DISTRESS RISK, INSTITUTIONAL TRADING AND THE CROSS SECTION OF STOCK RETURNS

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Abstract

This paper provides an alternative explanation for the distress risk puzzle documented in previous studies (e.g. Griffin and Lemmon 2002, Campbell et al. 2008) that firms with high default probability earn low returns by investigating the impact of institutional holding and trading on stock returns. We hypothesize that institutional investors are reluctant to hold stocks of firms with high distress risk and that a decline in their holding or trading lowers distress stocks' prices and causes the returns of these stocks to decrease. Our empirical evidences support these hypotheses. We further find that although both institutional holding and trading can capture the distress risk puzzle, institutional trading seems to be superior. In addition, we document that the holding or trading by either independent or short term institutional investors plays a significant role in explaining this puzzle while the holding or trading by dependent or long term institutional investors does not. Finally, our results suggest an important role of institutional investors in equity markets.

Key words: distress risk, institutional investors, institutional holding, institutional trading.

JEL Code: G20, G21, G22

Introduction

Why do firms with high default probability earn low returns? This question seems to be a puzzle for rational expectations because according to traditional wisdom, firms with high default probability have high risks and should earn high returns to compensate for these risks. However, recent empirical studies document the negative relation between default probability and realized stock returns (e.g. Griffin and Lemmon 2002, Campbell et al. 2008, George and Huang 2010). After controlling for size and book-to-market, Campbell, Hilscher, and Szilagyi (2008) conclude that this relation is "inconsistent with the conjecture that the value and size effects are compensation for the risk of financial distress". Further, they document that this relation is more pronounced for small stocks or stocks with high informational frictions.

Campbell, Hilscher, and Szilagyi (2008) suggest three possible explanations for distress risk puzzle which include some unexpected events in their sample, valuation errors by irrational investors, and some characteristics of distress stocks that may induce investors to hold them with low returns. On the other hand, Griffin and Lemmon (2002) suggest a mispricing interpretation for this puzzle while Garlappi and Yan (2010) document that the humped sharped relation between distress risk and stock returns is due to the likelihood of shareholder recovery from firms in financial distress.

George and Huang (2010) explain that the negative relation between stock returns and distress probability is due to the distress cost. According to their studies, firms with high leverage have low distress cost thus earn low returns but retain high default probability while firms with low leverage have high distress cost and earn high returns. The underlying assumption of this explanation is that firms can easily choose the optimal debt structure and the costs of increasing or decreasing debt are not sufficiently large enough to change the cost of capital. To prove this explanation, George and Huang (2010) divide all firms into three groups, high leverage group including firms in top 20% long term debt to total assets, low leverage group consisting of firms in bottom 20% long term debt ratio, and the rest, and then compare the returns of these high and low leverage groups with those of medium debt ratio. This classification is not supportive because almost firms in low leverage group have no long term debt. Further, that the average returns of high leverage group are lower than the average returns of medium leverage group is not necessary to prove the negative relation between leverage and stock returns because this relation is not monotonic. Gomes and Schmid (2010) find that returns will increase with leverage when leverage is low and decrease with leverage when leverage is high. Moreover, the cost of reducing leverage for distress firm is high and empirical evidences show that firms with high default probability also have high probability of bankruptcy (Campbell et al. 2008). Thus, this explanation can be applied for firms with high leverage rather than for all firms.

This paper provides an alternative explanation for the distress risk puzzle by examining the roles of institutional investors in the financial markets. Although these investors hold about 68% stock values in the U.S. equity market in 2008 and their trading accounts for over 90% of total dollar volume in 2003 and for over 96% of total dollar volume of the New York Stock Exchange in 2002 (Jones and Lipson 2004), their roles in asset pricing is neglected (Allen 2001). The standard asset pricing theories document that the prices and returns in financial markets are

determined by households (or by the "representative consumer") who seek to optimize their consumption and investment plans. To pursue their purpose, households need frictionless markets to trade and to arbitrage at any time they need. However, the real markets are dominated by a group of institutions as well as have a lack of arbitrage opportunities (Gompers and Metrick 2001).

We find that the negative relation between distress risk and stock returns is due to institutional holding and trading. Stocks with high default probability are not attractive to institutions. A decrease in institutional holding or trading causes stock prices to decline. As a result, the returns of these stocks will go down. As shown in table 1, the median of institutional holding of stocks in the highest quintile group is only 6.50% while this figure in the lowest quintile group is 39.79%. Institutional trading over a quarter goes down from 2.48% of group 1 to 0.12% of group 5 and stock cumulative returns also decrease from 1.68% to -3.23%, respectively. Moreover, the results in table 2 show that institutional holding and trading of firms with high distress risk have decreased over some previous years and this holding and trading also have declined when firms' performance becomes worse.

This finding is mainly based on two empirical evidences. First, we document that the link between default probability and institutional ownership lies on the firm's fundamentals. As shown in table 1, firms with high default risk are small, young and illiquid, and do not perform well. These characteristics are opposite to what institutional investors prefer. As documented in recent studies (e.g. Gompers and Metrick 2001), institutional investors prefer and hold more large and "prudent" stocks with outperformance. Due to low interests, institutional investors tend to move away their capital from these stocks and will invest in stocks with low default probability.

Second, we assume that the capital flows from institutional investors significantly affect stock returns and cause the distress risk anomaly. Stock returns are positively correlated with the capital flows from institutions, meaning that an increase in capital inflows will lead to high stock returns and an increase in capital outflow will lead to low returns. This assumption is supported by empirical evidence that institutional holding or trading is significantly positively correlated with stock returns (e.g. Sias et al. 2001, Nofsinger and Sias 1999, and Gompers and Metrick

2001). Further, Gompers and Metrick (2001), Jiao and Liu (2008), and Yan and Zhang (2009) document that stocks with high institutional holding or trading earn high future returns.

There are some reasons for the positive relation between institutional holding or trading and stocks returns. First, institutional investors are considered to have information advantage and they can choose to buy stocks with outperformance (Nofsinger and Sias 1999, Sias et al. 2001, and Gompers and Metrick 2001), thus an increase in institution's demand of a certain stock will pushes up its prices and thus increases its returns. Second, as documented in Sias et al. (2001), the positive relation between institutional trading and stock returns can arises from intra-period institutional positive feedback trading because institutional investors tend to be short-term traders. Third, due to herding, institutional trading can cause the price pressure when they trade a large amount of a certain stock (Sias et al. 2001, and Gompers and Metrick 2001).

It is important to note that the demand of shares of one group of investors is offset by the supply of shares of other groups of investors. If we accept the dominating role of institutional investors in the equity market, we implicitly assume that the demand and supply of shares are not perfect elastic, and also implicitly assume that trading by individual investors or small institutions does not have countervailing effect. The explanations of Gompers and Metrick (2001) and Sias et al. (2001) apply well in this case. According to Gompers and Metrick (2001), there are two main reasons why firm's shares are not perfect elastic with the change in demand and supply. First, "the optimal scale and scope of firms is a natural limit on the market's ability to simply increase the supply of large firms". Second, an increase in demand of institutional investors doesn't necessarily imply that they are willing to pay more for additional shares. Moreover, due to lack of arbitrage opportunities in the equity market (Gompers and Metrick 2001), individual and small institutional investors as well as arbitrageurs cannot take arbitrage opportunities to get profits or to reduce the benefits from information asymmetry driven by institutional investors.

This paper also documents both institutional holding and institutional trading (especially short-term or independent institutional trading) can be used to capture the impact of distress risk on stock returns. However, as shown in table 3, institutional trading impact seems to be superior. This finding is reasonable because recent studies (e.g. Sias et al. 2001, Jiao and Liu 2008 and Yan and Zhang 2009) document that price pressure is more consistent with information hypothesis.

