# The Importance of Cash-Flow News for Financially Distressed Firms

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*Previous studies have shown that stock prices are moved primarily by news about discount rates (expected returns). I argue that when a firm experiences financial distress, news about cash flows becomes more dominant in driving its stock returns. Applying Campbell's (1991) variance decomposition framework to financially distressed firms supports this argument. Furthermore, I find that more bankruptcies occur after negative shocks to expected cash flows than after positive shocks to discount rates; and that stock prices of distressed firms are less sensitive than those of sound firms to changes in equity risk.*

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Unexpected stock returns can be expressed as a function of changes in rational expectations of future dividend growth (i.e., cash-flow news) and future discount rates (i.e., expected-return news). Following the log-linear dividend-ratio model of Campbell and Shiller (1988), and using a vector autoregressive (VAR) approach, Campbell (1991) decomposes the variance of the market monthly returns into the variance and covariance terms of these two components, and finds that stock prices move primarily by expected-return news. Campbell and Ammer (1993) document similar results when adding bond market data to the VAR system. Other authors have since explored the characteristics of the cash-flow and expected-return news components.[1]

In this study I predict and find that cash-flow news becomes more important for firms in financial distress. The conventional valuation model used in Campbell's (1991) framework suggests that stock prices reflect an infinite series of discounted expected cash flows. Hence, unexpected stock returns of a typical firm are driven by changes in expectations of cash flows and discount rates for all future periods. When a firm faces severe financial distress, however, the value of its stock is strongly driven by the likelihood that the firm will go bankrupt. Since this likelihood is directly affected by the ability of the firm to generate cash in the near future, any news about the firm's cash flows should have a strong impact on its current stock price. Put differently, it is more likely that a firm will go bankrupt due to a decrease in its expected cash flows, rather than an increase in its discount rate.

This argument can be strengthened by taking into account the time series properties of cash-flow and expected-return news. As Campbell (1991) notes, expected-return news is dominant since changes in expected returns are more persistent than changes in expected cash flows. Hence, for

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[1]Vuolteenaho (2002) finds that cash-flow news is more dominant for firm-level returns, and that expected-return news is more highly correlated across firms than cash-flow news. Campbell and Vuolteenaho (2004) divide the CAPM beta of a stock into two components, reflecting news about expected returns and news about future cash flows, and argue that the latter should have a higher price of risk. Lamont and Polk (2001) argue that differences in values between diversified firm and single-segment firm portfolios must be due to differences in either future cash flows or future returns. Priestley (2001) finds that the persistence in expected-return news varies greatly over time, resulting in high variability in the relative importance of the two components in moving returns.

firms with short life expectancies, such as financially distressed firms, persistence has less of an effect, implying a weaker (stronger) impact of news about future returns (cash flows) on current firm value.

To assess the relative importance of cash-flow news for financially distressed firms, I perform three sets of tests. First, I apply Campbell's (1991) variance decomposition framework to three subindices that represent different levels of financial distress. The results consistently show that news about future cash flows becomes significantly more dominant in the presence of financial distress, while news about future returns becomes less dominant.

Second, I examine the effects of both cash-flow news and expected-return news on actual bankruptcies. By decomposing the returns of firms that have gone bankrupt, I find that cash-flow news becomes more dominant in the latest return before the bankruptcy date. Moreover, I find that more bankruptcies occur after marketwide shocks to expected cash flows than after marketwide shocks to discount rates. That is, although firms' values are moved mainly by expected-return news, bankruptcies are predominantly driven by cash-flow news.

Third, I examine the firm-specific relation between shocks to expected equity volatility (as a measure of discount-rate news) and current stock returns. The results show that the values of financially distressed firms are less sensitive to volatility shocks. This finding is consistent with the prediction that cash-flow news (relative to expected-return news) is more important for firms in financial distress than for healthy firms.

The remainder of the paper is organized as follows. The next section outlines the variance decomposition framework. Section II describes the data. Section III examines the variance decomposition for financially distressed firms. Section IV examines the effects of changes in expected returns and cash flows on actual bankruptcies. Section V tests the sensitivity of stock prices to current changes in equity volatility, and Section VI concludes.

## I. Variance Decomposition Framework

To decompose the variance of unexpected returns, I follow Campbell's (1991) framework. Campbell (1991) uses the log-linear dividend-ratio model of Campbell and Shiller (1988) to express the unexpected real stock return as a function of changes in rational expectations of future dividend growth and future stock returns:

$$h_{t+1} - E_t h_{t+1} = (E_{t+1} - E_t)\sum_{j=0}^{\infty}\rho^j \Delta d_{t+1+j} - (E_{t+1} - E_t)\sum_{j=1}^{\infty}\rho^j h_{t+1+j}. \tag{1}$$

where

$h_{t+1}$ = log real return on a stock from the end of period $t$ to the end of period $t$+1

$d_{t+1}$ = log real dividend paid during period $t$+1

$\rho$ = a number a little smaller than one (follows from Campbell and Shiller's (1988) approximation process).

For simplicity, define:

$$U_{r,t+1} \equiv h_{t+1} - E_t h_{t+1} \equiv \text{unexpected return} \tag{2}$$

$$N_{cf,t+1} \equiv (E_{t+1} - E_t)\sum_{j=0}^{\infty}\rho^j \Delta d_{t+1+j} \equiv \text{news about future cash flows} \tag{3}$$

$$N_{er,t+1} \equiv (E_{t+1} - E_t)\sum_{j=1}^{\infty}\rho^j h_{t+1+j} \equiv \text{news about future returns.} \tag{4}$$

Hence, the variance of unexpected return can be decomposed into the variance and covariance terms of cash-flow news and expected-return news:

$$Var(U_{r,t+1}) = Var(N_{cf,t+1}) + Var(N_{er,t+1}) - 2Cov(N_{cf,t+1}, N_{er,t+1}) . \quad (5)$$

By assuming that stock return is the first element in a first-order vector autoregression (VAR) system of the form $z_{t+1} = Az_t + w_{t+1}$ (where $z$ is the vector of the VAR variables, $A$ is the matrix of the VAR parameters, and $w$ is the vector of the error terms with a covariance matrix $\Sigma$), Campbell (1991) shows that:

$$N_{cf,t+1} = (e1' + \lambda')w_{t+1} \quad (6)$$

$$N_{er,t+1} = \lambda' w_{t+1} \quad (7)$$

where $\lambda \equiv e1' \rho A(I - \rho A)^{-1}$ and $e1$ is a vector whose first element is one and whose other elements are zero.

