Time-varying Return Predictability of Net Stock Issues and Profitability*

Shujing Wang
Hong Kong University of Science and Technology
Clearwater Bay, Kowloon, Hong Kong
Tel: (852) 2358-7666; fax: (852) 2358-1749
Email: shujingwang@ust.hk

K.C. John Wei
Hong Kong University of Science and Technology
Clearwater Bay, Kowloon, Hong Kong
Tel: (852) 2358-7676; fax: (852) 2358-1749
Email: johnwei@ust.hk

Abstract: The return predictability of net stock issues and profitability has changed significantly in the past four decades. While the return-profitability relation has weakened, the return-net stock issues relation has strengthened over time. A model of investment under uncertainty with convex external financing costs suggests that the decreasing level and decreasing persistence of firm profitability may explain the time-varying return predictability of net stock issues and profitability, respectively. We provide empirical evidence that while the change in firm fundamentals (i.e., profitability) can fully explain the time trend in the return predictability of net stock issues, investor sentiment cannot, contrary to what the market timing theory suggests. The return predictability of net stock issues increases more significantly for small, growth, and young firms since these firms tend to experience a larger decrease in the level of profitability over time.

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Corresponding author: K.C. John Wei, Department of Finance, The Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong. Tel: (852)-2358-7676; Fax: (852)-2358-1749. E-mail: johnwei@ust.hk.

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JEL Classification: G14, G31, G32, M41, M42

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1. Introduction

It has been widely documented that firms issuing new equity shares subsequently earn lower risk-adjusted returns, a phenomenon generally referred to as the "new issues puzzle." For example, Ritter (1991), Loughran and Ritter (1995), and Spiess and Affleck-Graves (1995) report that firms issuing common stocks in either an initial public offering (IPO) or a seasoned equity offering (SEO) underperform control groups over the following three to five years after the issue date. More recently, Daniel and Titman (2006), Fama and French (2008), and Pontiff and Woodgate (2008) show that a composite measure of net stock issues is also negatively related to future stock returns. At the aggregate level, Baker and Wurgler (2000) find that the share of equity issues in total new issues (i.e., equity plus debt) negatively predicts future market returns.

Despite ample empirical evidence, it remains an open question and an unsettled debate as to whether the "new issues puzzle" is a manifestation of an efficient market or a result of investor irrationality. The rational explanations based on firms' real investment decisions argue that the "new issues puzzle" is consistent with the efficient market hypothesis. The theory derived from the neoclassical q-theory of investment argues that firms respond to time-varying discount rates efficiently by investing more and issuing new shares when the cost of capital is low, and vice versa. For details of this argument, see, for example, Cochrane (1991, 1996), Zhang (2005), Lyandres, Sun, and Zhang (2008), Li, Livdan, and Zhang (2009), and Liu, Whited, and Zhang (2009).

An alternative rational explanation is built on the real options model of investment suggested by Berk, Green, and Naik (1999) and Carlson, Fisher, and Giammarino (2004; 2006), among others. This real options explanation argues that firms naturally become less risky after converting riskier growth options into safer assets in place. According to both the q-theory and the real options model, firms should experience low future returns after new share issues in a fully rational world. The rational explanations therefore suggest that the fundamental properties of firms, rather than investor sentiment, determine the negative relation between expected returns and new share issues.[1]

The behavioral explanation proposed by Loughran and Ritter (1995) and Baker and Wurgler (2000; 2002) claims that market timing is the main driver of the "new issues puzzle." Firms issue new equities when their stocks are overvalued to take advantage of the windows of opportunities. The market initially underreacts to the implications of new issues, resulting in long-run post-issue underperformance. The market timing hypothesis suggests that the underperformance should be more severe during the periods when investor sentiment is high and less so when investor sentiment is low (e.g., Stambaugh, Yu, and Yuan (2012)).

In this paper, we revisit the "new issues puzzle" by investigating the time trend in the return-new issues relation. Different from previous studies that are usually conducted in event time, we study the return predictability of new issues in calendar time. Instead of IPOs or SEOs, we use a composite measure of net stock issues, which is defined as the change in the natural logarithm of the split-adjusted shares outstanding in the previous year. This measure has been extensively used to study the cross-section of expected stock returns by Daniel and Titman (2006), Fama and French (2008), and Pontiff and Woodgate (2008). These researchers document a strong negative relation between net stock issues and subsequent stock returns. However, it is unclear how this negative return-net stock issues relation changes over time and what drives the change.

[1] There are also other risk-based explanations for the "new issues puzzle." Eckbo, Masulis, and Norli (2000) suggest that leverage decreases after firms issue SEOs, leading to lower unexpected inflation risk and default risk. Moreover, stock liquidity increases significantly after new equity issuance. He, Wang, and Wei (2013) find that information asymmetry is significantly reduced after firms issue SEOs.

There are several advantages of using this composite measure of share issues.[2] First, it enables us to perform a calendar-year study of the new issues effect. Previous studies focusing on event time and long-run performance have all been subject to statistical issues and benchmark problems. For example, Schultz (2003) shows that post-issue underperformance can be observed ex post even in an efficient market without ex ante expected abnormal returns, if firms issue equity based on past stock performance. This "pseudo market timing" problem can be easily solved by using calendar-time returns as suggested by Schultz himself. Second, it enables us to study the effect of new share issues for all stocks and apply the traditional methodology of conducting cross-sectional regression and portfolio analysis.

While new issues are closely related to the investment side of the rational investment theory, there is always another side of the theory, namely, firm profitability. On one hand, holding profitability constant, investment and new issues are negatively related to future returns; on the other hand, holding investment constant, profitability is positively related to future returns. Chen, Novy-Marx, and Zhang (2011) find that a three-factor model consisted of the market factor, an investment factor, and a profitability factor can well explain the cross-section of expected stock returns. Alternatively, motivated by valuation theory and clean surplus accounting, Fama and French (2006, 2008) suggest that both book-to-market (B/M) equity and expected equity cash flows (i.e., profitability) are important determinants of expected returns.[3] By decomposing the B/M ratio into lagged B/M, per share growth rates of book equity and market value, and net stock issues, Fama and French (2008) find that net stock issues, as a component of B/M, has

[2] This composite measure of share issues takes into account all types of transactions that increase the number of (split-adjusted) shares outstanding. As discussed by Fama and French (2005), besides SEOs, there are at least seven other sources of outside equity: (1) stock-financed mergers, (2) employee stock options, grants, and other employee benefit plans, (3) rights offerings, (4) warrants, (5) convertible bonds, (6) dividend reinvestment and other direct purchase plans, and (7) private placements.

[3] A recent paper by Novy-Marx (2012) provides evidence that a four-factor model comprising the market factor, an industry-adjusted value factor, a gross profitability factor, and a momentum factor can well explain a large number of asset pricing anomalies.

distinct explanatory power for the cross section of expected returns (see also Daniel and Titman, 2006). Due to its unique nature, Fama and French (2008, p. 2975) argue that "net share issues is itself an interesting candidate to capture variation in the cross section of BM due to expected cash flows, to better estimate expected returns." Therefore, in order to better understand the return predictability of new issues, one should always consider firm profitability (or cash flow).

In this paper, we study the time-series return predictability of both net new issues and profitability over the past four decades and make several interesting empirical findings. First, using data from 1973 to 2011, we find a strong increasing trend in the return predictability of net stock issues in the past four decades. Second, this time trend can be fully explained by the change in firm fundamentals (namely the decreasing level of profitability), but cannot be explained by the market timing measures, including the Baker and Wurgler (2006) sentiment index, the number of IPOs, and the first day's returns of IPOs. Third, we find a dramatic decreasing trend in the return predictability of profitability.[4] The opposite trends in the return predictability of new share issues and profitability cannot be easily reconciled by the behavioral explanations. Finally, we show that the decreasing return predictability of profitability can be partially explained by the decreasing persistence of firm profitability.

We propose a model of investment under uncertainty with convex external financing costs to provide a unified rational explanation for the observed time-varying return predictability of both net stock issues and profitability. The model predicts a negative relation between expected stock returns and new share issues, where the magnitude of the negative relation depends on the level of firm profitability. When profitability is low, new share issues are less sensitive to changes in the discount rates, and therefore the negative return-new issues relation is stronger. The model

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[4] Although not a focus of this paper, we interestingly find that the return volatility predictability of profitability as documented by Wei and Zhang (2006) has also decreased significantly over time.

also predicts a positive relation between expected stock returns and profitability, where the magnitude of the positive relation depends on the persistence of profitability. When persistence is low, current profitability contains less information about future profitability and therefore the relation between expected returns and current profitability is weaker. We document that both the level and persistence of profitability have decreased over time, which can simultaneously explain the increasing return predictability of new share issues and the decreasing return predictability of profitability.

Our paper contributes to the current literature in several aspects. First, it enriches our understanding of the long-standing "new issues puzzle." We document that over time, the fundamentals of the firm (i.e., profitability) determine the magnitude of the negative relation between expected stock returns and new share issues. While investor sentiment may affect the negative relation to a certain extent, it was not the main driving force behind the time-varying return predictability of new share issues in the past four decades. Second, this paper complements the investment-based asset pricing models by providing additional evidence and explanation for how the return predictability of profitability varies over time.[5] The standard q-theory suggests that all else being equal, expected returns should be positively correlated with profitability. However, it does not explain why the positive relation changes over time. We provide evidence that changes in the persistence of profitability would significantly affect the magnitude of the positive relation. Finally, we extend our analysis to the expected return

[5] The neoclassical *q*-theory of investment has also been widely applied to explain the negative relation between expected returns and investment-related variables such as accounting accruals. By contrast, behavioral theories attribute the investment-related anomalies to investor irrationality and market inefficiency. For details of this behavioral explanation, see, for example, Titman, Wei, and Xie (2004) and Cooper, Gulen, and Schill (2008). Both the q-theory with investment frictions and the behavioral mispricing with limits to arbitrage explanations for the investment anomalies have been empirically examined by Li and Zhang (2010) and Lam and Wei (2011).

volatility and show that the decreasing persistence of profitability also leads to the decreasing predictability of the expected return volatility.

The remainder of the paper proceeds as follows. Section 2 presents the model and its empirical predictions. Section 3 describes the data. Section 4 presents the empirical results. Finally, Section 5 concludes the paper.