Prior literature (e.g. Jiao and Liu 2008 and Yan and Zhang 2009) documents that institutions are far from homogeneity, thus their roles in the equity market are different. Jiao and Liu (2008) find that independent institutions which have fewer business relations with the firms in which they invest have information advantage over grey institutions which have strong business links with the firms in which they invest in the equity market. On the other hand, Yan and Zhang (2009) show that the positive relation between stock returns and institutional holding is driven by short term institutions. Thus, because of having information advantage, independent or short-term institutions are expected to play an important role in explaining distress risk puzzle. Our empirical results support this hypothesis.

This paper is the first to explain distress risk puzzle by investigating the role of institutional investors in the U.S. equity markets. Based on the empirical evidence of positive relation between institutional ownership and trading and stock returns, we find that the firms with very high default probability have low returns because institutional investors do not pay attention to these stocks.

The rest of the paper is organized as follow. Section 2 introduces the data, distress risk measures, and institutional trading measures and summarizes the descriptive statistic of firms characteristics based on their default probability. Section 3 analyzes the relation between distress risk, institutional investors and stock returns. We then investigate the relation between distress risk, firm's fundamentals and institutional activities in section 4. Section 5 concludes.

Data, variables and descriptive statistics

Distress risk measures

Using Ohlson (1980) O-score and Altman (1969) Z-score to proxy for distress risk, Dichev (1998) finds the negative relation between stock returns and default probability. Further, he documents that both have good out-of-sample predictive power for bankruptcy but that O-score predicts CRSP delistings better than Z-score. Because of this, Griffin and Lemmon (2002) focus on O-score to capture distress risk. This measure is also used in numerous recent studies (e.g. George and Huang 2010).

In this paper, we follow Gompers and Matrick (2001), Jiao and Liu (2008), and Yan and Zhang (2009) to control for firms characteristics to examine the power of institutional holding or trading

on explaining the distress risk puzzle. Because almost these characteristics are estimated from the market data and institutions prefer large stocks with high share prices, we focus on O-score to capture stock's distress risk.

We follow Griffin and Lemmon (2002) and George and Huang (2010) to calculate O-score as described in the footnote 6 of Griffin and Lemmon (2002):

O-score = –1.32 – 0.407 log(total assets) +6.03 (total liabilities/total assets) –1.43 (working capital/total assets) + 0.076(current liabilities/current assets) – 1.72(1 if total liabilities>total assets, or 0 otherwise) – 2.37 (net income/total assets) – 1.83(funds from operations/total liabilities) +0.285 (1 if net loss for the last two year, 0 otherwise) – 0.521(CHIN) (1)

where CHIN is the ratio of change in net income to absolute total net income in last 2 years.[1]

Classification of institutional investors

Thomson Financial CDA/Spectrum classifies institutions into five types: 1-bank trusts, 2-insurance companies, 3- investment companies, 4- investment advisors, and 5- others (pension funds, endowments, etc.). These groups have different relationship with and also have different impacts on the firms they invest. Thus, the relation between each type and stock returns may be different. Because type 1 and 2 have high ties with the firms in which they invest than type 3, 4, and 5, we classify type 1 and 2 as dependent institutions and the rest as independent ones. For each stock, we define dependent (independent) institutional ownership (trading) by the ratio of number of share held (traded) by dependent (independent) institutional investors and the total number of shares outstanding.

We also follow Yan and Zhang (2009) to classify institutions into short and long –term investors based on their portfolio turnover over the past four quarters. Specially, each quarter, we compute the aggregate purchase for each institution:

$$CR\_buy_{k,t} = \sum_{i=1}^{N_k} \left| S_{k,i,t} P_{i,t} - S_{k,i,t-1} P_{i,t-1} - S_{k,i,t-1} \Delta P_{i,t} \right| \quad (2)$$

[1] Our results are consistent when use the CHS measure of distress risk developed by Campbell, Hilscher, and Szilagyi (2008).

when $S_{k,i,t} > S_{k,i,t-1}$

and the aggregate sale for each institution:

$$CR\_sell_{k,t} = \sum_{i=1}^{N_k} \left| S_{k,i,t} P_{i,t} - S_{k,i,t-1} P_{i,t-1} - S_{k,i,t-1} \Delta P_{i,t} \right| \quad (3)$$

when $S_{k,i,t} \leq S_{k,i,t-1}$

where $S_{k,i,t-1}$ and $S_{k,i,t}$ are the number of shares of stock i held by institution k at the end of quarter t-1 and t, and $P_{i,t-1}$ and $P_{i,t}$ are the prices of stock i at the end of quarter t-1 and t. N_k is the total number of stocks held by institution k at the end of quarter t. $CR\_buy_{k,t}$ and $CR\_sell_{k,t}$ are the aggregate purchase and sale of institution k at the end of quarter t. We then calculate the churn rate for institution k in quarter t as follow:

$$CR_{k,t} = \frac{\min\left(CR_{buy}{}_{k,t}, CR_{sell_{k,t}}\right)}{\sum_{i=1}^{N_k} \frac{S_{k,i,t} P_{i,t} + S_{k,i,t-1} P_{i,t-1}}{2}} \quad (4)$$

Next, we compute the average churn rate for institution k over the past four quarters ($AVG\_CR_{k,t}$). Then, each quarter, we sort all institutions into three tertile portfolios based on $AVG\_CR_{k,t}$. Institutions ranked in the top tertile are classified as short term institutional investors while the institutions ranked the bottom tertile are defined as long-term institutional investors.

Data and sample selection

We collect stock returns, prices, volume, and number of shares outstanding from the Center for Research in Security Prices (CRSP) daily tapes for all ordinary common stocks (share code of 10 and 11). We also use COMPUSTAT files to calculate book value, leverage ratio, dividend, total assets, return on equity, research and development, and capital expenditures. Because institutional holding data is available since 1980 and distress risk significantly affects stock returns since 1981 (Dichev 1998 and Campbell et al. 2008), we choose the period of time from the fourth quarter of 1980 to 2008. Following Pastor and Veronesi (2003), we exclude any observation with market to book less than 0.01 or greater than 100. We eliminate any observation with total assets and market capitalization and book value less than $1 million, or

any observation with return on equity greater than 100 or less than -100. We also require an observation with more than 10 daily stock returns available a quarter to calculate stock's systematic and idiosyncratic risks. Financial companies are also excluded from our sample because their leverage is monitored by regulations.

We obtain institutional holding data from Thomson Financial CDA/Spectrum 13F filings for all ordinary common stocks traded on New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and National Association of Securities Dealers Automated Quotations (NASDAQ) from 1980 to 2008. Similar to Campbell et al. (2008), we clean this database because it contains numerous missing and errors. In our calculation, there are about 6% of quarter-stock-institution duplicated observations. We just keep only the latest report of latest FDATE for each report date. Institutional holding (IH) for each stock is calculated by the sum of its shares held by all institutions to total shares outstanding, institutional trading (IT) is the change in institutional holding in two subsequent quarters, and institutional herding for a certain stock is the ratio of the number of net buyers of that stock to total number of net buyers and number of net sellers. We then merge data from COMPUSTAT and CRSP with institutional holding database from CDA/Spectrum.

Firm's characteristics

We follow Pastor and Veronesi (2003) to define leverage as the ratio of long –term debt and total assets. We use CRSP annual data to calculate the firm's age which is assigned the value of one in the year when this firm is born and increases by one in each consequent year. We also focus on the following firm's characteristics:

- ME- market capitalization calculated as average logarithm of daily share price times total shares outstanding over a quarter.
- Dividend- firm's total dividend to total assets at the end of fiscal year.
- BM- the ratio of book value and market capitalization at the end of fiscal year or quarter.
- Price- share price from CRSP
- Turn- the turnover calculated as trading volume divided by total number of shares outstanding.

- Beta- time varying systematic risk which is calculated by regressing individual stock on value weighted rate of return from CRSP for each quarter.
- SPRISK- idiosyncratic risk – which is errors from the regression of individual stock on value weighted rate of returns from CRSP for each quarter.
- STD- volatility estimated as the standard deviation of daily stock returns over a quarter.
- ROE- return on equity at the end of fiscal year.
- RET- cumulative daily returns over a quarter.
- OSCORE- the Ohlson's (1980) O-score.
- CHS- the CHS distress risk measure developed by Campbell, Hilscher, and Szilagyi (2008).

