | 3.95 | 10.47 | 3.17 | 5.94 |
| 80 | 4.55 | 0.00 | 6.90 | 0.00 | 0.00 | 0.00 | 0.00 | 5.38 | 8.43 | 5.10 | 5.62 | 1.32 | 5.81 | 3.17 | 2.97 |
| 87 | 4.55 | 15.79 | 10.34 | 6.25 | 12.50 | 40.00 | 0.00 | 7.53 | 14.46 | 10.20 | 7.87 | 5.26 | 2.33 | 3.17 | 1.98 |

**Notes:** The sample consists of all non-financial and non-utilities firm unit IPOs in the SDC database from 1980 to 2001. Hot periods are defined by the number of unit IPOs issued. We rank the whole sample by the number of unit IPOs in a given year. Top third constitutes hot periods (total number of IPOs is 689), while the bottom third constitutes cold periods (total number of IPOs is 105)

**Table VIII.**
Percent of unit IPOs by industry, by individual hot and cold periods

| | Dependent variable: PUS | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| VW $WP_{t-1}$ | 0.01 | | | 0.02 | | 0.02 | |
| | (0.06) | | | (0.05) | | (0.03) | |
| | [0.09] | | | [0.06] | | [0.04] | |
| EW $WP_{t-1}$ | | 0.02 | | | 0.02 | | 0.02 |
| | | (0.00) | | | (0.00) | | (0.00) |
| | | [0.00] | | | [0.00] | | [0.00] |
| $UND_{t-1}$ | | | 0.01 | 0.01 | 0.00 | 0.01 | 0.00 |
| | | | (0.27) | (0.05) | (0.24) | (0.10) | (0.53) |
| | | | [0.31] | [0.11] | [0.29] | [0.16] | [0.50] |
| HOT | | | | | | −0.01 | −0.01 |
| | | | | | | (0.18) | (0.15) |
| | | | | | | [0.14] | [0.10] |
| $N$ | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| Adjusted $R^2$ | 10.93 | 51.44 | 2.57 | 20.57 | 51.04 | 21.88 | 53.5 |

**Notes:** This table presents the relation between the proportion of unit SEOs in the total number of SEOs and the 1-year lagged warrant premium. VW $WP_{t-1}$, log difference between the value weighted yearly M/B ratios of warrant and non-warrant firms; EW $WP_{t-1}$, log difference between the equally weighted yearly M/B ratios of warrant and non-warrant firms; $UND_{t-1}$, relative first day underpricing of unit IPOs relative to shares-only IPOs; HOT, indicator variable that takes values of one if the year belongs to a hot market period and 0 otherwise. $p$-values are based on standard errors that are robust to heteroskedasticity (in parentheses), and heteroskedasticity and serial correlation up to one lag (in square brackets)
**Source:** Newey and West (1987)

**Table IX.**
Relation between the proportion of unit SEOs in the total number of IPOs and 1-year lagged warrant premium

The EW WP by itself explains 51.44 percent of the variation in the PUS. The HOT variable, while negative, is mostly statistically insignificant. After the inclusion of the HOT variable, our variables of interest remain unchanged.

## 6. Summary and conclusions

The dividend catering theory of Baker and Wurgler (2004a, b), extended by Li and Lie (2006), describes how payout policy is influenced by investor preference for (or against) dividends. The empirical evidence on dividend catering is, however, mixed (see e.g. Denis and Osobov, 2008), raising the question whether catering influences other financing decisions. No research, to our knowledge, has examined whether corporate decisions about raising money are influenced by investor sentiment (and managerial catering to that sentiment). In this paper, we examine whether investor sentiment affects the type of securities that firms choose to issue at their IPOs.

Our results provide strong support for catering theory. We start by showing that there exists a time-varying WP/discount. That is, there is variation in the relative valuation of warrant firms vis-à-vis firms without warrants in their capital structure. The choice between unit and shares-only IPOs is responsive to changes in the WP. Specifically, the proportion of unit IPOs is higher following an increase in the WP. Returns subsequent to unit IPOs are low. Both findings are supportive of catering theory, and are robust to other possible explanations. We also provide an out of sample test of catering for security types in the context of SEOs. It provides further support for the notion that managers cater to investor preferences for warrants. We also report results that are not supportive of the staged financing and signaling theories of unit IPOs.

## Notes

1. We also use dollar values to compute the proportion of unit IPOs in all IPOs with qualitatively similar results.
2. While there is a large number of unit IPOs after 2001, according to SDC database great majority of them are Special Purpose Acquisition Corporations (SPACs). SPACs are shell companies organized with the purpose of acquiring another company, and are fundamentally different from unit IPOs in prior years. Hence, we do not include them in our analysis.
3. Byoun and Moore (2003) follow the same procedure.

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## Further reading

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## Appendix

This appendix describes the bootstrap procedure that generates the bias-adjusted coefficients and *p*-values reported in Table V. Stambaugh (1999) shows that small-sample bias arises when the explanatory variable is persistent and innovations in the explanatory variable and stock returns for the same period are correlated. Consider the following system:

$$Y_t = a + bX_{t-1} + u_t, \quad u_t \sim \text{i.i.d.}(0, \sigma_u^2) \tag{A.1}$$

$$X_t = c + dX_{t-1} + v_t, \quad v_t \sim \text{i.i.d.}(0, \sigma_v^2) \tag{A.2}$$

$Y$ is the relative future return and $X$ is the number of firms that went public using units. Stambaugh (1999) shows that the size of the bias in the estimate of $b$ when $u$ and $v$ are normally distributed is:

$$E[\widehat{b} - b] = \frac{\sigma_{uv}^2}{\sigma_v^2}[\widehat{d} - d] \tag{A.3}$$

where hats represent OLS estimates. To address the potential bias in the sample and conduct statistical inferences, we use a bootstrap estimation procedure. Our procedure follows Baker and Wurgler (2004a). For each equation in Table V, we perform two sets of simulations.

In the first set we recursively simulate (A.1) and (A.2) starting with X0, using the OLS coefficient estimates and drawing with replacement from the empirical distributions of residuals $u$ and $v$. We simulate both equations $100 + N$ times, where $N$ is the original sample size, and throw the first 100 draws to draw from the unconditional distribution of $X$. This is our simulated sample. With each simulated sample we re-estimate equation (A.1) to obtain bootstrap coefficient ($b$*). We repeat this procedure 50,000 times for a set of 50,000 $b$*. The bootstrap adjusted coefficient BA reported in Table V subtracts the bias (the mean of $b$*minus the OLS $b$) from the OLS $b$.

In the second set of simulations, we repeat the above procedure but constrain $b$ to 0 to test the null hypothesis of no predictability. This procedure gives us a second set of 50,000 estimates of $b$**. These coefficients allow us to estimate the probability of observing a coefficient as extreme as OLS $b$ by chance, if there is no predictability. These probabilities are the $p$-values reported in Table V.

**About the authors**

John S. Howe holds the Missouri Bankers Chair and is Professor of Finance at the University of Missouri (USA). He received his undergraduate degree from the Colorado College and his Master's and PhD degrees from Purdue University. He earned the Chartered Financial Analyst (CFA) certification in 1993. John S. Howe is the corresponding author and can be contacted at: howej@missouri.edu

Biljana Nikolic is Assistant Professor of Finance at the University of San Diego. She received her undergraduate degree from Braca Karic University in Serbia.