These expressions permit derivation of the three components of the variance of the unexpected return (Equation 5):

$$Var(N_{cf}) = (e1' + \lambda')\Sigma(e1 + \lambda) \quad (8)$$

$$Var(N_{er}) = \lambda' \Sigma \lambda \quad (9)$$

$$-2Cov(N_{er}, N_{cf}) = -2(e1' + \lambda')\Sigma \lambda . \quad (10)$$

## II. Data

As in Campbell (1991), I include the log of the realized return, the dividend yield, and the relative bill rate as predictive variables in the VAR system. I also use two common alternative variables to the dividend yield as proxies for future cash flows.[2] The first, following Vuolteenaho (2002), is the return on equity (ROE); and the second, following Larrain and Yogo (2007), is the net payout, which is the dividend plus equity repurchase, net of issuance. In addition, I use data on default risk and term spread as proxies for expected risk premium, and a set of accounting data to evaluate the financial health of the firms. The data are taken from CRSP and COMPUSTAT for all firms listed on the NYSE, Amex, and Nasdaq between 1976 and 1996.

Table I presents descriptive statistics, stationarity tests, and a correlation matrix of: 1) the monthly value-weighted market return, 2) the monthly value-weighted dividend yield, which is computed using the returns with and without dividends from CRSP, as described in Fama and French (1988), 3) the net payout, estimated by dividend plus equity repurchase minus equity issuance, divided by equity value,[3] 4) the return on equity, estimated by net income during the past four quarters divided by current market value of equity, 5) the relative bill rate, which is the difference between a one-month T-bill rate and its one-year backward moving average (see Fama and Schwert, 1977), 6) the default risk, which is the yield spread between Baa- and Aaa-rated securities, and 7) the term spread, which is the difference between the yields of ten-year and one-year government bonds.[4]

[2] See also Brook, Charlton, and Hendershott (1998) on the ability of dividends to predict future cash flows.

[3] Following Boudoukh, Michaely, Richardson, and Roberts (2007), the net payout for firm *i* in month *t* is defined as:

$$dividend\ yield_t + (shrout_{t-1} \times cfacshr_{t-1} - shrout_t \times cfacshr_t) \times (prc_t / cfacpr_t + prc_{t-1} / cfacpr_{t-1}) / 2$$

where *shrout* is the number of shares outstanding, *cfacshr* is the cumulative factor to adjust shares, *prc* is the month-end share price, and *cfacpr* is the cumulative factor to adjust price (all are taken from CRSP).

[4] The default risk and term spread data are taken from the Federal Reserve Bank of St. Louis's website, which can be accessed at www.stlouisfed.org/default.cfm.

**Table I: Descriptive Statistics, Stationarity Tests, and Correlations**

The table presents descriptive statistics (all values are in percents), stationarity tests, and a correlation matrix of the following variables: The market excess return is the difference between the market value-weighted monthly return and the one-month T-bill yield. The monthly dividend yield is computed using the returns with and without dividends from CRSP, as described in Fama and French (1988). The net payout is the dividend plus equity repurchase minus equity issuance, divided by market value of equity. The return on equity is the net income during the past four quarters divided by current market value of equity. The relative bill rate is the difference between the one-month T-bill rate and its one-year backward moving average. The risk-free rate is the one-month T-bill rate. The default risk is the yield spread between Baa- and Aaa-rated securities, and the term spread is the difference between the yields of ten-year and one-year government bonds. P25, P50, and P75 indicate the 25th, the 50th, and the 75th percentiles of each variable, and the ADF statistic denotes the augmented Dickey-Fuller unit root test. The results are based on monthly data on all firms listed on the NYSE, Amex, and Nasdaq between 1976 and 1996.

| Descriptive Statistics | Mean | StD | P25 | P50 | P75 | Stationarity Test | |
|---|---|---|---|---|---|---|---|
| | | | | | | ADF Statistic | P-value |
| Market excess return | 0.684 | 4.260 | -1.718 | 0.950 | 3.423 | -11.76 | <0.001 |
| Dividend yield | 3.920 | 0.905 | 3.141 | 3.944 | 4.623 | -3.43 | 0.043 |
| Net payout | 1.797 | 1.273 | 0.600 | 1.916 | 2.973 | -4.66 | <0.001 |
| Return on equity | 8.839 | 3.716 | 6.250 | 8.926 | 11.707 | -3.88 | 0.023 |
| Relative bill rate | -0.001 | 0.131 | -0.066 | -0.005 | 0.067 | -6.02 | <0.001 |
| Risk-free rate | 0.580 | 0.240 | 0.420 | 0.530 | 0.703 | -3.32 | 0.087 |
| Default risk | 1.168 | 0.465 | 0.815 | 1.090 | 1.413 | -3.60 | 0.038 |
| Term spread | 1.049 | 1.204 | 0.448 | 1.275 | 1.820 | -3.75 | 0.031 |

| Correlations | Market Excess Return | Dividend Yield | Net Payout | Return on Equity | Relative Bill Rate | Risk-free Rate | Default Risk | Term Spread |
|---|---|---|---|---|---|---|---|---|
| Market excess return | 1.00 | 0.05 | 0.07 | -0.10 | -0.22 | -0.12 | 0.08 | 0.09 |
| Dividend yield | | 1.00 | 0.73 | 0.85 | 0.02 | 0.70 | 0.68 | -0.47 |
| Net payout | | | 1.00 | 0.67 | 0.07 | 0.43 | 0.33 | -0.42 |
| Return on equity | | | | 1.00 | 0.24 | 0.71 | 0.50 | -0.70 |
| Relative bill rate | | | | | 1.00 | 0.39 | -0.25 | -0.55 |
| Risk-free rate | | | | | | 1.00 | 0.61 | -0.74 |
| Default risk | | | | | | | 1.00 | -0.19 |
| Term spread | | | | | | | | 1.00 |

All variables are found to be stationary at the 0.05 significance level, except the risk-free rate (p-value of 0.087). As expected, the three variables representing cash flows, the dividend yield, the net payout, and the ROE, are strongly correlated (coefficients between 0.67 and 0.85), yet they are not significantly correlated with the relative bill rate, which is also included in the VAR system.