Descriptive statistics

Each year, we sort all firms from COMPUSTAT into 5 groups based on their O-score, we then merge quarterly firm's characteristics estimated from CRSP and institutional holding data from Thomson Financial CAD/Spectrum next year. Table 1 reports the time series median of these 113 cross-sectional averages from the last quarter of 1980 to the end of 2008. On average, cumulative daily returns over a quarter slightly increase for the firms with low O-score but significantly decrease with default probability when this measure is high. Consistent with return pattern, return on equity, total asset or market capitalization, share price, and turnover also go down with O-score when it is high.

Although leverage decreases for firms with very high default probability, these firms have significantly higher leverage level than firms with low O-score do. Because using high leverage, according to George and Huang (2010), firms with high O-score have low distress costs. However, table 1 shows that these firms perform worse than firms with low default probability and leverage. This explanation generally seems to not hold for all stocks.

Tab. 1: Time series statistics of cross sectional median of the main variables

Group	1	2	3	4	5
Cumulative returns (%)	1.68	1.86	1.76	0.49	-3.23
O-score	-4.14	-2.18	-1.03	0.17	2.40
ROE	0.18	0.14	0.11	0.06	-0.34
BM	0.44	0.59	0.71	0.73	0.42
Leverage	0.01	0.13	0.22	0.25	0.13
Total Assets	4.79	5.33	5.32	4.57	3.22
ME	12.37	12.38	11.97	10.92	9.99
Age	12	14	14	11	8
Price	18.13	17.63	14.75	8.25	3.19
Turnover (%)	3.15	2.83	2.57	2.23	2.26
Std	0.03	0.03	0.03	0.03	0.05
Yield	0.00	0.00	0.00	0.00	0.00
Beta	0.77	0.72	0.62	0.55	0.53
Idiosyncratic	0.03	0.02	0.02	0.03	0.05
Holding (%)	39.79	39.65	32.64	18.71	6.50
Trading (%)	2.48	2.36	1.95	0.97	0.12
Independent Holding (%)	27.70	27.32	23.46	13.90	4.61
Dependent Holding (%)	7.99	8.84	6.93	3.02	0.67
Long-term Holding (%)	7.11	7.51	6.37	3.90	1.23
Short-term Holding (%)	15.53	15.50	12.49	6.35	1.01
Number	45	47	34	15	8
Observations	9,213	76,607	77,284	76,101	65,152

Source: authors' calculations

This table reports the time series statistics of cross sectional median of the main variables used in this paper. The sample period is from the fourth quarter of 1980 to the end of 2008. Cumulative returns are the cumulative daily returns over a quarter, O-score is Ohlson (1980)'s O-score, ROE is return on equity, BM is book-to-market at the end of fiscal year, Leverage is long term-debt to total asset, Total assets is logarithm of firm's total assets at the end of fiscal year, and ME is average daily logarithm of firm's market capitalization over a quarter. Age is firm's age, price is average daily share price over a quarter, turnover is calculated by the average daily trading volume divided by total number of shares over a quarter, Std is standard deviation of daily stock returns over a quarter and yield is dividend yield. Beta is estimated by running the regression of daily stock returns on daily market returns over a quarter and Idiosyncratic is idiosyncratic volatility which is sum of the errors from the regression of daily stock returns on daily market returns over a quarter. Holding is institutional holding which is computed by the sum of total shares held by all institutions to total shares outstanding. Trading is institutional trading which is the change in institutional holding. Independent holding, Dependent holding, Long-term holding, and Short-term holding are holding by independent, dependent, long-term and short-term institutions, respectively.

Our explanation of distress risk puzzle is based on the role of institutional investors. The low return level of high distress firms is due to the low levels of institutional ownership and trading. As shown in table 1, the median of average institutional ownership declines from 39.79% of group 1 to 6.5% of group 5, and the median of average institutional trading decreases from 2.48% to 0.12%, respectively. All types of institutions also hold and trade fewer stocks with high default probability.

As documented by recent studies (Gompers and Metrick 2001 and Sias et al. 2001), institutional investors have information advantage and their holdings are often considered as a proxy for the high supply of lendable shares. Thus, an increase in institutional holding or trading will make stock frequently traded. As a result, time varying systematic risk of this stock will increase while its idiosyncratic risk will decrease with institutional holdings or trading. This interpretation is supported by the actual figures in table 1. The median of stock time-varying beta declines from 0.77 of group 1 to 0.53 of group 5 while the median of stock idiosyncratic is goes up from 0.03 to 0.05, respectively.

Distress risk, the cross section of stock returns, and institutional investors

Changes in firm's characteristics and institutional behaviors

Table 1 documents the positive relation between stock returns and institutional holding and trading. In this section, we will provide more evidence on this relation by examining the changes in institutional holding and trading over time and the impact of these changes on stock returns.

If institutions have information advantage and prefer large and "prudent" stocks, their holding and trading will decrease for downgrading firms and will increase for upgrading firms. Thus, we expect that institutional holding or trading for firms with high O-score (underperformance) will decrease over time and institutional holding or trading for firms with low O-score (outperformance) will increase.

Tab. 2: Changes in firm's characteristics, O-score and institutional behaviors

Panel A: Highest and Lowest O-score groups

	Highest O-score group			Lowest O-score group		
	Year -1	Year -2	Year -3	Year -1	Year -2	Year -3
O-score	2.66	2.64	2.57	-4.19	-4.19	-4.20
Cumulative returns	-7.61	-5.22	-3.27	3.58	3.73	3.54
ROE	-0.39	-0.40	-0.39	0.17	0.16	0.16
ME	10.09	10.29	10.36	12.34	12.27	12.21
Assets	3.24	3.32	3.40	4.92	5.06	5.18
Price	3.41	4.25	4.75	19.25	18.71	18.13
Beta	0.54	0.58	0.59	0.82	0.80	0.79
Idiosyncratic	0.05	0.04	0.04	0.03	0.03	0.03
Holding	7.08	8.34	9.05	38.49	37.12	35.80
Trading	0.11	0.24	0.31	2.77	2.62	2.45
In-Holding	5.03	6.06	6.56	27.23	26.20	25.01
De-Holding	0.69	0.85	0.97	7.47	7.21	7.08
Long-Holding	1.22	1.40	1.55	6.42	6.34	6.19
Short-Holding	1.26	1.91	2.20	16.10	15.41	14.65
Num	7	7	8	40	38	35
Observations	76,913	69,743	59,270	79,863	73,165	65,843

Panel B: Positive and negative changes in O-score

	Negative change in O-score			Positive change in O-score		
	Year +1	Year -1	Year -2	Year +1	Year -1	Year -2
Oscore	-1.70	-1.70	-1.70	-0.64	-0.59	-0.58
Cumulative returns	**6.7%**	**5.01%**	**1.21%**	**0.5%**	**-0.08%**	**1.16%**
ROE	0.13	0.13	0.12	0.05	0.05	0.04
ME	11.81	11.68	11.59	11.53	11.61	11.72
Assets	4.90	4.93	4.99	4.91	4.94	4.98
Price	**14.13**	**13.50**	**12.13**	**11.38**	**11.82**	**13.25**
Beta	0.68	0.67	0.66	0.62	0.65	0.68
Idiosyncratic	0.03	0.03	0.03	0.03	0.03	0.03
Holding	**31.49**	**29.42**	**28.07**	**28.96**	**29.23**	**29.60**
Trading	**1.81**	**1.73**	**1.60**	**1.49**	**1.57**	**1.81**
In-Holding	22.40	20.77	19.99	20.60	20.75	21.01
De-Holding	5.88	5.40	5.12	5.22	5.39	5.45
Long-Holding	5.86	5.43	5.23	5.71	5.59	5.31
Short-Holding	11.92	11.11	10.53	10.35	10.76	11.47
Num	28	25	23	23	24	25