2. A Model of Investment under Uncertainty with Convex External Financing Costs

There are *N* firms indexed by *i* in the economy. Firm *i* starts with initial capital stock K_{i0} at the beginning of period 0, invests I_{i0} at the end of period 0, and produces a single good in two periods, 0 and 1. Firm *i* has a constant-returns-to-scale profit function given by

$$Y_{it} = \pi_{it} K_{it}, \tag{1}$$

where Y_{it} is its profit and K_{it} is its capital stock at the beginning of period *t* (*t* = 0,1). The return on equity for firm *i*, denoted by π_{it}, is given by the sum of an aggregate productivity shock x_t and a firm-specific productivity shock z_{it}, i.e. $\pi_{it} = x_t + z_{it}$. The aggregate productivity shock (x_t) follows an AR(1) process:

$$x_{t+1} = \alpha + \rho_x x_t + u_{x,t+1}, \tag{2}$$

where $\alpha > 0$ is a constant, $\rho_x \in (1,0)$ and $u_{x,t+1} \sim N(0, \sigma_x^2)$. The idiosyncratic productivity shock for firm *i* (z_{it}) also follows an AR(1) process with a long-run mean of zero:

$$z_{t+1} = \rho_x z_{it} + u_{z,t+1}, \tag{3}$$

where $\rho_z \in (1,0)$ and $u_{z,t+1} \sim N(0, \sigma_z^2)$. For simplicity, we assume that $\rho_x = \rho_z = \rho \in (1,0)$. In this case, total productivity π_{it} can be written in an AR(1) form as follows:

$$\pi_{t+1} = \alpha + \rho \pi_t + u_{\pi,t+1}, \tag{4}$$

where $u_{\pi,t+1} \sim N(0, \sigma_\pi^2)$ and $\sigma_\pi^2 = \sigma_x^2 + \sigma_z^2$ (here we assume that $u_{x,t+1}$ and $u_{z,t+1}$ are uncorrelated). In the model, the aggregate productivity shock drives the economic fluctuations and generates the systematic risk. The firm-specific productivity shock generates heterogeneity in firm profitability.

We define the gross equity issues at the end of period 0 as

$$e(\pi_{i0}, K_{i0}) = I_{i0} - \pi_{i0} K_{i0}. \quad (5)$$

If $e(\pi_{i0}, K_{i0}) > 0$, the firm issues equity. If $e(\pi_{i0}, K_{i0}) < 0$, the firm distributes dividends to shareholders. When the firm issues equity, it incurs an external financing cost $C(e(\pi_{i0}, K_{i0}))$, which is a linear-quadratic and convex function given by

$$C\big(e(\pi_{i0}, K_{i0})\big) = \phi_{i0}\left(\lambda_0 + \lambda_1 e(\pi_{i0}, K_{i0}) + \frac{1}{2}\lambda_2 e(\pi_{i0}, K_{i0})^2\right), \quad (6)$$

$$where\ \lambda_k > 0, k = 0,1,2,$$

where ϕ_{i0} equals 1 if $e(\pi_{i0}, K_{i0}) > 0$ and zero otherwise, indicating that issuing new shares is costly while repurchasing shares or distributing dividends is costless.[6] We assume that all firms are purely equity-financed. The assumption of convex external financing costs is consistent with a number of theoretical and empirical studies. Krasker (1986) generalizes the model of Myers and Majluf (1984) by allowing the firm to choose the scale of investment and the number of new shares to issue. He shows that the shadow costs of external equity financing increases with the number of new shares issued in the presence of adverse selection in the equity market. Altinkilic and Hansen (2000) provide direct empirical evidence that the marginal underwriting fees are increasing in the size of the equity offering.

Firm *i* optimally chooses investment I_{i0} to maximize its market value of equity at the end of period 0:

$$\text{Max}_{\{I_{i0}\}}\ - e(\pi_{i0}, K_{i0}) - C\big(e(\pi_{i0}, K_{i0})\big) + E_0[m_1(\pi_{i1}K_{i1} + (1-\delta)K_{i1})], \quad (7)$$

[6] Under the current setting of our model, the assumption of a functional form for external financing costs has different implications for issuing and repurchasing firms. We discuss this issue in detail in section 4.3.

$$s.t.\ K_{i1} = I_{i0} + (1-\delta)K_{i0}, \tag{8}$$

where m_1 is the stochastic discount factor in period 1 and $E_0(.)$ is an expectation operator at the end of period 0. Equation (8) is the standard capital accumulation process and δ is the depreciation rate of capital. Firm *i* does not invest in period 1 and exits at the end of period 1 with a liquidation value of $(1-\delta)K_{i1}$.[7] The first-order condition with respect to I_{i0} gives[8]

$$1 + \phi_{i0}\big(\lambda_1 + \lambda_2 e(\pi_{i0}, K_{i0})\big) = E_0[m_1(\pi_{i1} + 1 - \delta)].$$

The stock return of firm *i* in period 1 is then given by

$$R_i = \frac{D_1}{P_0} = \frac{\pi_{i1}K_{i1} + (1-\delta)K_{i1}}{E_0[m_1(\pi_{i1}K_{i1} + (1-\delta)K_{i1})]} = \frac{\pi_{i1} + 1 - \delta}{E_0[m_1(\pi_{i1} + 1 - \delta)]}$$

$$= \frac{\pi_{i1} + 1 - \delta}{1 + \phi_{i0}(\lambda_1 + \lambda_2 e(\pi_{i0}, K_{i0}))}. \tag{9}$$

We obtain the relation between expected returns and external financing by taking the expectation of equation (9) as follows:

$$E_0(R_i) = \frac{E_0(\pi_{i1}) + 1 - \delta}{1 + \phi_{i0}\big(\lambda_1 + \lambda_2 e(\pi_{i0}, K_{i0})\big)}. \tag{10}$$

Firm *i* chooses optimal investment taking $E_0(R_i)$ and $E_0(\pi_{i1})$ as given, meaning that $e(\pi_{i0}, K_{i0})$ is a function of $E_0(R_i)$ and $E_0(\pi_{i1})$. Differentiating equation (10) with respect to $E_0(R_i)$ gives the sensitivity of new issues to the expected return:

$$\frac{d(e(\pi_{i0}, K_{i0}))}{dE_0(R_i)} = -\frac{\big[1 + \phi_{i0}\big(\lambda_1 + \lambda_2 e(\pi_{i0}, K_{i0})\big)\big]^2}{\phi_{i0}\lambda_2[E_0(\pi_{i1}) + 1 - \delta]} < 0. \tag{11}$$

Equation (11) holds if all firms are assumed to have nonnegative return on equity in period 0.

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[7] Li and Zhang (2010) use a similar two-period setup featuring adjustment costs to study the effect of investment frictions on the cross-section of expected returns. However, their model does not have uncertainty in firm productivity.

[8] The first-order condition holds if and only if the firm's optimal investment decision involves the issuing of new equity, which implies $\phi_{i0} = 1$. In Appendix B, we provide a full characterization of the firm's optimal investment policy in the model. We show that the firm chooses to issue equity if and only if its marginal $q_{i0} = E_0[m_1(\pi_{i1} +$ *1−δ>1+λ1+2λ0λ2.*

Equation (11) suggests that new issues and expected returns are negatively related, consistent with findings by Lyandres, Sun, and Zhang, (2008) and Li, Livdan, and Zhang (2009). When discount rates are low, firms invest more and issue more equity.

In order to understand how expected profitability affects the sensitivity of new issues to the expected return, we differentiate the absolute value of $d(e(\pi_{i0}, K_{i0}))/dE_0(R_i)$ in equation (11) with respect to $E_0(\pi_{i1})$ as follows:

$$\frac{d\left|\frac{d(e(\pi_{i0}, K_{i0}))}{dE_0(R_i)}\right|}{dE_0(\pi_{i1})} = \frac{d\left(\frac{1+\phi_{i0}\left(\lambda_1+\lambda_2 e(\pi_{i0}, K_{i0})\right)}{E_0(\pi_{i1})+1-\delta}\right)^2}{dE_0(\pi_{i1})} \frac{E_0(\pi_{i1})+1-\delta}{\phi_{i0}\lambda_2}$$

$$+\left(\frac{1+\phi_{i0}\left(\lambda_1+\lambda_2 e(\pi_{i0}, K_{i0})\right)}{E_0(\pi_{i1})+1-\delta}\right)^2 \frac{d\left(\frac{E_0(\pi_{i1})+1-\delta}{\phi_{i0}\lambda_2}\right)}{dE_0(\pi_{i1})}$$

$$= \left(\frac{1+\phi_{i0}\left(\lambda_1+\lambda_2 e(\pi_{i0}, K_{i0})\right)}{E_0(\pi_{i1})+1-\delta}\right)^2 \frac{1}{\phi_{i0}\lambda_2} > 0. \qquad (12)$$

The second equality holds because

$$\frac{d\left(\frac{1+\phi_{i0}\left(\lambda_1+\lambda_2 e(\pi_{i0}, K_{i0})\right)}{E_0(\pi_{i1})+1-\delta}\right)}{dE_0(\pi_{i1})} = 0,$$

by differentiating equation (10) with respect to $E_0(\pi_{i1})$. Equation (12) suggests that when the expected profitability increases, new issues become more sensitive to the discount rate. The economic intuition is as follows. When expected profitability is high, the marginal benefit of investment is more sensitive to changes in the discount rate. In equilibrium, the marginal cost of investment equals the marginal benefit. Therefore, the marginal cost, or equivalently, new issues, also become more sensitive to changes in the discount rate when expected profitability is high. In other words, a given change in the discount rate corresponds to a larger change in new issues. Equivalently, a given change in new issues corresponds to a smaller change in the discount rate.

This effect means that the expected return-new issues relation is less negative when expected profitability is higher. The above discussions lead to our first proposition.