## III. Variance Decomposition for Financially Distressed Firms

To evaluate the relative importance of cash-flow news and expected-return news for firms in financial distress, I apply the variance decomposition framework to three subindices that represent different levels of financial distress.

## A. Constructing the Financial Distress Indices

I first estimate the degree of financial distress of each firm in each month between January 1976 and December 1996.[5] The criterion I use is based on Altman's (1968) Z-score, a widely used model of bankruptcy prediction.[6] As implied by the model, there are three levels of financial distress: a Z-score above 2.99 indicates that the firm is financially sound with no bankruptcy risk; a Z-score between 1.81 and 2.99 implies warning signs, although without immediate risk of bankruptcy (commonly defined as the gray area); and a Z-score below 1.81 indicates that the firm is in serious financial difficulties, and could be heading toward bankruptcy. Accordingly, I divide the firms into three groups—healthy firms, gray area firms, and financially distressed firms. I then compute the value-weighted averages of the returns and the dividend yields of each subgroup.

Figure 1 presents the cumulative value-weighted return of the market index and the three financial distress subindices. As expected, there is a negative relation between the cumulative return and the extent of financial distress.[7] The cumulative return of the healthy firms index between 1976 and 1996 is more than 2600%, while those of the gray area and the distressed firms indices are around 800% and 450%, respectively.

## B. Variance Decomposition for the Three Indices

I use the value-weighted returns and dividend yields of the three indices to decompose the variance of the returns of each index following the general framework outlined in Section I, where the state-vector of the specific indices includes two different variables, return and dividend yield, and one common variable, the relative bill rate.

Table II shows the VAR estimation results and the variance decomposition structure for the market index and the three subindices.[8] Consistent with Campbell (1991), the results for the market index show that news about future returns is the most dominant factor in moving stock prices. The variance of expected-return news is 95% of the total variance of the unexpected returns, higher than Campbell's (1991), which is around 77%. The difference may be due to different sample periods and different market indices (I include all firms listed on the NYSE, Amex, and Nasdaq, while Campbell includes NYSE firms only).

Examination of each subindex separately indicates that news about future returns becomes less important with the extent of financial distress. For the healthy firms index, the ratio of the variance of expected-return news to the variance of unexpected returns is the highest at approximately

[5]The financial distress measure is based on accounting data, which have many missing values; hence, I use this time period to ensure a sufficient number of both cross-sectional and time series observations.

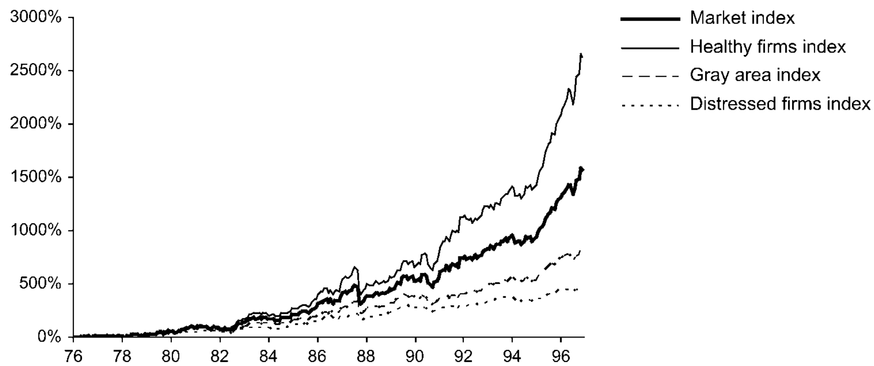
[6]The Altman (1968) Z-score model for predicting bankruptcies is:
*Z-score=1.2(working capital/total assets)+1.4(retained earnings/total assets)+3.3(earnings before interest and taxes/total assets)+0.6(market value of equity/book value of total liabilities)+0.999(sales/total assets)*.

[7]Note that the firm-specific returns are taken in the same period the financial distress level is estimated. Hence, the differences between the cumulative returns among the three subindices do not mean that ex-ante investments in healthy firms yield higher profits than in financially distressed firms. Rather firms that had experienced financial difficulties simultaneously had relatively low returns.

[8]Following Campbell (1991), I estimate the standard errors of the variance decomposition using the delta method. That is, the standard error of each of the three components defined in Equations (8)-(10) is estimated by $\sqrt{f_y(y)'Vf_y(Y)}$, where $\gamma$ is a vector of the VAR coefficients, $V$ is the covariance matrix of the coefficients, and $f_\gamma(\gamma)$ is a vector of the partial derivatives of the function of the component with respect to each of the coefficients.

**Figure 1: Cumulative Returns of Financial Distress Indices**

The figure shows the cumulative monthly returns of the market index and three subindices representing different levels of financial distress (based on Altman's (1968) Z-score model) between 1976 and 1996. The market index is the CRSP value-weighted index of the NYSE, Amex, and Nasdaq. The healthy firms index includes firms with Z-scores above 2.99; the gray area index includes firms with Z-scores between 1.81 and 2.99; and the distressed firms index includes firms with Z-scores below 1.81.




104%, compared to ratios of 54% and 40% for the gray area and the distressed firms indices. In addition, the variance of cash-flow news accounts for almost 47% of the variance of unexpected returns for the distressed firms index, which is more than twice than the percentage for the other indices.

These results are consistent with my prediction that when a firm faces possible bankruptcy, cash-flow news has a stronger effect on its current value. Yet, we should note that the R-square of the real return equation is the highest for the healthy firms index (2.6%) and the lowest for the distressed firms index (0.4%). This may indicate that the healthy firms index estimates are noisier, producing an upward bias on the effect of expected-return news. Campbell (1991) addresses this concern by simulating a VAR system when returns are restricted to be non-predicted, and finds that the decomposition structure is robust with respect to this issue.

The variance decomposition structure is directly affected by choice of the predictive variables in the VAR system; particularly the dividend yield, which may not be an appropriate proxy for future cash flows of distressed firms, as firms tend to cut dividends when they experience financial difficulties (see, e.g., DeAngelo and DeAngelo, 1990). Therefore, I re-examine the results using two alternative measures of expected cash flows.