Source: Authors' calculation

This table reports the changes in the median of firm's characteristics, institutional holding and trading over time. The sample period is from the fourth quarter of 1980 to the end of 2008. Cumulative returns are the cumulative daily returns over a quarter, O-score is Ohlson (1980)'s O-score, ROE is return on equity, Total assets is logarithm of firm's total assets at the end of fiscal year, and ME is average daily logarithm of firm's market capitalization over a quarter. Price is average daily share price over a quarter. Beta is estimated by running the regression of daily stock returns on daily market returns over a quarter and Idiosyncratic is idiosyncratic volatility which is sum of the errors from the regression of daily stock returns on daily market returns over a quarter. Holding is institutional holding which is computed by the sum of total shares held by all institutions to total shares outstanding. Trading is institutional trading which is the change in institutional holding. In-Holding, De-Holding, Long-Holding, and Short-Holding are independent, and dependent, long-term and short-term institutional holding, respectively. In Panel A, each year, we sort all firms into quartiles. The highest O-score group consists of all firms with O-score greater than 80th percentile breakpoint while the lowest O-score group includes all firms with O-score less than 20th percentile breakpoint. Panel A summarizes the median of firm's characteristics, institutional holding and trading of these two groups over three previous years from the time of portfolio formation. In Panel B, we sort firms into 2 groups based on the changes in O-score: the positive change and negative change. We report the median of firm's characteristics, institutional holding and trading of these two groups over the period of time from 2 previous years to 1 year after the time of portfolio construction.

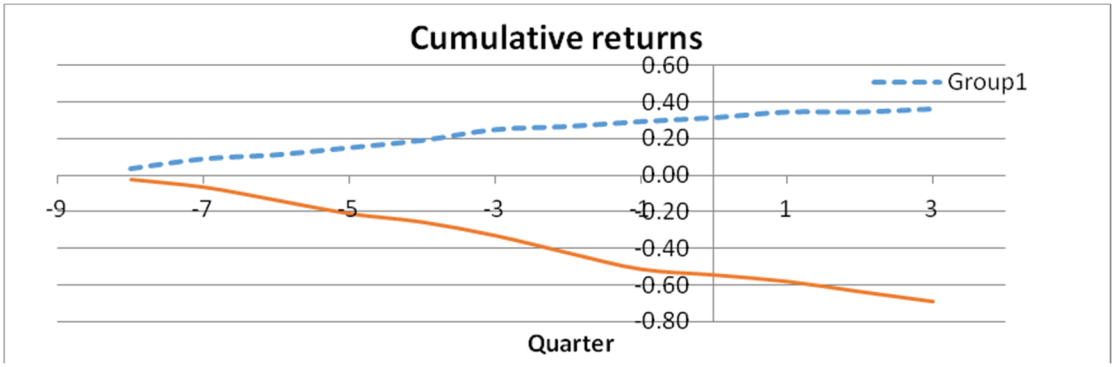
In panel A of table 2, we focus on two types of firms- the firms with the lowest O-score and the firms with the highest O-score. Each year, we sort all firms based on their O-score into 5 groups. Highest O-score group consists of all firms with O-score greater than 80th percentile breakpoint while lowest O-score group include all firms with O-score less than 20th percentile breakpoint. We then investigate the changes in firm's characteristics and institutional behaviors over three previous years.

As expected, institutional holding and trading of the highest O-score group have decreased while these institutional holding and trading of the lowest O-score group have increased over time. The decrease in institutional holding and trading of the highest O-score group have lowered stock prices, thus cause the returns of firms in this group to decrease. The median of share prices of the highest O-score group declines from $4.75 in the previous three years to $3.41 in the previous year when this group is formed. Similarly, the median of stock returns of this group also go down from -3.27% to -7.61%, respectively.

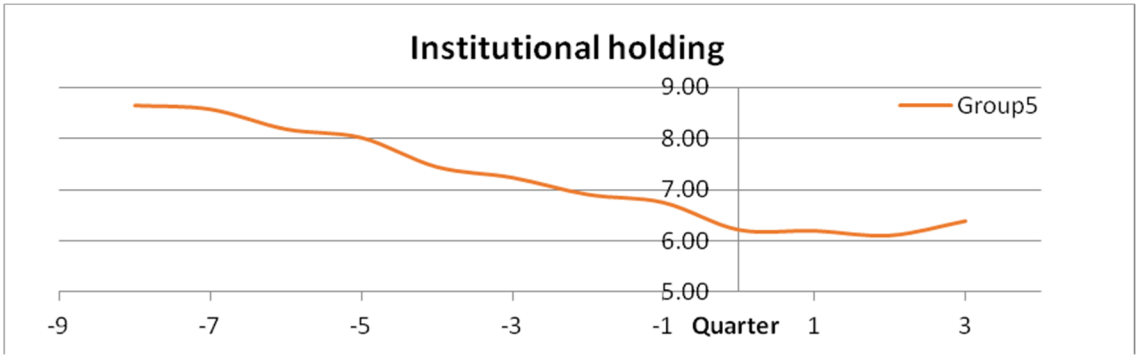
We further investigate the impact of institution behaviors on the stock returns of distress firms by examining the changes in firm's characteristics and institutional holding and trading due to the change in firm's distress risk. Each year, we sort all firms into 2 groups based on the change in O-score. The positive change in O-score implies that firm's distress risk is increasing and the negative change in O-score means that this risk is decreasing. We then examine the change in firm's characteristics and institution behaviors over 2 previous years. The results are reported in the panel B of table 2.

Similar to the results in the panel A of table 2, the outcomes in the panel B and in figure 1 show the opposite patterns in changes in firm's characteristics and institution behaviors of the two groups of firms. For firms with negative change in O-score, institutional holding and trading have increased, pushed up their share prices and caused their returns to increase. Moreover, their stocks are traded more frequently, pushing up their time varying beta. On the other hand, institutional holding and trading of unperformed firms (firms with positive change in O-score) have decreased and pushed down their share prices and stock returns.

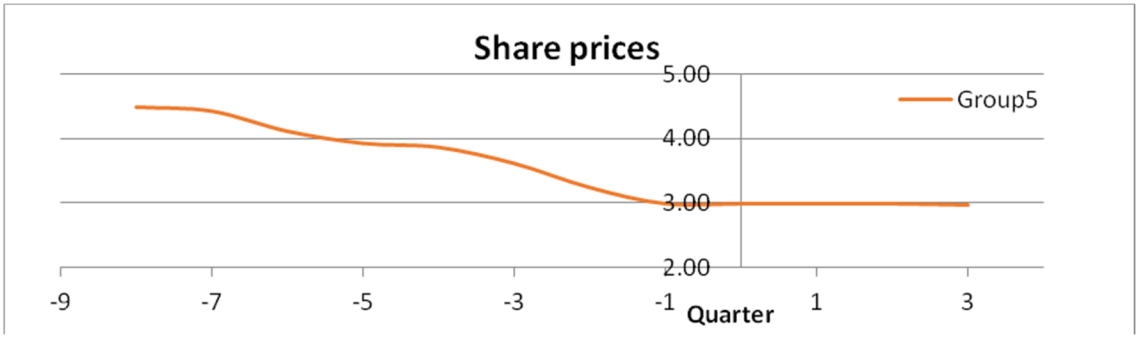
Fig. 1: Changes in cumulative returns, institutional holding and share prices
Panel A: Cumulative quarterly returns



Panel B: Change in institutional holding



Panel C: Change in share prices



Source: Authors' calculation

This figure shows the changes in cumulative quarterly returns, institutional holding and stock returns over the period of time from 2 previous years 1 year after the time of portfolio formations. Panel A reports the cumulative quarterly returns of group 1 (the lowest O-score group) and 5 (the highest O-score group), while Panel B and C report the changes in institutional holding and share prices of group 5, respectively.

One question may arise here that why do individual investors trade stocks in distress? There are some scenarios for this question. First, individual investors do not have good information and they do not process information effectively. In this case, they hold or trade these stocks due to lack of information. Second, the low share prices of these stocks may be attractive to them. Third, due to market microstructure, individual investors cannot sell or arbitrage these stocks immediately. Fourth, the cost of transaction for these stocks is high because institutional investors are reluctant to buy these stocks.