Proposition 1. *The q-theory of investment with convex external financing costs predicts that expected returns and new share issues are negatively related. In addition, the magnitude of the negative relation depends on the profitability level of the firm. When profitability is low, new share issues are less sensitive to changes in the discount rate and therefore the negative return-new issues relation is stronger, and vice versa.*[9]

From equation (10), we can also easily show that expected returns and expected profitability are positively related. More specifically, holding investment constant, high expected profitability leads to high expected returns. However, since we can only form expectation about future profitability from current profitability, we are more interested in the relation between expected returns and current profitability. Differentiating equation (10) with respect to π_{i0} gives the relation as follows:

$$\frac{dE_0(R_i)}{d\pi_{i0}} = \frac{\rho\left[1+\phi_{i0}\left(\lambda_1+\lambda_2 e(\pi_{i0},K_{i0})\right)\right]+\phi_{i0}\lambda_2 K_{i0}[E_0(\pi_{i1})+1-\delta]}{\left[1+\phi_{i0}\left(\lambda_1+\lambda_2 e(\pi_{i0},K_{i0})\right)\right]^2} > 0. \qquad (13)$$

Equation (13) suggests that expected return and current profitability are positively related. When

[9] Due to the simplified assumption of investment in this model (for example, there is no adjustment costs of investment), there is a one-to-one mapping between investment and new issues when firms issue new equity. Therefore, all the results on the return-new issues relation apply similarly to the return-investment relation. However, while we observe a significant time trend in the return-new issues relation, we do not observe the same in the return-investment relation. We provide two possible explanations: (1) in the presence of adjustment costs of investment, there is a wedge between investment and new issues when firms issue new equity. The change in adjustment costs over time may affect the relation between expected returns and investment or new issues differently, leading to different time trends as seen in the data; (2) firms may not expand instantaneously but rather take time to invest. In this case, the return-investment relation may be smoothed over time. Empirically, DeAngelo, DeAngelo, and Stulz (2009) and Kim and Weisbach (2008) find that SEO proceeds are not fully invested within a year. Theoretically, Carlson, Fisher, and Giammarino (2010) show that commitment-to-invest in the form of future required outlays can explain the stylized fact that the risk of firms issuing new equity gradually declines over a period of three years.

current profitability is high, expected future profitability is also high and therefore expected return is high.

In addition, we are interested in how the persistence of profitability would affect the magnitude of the positive relation between expected returns and current profitability. To find out, we further differentiate $dE_0(R_i)/d\pi_{i0}$ with respect to ρ to obtain

$$\frac{d\left(\frac{dE_0(R_i)}{d\pi_{i0}}\right)}{d\rho} = \frac{\left[1 + \phi_{i0}\big(\lambda_1 + \lambda_2 e(\pi_{i0}, K_{i0})\big)\right] + \phi_{i0}\lambda_2 K_{i0}\pi_{i0}}{\left[1 + \phi_{i0}\big(\lambda_1 + \lambda_2 e(\pi_{i0}, K_{i0})\big)\right]^2} > 0. \qquad (14)$$

Equation (14) suggests that expected returns are less sensitive to changes in current profitability when profitability is less persistent. The intuition is straightforward. When profitability is less persistent, current profitability is less informative about future profitability. A given change in current profitability corresponds to a smaller change in expected future profitability and therefore a smaller change in expected returns. The above results are summarized in the following proposition.

Proposition 2. *The q-theory of investment with convex external financing costs predicts that expected returns and current profitability are positively related. In addition, the magnitude of the positive relation depends on the persistence of firm profitability. When the persistence of profitability is low, current profitability contains less information about future profitability and hence the positive return-profitability relation is weaker, and vice versa*.

Previous studies have shown that there is a strong relation between expected return volatility and firm profitability (Wei and Zhang, 2006; Irvine and Pontiff, 2009; Zhang, 2010). Since the *q*-theory suggests that the *persistence* of firm profitability affects the magnitude of the positive relation between expected returns and profitability, it is important to understand whether the *persistence* of profitability also affects the predictability of profitability for expected return volatility. To find out, we consider a more general case with an infinite horizon and allow the volatility of profitability (σ_π^2) to vary over time (i.e., $Var_{t-1}(u_{\pi,it})$). Following Wei and Zhang (2006), we assume that the error terms in the AR(1) process of π_{it} are conditionally heteroskedastic:

$$Var_{t-1}(u_{\pi,it}) = g(u_{\pi,it-1}^2, \dots u_{\pi,it-k}^2, u_{\pi,it-1}). \tag{15}$$

$Var_{t-1}(u_{\pi,it})$ is positively related to $u_{\pi,it-1}^2, \dots u_{\pi,it-k}^2$ due to the effect of volatility clustering and negatively related to $u_{\pi,it-1}$ due to the fact that volatility tends to decrease in good times and increase in bad times. Wei and Zhang (2006) show that both return on equity (ROE) and the volatility of return on equity (VROE) are important in explaining expected return volatility in both the cross section and time series.

By extending the Campbell and Shiller (1988) log-linear model expression of return shocks as Vuolteenaho (2002) has done and focusing on the conditional cash flow component, we obtain the final expression for the conditional or expected return volatility ($Var_{t-1}(R_{it})$) following Wei and Zhang (2006):

$$\begin{aligned} Var_{t-1}(R_{it}) &= Var_{t-1}\left(\frac{1}{1-\rho\beta}u_{\pi,it}\right) + v_{it} \\ &= \left(\frac{1}{1-\rho\beta}\right)^2 g(u_{\pi,it-1}^2, \dots u_{\pi,it-k}^2, u_{\pi,it-1}) + v_{it}\,,. \end{aligned} \tag{16}$$

where β is a subjective discount factor, which is smaller than but close to 1. It is easy to see that when ρ decreases, the magnitude of the coefficients on $u_{\pi,it-1}^2, \dots u_{\pi,it-k}^2$ and $u_{\pi,it-1}$ all decrease at the same time. The result in equation (16) leads to our final proposition.

Proposition 3. *Expected return volatility is negatively related to the current profitability level and positively related to the current and past volatility of profitability. All else being equal, the negative (positive) relation between expected return volatility and profitability (the volatility of profitability) is weaker when profitability is less persistent.*

3. Data Description and Measurement of Variables

3.1. The Data

We obtain monthly and daily stock return data from the Center for Research in Security Prices (CRSP) and annual and quarterly accounting data from Compustat. We include only common stocks traded on NYSE, Amex, and NASDAQ and whose accounting and return data are available. We exclude financial and utility firms (i.e., firms with four-digit SIC codes between 6000 and 6999 or between 4900 and 4949) and firms with negative book equity. We require firms to have appeared on Compustat for at least two years in order to alleviate the selection and backfilling bias. Data on annual accounting are available from 1963 to 2011 and data on quarter accounting data are available from 1971 to 2011. This selection process results in a final sample of 3,573 firms per month on average.

3.2. Summary Statistics

Table 1 reports the summary statistics and cross-correlations of all firm characteristics in the full sample during 1973-2011. We winsorize all variables (except firm age) at 1% and 99% to alleviate the effect of extreme values. From Panel A of Table 1, return on equity (ROE) is negatively skewed with a much larger median than mean, while volatility of return on equity

(VROE) and net stock issues (NSI) are positively skewed. The average annual return on equity, volatility of return on equity, and net stock issues are 2.6%, 7.2% and 4.1%, respectively.

We also report the Pearson cross-correlations among firm characteristics in Panel B. All the firm characteristic variables are correlated with each other and significant at the 5% level. Firms with higher return on equity (ROE) have lower ROE volatility (VROE), lower book-to-market equity ratio (BM), and larger firm size (SZ). Moreover, high ROE firms tend to invest more (investment-to-asset ratio, I/A) but issue less equity shares (NSI). These variables are described in detail in the Appendix.

4. Empirical Results

4.1. Time Trend Analysis

4.1.1. Fama and MacBeth cross-sectional regressions over time

In this section, we study the time trend in the relation between expected returns and net stock issues (or profitability), while controlling for a variety of variables that have been shown to explain expected returns or expected return volatility. We perform the Fama and MacBeth (1973) cross-sectional regressions and study how the regression coefficients on net stock issues (NSI) or profitability (ROE) change over time. In addition, we also examine the relation between expected return volatility and profitability (or the volatility of profitability). We assume that all accounting variables are publicly available three months after the fiscal year-end or quarter-end.[10] We always use the market capitalization or firm size (SZ) and the past six-month returns

[10] We use a three-month lag to fully capture the short-lived effect of profitability. Our results remain quantitatively similar if we use a six-month lag or apply the approach adopted by Fama and French (1992) to match the annual accounting data for all fiscal year-ends in calendar year *t*-1 with the returns between July of year *t* and June of year *t*+1. However, the effect of profitability in general decreases with the time lag.

($RET_{-7,-2}$) updated in the previous month. Since we require at least eight quarters of quarterly ROE data to calculate VROE, our regression starts from January 1973.

Table 2 presents the regression results from the following Fama and MacBeth (1973) cross-sectional regressions of monthly returns or monthly return volatility in the full period (1973-2011) and three subperiods (1973-1984, 1985-1998, and 1999-2011):

$$R_{it+1} = \beta_0 + \beta_1 ROE_{it} + \beta_2 NSI_{it} + Controls_{it} + \varepsilon_{it+1},$$
$$VR_{it+1} = \beta_0 + \beta_1 ROE_{it} + \beta_2 VROE_{it} + Controls_{it} + \varepsilon_{it+1}, \tag{17}$$

where R_{it+1} is the monthly raw stock return in month t+1, and VR_{it+1} is the standard deviation of daily raw stock returns in month t+1. Controls in the expected return regression include the logarithm of book-to-market equity (Ln(BM)), logarithm of firm size (Ln(SZ)), past six-month returns ($RET_{-7,-2}$), logarithm of firm age (Ln(AGE)), and investment-to-asset ratio (I/A). Controls in the regression of expected return volatility include Ln(BM), Ln(SZ), $RET_{-7,-2}$, Ln(AGE), financial leverage (LEV), contemporaneous return (R_{it+1}), and lagged return volatility (VR_{it}). The corresponding t-statistics are reported in parentheses and are calculated from Newey and West's (1987) robust standard errors.

Consistent with the model predictions and previous empirical results, NSI negatively predicts but ROE positively predicts future stock returns. In the cross-sectional regression of expected returns in the full sample, the coefficient on NSI is -1.07 with a t-statistic of -4.00, and the coefficient on ROE is 4.65 with a t-statistic of 4.55. Moreover, ROE negatively predicts but VROE positively predicts future return volatility. In the cross-sectional regression of expected return volatility in the full sample, the coefficient on ROE is -2.09 with a t-statistic of -14.56 and the coefficient on VROE is 0.86 with a t-statistic of 4.42.