The first measure is the net payout, which is the dividend plus equity repurchase net of issuance. The results reported in Table III show first that overall cash-flow news becomes more important in this case, while expected-return news becomes less important. For the market index, the variance of cash-flow news is 107% of the total variance of the unexpected returns, compared to 14% using the dividend yield; the variance of expected-return news is 49%, compared to 95% using the dividend yield. This result is consistent with Larrain and Yogo (2007) who find that including the net payout in the VAR system instead of the dividend yield makes cash-flow news significantly more important for unexpected returns.

More importantly, consistent with the results based on the dividend yield, cash-flow news becomes more dominant for firms in financial distress; the ratios of the variance of cash-flow news to the variance of unexpected return are 0.99, 1.13, and 1.37 for healthy firms, gray area

### Table II: Variance Decomposition for Financially Distressed Firms when the Predictive Variables are Realized Return, Dividend Yield, and Relative Bill Rate

The table reports the variance decomposition of unexpected return for the market index and for three subindices representing different levels of financial distress (based on Altman's (1968) Z-score, as defined in Section III). The components of the unexpected return variance are estimated using Campbell's (1991) vector autoregressive (VAR) approach. I first estimate the parameters and the covariance matrix of the residuals of the following first order VAR system: $z_{t+1} = Az_t + \omega_{t+1}$, $\omega_t \sim N(0,\Sigma)$, where the variables included in the system are the log of the real monthly return of the value-weighted index (LR), the value-weighted dividend yield (DP), and the relative bill rate (RB), which is the difference between a short-term T-bill and its one-year backward moving average. The VAR estimates are reported in the upper part of each box (standard errors are in parentheses). Then, the three components are estimated as follows (reported in the lower part of each box): $Var(N_{er}) = \lambda'\Sigma\lambda$, $Var(N_{cf}) = (e1' + \lambda')\Sigma(e1+\lambda)$, and $-2Cov(N_{er}, N_{cf}) = -2(e1' + \lambda')\Sigma\lambda$, where $N_{er}$ and $N_{cf}$ denote expected-return news and cash-flow news, $\lambda \equiv e1'\rho A(I - \rho A)^{-1}$, and $e1$ is a vector whose first element is one and whose other elements are zero; the parameter $\rho$ represents the average ratio of the market price to the sum of the market price and the dividend; given the sample means, $\rho$ is set to be 0.996. The standard errors of the variance decomposition components (reported in parentheses) are estimated using the delta method, as described in Section III. The results are based on all firms listed on the NYSE, Amex, and Nasdaq between January 1976 and December 1996.

| | **Market Index** | | | | | **Healthy Firms Index** | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **LRt** | **DPt** | **RBt** | **R-square** | | **LRt** | **DPt** | **RBt** | **R-square** |
| LRt+1 | 0.011 | 0.428 | -3.172 | 0.018 | LRt+1 | 0.025 | 0.497 | -4.218 | 0.026 |
| | (0.065) | (0.303) | (2.073) | | | (0.065) | (0.325) | (2.231) | |
| DPt+1 | -0.037 | 1.003 | 0.099 | 0.996 | DPt+1 | -0.034 | 1.003 | 0.094 | 0.994 |
| | (0.001) | (0.004) | (0.028) | | | (0.001) | (0.005) | (0.035) | |
| RBt+1 | 0.001 | -0.004 | 0.674 | 0.451 | RBt+1 | 0.001 | -0.004 | 0.675 | 0.451 |
| | (0.002) | (0.007) | (0.048) | | | (0.001) | (0.007) | (0.048) | |
| | **Var(Ncf)** | **Var(Ner)** | **-2Cov** | | | **Var(Ncf)** | **Var(Ner)** | **-2Cov** | |
| | 0.141 | 0.951 | -0.092 | | | 0.212 | 1.039 | -0.251 | |
| | (0.053) | (0.185) | (0.238) | | | (0.048) | (0.146) | (0.194) | |
| | **Gray Area Index** | | | | | **Distressed Firms Index** | | | |
| | **LRt** | **DPt** | **RBt** | **R-square** | | **LRt** | **DPt** | **RBt** | **R-square** |
| LRt+1 | -0.043 | 0.325 | -3.071 | 0.012 | LRt+1 | -0.031 | 0.201 | 0.221 | 0.004 |
| | (0.065) | (0.324) | (2.216) | | | (0.064) | (0.246) | (1.663) | |
| DPt+1 | -0.034 | 0.999 | 0.124 | 0.994 | DPt+1 | -0.037 | 0.997 | 0.234 | 0.986 |
| | (0.001) | (0.005) | (0.033) | | | (0.002) | (0.008) | (0.051) | |
| RBt+1 | 0.001 | -0.004 | 0.675 | 0.452 | RBt+1 | -0.001 | -0.004 | 0.669 | 0.451 |
| | (0.001) | (0.007) | (0.048) | | | (0.002) | (0.007) | (0.047) | |
| | **Var(Ncf)** | **Var(Ner)** | **-2Cov** | | | **Var(Ncf)** | **Var(Ner)** | **-2Cov** | |
| | 0.198 | 0.541 | 0.261 | | | 0.474 | 0.401 | 0.124 | |
| | (0.017) | (0.179) | (0.195) | | | (0.053) | (0.373) | (0.425) | |

firms, and distressed firms, respectively. In a similar way, expected-return news becomes less dominant for these firms (equivalent ratios of 0.55, 0.37, and 0.08).