Distress risk and the cross section of stock returns

Dichev (1998), Griffin and Lemmon (2002), and Campbell at el. (2008) document that stock with high default probability earn low returns, especially since 1980. They find that under standard finance theory, this puzzle cannot be explained because the loadings on market premium, size or book-to-market are high. In this section, we document this puzzle and use institutional holding or trading to explain it.

Following Gompers and Metrick (2001), and Yan and Zhang (2009), we include three sets of firm characteristics in own analysis. Firm size, book-to-market, and lag return can be used to proxy for common risks (e.g. Fama and French 1992). Firm size, turnover, and S&P 500 is used to capture liquidity and transaction costs while firm size, book-to-market, share price, dividend

yield and firm's age are used to proxy for stock "prudence" (e.g. Falkenstein 1996). Because distress risk is mainly caused by firm leverage, we also include leverage to examine the effect of distress risk and institutional holding on stock returns.

Using Fama and Macbeth (1973)'s method, each quarter we run the following cross sectional regression of stock returns on firm characteristics and institutional activities:

$$RET_{i,t} = \alpha_o + \alpha_1 O\text{-}SCORE_{i,t-j} + \alpha_2 INS_{i,t} + \alpha_3 LEVERAGE_{i,t-j} + \alpha_4 ME_{i,t-1} + \alpha_5 BM_{i,t-j} + \alpha_6 RET_{i,t-1} + \alpha_7 PRC_{i,t-1} + \alpha_8 TURN_{i,t-1} + \alpha_9 AGE_{i,t} + \alpha_{10} STD_{i,t-1} + \alpha_{11} YIELD_{i,t-j} + \alpha_{12} SP_{i,t} + e_{i,t} \quad (5)$$

where INS is either institutional holding, institutional trading, or institutional herding, and other firm's variables are defined in section 2.4; and j is the number of month(s) from the last fiscal year to the time t.

Table 3 reports the regression results for various alternative specifications. Model 1 and 2 show that default probability is significantly negatively related with stock returns whether leverage is present or not. This result implies that with such above firm characteristics, leverage measured by long term debt to total assets doesn't capture distress risk.

Tab. 3: Determinants of stock returns

Model	1	2	3	4	5	6	7
O-score	-0.001	-0.001	0.000	-0.001	-0.001	-0.001	-0.001
	(-2.35)	(-2.98)	(-1.13)	(-1.86)	(-1.72)	(-1.25)	(-1.49)
Holding			0.001	0.001		0.001	
			(14.08)	(14.16)		(7.75)	
Trading					0.006	0.006	
					(16.26)	(15.13)	
Herding							0.092
							(13.19)
Leverage	-0.017		-0.023		-0.019	-0.022	-0.017
	(-2.08)		(-2.76)		(-2.39)	(-2.70)	(-2.18)
MElag	-0.009	-0.009	-0.017	-0.018	-0.013	-0.017	-0.011
	(-8.17)	(-8.54)	(-13.13)	(-13.47)	(-11.48)	(-12.63)	(-9.60)
BM	0.007	0.007	0.003	0.002	0.006	0.004	0.007
	(2.86)	(2.50)	(1.10)	(0.74)	(2.52)	(1.65)	(2.68)
Retlag	-0.039	-0.039	-0.039	-0.038	-0.045	-0.045	-0.043
	(-4.98)	(-4.88)	(-4.94)	(-4.84)	(-5.70)	(-5.65)	(-5.49)
Pricelag	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	(3.00)	(3.15)	(1.06)	(1.25)	(3.06)	(2.07)	(3.61)
Turnlag	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003	-0.002
	(-5.28)	(-5.18)	(-7.26)	(-7.07)	(-8.69)	(-9.20)	(-5.77)
Age	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(2.79)	(2.65)	(2.76)	(2.57)	(3.89)	(3.85)	(3.09)
Stdlag	0.072	0.071	0.152	0.155	0.143	0.173	0.135
	(0.69)	(0.68)	(1.44)	(1.47)	(1.36)	(1.63)	(1.28)
Yield	-0.017	-0.022	0.016	0.009	0.019	0.029	-0.022
	(-0.30)	(-0.39)	(0.3)	(0.17)	(0.36)	(0.54)	(-0.39)
SP500	0.022	0.023	0.030	0.031	0.034	0.036	0.030
	(7.34)	(7.50)	(8.54)	(8.67)	(10.18)	(9.92)	(9.03)

Source: Authors' calculation

This table reports the results of cross sectional regressions of stock cumulative returns on O-score, firm's characteristics and institutional holding, or institutional trading or institutional herding. The sample period is from the fourth quarter of 1980 to the end of 2008. Holding, Trading, and Herding are institutional holding, trading and herding, respectively. Leverage is long-term debt to total assets, MElag is lag market capitalization, BM is book-to-market ratio at the end of fiscal year. RETlag is the lag cumulative daily returns over a quarter, Pricelag, Turnlag, and Stdlag are lag share price, turnover and standard deviation of stock returns, respectively. Age is firm's age, Yield is dividend yield, and SP500 is dummy variable which is equal 1 if a firm belongs to S&P 500 index and 0 otherwise.

When we include institution activity variables, the impact of distress risk on stock return is disappeared. T-statistics of coefficients of O-score are less than 1.86 in all models. In contrast, institutional holding, trading or herding is significantly an important factor to capture stock returns. T-statistics of coefficients of these variables are greater than 13.19 in our analysis. These results shed the light on explainable power of holding and trading by institutions on distress risk puzzle.

The results in table 3 are consistent with the findings by Nofsinger and Sias (1999), Gompers and Metrick (2001) and Sias at el. (2003) that institutional activities significantly affect stock returns. While Gompers and Metrick (2001) emphasize on the impact of demand shocks on stock returns, Nofsinger and Sias (1999) and Sias at el. (2003) focus on the information advantage of institutional investors. We examine these two effects by including institutional holdings and trading in the same regression model. Model 6 shows that both demand shock and information advantage significantly affect stock returns. However, the t-statistic of coefficient of institutional trading is higher than this figure of institutional holding, implying that information advantage

have higher impact on stock returns than demand shock does. This result is consistent with the findings by Nofsinger and Sias (1999) and Yan and Zhang (2009).

Together with institutional holding and trading, institutional herding is also an important factor explaining the cross section of stock returns (Nofsinger and Sias 1999 and Gutierrez and Kelley 2009). Our results further show that institutional herding can be used to interpret distress risk puzzle. T-statistic of coefficient of O-score decreases from -2.53 in model 1 to -1.49 in model 7, meaning that the part of impact of default probability on stock returns which is not captured by firm characteristics can be explained by institutional herding.

Interestingly, our analysis shows book-to-market and share price insignificantly affects stock returns when we include institutional holding in the model. If book-to-market is used to measure distress risk (Fama and French 1992), table 3 provides a confirmation that institutional holding can be used to capture distress risk puzzle.

Consistent with recent studies (e.g. Amihud 2002), the results in table 2 shows that liquidity is important factor affecting stock returns. T-statistics of turnover coefficients in all models are less than -5.18, implying that investors require liquidity premium to invest in equity markets. However, turnover cannot capture the impact of distress risk on stock returns. This result is supported by the figures in table 1 which show that also firms with high default probability earn low returns and their stocks are also less liquid.

Distress risk, independent institutional investors and stock returns

Because institutional investors have significantly different influence on the firms in which they invest, the impact of their holding or trading on the equity of the firms may be different. Independent institutions which have no or fewer business ties with the firms in which they invest are considered to have more informational advantage or stronger incentives to monitor firm's management than grey institutions (Jiao and Liu 2008). Thus, independent institutional holding or trading may be more sensitive to firm's fundamentals.

While Jiao and Liu (2008) emphasize on the predictive power of independent institutional trading on future stock returns, we focus on whether its trading can be used to explain distress puzzle. If independent institutions have more information advantages and can process private information better than grey ones, their activities must be more sensitive to the stocks of firms

with distress risk. They will benefit by selling stocks with bad information and buying stocks with good information in advance. This leads to a decrease in demand of stocks with high default probability and an increase in demand of stocks with low distress risk. As a result, stocks with high default probability earn lower returns.