More importantly, the regression results in subperiods suggest that the return predictability of both NSI and ROE changes significantly over time. On one hand, the return predictability of NSI has increased over time. The coefficient on NSI in the cross-sectional regression of expected returns is -0.61 with a *t*-statistic of -1.19 during 1973-1984, strengthens to -0.89 with a *t*-statistic of -3.25 during 1985-1998, and reaches -1.70 with a *t*-statistic of -3.32 during the recent years from 1999 to 2011. On the other hand, the return predictability of ROE and the return volatility predictability of both ROE and VROE have decreased dramatically over time. The coefficient on ROE in the expected return regression is 10.62 with a *t*-statistic of 6.03 during 1971-1984 but is only 1.02 with a *t*-statistic of 0.91 during 1999-2011. The coefficient on ROE (VROE) in the regression of expected return volatility is -2.97 with a *t*-statistic of -13.03 (2.26 with a *t*-statistic of 8.23) during 1971-1984 but is only -1.89 with a *t*-statistic of -16.03 (0.29 with a *t*-statistic of 10.45) during 1999-2011.

To obtain a better grasp of the time-varying return (return volatility) predictability, we further investigate the time-series pattern of the return (return volatility) predictability by estimating the Fama and MacBeth (1973) cross-sectional regressions every month using a rolling window of the past five years (60 months). Figures 1 and 2 plot the time series of the slope coefficients on NSI and ROE in the expected return regressions, respectively. The patterns are quite similar to those reported in Table 2. On one hand, the magnitudes of the coefficients on NSI have increased over time with three obvious spikes during 1983-1987, 2000-2003, and 2008-2009. On the other hand, the coefficients on ROE have decreased significantly in magnitude with the biggest drop occurring during 1983-1987. Figure 3 plots the time series of the coefficients on ROE and VROE in the regression of expected return volatility. Similar to the results reported in Table 2, the coefficients on both ROE and VROE have decreased dramatically in magnitude with the largest drop taking place during 1983-1987. We also observe that the magnitudes of the coefficients on both ROE and VROE have increased slightly after 1998, especially for ROE.

In sum, by examining the time trend in the coefficients in the cross-sectional regressions of expected returns and expected return volatility, we find that the return predictability of net stock issues and profitability has changed significantly during 1973-2011. While the return-new issues relation has strengthened over time, the return-profitability relation has weakened, as has the relation between return volatility and profitability (and volatility of profitability).

4.1.2. The level and persistence of profitability over time

The opposite time trends in the return predictability of net stock issues versus profitability provide an ideal setting to test our model predictions. The simple inefficient market argument can hardly explain why the market becomes less efficient for one variable but becomes more efficient for the other. Our model contributes to the literature by providing a unified rational explanation for the time-varying return predictability of both net stock issues and profitability.

The model predicts that the negative relation between expected returns and net stock issues should strengthen when the *level* of profitability decreases, but that the positive relation between expected returns and current profitability should weaken when the *persistence* of profitability decreases. In order to understand why the return predictability changes over time due to changes in firm fundamentals (i.e., profitability), we examine the time trend in both the *level* and *persistence* of firm profitability.

We measure the *level* of profitability by the average ROE of all firms within our sample. Table 3 presents the time-series average of annual ROE for non-overlapping five-year subperiods from 1972 to 2011. The average ROE significantly decreases over time: it drops from 0.124

during 1972-1976, to 0.059 during 1982-1986, and further down to -0.064 during 1997-2001. While the average ROE rebounds slightly after 2002, it is still much lower (-0.017 during the most recent years from 2007 to 2011) than the earlier levels. We also present the median ROE over the sample period, which follows a similar pattern as the average ROE. It is worth noting that in the years after 1982, the median ROE is always higher than the mean ROE, suggesting that profitability has become more negatively skewed. Figure 4 plots the time-series mean and median of annual ROE every year during 1973-2011. It is evident from the figure that the average ROE decreases over time with three big drops occurring during 1981-1986, 2000-2002 and 2008-2009. The decreasing pattern is a near mirror image of the increasing trend in the return predictability of net stock issues, thus providing first-hand evidence supporting the model predictions stated in Proposition 1.

Furthermore, we examine how the persistence of profitability changes over time. We estimate the following regression for non-overlapping five-year subperiods during 1972-2011:

$$ROE_{it+1} = a_i + a_t + \rho ROE_{it} + \varepsilon_{it+1}, \tag{18}$$

where ROE_{it+1} is the annual ROE of firm i in fiscal year t+1, α_i and α_t represent the firm and time fixed effects, respectively, and the regression coefficient ρ is the persistence measure of ROE. As the ordinary least squares (OLS) estimator suffers from dynamic panel bias, we use the two-step first-differenced GMM approach suggested by Arellano and Bond (1991) instead to estimate the ROE persistence.[11] The model is estimated using the first differences instrumented by all available lagged ROE up to $t-2$ for each of the non-overlapping five-year subperiods. There must be at least three observations available for a firm to be included in the panel estimation.

[11] Chen and Chen (2012) study the persistence of cash flow for manufacturing firms during 1967-2006 using the same methodology. They find that the persistence of cash flow has decreased over time during the sample period.

Table 3 reports the estimates of the ROE persistence in each five-year subperiod during 1972-2011. ROE persistence decreases significantly over time: it goes from as high as 0.439 (*t*-statistic = 5.75) during 1972-1976 to as low as 0.107 during 1987-1991. It rebounds after 1992 and reaches 0.410 during 2002-2006 but plunges again to as low as 0.142 (*t*-statistic = 2.41) during the most recent years from 2007 to 2011. Figure 5 plots the persistence of ROE in every year using a rolling window of the past five years. The figure clearly shows a declining pattern similar to that in Table 3. The persistence of ROE has decreased over time with the biggest drop taking place during the 1980s. It increased after 1997 until 2006. The time-varying pattern of ROE persistence coincides with the change in the return (or return volatility) predictability of ROE over time, which is again consistent with the predictions of Propositions 2 and 3.

In sum, both the level (measured as the average ROE) and the persistence of profitability have decreased significantly in the past four decades. The results suggest not only that the average firm has become less profitable, but also that the information contained in current profitability about future profitability has decreased over time.

4.1.3. Time-series regressions

Having shown that the time-varying return predictability of net stock issues and profitability are closely related to changes in the level and persistence of profitability, we further establish the link by running the following time-series regressions:

$$\beta\_R\_NSI_{it+1} = b_0 + b_1 t + b_2 Avg(ROE)_t + v_{t+1},$$
$$\beta\_R\_ROE_{it+1} = b_0 + b_1 t + b_2 Pers(ROE)_t + v_{t+1},$$
$$\beta\_VR\_ROE_{it+1} = b_0 + b_1 t + b_2 Pers(ROE)_t + v_{t+1}, \quad (19)$$
$$\beta\_VR\_VROE_{it+1} = b_0 + b_1 t + b_2 Pers(ROE)_t + v_{t+1},$$

where $\beta\_R\_NSI_{t+1}$ and $\beta\_R\_ROE_{t+1}$ ($\beta\_VR\_ROE_{t+1}$ and $\beta\_VR\_VROE_{t+1}$) are the regression coefficients on NSI and ROE in the Fama and MacBeth (1973) cross-sectional regression of expected returns (expected return volatility) in month *t*+1 estimated from a rolling window of the past five years, respectively. $Avg(ROE)_t$ is the average annual ROE over the past five years for all firms in month *t*. $Pers(ROE)_t$ is the ROE persistence estimated by the two-step first-differenced GMM using a rolling window of the past five years. The explanatory variable *t*, which is the number of months from the beginning of the sample, measures the time trend. The *t*-statistics are calculated from Newey and West (1987) standard errors, which correct for autocorrelation with conditional heteroskedasticity in the error terms.

The regression results are reported in Table 4. Models 1-3 use the regression coefficients on NSI in the Fama and MacBeth (1973) cross-sectional regression of expected returns ($\beta\_R\_NSI_{t+1}$) as the dependent variable. The first regression uses the time trend as the only explanatory variable. The slope coefficient on the time trend variable is significantly negative at the 1% level (coeff. = - 4.71 and *t*-statistic = - 5.25), confirming our previous finding that the return predictability of NSI exhibits a significant increasing time trend. The second regression uses the average ROE (*Avg*(*ROE*)) as the only explanatory variable. The slope coefficient is significantly positive at the 1% level (coeff. = 9.23 and *t*-statistic = 9.69), indicating that the magnitude of the negative returns-new issues relation decreases with the level of profitability. In the third regression, we include both the time trend and the average ROE as explanatory variables. The slope coefficient on *Avg*(*ROE*) remains statistically significant at the 1% level (coeff. = 9.15 and *t*-statistic = 4.44)l. However, the slope coefficient on the time trend is no longer significant (coeff. = - 0.05 and *t*-statistic = - 0.05). This result strongly suggests that the increasing return predictability of NSI can be fully explained by the decreasing level of profitability over time, consistent with the prediction of Proposition 1.

Models 4-6 use the regression coefficients on ROE in the Fama and MacBeth (1973) cross-sectional regression of expected returns ($\beta\_R\_ROE_{t+1}$) as the dependent variable. Model 4 includes the time trend as the only explanatory variable. The slope coefficient on the time trend is negative and highly significant (coeff. = -30.53 with *t*-statistic = 7.85), suggesting that the magnitude of the positive relation between return and ROE decreases over time. Model 5 includes the persistence of profitability as the only explanatory variable. The slope coefficient on $Pers(ROE)_t$ is positive and highly significant (coeff. = 22.05 with *t*-statistic = 4.76), confirming that the magnitude of the positive relation between return and ROE increases with ROE persistence. In Model 6 where both the time trend and profitability persistence are included, the coefficient on $Pers(ROE)_t$ remains significantly positive. Furthermore, while the coefficient on the time trend is still negative and significant, the magnitude is reduced by about 20%. The results suggest that a significant portion of the time variation in the return predictability of ROE can be explained by the ROE persistence. However, a large part of the time trend remains unexplained, which might be of the interest to future research.

It is worth mentioning that the ROE persistence is estimated with errors, and so the coefficients on the ROE persistence in the cross-sectional regressions are biased downward. This downward bias only weakens our results. The magnitude of the actual coefficient on the ROE persistence should be larger and the explanatory power of the ROE persistence stronger. These results in general support the prediction of Proposition 2.

Models 7-9 use the regression coefficients on ROE in the Fama and MacBeth (1973) cross-sectional regression of expected return volatility ($\beta\_VR\_ROE_{t+1}$) as the dependent variable. The regression coefficient on the time trend in Model 7 is positive (coeff. = 2.86) and highly significant (*t*-statistic = 3.22), suggesting that the magnitude of the negative relation between return volatility and ROE decreases over time. The regression coefficient on $Pers(ROE)_t$ in Model 8 is negative (coeff. = - 2.91) and highly significant (*t*-statistic = - 3.94), confirming that the magnitude of the negative relation between return volatility and ROE increases with ROE persistence. In Model 9 when the time trend and profitability persistence are both included, $Pers(ROE)_t$ remains significantly negative, while the magnitude of the time trend is reduced by about 50%.