The second alternative measure of expected cash flows is the firm's return on equity (ROE), which is the net income divided by equity value. Since net income is reported quarterly, I adjust

## Table III: Variance Decomposition for Financially Distressed Firms when the Predictive Variables are Realized Return, Net Payout, and Relative Bill Rate

The table reports the variance decomposition of unexpected return for the market index and for three subindices representing different levels of financial distress. The estimation procedure is similar to that in Table II, where instead of the dividend yield, the value-weighted net payout of each index is included in the VAR system. The net payout (NP) is estimated by dividend plus equity repurchase minus equity issuance, divided by market value of equity. The upper part of each box reports the VAR estimates (standard errors are in parentheses) and the lower part of each box reports the variance decomposition components (standard errors, estimated using the delta method, are in parentheses). The results are based on all firms listed on the NYSE, Amex, and Nasdaq between January 1976 and December 1996.

| | Market Index | | | | | Healthy Firms Index | | | |
|---|---|---|---|---|---|---|---|---|---|
| | LRt | NPt | RBt | R-square | | LRt | NPt | RBt | R-square |
| LRt+1 | -0.010 | 0.367 | -3.484 | 0.019 | LRt+1 | 0.010 | 0.493 | -3.943 | 0.023 |
| | (0.064) | (0.263) | (2.061) | | | (0.064) | (0.305) | (2.215) | |
| NPt+1 | -0.022 | 0.978 | 0.100 | 0.937 | NPt+1 | -0.024 | 0.976 | 0.040 | 0.938 |
| | (0.004) | (0.016) | (0.126) | | | (0.003) | (0.016) | (0.116) | |
| RBt+1 | 0.000 | 0.000 | 0.672 | 0.450 | RBt+1 | 0.000 | -0.003 | 0.675 | 0.451 |
| | (0.001) | (0.006) | (0.048) | | | (0.001) | (0.007) | (0.048) | |
| | Var(Ncf) | Var(Ner) | -2Cov | | | Var(Ncf) | Var(Ner) | -2Cov | |
| | 1.067 | 0.491 | -0.558 | | | 0.986 | 0.551 | -0.537 | |
| | (0.042) | (0.075) | (0.116) | | | (0.034) | (0.071) | (0.104) | |
| | **Gray Area Index** | | | | | **Distressed Firms Index** | | | |
| | LRt | NPt | RBt | R-square | | LRt | NPt | RBt | R-square |
| LRt+1 | -0.056 | 0.377 | -1.988 | 0.016 | LRt+1 | 0.139 | 0.282 | -2.221 | 0.028 |
| | (0.064) | (0.254) | (1.974) | | | 0.063 | 0.287 | 3.855 | |
| NPt+1 | -0.024 | 0.961 | 0.094 | 0.897 | NPt+1 | -0.006 | 0.796 | -0.793 | 0.649 |
| | (0.005) | (0.021) | (0.163) | | | 0.008 | 0.038 | 0.512 | |
| RBt+1 | 0.000 | -0.004 | 0.665 | 0.451 | RBt+1 | 0.002 | 0.003 | 0.694 | 0.460 |
| | (0.002) | (0.006) | (0.049) | | | 0.001 | 0.004 | 0.048 | |
| | Var(Ncf) | Var(Ner) | -2Cov | | | Var(Ncf) | Var(Ner) | -2Cov | |
| | 1.132 | 0.370 | -0.502 | | | 1.368 | 0.081 | -0.450 | |
| | (0.032) | (0.042) | (0.073) | | | (0.031) | (0.016) | (0.042) | |

the other VAR variables (realized return and relative bill rate) to quarterly series. To avoid the effect of seasonality in earnings, I use the sum of the net incomes in the past four quarters, divided by the current market value of equity.

Table IV reports variance decomposition results using the ROE. For the market index, the variance of cash-flows news accounts for 56% of the variance of unexpected return (compared to 14% and 107% using the dividend yield and the net payout). Similar to the previous results, cash-flow news becomes more important with the extent of financial distress (variance ratios of 0.50, 0.88, and 1.04 for the healthy, gray area, and distressed firms indices, respectively), while expected return news becomes less important (equivalent ratios of 0.22, 0.05, and 0.01).

The finding that cash-flow news is more important for firms in financial distress is robust, therefore, to the choice of the predictive variables in the VAR system.

**Table IV: Variance Decomposition for Financially Distressed Firms when the Predictive Variables are Realized Return, ROE, and Relative Bill Rate**

The table reports the variance decomposition of unexpected return for the market index and for three subindices representing different levels of financial distress. The estimation procedure is similar to that in Table II, where instead of the dividend yield, the value-weighted return on equity (ROE) of each index is included in the VAR system. The ROE is estimated by net income during the past four quarters divided by current market value of equity. The upper part of each box reports the VAR estimates (standard errors are in parentheses) and the lower part of each box reports the variance decomposition components (standard errors, estimated using the delta method, are in parentheses). The results are based on all firms listed on the NYSE, Amex, and Nasdaq between January 1976 and December 1996.

| | Market Index | | | | | Healthy Firms Index | | | |
|---|---|---|---|---|---|---|---|---|---|
| | LRt | ROEt | RBt | R-square | | LRt | ROEt | RBt | R-square |
| LRt+1 | -0.013 | 0.201 | -9.043 | 0.042 | LRt+1 | 0.008 | 0.205 | -8.860 | 0.043 |
| | (0.110) | (0.209) | (5.093) | | | (0.110) | (0.238) | (4.960) | |
| ROEt+1 | -0.007 | 0.943 | 2.069 | 0.933 | ROEt+1 | -0.001 | 0.950 | 1.824 | 0.930 |
| | (0.016) | (0.030) | (0.737) | | | (0.014) | (0.031) | (0.640) | |
| RBt+1 | 0.003 | 0.002 | 0.485 | 0.244 | RBt+1 | 0.003 | 0.001 | 0.490 | 0.246 |
| | (0.002) | (0.004) | (0.102) | | | (0.002) | (0.005) | (0.100) | |
| | Var(Ncf) | Var(Ner) | -2Cov | | | Var(Ncf) | Var(Ner) | -2Cov | |
| | 0.557 | 0.203 | 0.240 | | | 0.497 | 0.221 | 0.282 | |
| | (0.033) | (0.088) | (0.062) | | | (0.047) | (0.105) | (0.061) | |
| | Gray Area Index | | | | | Distressed Firms Index | | | |
| | LRt | ROEt | RBt | R-square | | LRt | ROEt | RBt | R-square |
| LRt+1 | 0.019 | 0.080 | -1.287 | 0.004 | LRt+1 | 0.020 | 0.058 | -4.503 | 0.007 |
| | (0.112) | (0.173) | (4.183) | | | (0.103) | (0.127) | (6.921) | |
| ROEt+1 | 0.004 | 0.908 | 0.617 | 0.828 | ROEt+1 | 0.021 | 0.609 | -0.897 | 0.370 |
| | (0.031) | (0.048) | (1.165) | | | (0.080) | (0.098) | (5.335) | |
| RBt+1 | 0.003 | 0.002 | 0.482 | 0.232 | RBt+1 | 0.003 | 0.004 | 0.391 | 0.300 |
| | (0.003) | (0.004) | (0.102) | | | (0.002) | (0.002) | (0.103) | |
| | Var(Ncf) | Var(Ner) | -2Cov | | | Var(Ncf) | Var(Ner) | -2Cov | |
| | 0.875 | 0.047 | 0.079 | | | 1.037 | 0.012 | -0.049 | |
| | (0.036) | (0.027) | (0.021) | | | (0.038) | (0.006) | (0.038) | |