Grey institutions, on the other hand, do not have information advantages, so their activities do not lead the equity market. Although they do not hold large amount of stocks with high default risk, their holding or trading is expected to be less sensitive to stock distress risk.

We run regression model 6 in section 3.2 of stock returns on firm characteristics and institutional variables. Instead of using institutional holding or trading generally, we focus on holding or trading by independent and dependent institutions. The results are reported in table 4.

As expected, table 4 shows that t-statistics of coefficients of institutional variables are greater than 8.01, implying that both holding and trading by independent or dependent institutions significantly affects stock returns. Further, the coefficients and t-statistics of holding and trading by independent institutional investors are larger than those of dependent institutional investors, confirming the hypothesis that independent institutional investors have more power on stock returns.

Tab. 4: Stock returns and independent and dependent institutions

	1	2	3	4	5
O-score	-0.001	0.000	-0.001	-0.001	-0.001
	(-2.35)	(-1.10)	(-2.15)	(-1.66)	(-2.34)
In-Holding		0.001			
		(13.93)			
De-Holding			0.001		
			(8.01)		
In-trading				0.008	
				(14.86)	
De-trading					0.005
					(9.91)
Leverage	-0.017	-0.022	-0.018	-0.019	-0.017
	(-2.08)	(-2.69)	(-2.29)	(-2.37)	(-2.12)
Melag	-0.009	-0.016	-0.011	-0.013	-0.009
	(-8.17)	(-13.00)	(-9.57)	(-11.51)	(-8.46)
BM	0.007	0.003	0.006	0.006	0.007
	(2.86)	(1.18)	(2.34)	(2.55)	(2.83)
Retlag	-0.039	-0.039	-0.039	-0.045	-0.041
	(-4.98)	(-4.99)	(-4.95)	(-5.63)	(-5.20)
Pricelag	0.000	0.000	0.000	0.000	0.000
	(3.00)	(1.34)	(2.30)	(3.26)	(2.93)
Turnlag	-0.002	-0.003	-0.002	-0.003	-0.002
	(-5.28)	(-7.64)	(-5.53)	(-8.82)	(-5.62)
Age	0.000	0.000	0.000	0.000	0.000
	(2.79)	(3.24)	(2.22)	(3.94)	(2.84)
Stdlag	0.072	0.156	0.086	0.145	0.081
	(0.69)	(1.47)	(0.83)	(1.38)	(0.78)
Yield	-0.017	0.038	-0.027	0.031	-0.019
	(-0.30)	(0.71)	(-0.49)	(0.58)	(-0.34)
SP500	0.022	0.034	0.019	0.034	0.023
	(7.34)	(9.58)	(6.40)	(10.08)	(7.59)

Source: Authors' calculation

This table provides the results of cross sectional regressions of stock cumulative returns on O-score, firm's characteristics and independent or dependent institutional holding or trading. The sample period is from the fourth quarter of 1980 to the end of 2008. In-Holding, De-Holding, In-Trading, and De-trading are independent and dependent institutional holding, independent and dependent trading, respectively. Leverage is long-term debt to total assets, MElag is lag market capitalization, BM is book-to-market ratio at the end of fiscal year. RETlag is the lag cumulative daily returns over a quarter, Pricelag, Turnlag, and Stdlag are lag share price, turnover and standard deviation of stock returns, respectively. Age is firm's age, Yield is dividend yield, and SP500 is dummy variable which is equal 1 if a firm belongs to S&P 500 index and 0 otherwise.

Although both activities of independent and dependent institutions have significant effects on stock returns, these investors differ in their power on capturing the impact of distress risk on stock returns. Model 3 and 5 report that default probability is significantly related to stock returns at 5% significance level, implying that holding or trading by dependent institutions don't capture the impact of default probability on equity returns. On the other hand, holding or trading by independent institutions successes to capture this impact. T-statistics of coefficients of O-score in model 2 and 4 are less than -1.66.

Table 4 also shows that book-to-market and share price become insignificant factors when independent institutional holding is present. Consistent with the results in table 2, we expect institutional holding can capture the part of impact of distress risk on stock returns.

Distress risk, short-term institutional investors, and stock returns

Because institutions differ in their degree of independence from the firms in which they invest, and their holding and trading patterns are also different, we can classify different institutions based on their business ties with the firms they invest or based on their investment horizon. As pointed by Yan and Zhang (2009), institutions may have different investment horizon because they differ in investment objectives, styles, legal restrictions, and ability to process information. If an institution processes superior information and has capacity to identify regularly overvalued or undervalued stocks, it is expected to trade more frequently than others. Further, an institution which trades more frequently may be better at collecting information. In both ways, its trading activities are expected to contain more information than infrequently trading institutions. However, if short term institutions are overconfident and trade on basis of noise, long term institutions are considered to have better information.

If short term institutions have better information, we expect that their trading activities can be used to explain distress puzzle because they are able to identify stocks in which these stocks will downgrade or upgrade. On the other hand, if long term institutions are better informed, their trading is expected to be higher sensitive to stock returns. As a result, their trading can be used to capture a part of impact of default probability on stock returns.

Another possibility of difference in trading horizon is that short term institutions have better short term information while long term institutions are better informed in the long run. In this

case, we expect that long term institutional holding or trading can be used to explain distress risk puzzle because this puzzle is related to firm's long run performance.

To examine whether institution's investment horizon can be used to explain distress risk puzzle, we run regression of stock returns on firm characteristics and holding and trading by short term and long term institutions. The model is presented in section 3.2, and the results are summarized in table 5.

Tab. 5: Stock returns and short-term and long-term institutions

	1	2	3	4	5
O-score	-0.001	-0.001	-0.001	-0.001	-0.001
	(-2.35)	(-2.38)	(-1.19)	(-2.24)	(-2.02)
Long-Holding		0.000			
		(0.26)			
Short-Holding			0.003		
			(19.44)		
Long-Trading				0.003	
				(5.20)	
Short-Trading					0.012
					(22.17)
Leverage	0.022	-0.017	-0.024	-0.017	-0.018
	(7.34)	(-2.09)	(-3.00)	(-2.16)	(-2.31)
Melag	-0.017	-0.009	-0.018	-0.009	-0.012
	(-2.08)	(-7.66)	(-14.45)	(-8.54)	(-11.02)
BM	-0.009	0.007	0.004	0.007	0.007
	(-8.17)	(2.90)	(1.44)	(2.78)	(2.68)
Retlag	0.007	-0.040	-0.041	-0.040	-0.049
	(2.86)	(-5.03)	(-5.14)	(-5.06)	(-6.24)
Pricelag	-0.039	0.000	0.000	0.000	0.000
	(-4.98)	(2.98)	(0.40)	(2.99)	(3.39)
Turnlag	0.000	-0.002	-0.003	-0.002	-0.003
	(3.00)	(-5.23)	(-9.57)	(-5.47)	(-9.38)
Age	-0.002	0.000	0.000	0.000	0.000
	(-5.28)	(2.82)	(5.09)	(2.80)	(4.25)
Stdlag	0.000	0.069	0.156	0.078	0.148
	(2.79)	(0.66)	(1.5)	(0.74)	(1.41)
Yield	0.072	-0.015	0.084	-0.014	0.035
	(0.69)	(-0.27)	(1.62)	(-0.25)	(0.67)
SP500	-0.017	0.022	0.037	0.023	0.036
	(-0.30)	(7.19)	(9.75)	(7.50)	(10.4)

Source: Authors' calculation

This table summarizes the results of cross sectional regressions of stock cumulative returns on O-score, firm's characteristics and long-term or short-term institutional holding or trading. The sample period is from the fourth quarter of 1980 to the end of 2008. Long-Holding, Short-Holding, Long-Trading, and Short-trading are long-term and short-term institutional holding, long-term and short-term trading, respectively. Leverage is long-term debt to total assets, MElag is lag market capitalization, BM is book-to-market ratio at the end of fiscal year. RETlag is the lag cumulative daily returns over a quarter, Pricelag, Turnlag, and Stdlag are lag share price, turnover and standard deviation of stock returns, respectively. Age is firm's age, Yield is dividend yield, and SP500 is dummy variable which is equal 1 if a firm belongs to S&P 500 index and 0 otherwise.