Models 10-12 use the regression coefficients on VROE in the Fama and MacBeth (1973) cross-sectional regression of expected return volatility ($\beta\_VR\_VROE_{t+1}$) as the dependent variable. The regression coefficient on the time trend in Model 10 is negative (coeff. = - 6.36) and highly significant (*t*-statistic = - 5.07), suggesting that the magnitude of the positive relation between return volatility and ROE volatility decreases over time. The regression coefficient on $Pers(ROE)_t$ in Model 11 is positive (coeff. = 5.54) and highly significant (*t*-statistic = 4.83), confirming that the magnitude of the positive relation between return volatility and ROE volatility increases with ROE persistence. In Model 12 when the time trend and profitability persistence are both included, $Pers(ROE)_t$ remains significantly positive, while the magnitude of the time trend is reduced by about 30%.

In sum, the results from Models 7-12 suggest that a significant portion of the time-varying relation between return volatility and ROE (VROE) can be explained by ROE persistence. As discussed above, ROE persistence is estimated with errors and therefore, the magnitude of the actual coefficient on $Pers(ROE)_t$ should be larger and the explanatory power of $Pers(ROE)_t$ stronger. All these results appear to be consistent with the predictions of Proposition 3.

Overall, on one hand, the increasing trend in the return predictability of net stock issues can be fully explained by the decreasing trend in the average level of firm profitability over time; on the other hand, a significant portion of the decreasing trend in the return (return volatility) predictability of profitability can be explained by the decreasing trend in the persistence of profitability.

4.1.4. Results from time-series regressions with sentiment measures

The market timing hypothesis suggests that the negative relation between expected returns and net stock issues should change with investor sentiment. When investors are more overoptimistic and stocks are more overvalued, firms issuing new equity should experience a stronger post-issue underperformance. In order to test whether it is the change in firm fundamentals or the change in investor sentiment that leads to the increasing return predictability of net stock issues, we run the time-series regression by including both the level of average ROE and various proxies for investor sentiment ($SENT_t$), including the Baker and Wurgler (2006) sentiment index (BW), the number of IPOs (N_IPO), and the first day's returns of IPOs (R_IPO) as follows:

$$\beta\_R\_NSI_{it+1} = b_0 + b_1 t + b_2 Avg(ROE)_t + b_3 SENT_t + v_{t+1}, \quad (20)$$

where $\beta\_R\_NSI_{t+1}$ and $Avg(ROE)_t$ are defined as in equation (19), and are estimated from a five-year rolling window. The sentiment variables are also averaged over the past five years to match the time line. The regression results are reported in Table 5. Model 1 repeats the baseline model by regressing $\beta_R_NSI_{t+1}$on the time trend variable only. Models 2-4 include both the time trend and one sentiment proxy at a time as the explanatory variables. The results suggest that only the Baker and Wurgler sentiment index (BW) has a significant coefficient (coeff. = -0.317 with *t*-statistic = -1.94) in the time-series regression. Moreover, after controlling for various sentiment measures, the magnitude of the time trend variable remains almost unchanged, suggesting that sentiment variables have very little power in explaining the time-varying return predictability of net stock issues. Models 5-7 include the time trend, $Avg(ROE)_t$, and one sentiment proxy at a time as the explanatory variables. The results show that while none of the sentiment variables is significant, $Avg(ROE)_t$ remains significant at the 1% level and the time trend variable becomes insignificant after controlling for $Avg(ROE)_t$ in all regressions.

In sum, the increasing time trend in the return predictability of net stock issues can be fully explained by the change in firm fundamentals (namely the decreasing trend in firm profitability), but cannot be explained by various sentiment proxies, contrary to what the behavioral market timing hypothesis suggests.

4.1.5. Unit root and cointegration tests

In time-series analysis, the existence of non-stationary variables may generate spurious relations in the standard regression estimation. If the variables we investigate in our previous time-series regressions have stochastic trends, which would make them non-stationary, our interpretation of the regression results would be affected. In contrast, if some of the variables we investigate are cointegrated, i.e., some variables share similar non-stationary properties in the long-run equilibrium, then standard regressions involving the levels of these cointegrated variables would not generate spurious results (Engle and Granger (1987)). In this section, we perform unit root and cointegration tests on the time-series of coefficients in the return (and return volatility) cross-sectional regressions as well as on the time series of the level and persistence of ROE, calculated from a five-year rolling window.

To test stationarity and the existence of a unit root, we perform the augmented Dickey and Fuller (1979) *t*-tests and the Phillips and Perron (1988) ρ-tests and τ-tests. The corresponding test statistics are reported in Panel A of Table 6. The unit-root tests are employed by regressing time-series variables on their lagged values. In order to account for serial correlation, the augmented Dickey and Fuller (1979) tests include lagged first differences in the regression, whereas the Phillips and Perron (1988) tests apply the Newey and West (1987) standard errors. The number of lagged differences to be included is determined by the minimum Schwarz information criterion (SIC). We also use other criteria, such as the Ng-Perron modified Akaike information criterion (MAIC), and the results are qualitatively similar. The hypothesis of a unit root cannot be rejected at the 5% level for any of the variables we study, whether a deterministic linear time trend is allowed or not (except for the augmented Dickey-Fuller test for β_VR_ROE and the Phillips-Perron test for ROE persistence). The results reveal a potential problem with our time-series regressions based on the levels of all variables due to the non-stationary nature of these variables.

To fully address this concern, we further proceed with cointegration tests following the two-step method suggested by Engle and Granger (1987). We first regress one non-stationary variable on another via OLS and then perform the stationarity tests, including the Dickey-Fuller tests and the Phillips-Perron tests, on the residuals. We perform the Engle-Granger cointegration tests between β_R_NSI and *Avg*(*ROE*) and between β_R_ROE (β_VR_ROE or β_VR_VROE) and *Pers*(*ROE*). The results are reported in Panel B of Table 6. We only include a constant but no deterministic time trend in the regressions. The results show that the hypothesis of a unit root is rejected at the 5% level for all variable pairs (except for the Dickey-Fuller test for the pair *β_R_ROE* and *Pers*(*ROE*), which can only reject a unit root at the 10% level, and the Dickey-Fuller test for the pair *β_VR_VROE* and *Pers*(*ROE*), which cannot reject a unit root). The results suggest that *β_R_NSI* is cointegrated with *Avg*(*ROE*), while *β_R_ROE* (*β_VR_ROE* or *β_VR_VROE*) is cointegrated with *Pers*(*ROE*). Therefore, the standard time-series regressions involving the levels of these variables are valid and can lead to correct inferences being made.

4.2. Cross-Sectional Analysis

4.2.1. Fama and MacBeth cross-sectional regressions and portfolio analysis for ROE subsamples

While the aggregate productivity shock may generate the time-varying return predictability of new issues, the firm-specific productivity shock may generate the cross-sectional difference in the return predictability of new issues. In this section, we explore the cross-sectional implications of our model. Specifically, we study how the negative relation between expected returns and net stock issues varies with the level of ROE in the cross section using both regressions and portfolio analysis.

We start by performing the Fama and MacBeth (1973) cross-sectional regressions of expected returns for subsamples split by the level of ROE. We also use the following regression with an interaction term between NSI and ROE in the full sample:

$$R_{it+1} = \gamma_0 + \gamma_1 ROE_{it} + \gamma_2 NSI_{it} + \gamma_3 NSI_{it} \times D\_ROE_{it} + Controls_{it} + \varepsilon_{it+1}, \quad (21)$$

where D_ROE is the ROE dummy, which equals 1 if firm *i*'s quarterly ROE is above the median and zero otherwise. Table 7 presents the regression results. The coefficient on NSI in the low ROE subsample is -1.13 (*t*-statistic = -3.85), and its magnitude is about 50% higher than that in the high ROE subsample (coeff. = -0.77 and *t*-statistic = -2.74). Moreover, the interaction term between NSI and the ROE dummy in the full sample regression is significantly positive at the 1% level. The results strongly suggest that the return predictability of net stock issues is stronger in less profitable firms than in more profitable firms.

We report the portfolio analysis on the return-new issues relation for subsamples split by ROE in Table 8. We independently sort stocks into terciles by ROE and quintiles by NSI every month. Taking intersections of the ROE terciles and NSI quintiles, we form 15 portfolios and calculate their equal-weighted and value-weighted returns every month. We then calculate the High-Low NSI hedge portfolio return, which is the zero-investment portfolio return of buying the highest quintile of NSI and selling the lowest quintile of NSI, for stocks in each ROE tercile. We also report the Fama and French three-factor alpha and Carhart four-factor alpha for each portfolio.

It is evident that the magnitudes of both the equal-weighted and value-weighted High-Low portfolio returns and alphas decrease with the level of ROE. The equal-weighted High-Low portfolio return, three-factor alpha, and four-factor alpha are -1.00%, -0.88% and -0.69% per month, respectively, in the low ROE tercile, but are only -0.54%, -0.54% and -0.54% per month, respectively, in the high ROE tercile. The differences in the equal-weighted High-Low portfolio return and three-factor alpha between the high and low ROE terciles are 0.46% and 0.34%, which are significant at the 1% and 10%, respectively. The four-factor alpha is positive with a value of 0.15%, but is not significant.

The difference is more significant for value-weighted hedge portfolio returns. The value-weighted hedge portfolio return, three-factor alpha, and four-factor alpha are -1.09%, -0.97%, and -0.89% per month, respectively, and are all significant at the 1% level in the low ROE tercile, but are only -0.25%, -0.24%, and -0.31% per month and statistically insignificant (except for the four-factor alpha, which is significant at the 10% level) in the high ROE tercile. The differences in the value-weighted portfolio return, three-factor alpha, and four-factor alpha between the high and low ROE terciles are 0.84%, 0.73%, and 0.54%, respectively, which are significant at the 5% level or better.

In sum, the results from both cross-sectional regressions and portfolio analysis reported in Tables 6 and 7 suggest that the negative relation between net stock issues and expected returns is stronger for firms with low profitability than for firms with high profitability. These results are consistent with our Proposition 1.