## IV. What Causes Bankruptcies?

Another way to address the importance of cash-flow news for financially distressed firms is to study firms that go bankrupt. Since firms go bankrupt typically due to inability to pay debt, the major factor in determining whether a firm will go bankrupt is the availability of cash, while expected future returns should not have a significant effect on the probability of bankruptcy. Hence, I argue that for the latest return prior to bankruptcy, cash-flow news would be even more dominant for the returns of financially distressed firms. I test this hypothesis using both firm-level and market-level approaches.

### A. Firm-level Test

To examine whether the latest return prior to the firm's bankruptcy date is driven mainly by a decline in expected cash flows (versus an increase in expected returns), I use the following approach.

I consider a subsample of firms that went bankrupt between 1953 and 2001, and were listed on the market for at least ten years; this requirement ensures enough firm-level time series observations to compare last-year and prior returns. I apply the VAR framework to this subsample, replacing the dividend yield with the default risk as a predictive variable (the latter seems more appropriate for firms that went bankrupt), and assuming constant coefficients of the VAR system, both over time and across firms.[9] Given the VAR estimates, the return of each firm in each year is broken into cash-flow news and expected-return news. That is, instead of generally measuring the variance decomposition structure, I estimate the time series effects of each of the two components, as defined in Equations (6) and (7). Using these estimates, I compute the following for each firm *i*:

$\overline{Ncf_i}$ ≡ time series average of cash-flow news in firm *i*'s returns

$Ncf_i\_Last\,Year$ ≡ cash-flow news in firm *i*'s return during the last year prior to bankruptcy

$\overline{Ner_i}$ ≡ time series average of expected-return news in firm *i*'s returns

$Ner_i\_Last\,Year$ ≡ expected-return news in firm *i*'s return during the last year prior to bankruptcy.

If negative cash-flow news (versus positive expected-return news) becomes more dominant in the return prior to bankruptcy, then the following inequality is expected to hold (averaging for all firms):

$$-\left(\overline{Ncf\_Last\,Year}-\overline{\overline{Ncf}}\right)>\overline{Ner\_Last\,Year}-\overline{\overline{Ner}} \tag{11}$$

where the left-hand side represents the average difference between the effect of cash-flow news in the last-year return and the returns in preceding years, and the right-hand side represents the equivalent difference between the effects of expected-return news.

The results reported in Table V are based on 79 firms that went bankrupt after being listed on the market for at least ten years. The results show, first, that in general cash-flow news is more dominant than expected-return news for firms that went bankrupt, where the variance of cash-flow news is 96% of the total variance of unexpected return. This finding is consistent with the results in Section III that indicate prices of financially distressed firms are more strongly affected by cash-flow news than by expected-return news, compared to healthy firms.

More interestingly, when we compare the dominance of cash-flow news in the latest return before bankruptcy and in prior returns, the results indicate bankruptcies are driven mainly by negative cash-flow innovations. On average, in the last year prior to bankruptcy, the negative cash-flow news is higher by nearly 50% than that in the previous years; while the positive expected-return news in the last year prior to bankruptcy is higher by only 1.5% than that in preceding years. The difference between the two effects is significant (t-statistic of 5.86). Thus, as expected, Inequality (11) holds. This finding suggests that bankruptcies are driven primarily by negative changes in expected cash flows.

### B. Market-level Test

I next use estimates of both cash-flow news and expected-return news at the market level to examine which type of news has a stronger effect on subsequent bankruptcy frequencies. I first

[9]Other authors performing firm-level variance decomposition frameworks also assume constant coefficients; see, for instance, Vuolteenaho (2002).

## Table V: The Effect of Cash-Flow News on the Last Year Return Before Bankruptcy

The table presents the VAR estimation results and the variance decomposition structure for subsamples of firms that went bankrupt between 1953 and 2001, and were listed on the market for at least ten years. The sample includes 1,416 firm-years that represent 79 different bankrupt firms. The estimation procedure is similar to that in Table II, where the variables included in the VAR system are the log of the real annual return (LR) of all firm-years, the annual default risk (DEF), estimated by the yield spread between Baa- and Aaa-rated securities, and the relative bill rate (RB), which is the difference between a short-term T-bill and its one-year backward moving average. The upper part of the table reports the VAR estimates (standard errors are in parentheses) and the middle part of the table reports the variance decomposition components (standard errors, estimated using the delta method, are in parentheses). Given the VAR estimates, the cash-flow news and expected-return news in each firm-year return are estimated (as defined in Equations (6) and (7)). Using these estimates, I compute the average difference between cash-flow (expected-return) news in the last year prior to bankruptcy and cash-flow (expected-return) news in the previous years (presented in the lower part of the table).