Table 5 presents that both holding and trading by short- term or long- term institutions are significantly positively related to stock returns. Because both t-statistics and coefficients of holding and trading by short-term institutions are higher than those of long- term ones, short term institutions can be considered to have information advantage. This result is consistent with the finding by Yan and Zhang (2009).

Although holding or trading by long- term institutions significantly affects stock returns, O-score is still significantly correlated with stock returns. It implies the activities of these institutions cannot capture an impact of distress risk on stock returns. On the other hand, when the holding or trading by short-term institutions is present, O-score becomes an insignificant factor affecting stock returns. Thus, short- term institution activities can be used to capture a part of this impact.

The different impact of holding and trading by short term or long term institutions on stock returns can be partly explained the different information role of each type of investors in equity market. In addition to findings by Yan and Zhang (2009), the results in table 5 suggest that short-term institutional investors are considered to be active and more informed.

3.5. Demand shocks and information advantage

Gompers and Metrick (2001) and Sias et al. (2003) document that the positive relation between institutional holding and stock returns can be explained by demand shocks or information advantage. While demand shocks focus on the pressure to push up share price when institutions hold or buy large amount of a certain stock, information advantage emphasizes on the herding or short-term trading by institutions.

In this section, we investigate both impacts on the returns of stocks with distress risk. Table 6 shows that both institutional holding generally considered to capture demand shocks and institutional trading which is used to proxy for information advantage significantly affect stock

returns after we control for stock default probability. However, both t-statistics and coefficients of institutional trading are higher than those figures of institutional holding, implying that information advantage seems to have higher impact on stock returns. This hypothesis is supported by the stronger impacts of short-term institutional trading.

Tab. 6: Stock returns, institutional holding and institutional trading

Model	1		2		3	
Holding	0.001	(7.75)				
Trading	0.006	(15.13)				
In-Holding			0.001	(7.09)		
In-Trading			0.007	(13.82)		
Short-Holding					0.001	(12.03)
Short-Trading					0.011	(20.84)
O-score	-0.001	(-1.25)	0.001	(-1.21)	-0.001	(-1.42)
Leverage	-0.022	(-2.70)	-0.021	(-2.64)	-0.022	(-2.79)
MElag	-0.016	(-12.63)	-0.016	(-12.76)	0.017	(-13.56)
BM	0.004	(1.65)	0.005	(1.75)	0.005	(1.84)
Retlag	-0.045	(-5.65)	-0.044	(-5.60)	-0.049	(-6.22)
Pricelag	0.000	(2.07)	0.000	(2.42)	0.000	(1.87)
Turnlag	-0.003	(-9.20)	-0.003	(-9.36)	-0.004	(-10.83)
Age	0.000	(3.85)	0.000	(4.11)	0.000	(5.33)
Stdlag	0.173	(1.63)	0.176	(1.65)	0.184	(1.76)
Yield	0.029	(0.54)	0.048	(0.91)	0.082	(1.60)
SP500	0.036	(9.92)	0.038	(10.30)	0.042	(10.73)

Source: Authors' calculation

This table reports the results of cross sectional regressions of stock cumulative returns on O-score, firm's characteristics and institutional holding or trading. The sample period is from the fourth quarter of 1980 to the end of 2008. Holding and trading are institutional holding and trading, respectively. In-Holding, In-Trading, Short-Holding, and Short-Trading are independent institutional holding and trading, short-term institutional holding and trading, respectively. Leverage is long-term debt to total assets, MElag is lag market capitalization, BM is book-to-market ratio at the end of fiscal year. RETlag is the lag cumulative daily returns over a quarter, Pricelag, Turnlag, and Stdlag are lag share price, turnover and standard deviation of stock returns, respectively. Age is firm's age, Yield is dividend yield, and SP500 is dummy variable which is equal 1 if a firm belongs to S&P 500 index and 0 otherwise.

Distress risk and institutional investors

Prior sections document that holding or trading by institutions, especially independent or short-term ones, can be used to capture distress risk puzzle. In this section, we investigate the relation between default probability and institutional holding and trading. If holding or trading by

institutions can explain distress risk puzzle, it is hypothesized that default probability is significantly correlated with the institutional activities.

Tab. 7: Time series correlations between default probability and institutional holding and trading

	O-score	Holding	Trading	Num	In-Holding	De-Holding	Long-Holding	Short-Holding
O-score	1							
Holding	-0.15	1						
	<.0001							
Trading	-0.05	0.41	1					
	<.0001	<.0001						
Num	-0.11	0.53	0.1	1				
	<.0001	<.0001						
In-Holding	-0.13	0.96	0.4	0.46	1			
	<.0001	<.0001	<.0001	<.0001				
De-Holding	-0.13	0.65	0.26	0.48	0.42	1		
	<.0001	<.0001	<.0001	<.0001	<.0001			
Long-Holding	-0.11	0.67	0.3	0.46	0.6	0.56	1	
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001		
Short-Holding	-0.12	0.88	0.4	0.41	0.87	0.5	0.4	1
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	

Source: Authors' calculation

This table provides the time series correlations between default probability and institutional holding and trading. The sample period is from the fourth quarter of 1980 to the end of 2008. O-score is Ohlson (1980)'s O-score, Holding, Trading, and Num are institutional holding, institutional trading and the number of institutions involving in a certain stocks. In-Holding, De-Holding, Long-Holding, and Short-Holding are holding by independent, dependent, long-term, and short-term institutions, respectively.

Table 7 reports the results of time series correlations between O-score and holding and trading by institutions. Interestingly, O-score is significantly negatively correlated with all institution activity variables at 0.1% significance level. These results present that institutions prefer stocks with low default probability to stocks with high default probability. Because institutions are considered to have information advantage, their holding or trading should affect high stock returns. Thus, due to low holding and trading by institutions, it is reasonable to induce that stocks with high default probability earn low returns than stocks with low default probability.

We further investigate the relation between institution activities and stock's default probability and other firm's characteristics by running the regression of institutional holding and trading on O-score and other explanatory variables. In summary, our model is as follow:

$$INS_{i,t} = \alpha_o + \alpha_1 O\text{-}SCORE_{i,t-j} + \alpha_2 LEVERAGE_{i,t-j} + \alpha_3 ME_{i,t-1} + \alpha_4 BM_{i,t-j} + \alpha_5 RET_{i,t-1} + \alpha_6 PRC_{i,t-1} + \alpha_7 TURN_{i,t-1} + \alpha_8 AGE_{i,t} + \alpha_9 STD_{i,t-1} + \alpha_{10} YIELD_{i,t-j} + \alpha_{11} SP_{i,t} + e_{i,t} \quad (6)$$

where INS is either institutional holding, institutional trading, or institutional herding, and other firm's variables are defined in section 2.4; j is the number of month(s) from the last fiscal year to the month t.

Table 8 presents that market capitalization, share price and turnover are significantly positively correlated with institutional holding, while stock volatility is significantly negatively at 1% significance level. Consistent with the findings by Falkenstein (1996), our results suggest that institutions prefer large and "prudent" stocks. However, table 8 shows that firm's age and share prices are significantly related to institutional trading, especially trading by short term or independent institutions. Thus, although institutions prefer large stocks, they also shift their preference to small and young stocks to earn abnormal returns.