4.3. Robustness Checks

4.3.1. Fama and Macbeth cross-sectional regressions in subperiods for firm size, BM, and age subsamples

In this section, we further investigate how firm heterogeneity affects our results. Specifically, we study how the return predictability of new issues and profitability changes for firms that vary by firm size, BM, and firm age. Size and BM are among the most important firm characteristics that determine the cross section of stock returns. Firm age is not only an important indicator of a firm's lifecycle but is also widely used as one of the most robust proxies for financial constraints. Firms that vary by size, BM, or age may have different growth opportunities, profitability, and financial conditions. They may experience different changes in their fundamentals, which would have distinct implications for their asset prices.

We first split the whole sample into three size groups based on the NYSE breakpoints (bottom 30%, middle 40%, and top 30%) every month and report the coefficients of the cross-sectional regression over time for these size subsamples. The results are reported in Table 9.

Panels A and B report the results for the cross-sectional regression of expected returns and expected return volatility, respectively.

Panel A of Table 9 shows that, for all size groups, the magnitude of the negative coefficient on NSI in the regression of expected returns has increased over time. More specifically, during 1973-1984, the coefficients are -0.66, -1.06, and -0.70 for the small, medium, and large size groups, respectively, and none of them are statistically significant. These coefficients increase to -1.80, -1.42, and -1.48 in the most recent years during 1999-2011 and are all statistically significant at the 5% level. The results suggest that the increasing trend is not limited to small firms but is evident in medium and large firms. However, the increasing trend is obviously more significant for small firms, with the corresponding regression coefficient almost tripling since the 1970s. Moreover, the magnitude of the coefficient for medium and large firms significantly increases only during 1999-2011 but not in earlier years.

One possible explanation is that small firms have experienced a larger change in their profitability over time. Figure 6 plots the time series of average ROE for the size groups. It is evident from the figure that the profitability of small firms indeed shows a much stronger decreasing trend. Medium and large firms have also experienced a decrease in profitability but that is confined to the more recent years after 2000 and not in earlier years. The time trends in profitability for different size groups are consistent with the pattern observed in the negative relation between net stock issues and expected returns, providing further support for our prediction in Proposition 1.

Furthermore, Panel A of Table 9 finds that the magnitude of the coefficient on ROE in the regression of expected returns has decreased over time in all size subsamples. In particular, during the 1973-1984 subperiod, the coefficients are 10.70, 12.97, and 12.14 for the small, medium, and large size groups, respectively, and are all statistically significant at the 1% level. These coefficients drop significantly to 1.01, 1.21, and 2.99 and are all statistically insignificant, except the one for large firms, in the most recent years during the 1999-2011 subperiod.

Panel B of Table 9 reports that the predictability of ROE and VROE for expected return volatility also decreases over time in all size subsamples. During the 1973-1984 subperiod, the coefficients on ROE are -2.77, -1.88, and -1.24 for the small, medium, and large size groups, respectively. These coefficients decrease to -1.81, -1.04, and -0.81 in the most recent years during the 1999-2011 subperiod. The coefficients on VROE decrease from 1.78, 1.81, and 2.80 during 1973-1984 to 0.28, 0.26, and 0.13 in the most recent years during 1999-2011 for the small, medium, and large size groups, respectively.

In sum, for all size groups, the return predictability of net stock issues has increased over time and the time trend is more significant for small firms. In contrast, both the return and return volatility predictability of profitability have decreased over time for all size groups.

We further investigate how BM affects the time-varying return predictability of net stock issues and profitability. We split the whole sample into three BM groups based on the NYSE breakpoints (bottom 30%, middle 40%, and top 30%) every month. The coefficients on NSI and ROE of the cross-sectional regressions over time for BM subsamples are reported in Table 10.

The regression results from Panel A of Table 10 suggest that the increasing trend in the return predictability of NSI is stronger for growth firms (i.e., firms with low BM) than for value firms. For high BM firms, the return predictability of NSI shows no obvious time trend. One possible explanation is that the profitability of growth firms tends to decrease while the profitability of value firms does not change much over time. Figure 7 plots the time series of average ROE for the BM groups. We find that indeed ROE decreases the most for low BM firms but much less for high BM firms, which helps explain why the return predictability of NSI does not change much for value firms. The return predictability of ROE (Panel A) and the return volatility predictability of VROE (Panel B) decrease across all BM groups, but the change in the return volatility predictability of ROE (Panel B) appears to be weaker for value firms.

In sum, the regression results from BM subsamples suggest that the return predictability of NSI has improved to a larger extent for growth firms. In contrast, the return predictability of ROE has decreased over time for all BM groups.

Lastly, we study how firm age affects the time-varying return predictability of net stock issues and profitability. We split the whole sample into terciles based on firm age every month. The coefficients of the cross-sectional regression over time for age subsamples are reported in Table 11. The regression results from Panel A show that the return predictability of NSI has improved to a larger extent for young firms. For old firms, the improvement is smaller. One possible explanation is that young firms tend to experience more significant decreases in their profitability. Figure 8 plots the time series of average ROE for the age groups. It is evident that while young firms have experienced a large decrease in profitability, old firms have not. The results clearly explain why the return predictability of NSI does not change much for old firms. Panel A also finds that the return predictability of ROE has decreased across all age groups. Panel B shows that while the change in the return volatility predictability of ROE appears to be weaker for old firms, the change in the return volatility predictability of VROE is weaker for young firms. Thus there might be other factors affecting the relation between expected return volatility and ROE (VROE) for firms in different age groups.

In sum, the regression results from age subsamples suggest that the return predictability of NSI has gone up for young firms. By contrast, the return predictability of ROE, however, has gone down over time for all age groups.

Taken together, we find that the increasing trend in the return predictability of NSI is stronger for small, growth, and young firms because these firms tend to experience a more significant decrease in their profitability over time. The return predictability of ROE, however, decreases for all types of firms.

4.3.2. Repurchasing and issuing firms

Due to the fact that firms only incur external financing costs when they issue shares, our theory predicts that there is a negative relation between expected returns and net stock issues only when firms issue shares but that no such relation exists when they repurchase shares. Therefore, instead of investigating all firms as a whole, in this section we study issuing firms and repurchasing firms, separately. Our unreported results confirm that consistent with our theory predictions, the negative return-new issues relation only exists in issuing firms but not in repurchasing firms. More specifically, the magnitude of the coefficient on net stock issues in the cross-sectional regression of expected returns for repurchasing firms is much smaller than that for issuing firms and is statistically insignificant. Moreover, all the time-series results remain the same for issuing firms, but disappear for repurchasing firms.

While the empirical results are in favor of our theory, they are at odds with the literature on the long-run performance of repurchasing firms. Lakonishok and Vermaelen (1990), Ikenberry, Lakonishok, and Vermaelen (1995), and Peyer and Vermaelen (2008) show that firms experience positive abnormal returns over the four years after a stock repurchase announcement. We provide two possible explanations for the seemingly contradicting results. First, the long-run performance studies all examine the stock returns after the announcement of repurchases, and not actual share repurchases. After the announcement, firms may choose to wait some time (up to several years) before repurchasing their shares. Moreover, since they are not actually obligated to repurchase their shares after the announcement, they may choose not to repurchase the exact amount of shares as indicated in the announcement or they may even choose not to repurchase any shares at all. While there might be an announcement effect involved in share repurchases, a relation between expected returns and the number of shares that firms actually repurchase does not necessarily exist. Second, the long-run performance studies are all event studies. While in the calendar-time studies we can easily control for the effects of many other firm characteristics in the cross-sectional regression, the event studies may not be able to fully account for those effects. At the aggregate level, Dittmar and Dittmar (2008) find that aggregate repurchases are not significantly related to future absolute or relative returns, which also casts doubt on the relation between expected returns and share repurchases for the market as a whole.

4.3.3. Alternative measure of firm profitability

We have been using ROE as our primary measure for firm profitability. Since ROE depends on the leverage of the firm, one concern is whether the change in the expected return-ROE relation is driven by the change in leverage over time. To address this question, we first show that the average leverage, as measured by the sum of long-term debt (item DLTT) and debt in current liability (item DLC) and dividing that by book assets, does not have a significant time trend during our sample period. Second, we use return on assets (ROA) as an alternative measure of firm profitability. ROA is not directly linked to leverage and complements our results on

ROE. The results remain largely the same, further confirming that our results are not driven by the change in leverage.

4.3.4. Alternative measures of return volatility

In the previous sections, we have focused on the relation between total return volatility and firm profitability. Ever since Campbell et al. (2001) suggested that idiosyncratic volatility had increased noticeably from 1962 to 1997, a significant amount of literature has been devoted to studying the determinants of idiosyncratic volatility. Therefore, we also investigate how the relation between idiosyncratic volatility and profitability has evolved over time. We decompose daily stock return into systematic and idiosyncratic components by performing the following regression every month:

$$r_{itd} = a_{it} + b_{it}' f_{td} + \varepsilon_{itd}, \tag{22}$$

where r_{itd} is the stock return on trading day *d* for firm *i* in month *t*, and f_{td} are the daily factor returns on day *d* in month *t*. The idiosyncratic volatility for stock *i* in month *t* is defined as

$$IV_{it} = \sqrt{\frac{1}{n}\sum_{d=1}^{n} \varepsilon_{itd}^2}, \tag{23}$$

where *n* is the number of trading days for firm *i* in month *t*. The definition of idiosyncratic volatility depends on the systematic factors in the regression of equation (22). We consider three sets of systematic factors. The first set contains the excess returns on the market portfolio or the market factor (MKT). The second set consists of Fama and French's (1993) three factors, including MKT, the small-minus-big (SML) size factor, and the high-minus-low (HML) value factor. The third set uses Carhart's (1997) four factors, including MKT, SML, HML and a momentum factor (MOM). These factor returns are retrieved from Kenneth French's website.

We study the relation between different specifications of idiosyncratic volatility and ROE (VROE). The unreported results are very similar to those on total return volatility.

5. Conclusion

The stock underperformance after new equity issuance has been studied extensively in the literature. Yet, the time-series properties of this prominent negative relation between expected returns and net stock issues have received little attention. We provide empirical evidence that the return predictability of net stock issues has increased over time in the past four decades. At the same time, the return predictability of profitability has decreased significantly.

We propose a simple model of investment under uncertainty with convex external financing costs to provide a rational explanation for the two opposite time trends in return predictability. The model suggests that the magnitude of the negative return-new issues relation should decrease with the *level* of firm profitability and that the return predictability of profitability itself should increase with the *persistence* of profitability. We provide supporting evidence that the increase in the return predictability of new issues over time can be fully explained by the change in firm fundamentals, namely the decreasing level of profitability, but cannot be explained by the investor sentiment measures, contrary to what the market timing hypothesis suggests. Moreover, the decreasing persistence of profitability explains a large portion of the decreasing trend in both the return predictability and the return volatility predictability of profitability itself.