| **VAR Estimation** | | | | |
|---|---|---|---|---|
| | **LRt** | **DEFt** | **RBt** | **R-square** |
| LRt+1 | -0.019 | -1.645 | -2.771 | 0.002 |
| | (0.031) | (1.526) | (1.066) | |
| DEFt+1 | 0.001 | 0.968 | 0.151 | 0.681 |
| | (0.000) | (0.006) | (0.004) | |
| RBt+1 | 0.006 | -0.229 | 0.192 | 0.101 |
| | (0.001) | (0.039) | (0.027) | |
| **Variance Decomposition** | | | | |
| | | **Var(Ncf)** | **Var(Ner)** | **-2Cov** |
| | | 0.961 | 0.023 | 0.016 |
| | | (0.254) | (0.251) | (0.474) |
| **Last Year Effects** | | | | |
| | | **-(Ncf_Last Year - Ncf)** | **Ner_Last Year - Ner** | **Difference** |
| Mean | | 0.499 | 0.015 | 0.484 |
| T-stat | | 5.93 | 1.53 | 5.86 |

estimate market-level time series of expected cash flows and expected discount rates as follows. The expected cash flow (*Ecf*) is measured by the current monthly dividend yield, and the expected discount rate (*Edr*) by the expected market risk premium. I estimate the expected risk premium using the fitted values of the following regression (also used in Fama and French (1989) and Ferson and Harvey (1991), for instance):

$$ExMkt_t = \beta_0 + \beta_1 RF_{t-1} + \beta_2 DIV_{t-1} + \beta_3 DEF_{t-1} + \beta_4 TERM_{t-1} + \varepsilon_t \quad (12)$$

where

*ExMkt* is the excess market return
*RF* is the risk-free rate, estimated by the one-month T-bill rate

*DIV* is the market dividend yield
*DEF* is the default risk, estimated by the difference between the yields of Baa-rated and Aaa-rated bonds
*TERM* is the term spread, estimated by the difference between the yields of ten-year and one-year government bonds.

Second, I compute the bankruptcy frequency (*Bank_freq*), which is the number of bankruptcies during the following twelve months divided by the total number of firms listed on the market during that period. I then regress *Bank_freq* on *Ecf* and *Edr* to examine which factor creates a stronger response with respect to bankruptcies. The regression includes a dummy variable that represents National Bureau of Economic Research (NBER) recessions (*BC*), in order to eliminate the effect of the state of the economy on bankruptcy frequency. Thus, I run the regression:[10]

$$Bank\_freq_t = \beta_0 + \beta_1 Ecf_t + \beta_2 Edr_t + \beta_3 BC_t + \varepsilon_t. \tag{13}$$

Finally, I assess the relative importance of cash-flow and expected-return news by a measure representing the ratio of the effect of a change in one standard deviation of *Ecf* on *Bank_freq* to the equivalent effect of *Edr*:

$$Effects\_ratio = \frac{-\beta_1 \sigma(Ecf)}{\beta_2 \sigma(Edr)}. \tag{14}$$

The results reported in Table VI show that both declines in expected cash flow and increases in expected discount rate increase the number of bankruptcies. The cash-flow effect is stronger than the discount rate effect. First, the coefficient of expected cash flow is always significantly negative, while that of expected discount rate is insignificant in the presence of expected cash flow. Second, according to the effects ratio measure, expected cash flow is 1.3 to 2.2 times more important than expected return. Hence, cash-flow news is even more dominant in causing bankruptcies than it is generally for the returns of financially distressed firms.

These results are informative for several reasons. First, they provide additional evidence for the relative importance of cash-flow news for financially distressed firms. Second, the market-level test is not based on VAR models, and hence is not subject to noise associated with such models. Third, while the results in the previous sections are based on a financial-distress model, and therefore are exposed to model errors, the tests in this section are based on actual bankruptcies.

## V. The Effect of Volatility Shocks on Concurrent Returns

Expected future stock returns reflect the risk level of equity. Hence, we can test the relative effect of expected-return news on the firm's stock price by regressing firm-specific stock returns on concurrent shocks to expected volatility of stock returns. As discussed previously, firms that

[10]Since *Edr* is a generated regressor, the standard error of its ordinary least squares (OLS) coefficient may be negatively biased, resulting in an overstated t-statistic. Pagan (1984), however, notes that this potential bias is not significant, and generally has a minor effect on the regression results. In addition, a lower "true" t-statistic of *Edr* implies that the actual effect of expected-return news on the bankruptcy frequency is weaker, and therefore strengthens the results.

**Table VI: Regressions of Bankruptcy Frequency on Expected Cash Flows and Discount Rates**

The dependent variable is the number of bankruptcies during a period of twelve months, divided by the total number of firms (denoted by Bank_freq). The independent variables are expected cash flow (Ecf), estimated by current dividend yield, expected discount rate (Edr), estimated by expected risk premium, which is measured using the fitted values of the regression model defined in Equation (12), and a dummy variable that represents NBER recessions (BC). Since for each month the bankruptcy frequency is based on the following twelve months, I estimate the autocorrelation structure of the coefficients and correct the standard errors using the Newey-West (1987) formula. The Effects_ratio measure is calculated by $-\beta_1\sigma(Ecf)/\beta_2\sigma(Edr)$, as defined in Equation (14). The data are based on all firms listed on the NYSE, Amex, and Nasdaq between August 1971 and December 2001.

| **Bank_freq Predicted** | **$\beta_0$ (+)** | **$\beta_1$Ecf (-)** | **$\beta_2$Edr (+)** | **$\beta_3$BC (+)** | **R-square** | **Effects Ratio[1]** |
|---|---|---|---|---|---|---|
| Coefficient | 0.109 | -1.189 | | | 0.295 | |
| T-stat | 9.52 | -3.61 | | | | |
| Coefficient | 0.034 | | 4.065 | | 0.136 | 1.34 |
| T-stat | 2.05 | | 2.22 | | | |
| Coefficient | 0.084 | -1.032 | 2.195 | | 0.329 | 2.16 |
| T-stat | 3.78 | -2.99 | 1.27 | | | |
| Coefficient | 0.084 | -1.040 | 2.191 | 0.001 | 0.330 | 2.17 |
| T-stat | 3.72 | -2.75 | 1.26 | 0.05 | | |

[1]Based on the coefficients of the first two regressions.

face high bankruptcy risk are expected to be more sensitive to cash-flow news; thus, shocks to equity volatility should have a stronger effect on stock prices of financially healthy firms than on stock prices of financially distressed firms.

## A. Variable Estimation

Monthly stock returns are taken from CRSP for all firms listed on the NYSE, Amex, and Nasdaq. Firms with Z-scores below 1.81 are classified as financially distressed (Altman, 1968). Timely changes in stock return volatility are more complicated to estimate. Realized volatility estimates would be smoothed and thus underestimate any effect of current changes in volatility; that is, a moving average of equity volatility would weaken sudden changes in expected volatility. Hence, to assess timely changes in equity volatility, I use implied volatilities from the options market (as measures of timely assessments of the market). These estimates should capture any sudden change in the equity volatility and therefore are more appropriate regressors to examine the effect of current shocks to equity risk on current stock prices.