Tab. 8: Determinants of institutional holding and trading

	Holding	Trading	In-Holding	In-Trading	Short-Holding	Short-Trading	Herding
O-score	-0.438	-0.042	-0.380	-0.039	-0.178	-0.012	-0.005
	(-14.95)	(-10.09)	(-15.16)	(-10.53)	(-11.65)	(-5.27)	(-13.15)
Leverage	5.014	0.388	4.419	0.345	3.153	0.189	0.017
	(6.88)	(4.18)	(7.96)	(4.10)	(7.54)	(2.90)	(2.60)
Melag	7.847	0.717	5.856	0.608	3.832	0.290	0.040
	(30.79)	(29.47)	(23.1)	(23.14)	(32.50)	(17.82)	(15.74)
BM	3.701	0.128	2.976	0.098	1.212	0.032	0.006
	(14.12)	(3.64)	(13.57)	(3.26)	(9.98)	(1.70)	(3.62)
Retlag	-0.945	0.940	-0.597	0.686	0.218	0.864	0.039
	(-4.77)	(11.13)	(-3.47)	(10.64)	(1.70)	(15.73)	(12.75)
Pricelag	0.169	0.000	0.112	-0.004	0.107	-0.003	-0.001
	(14.93)	(0.12)	(12.44)	(-2.41)	(13.09)	(-2.08)	(-8.88)
Turnlag	0.531	0.149	0.525	0.134	0.518	0.092	0.002
	(14.68)	(15.65)	(16.32)	(19.04)	(16.21)	(17.11)	(3.76)
Age	-0.008	-0.016	-0.042	-0.014	-0.087	-0.010	0.000
	(-0.72)	(-9.16)	(-4.02)	(-8.78)	(-12.55)	(-10.32)	(0.25)
Stdlag	-95.367	-14.131	-85.061	-11.599	-41.919	-6.796	-0.720
	(-10.11)	(-10.84)	(-10.29)	(-11.17)	(-8.93)	(-8.55)	(-11.77)
Yield	-35.013	-5.482	-43.054	-5.666	-42.555	-4.271	0.095
	(-5.65)	(-4.67)	(-8.12)	(-5.01)	(-12.88)	(-8.15)	(1.67)
SP500	-8.353	-1.942	-10.417	-1.765	-6.084	-1.193	-0.107

(-6.50)	(-11.78)	(-9.47)	(-11.43)	(-9.05)	(-11.83)	(-16.53)

Source: Authors' calculation

This table reports the results of cross sectional regressions of institutional holding and trading on O-score and firm's characteristics. The sample period is from the fourth quarter of 1980 to the end of 2008. Holding and trading are institutional holding and trading, respectively. In-Holding, In-Trading, Short-Holding, and Short-Trading are independent institutional holding and trading, short-term institutional holding and trading, respectively. Herding is institutional herding. Leverage is long-term debt to total assets, MElag is lag market capitalization, and BM is book-to-market ratio at the end of fiscal year. RETlag is the lag cumulative daily returns over a quarter, Pricelag, Turnlag, and Stdlag are lag share price, turnover and standard deviation of stock returns, respectively. Age is firm's age, Yield is dividend yield, and SP500 is dummy variable which is equal 1 if a firm belongs to S&P 500 index and 0 otherwise.

Although after controlling firm characteristics used to proxy for stock prudence, liquidity, and predictive capacity on stock returns, we find that default probability is significantly negatively related to institutional holding, trading or herding at 1% significance level. This result supports to the hypothesis that institutional investors prefer "prudent" stocks (Falkenstein 1996), and more importantly can explain the negative relation between default probability and stock returns. Thus, under the institutional holding and trading scenarios, firms with high default probability which are generally small and perform poorly earns low returns due to the lack of institutional interests.

Distress risk, firm's fundamentals and institutional investors

Thus far we have shown that firms with high default probability earn low returns because they are not attractive to institutions. To provide more evidence that institutional investors do not prefer stocks with high distress risk, we examine the relation between institutional holding or trading and firm's characteristics. Especially, we investigate why institutions do not prefer the characteristics of firms with high default probability.

Prior literature documents that institutions prefer large, liquid and "prudent" stocks (Falkenstein 1996, and Gompers and Metrick 2001), and this pattern is persistent over time. Further, due to information advantage, holding or trading by institutions is significantly positively related to stock future returns or firm's future performance.

In contrast, firms with high default probability are usually small and perform worse. As documented in table 1, firms in the last quintile are much small which low share price, illiquidity and they also perform worse. Thus, the characteristics of these firms are not interesting to the institutional investors.

We further investigate the relation between firm characteristics and default probability by running the cross sectional regression of firm size and performance on firm default probability, institutional holding and trading, and other firm characteristics. Table 9 reports the average coefficients and t-statistics over 113 quarters.

Tab. 9: Distress risk and firm fundamentals

Variables	ME		ROE		Leverage		ROE	
O-score	-0.035	(-14.23)	-0.109	(-14.75)	0.014	(18.94)	-0.109	(-14.74)
Holding	0.026	(65.56)	0.001	(3.36)	0.000	(3.93)		
Trading							0.003	(5.47)
Leverage	0.789	(20.55)	0.666	(9.80)			0.674	(9.7)
Melag			-0.029	(-4.00)	0.019	(23.51)	-0.020	(-3.12)
BM	-0.565	(-29.86)	0.018	(1.27)	0.030	(16.35)	0.024	(1.62)
Retlag	0.281	(16.57)	0.048	(3.74)	0.000	(-0.23)	0.043	(3.39)
Pricelag	0.035	(23.23)	0.001	(3.84)	-0.001	(-9.98)	0.002	(4.14)
Turnlag	0.043	(13.10)	0.003	(2.10)	-0.001	(-1.59)	0.003	(2.18)
Age	0.009	(13.98)	-0.001	(-1.37)	0.001	(12.61)	0.001	(-1.49)
Stdlag	-11.783	(-22.07)	-2.128	(-4.67)	-0.356	(-8.93)	-2.266	(-5.04)
Yield	2.641	(5.83)	0.321	(1.01)	0.211	(5.63)	0.246	(0.77)
SP500	1.636	(25.98)	0.038	(1.90)	-0.042	(-17.74)	0.028	(1.46)

Source: Authors' calculation

This table provides the results of cross sectional regressions of firm's market capitalization, return on equity, and leverage on O-score, firm's characteristics, and institutional holding or trading. The sample period is from the fourth quarter of 1980 to the end of 2008. O-score is Ohlson (1980)'s O-score. Holding and trading are institutional holding and trading, respectively. Leverage is long-term debt to total assets, MElag is lag market capitalization, and BM is book-to-market ratio at the end of fiscal year. RETlag is the lag cumulative daily returns over a quarter, Pricelag, Turnlag, and Stdlag are lag share price, turnover and standard deviation of stock returns, respectively. Age is firm's age, Yield is dividend yield, and SP500 is dummy variable which is equal 1 if a firm belongs to S&P 500 index and 0 otherwise.

Consistent with the evidence in table 1, the results in table 9 show that default probability is significantly negatively related to firm size and profitability. This implies that firms with high default probability are small with poor performance. Due to these characteristics, institutional investors are reluctant to hold stocks of these firms.

Conclusion

This paper contributes to the literature on financial distress risk puzzle by emphasizing the role of institutional investors in the equity markets. We find that the distress risk puzzle documented in previous studies (Dichev 1998, Griffin and Lemmon 2002, Campbell et al. 2008, and George

and Huang 2010) can be explained by the behavior of institutions. Because institutional investors don't prefer the characteristics of firms with high default probability, they tend to switch their holding and trading to stocks of firms with low probability of default. These capital flows will plunge the share prices of these stocks. As a result, their returns will be low in the near future. This explanation assumes that institutions have information advantage and their trading significantly impact stock returns. Interestingly, this assumption is supported by many empirical studies (Falkenstein 1996, Gompers and Metrick 2001, Jiao and Liu 2008, and Yan and Zhang 2009).

While both holding and trading by dependent or long- term institutions insignificantly affect contemporaneous stock returns, they don't capture the impact of default probability on stock returns after some common firm's characteristics are controlled. In contrast, either holding or trading by independent or short- term institutions significantly positively affect stock returns and also capture the impact of distress risk on stock returns. These findings support the hypothesis that short-term or independent institutions have superior information over long term or dependent institutions in the equity market suggested by Jiao and Liu (2008), and Yan and Huang (2009).

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