Empirical research studying the return predictability of anomaly variables usually performs analysis in different subperiods as a robustness check. This paper suggests that the return predictability of anomaly variables may change over time due to changes in firm fundamentals and not simply periodic sentiment fluctuations. While changes in firm fundamentals and changes in market sentiment may coincide at times, they may exhibit different time trends over a sufficiently long period. Therefore, studying the return predictability in both the cross section and time series may provide us with additional information for disentangling the effects from both the rational and the behavioral sides of the market.

Appendix A. Definition of Variables

Variable	Definition
SZ	Market value of equity, the closing stock price multiplied by the number of shares outstanding.
BM	Book-to-market equity ratio, the book value of equity divided by the market value of equity at the fiscal year end. Book value of equity is defined as common equity (item CEQ) if available or total assets (item AT) minus liability (item LT), plus balance sheet deferred taxes (item TXDB) if available and investment tax credits (item ITCI) if available, minus preferred stock liquidation value (item PSTKL) if available, or redemption value (item PSTKRV) if available, or carrying value (item PSTK) if available.
I/A	Investment-to-asset ratio, sum of the change in gross property, plant and equipment (item PPEGT) and the change in inventory (item INVT) scaled by lagged assets.
NSI	Net stock issue, the natural log of the ratio of the split-adjusted shares outstanding (annual item CSHO times item ADJEX C) divided by lagged split-adjusted shares outstanding.
ROE_A	Return on equity from annual data, income before extraordinary items (item IB) scaled by lagged book value of equity.
ROE_Q	Return on equity from quarterly data, income before extraordinary items (item IBQ) scaled by lagged book value of equity. Quarterly book value of equity is defined as common equity (item CEQQ) if available or total assets (item ATQ) minus liability (item LTQ), plus balance sheet deferred taxes and investment tax credits (item TXDITCQ) if available, minus redemption value (item PSTKRQ) if available, or carrying value (item PSTKQ) if available.
$VROE_Q$	Volatility of return on equity from quarterly data, the standard deviation of quarterly ROE for the previous three years. We require at least 8 observations.
LEV	Leverage, the sum of long-term debt (item DLTT) and debt in current liability (item DLC) divided by book assets. DLTT and DLC are set to zero when missing.
$RET_{-7,-2}$	Cumulative return from month t–2 to t–7.
AGE	Firm age, the number of years a stock has appeared in the CRSP database.
VR	Standard deviation of daily raw returns within a month, defined as $$VR_{it} = \sqrt{\frac{\sum_{d=1}^{n}(r_{itd} - \bar{r})^2}{n-1}},$$ where n is the number of trading days, r_{itd} is the daily raw return and $\bar{r}$ is the average daily return for stock i in month t.

Appendix B. Optimal Investment Policy of the Model

Firm *i* optimally chooses investment I_{i0} to maximize its market value of equity at the end of period 0:

$$\text{Max}_{\{I_{i0}\}} \; -e(\pi_{i0},K_{i0}) - C\big(e(\pi_{i0},K_{i0})\big) + E_0[m_1(\pi_{i1}K_{i1} + (1-\delta)K_{i1})],$$

$$s.t. \; K_{i1} = I_{i0} + (1-\delta)K_{i0}.$$

We assume all firms start with nonnegative return on equity in period 0. The marginal q of firm *i* is given by

$$q_{i0} = \frac{\partial E_0[m_1(\pi_{i1}K_{i1} + (1-\delta)K_{i1})]}{\partial K_{i1}} = E_0[m_1(\pi_{i1} + 1 - \delta)].$$

If the optimal investment $I_{i0}^* \leq \pi_{i0}K_{i0}$ so that firm *i* does not issue equity, the firm's maximization problem becomes

$$\text{Max}_{\{I_{i0}\}} \; -e(\pi_{i0},K_{i0}) + E_0[m_1(\pi_{i1}K_{i1} + (1-\delta)K_{i1})],$$

$$s.t. \; K_{i1} = I_{i0} + (1-\delta)K_{i0}.$$

Then we have

$$\begin{aligned} \text{V}_{\text{i0}}^* &= \underset{\{I_{i0}\}}{\text{Max}} \; \pi_{i0}K_{i0} - I_{i0} + E_0[m_1(\pi_{i1}K_{i1} + (1-\delta)K_{i1})] \\ &= \underset{\{I_{i0}\}}{\text{Max}} \; \pi_{i0}K_{i0} - I_{i0} + E_0[m_1(\pi_{i1} + 1 - \delta)][I_{i0} + (1-\delta)K_{i0}] \\ &= \underset{\{I_{i0}\}}{\text{Max}} \; \pi_{i0}K_{i0} + q_{i0}(1-\delta)K_{i1} + (q_{i0} - 1)I_{i0}. \end{aligned}$$

Case 1: If $q_{i0} \leq 1$, the firm chooses to disinvest all its capital at the end of period 0 and we have

$$I_{i0}^* = -(1-\delta)K_{i0},$$

$$\text{V}_{\text{i0}}^* = (\pi_{i0} + 1 - \delta)K_{i0}.$$

Case 2: If $q_{i0} > 1$, the firm chooses to maximize its investment and we have

$$I_{i0}^* = \pi_{i0}K_{i0},$$

$$V_{i0}^* = q_{i0}(\pi_{i0} + 1 - \delta)K_{i0}.$$

Case 3: If the optimal investment $I_{i0}^* > \pi_{i0}K_{i0}$ so that firm *i* issues equity and incurs external financing costs, the firm's maximization problem becomes

$$\text{Max}_{\{I_{i0}\}} - e(\pi_{i0}, K_{i0}) - \left[\lambda_0 + \lambda_1 e(\pi_{i0}, K_{i0}) + \frac{1}{2}\lambda_2 e(\pi_{i0}, K_{i0})^2\right] + E_0[m_1(\pi_{i1}K_{i1} + (1-\delta)K_{i1})],$$

$$s.t.\ K_{i1} = I_{i0} + (1-\delta)K_{i0}.$$

The first-order condition with respect to I_{i0} gives

$$I_{i0}^* = \frac{q_{i0} - 1 - \lambda_1}{\lambda_2} + \pi_{i0}K_{i0},$$

$$e_{i0}^* = \frac{q_{i0} - 1 - \lambda_1}{\lambda_2} > 0.$$

Firm value is given by

$$V_0^* = -e_{i0}^* - \left[\lambda_0 + \lambda_1 e_{i0}^* + \frac{1}{2}\lambda_2 (e_{i0}^*)^2\right] + q_{i0}[e_{i0}^* + \pi_{i0}K_{i0} + (1-\delta)K_{i0}]$$

$$= -\lambda_0 + (q_{i0} - 1 - \lambda_1)e_{i0}^* - \frac{1}{2}\lambda_2 (e_{i0}^*)^2 + q_{i0}(\pi_{i0} + 1 - \delta)K_{i0},$$

where

$$-\lambda_0 + (q_{i0} - 1 - \lambda_1)e_{i0}^* - \frac{1}{2}\lambda_2 (e_{i0}^*)^2$$

$$= -\lambda_0 + (q_{i0} - 1 - \lambda_1)\frac{q_{i0} - 1 - \lambda_1}{\lambda_2} - \frac{1}{2}\lambda_2 (\frac{q_{i0} - 1 - \lambda_1}{\lambda_2})^2$$

$$= \frac{1}{2\lambda_2}(q_{i0} - 1 - \lambda_1)^2 - \lambda_0 > 0 \ \ if\ \ q_{i0} > 1 + \lambda_1 + +\sqrt{2\lambda_0\lambda_2}.$$

Summarizing the above three cases gives the firm's optimal investment policy

$$I_{i0}^* = \begin{cases} -(1-\delta)K_{i0},\ if\ q_{i0} \le 1 \\ \pi_{i0}K_{i0},\ if\ 1 < q_{i0} \le 1 + \lambda_1 + +\sqrt{2\lambda_0\lambda_2} \\ \frac{q_{i0} - 1 - \lambda_1}{\lambda_2} + \pi_{i0}K_{i0},\ if\ \ q_{i0} > 1 + \lambda_1 + +\sqrt{2\lambda_0\lambda_2}. \end{cases}$$

The following figure presents the optimal investment as a function of marginal q in the model. If $q_{i0} \leq 1$, the firm chooses to disinvest all capital at the end of period 0; in the range $1 < q_{i0} \leq 1 + \lambda_1 + +\sqrt{2\lambda_0\lambda_2}$, the firm invests all its profits $\pi_{i0}K_{i0}$ but does not issue new equity; when $q_{i0} > 1 + \lambda_1 + +\sqrt{2\lambda_0\lambda_2}$, the firm not only invests all its profits $\pi_{i0}K_{i0}$ but also issues new equity and invests an additional amount that is proportional to the marginal q.

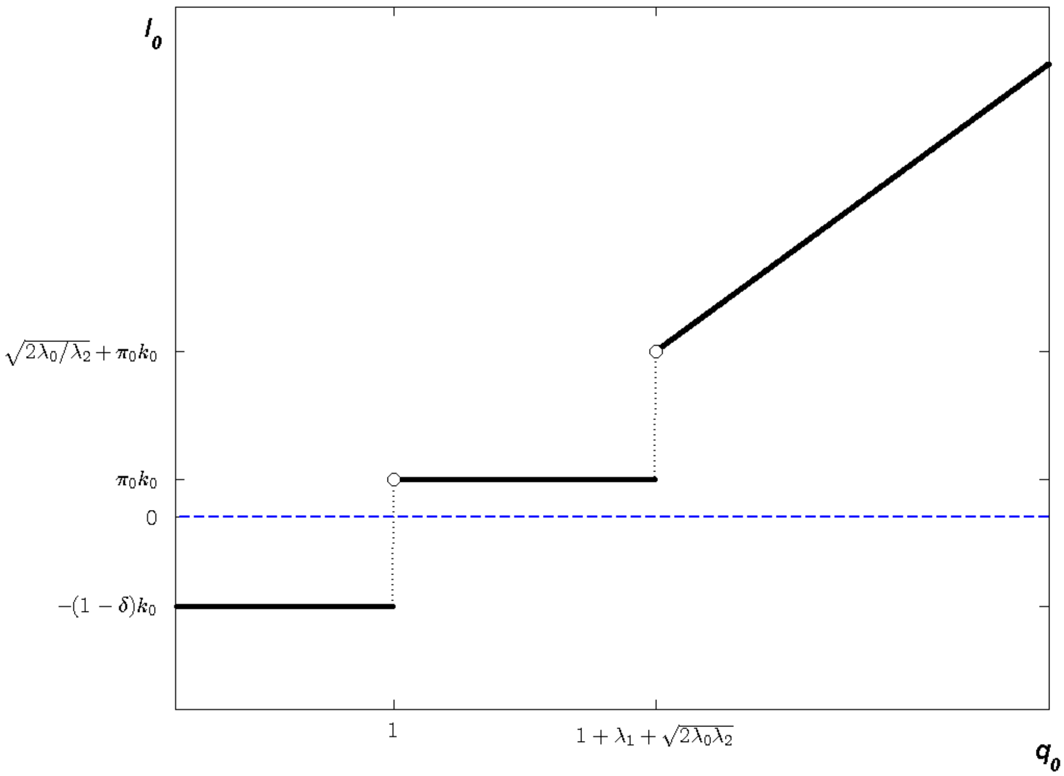

Figure A1. Optimal investment and marginal *q*.