Since firm-level implied volatilities are not readily available, I use a private database that provides firm-level options data for the years 2000-2002.[11] For each firm in each month, the implied volatility is based on a weighted average of the annual implied volatilities of all options traded on the firm stock price as of the last trading day of the quarter with times-to-maturity of 30 days (or the closest to 30 days). For a firm to be included in the sample, it must have traded options on its stock price, as well as the remaining variables required to compute the Z-score.

[11]The data are taken from www.IVolatility.com, which has collected firm-level implied volatility data since late 2000.

After including all firms listed on the NYSE, Amex, and Nasdaq that satisfy these conditions, the final sample includes 25,253 firm-months during 2000-2002.

### B. Results

Table VII presents results of regressions of monthly returns on concurrent changes in expected volatility and on a dummy variable that represents the interaction between changes in expected volatility and financial distress. The results are also presented for subsamples divided by market-to-book ratio (estimated by market value of equity divided by book value of equity) and firm size (estimated by market value of equity). As expected, the coefficient of volatility changes is significantly negative in all regressions, implying that a positive (negative) shock to expected volatility is associated with a decrease (increase) in the stock price (t-statistics lower than -10). In the case of financially distressed firms, volatility changes have a significantly weaker effect on the stock price (reflected in the significance of the interactive variable coefficient). This indicates that financially distressed firms are less sensitive than healthy firms to expected-return news, which is consistent with the results described so far. The results remain significant at any level of size and market-to-book ratio, suggesting that they are not driven by small or growth firms.

Although this approach to evaluate the relative effect of news about expected return on current unexpected returns overcomes several limitations of the variance decomposition framework, it introduces new concerns.[12] First, the regression includes the effect of expected-return news only, and not the effect of cash-flow news. Hence, firm-specific covariance between these two factors may affect the results. For example, given a negative covariance between expected-return news and cash-flow news, a positive shock to the former (which is associated with a negative return) implies a negative shock to the latter, which also contributes to the negative return. Thus, the lower the covariance between the two factors, the greater the bias in the effect of volatility shocks. Given the results reported in Tables II-IV, however, there is no clear relation between the covariance between the two factors and the extent of financial distress.

Second, although the sample includes a sufficient number of observations, it covers only two years (2001-2002), so the results may be affected by the specific characteristics of these years. Third, setting returns as the dependent variable and changes in expected volatility as the independent variable implies a one-way causality. Yet, both factors are determined simultaneously and may have mutually reinforcing effects (this issue is also relevant for the variance decomposition framework).

## VI. Conclusions

Previous studies have documented that stock prices are moved primarily by shocks to expected future returns, rather than by shocks to expected future cash flows. In this study I predict and find that when firms face high bankruptcy risk, cash-flow news dominates expected-return news in driving stock returns.

Application of Campbell's (1991) variance decomposition framework to three subindices representing different levels of financial distress reveals that news about expected returns becomes

[12]As Campbell (1991) notes, the variance decomposition results are based on Taylor approximations, they depend on forecasting state variables, and they may be affected by small-sample biases.

## Table VII: Regressions of Stock Returns on Concurrent Changes in Stock Return Volatility for Financially Distressed Firms

The dependent variable is firm-specific monthly return, and the independent variables are the change in the volatility of the firm's stock return and a dummy variable representing the interaction between the change in volatility and financial distress. The change in expected volatility (DSE) is the difference between the implied volatility of the firm's stock in the current month and that of the previous month; the implied volatility is based on a weighted average of the annual implied volatilities of all options traded on the firm stock price as of the last trading day of the quarter with times-to-maturity of 30 days (or the closest to 30 days). The financial distress dummy variable (D1) equals one if the firm's Altman Z-score is lower than 1.81, and zero otherwise. Regressions results are also reported for equal-sized subsamples divided by market-to-book ratio (estimated by market value of equity divided by book value of equity) and firm size (estimated by market value of equity). The regressions are Fama-MacBeth (1973) with 25 monthly cross-sections. The reported coefficients are the average coefficients in the monthly cross-section regressions, and the t-statistics of the coefficients are the averages of the coefficients divided by their time series standard errors. The results are based on 25,253 firm-month observations between December 2000 and December 2002, representing 1,453 different firms listed on the NYSE, Amex, and Nasdaq.

| | Return Predicted | $\beta_0$ | $\beta_1$DSE (-) | $\beta_2$(D1*DSE) (+) |
|---|---|---|---|---|
| All | Coefficient | 0.007 | -0.284 | 0.075 |
| | T-stat | 0.66 | -29.36 | 4.82 |
| Market-to-book | | | | |
| Low | Coefficient | -0.256 | 0.074 | 0.006 |
| | T-stat | 1.31 | -11.46 | 2.16 |
| Mid | Coefficient | 0.006 | -0.292 | 0.086 |
| | T-stat | 0.55 | -14.72 | 2.56 |
| High | Coefficient | 0.004 | -0.354 | 0.018 |
| | T-stat | 0.48 | -20.23 | 1.66 |
| Size | | | | |
| Small | Coefficient | 0.004 | -0.196 | 0.036 |
| | T-stat | 0.25 | -12.59 | 1.92 |
| Mid | Coefficient | 0.013 | -0.387 | 0.131 |
| | T-stat | 1.41 | -21.61 | 4.20 |
| Large | Coefficient | 0.006 | -0.580 | 0.100 |
| | T-stat | 0.93 | -31.06 | 2.94 |

significantly less important with a firm's degree of financial distress; and that news about cash flows is significantly more important for firms in serious financial distress.

Examination of the effects of cash-flow news and expected-return news with regard to actual bankruptcies shows that cash-flow news becomes more dominant for the latest return before bankruptcy. Moreover, more bankruptcies occur after a market decline that is driven by negative shocks to expected cash flows than after a market decline that is driven by positive shocks to discount rates.

Finally, I examine the direct relation between changes in expectations of stock return volatility (as a proxy for expected-return news) and concurrent returns. Consistent with the variance decomposition results, firms in financial distress are less sensitive than healthy firms to changes in short-term equity volatility.

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