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Table 1. Summary Statistics and Cross Correlations

Panel A reports the summary statistics calculated as the time-series averages of the number, mean, standard deviation, minimum, 5th percentile, 25th percentile, median, 75th percentile, 95th percentile, and maximum of firm characteristics, including quarterly and annual return on equity (ROE_Q and ROE_A), volatility of quarterly return on equity ($VROE_Q$), investment-to-assets ratio (I/A), net stock issues (NSI), book-to-market equity ratio (BM), leverage (LEV), natural logarithm of market value in millions (Ln(SZ)), past six-month returns from month *t*-2 to *t*-7 ($RET_{-7,-2}$), and firm age (AGE). See Appendix A for the definition of variables. All variables are winsorized at the 1% and 99% levels. Panel B reports the time-series averages of the pairwise cross-sectional Pearson correlations. All correlations are significant at the 5% level. The sample period is from January 1973 to December 2011.

Panel A: Summary Statistics

Variable	N	Mean	SD	Min	5th pctl	25th pctl	Median	75th pctl	95th pctl	Max
ROE_Q	3,272	-0.002	0.109	-0.602	-0.190	-0.011	0.021	0.042	0.094	0.240
$VROE_Q$	2,846	0.072	0.157	0.003	0.006	0.014	0.028	0.062	0.249	1.202
ROE_A	3,484	0.026	0.385	-2.042	-0.556	-0.036	0.085	0.172	0.393	1.235
I/A	3,268	0.092	0.177	-0.347	-0.114	0.010	0.061	0.138	0.404	0.948
NSI	3,318	0.041	0.117	-0.168	-0.048	-0.001	0.006	0.033	0.266	0.661
BM	3,573	0.882	0.723	0.053	0.142	0.399	0.700	1.136	2.266	4.149
LEV	3,573	0.219	0.182	0.000	0.000	0.057	0.190	0.338	0.566	0.724
Ln(SZ)	3,573	4.466	1.959	0.564	1.465	3.037	4.318	5.747	8.015	9.578
$RET_{-7,-2}$	3,547	0.071	0.364	-0.603	-0.421	-0.155	0.024	0.227	0.736	1.522
AGE	3,573	13.873	14.021	0.336	1.692	4.651	9.006	17.971	44.345	66.375

Panel B: Cross Correlation (Pearson)

Variable	ROE_Q	$VROE_Q$	ROE_A	IA	NSI	Ln(BM)	LEV	Ln(SZ)	$RET_{-7,-2}$
$VROE_Q$	-0.260								
ROE_A	0.548	-0.274							
I/A	0.086	-0.022	0.148						
NSI	-0.132	0.171	-0.190	0.260					
BM	-0.056	-0.111	-0.073	-0.176	-0.131				
LEV	-0.074	0.150	-0.073	0.099	0.022	0.106			
Ln(SZ)	0.272	-0.179	0.271	0.106	-0.038	-0.285	-0.023		
$RET_{-7,-2}$	0.177	-0.026	0.062	-0.047	-0.054	0.032	-0.018	0.148	
AGE	0.103	-0.129	0.098	-0.118	-0.114	0.076	0.044	0.416	0.026

Table 2. Fama and Macbeth Cross-sectional Regressions for the Full Sample and in Subperiods

This table reports the results from the Fama and MacBeth (1973) cross-sectional regressions of expected returns (Panel A) and expected return volatility (Panel B) in the full sample (1973-2011) and subperiods (1973-1984, 1985-1998, and 1999-2011) as follows:

$$R_{it+1} = \beta_0 + \beta_1 ROE_{it} + \beta_2 NSI_{it} + Controls_{it} + \varepsilon_{it+1}$$
$$VR_{it+1} = \beta_0 + \beta_1 ROE_{it} + \beta_2 VROE_{it} + Controls_{it} + \varepsilon_{it+1}$$

where R_{it+1} is the monthly raw stock return in month t + 1, and $Var(R_{it+1})$ is the standard deviation of daily raw stock returns in month t + 1. Controls in the expected return regression include the logarithm of book-to-market equity (Ln(BM)), logarithm of firm size (Ln(SZ)), investment-to-asset ratio (I/A), past six-month returns ($RET_{-7,-2}$), and logarithm of firm age (Ln(AGE)). Controls in the regression of expected returns volatility include Ln(BM), Ln(SZ), $RET_{-7,-2}$, Ln(AGE), leverage (LEV), R_{it+1}, and $Var(R_{it})$. The corresponding *t*-statistics are reported in parentheses and are calculated from Newey and West (1987) robust standard errors.

Panel A: Expected return regressions ($R_{it+1} \times 100$)

Period	Intercept	ROE	NSI	Ln(BM)	Ln(SZ)	$RET_{-7,-2}$	Ln(AGE)	I/A	Avg Adj R^2
1973-2011	2.41	4.65	-1.07	0.17	-0.24	0.13	0.04	-1.74	0.034
	(4.80)	(4.55)	(-4.00)	(2.06)	(-5.95)	(0.50)	(0.78)	(-6.94)	
1973-1984	2.44	10.62	-0.61	0.28	-0.29	0.43	0.09	-2.09	0.048
	(2.61)	(6.03)	(-1.19)	(1.78)	(-4.35)	(0.95)	(0.81)	(-5.45)	
1985-1998	2.13	2.91	-0.89	0.10	-0.18	0.15	0.06	-1.55	0.019
	(4.16)	(6.60)	(-3.25)	(1.06)	(-2.83)	(0.65)	(1.21)	(-7.72)	
1999-2011	2.70	1.02	-1.70	0.13	-0.27	-0.18	-0.03	-1.63	0.036
	(2.42)	(0.91)	(-3.32)	(0.86)	(-3.41)	(-0.31)	(-0.32)	(-2.71)	

Panel B: Expected return volatility regressions ($Var(R_{it+1}) \times 100$)

Period	Intercept	ROE	VROE	Ln(BM)	Ln(SZ)	$RET_{-7,-2}$	Ln(AGE)	LEV	R_t	VR_t	Avg Adj R^2
1973-2011	2.76	-2.09	0.86	-0.13	-0.23	-0.26	-0.07	0.32	0.02	0.47	0.476
	(14.54)	(-14.56)	(4.42)	(-9.34)	(-14.96)	(-5.08)	(-4.58)	(5.32)	(15.36)	(23.15)	
1973-1984	1.69	-2.97	2.26	-0.17	-0.17	-0.18	0.03	0.64	0.02	0.48	0.498
	(24.40)	(-13.03)	(8.23)	(-18.29)	(-9.88)	(-2.22)	(1.49)	(10.48)	(8.32)	(58.46)	
1985-1998	2.59	-1.51	0.20	-0.10	-0.23	-0.34	-0.11	0.18	0.02	0.58	0.527
	(17.68)	(-15.52)	(5.16)	(-4.52)	(-9.30)	(-5.90)	(-8.36)	(3.67)	(11.43)	(26.02)	
1999-2011	3.92	-1.89	0.29	-0.11	-0.29	-0.25	-0.13	0.18	0.03	0.35	0.400
	(19.53)	(-16.03)	(10.45)	(-4.31)	(-16.27)	(-2.20)	(-5.83)	(1.56)	(8.87)	(19.15)	

Table 3. The Level and Persistence of ROE in Subperiods

This table reports the level and persistence of ROE in subperiods during 1972-2011. The level of ROE is measured by the time-series mean and median of annual average ROE in a five–year period. The persistence of ROE is estimated by a two-step first-differenced GMM each of the non-overlapping five-year periods as follows:

$$ROE_{it+1} = a + a_i + \rho ROE_{it} + \varepsilon_{it+1},$$

where ROE_{it+1} is annual ROE of firm i in fiscal year $t+1$ and the regression coefficient ρ is the persistence of ROE. The t-statistics, and the lower (L95) and upper (H95) limits of the 95% confidence interval for the estimated persistence are reported.

	Level of *ROE*		Persistence of *ROE*			
Year	Mean	Median	Persistence	*t*-stat	L95	H95
1972-1976	0.124	0.114	0.439	5.750	0.290	0.589
1977-1981	0.142	0.139	0.346	3.010	0.121	0.572
1982-1986	0.059	0.090	0.376	4.160	0.199	0.553
1987-1991	0.013	0.070	0.107	1.770	-0.012	0.226
1992-1996	0.002	0.072	0.182	1.960	0.000	0.365
1997-2001	-0.064	0.075	0.213	2.850	0.066	0.359
2002-2006	-0.036	0.054	0.410	4.000	0.209	0.610
2007-2011	-0.017	0.079	0.142	2.410	0.027	0.257

Table 4. Time Trend Analysis

This table reports the time trend analysis of the coefficients in the Fama and MacBeth (1973) cross-sectional regressions of expected return and expected return volatility.

$$\beta\_R\_NSI_{it+1} = b_0 + b_1 t + b_2 Avg(ROE)_t + v_{t+1},$$
$$\beta\_R\_ROE_{it+1} = b_0 + b_1 t + b_2 Pers(ROE)_t + v_{t+1},$$
$$\beta\_VR\_ROE_{it+1} = b_0 + b_1 t + b_2 Pers(ROE)_t + v_{t+1},$$
$$\beta\_VR\_VROE_{it+1} = b_0 + b_1 t + b_2 Pers(ROE)_t + v_{t+1},$$

where $\beta\_R\_NSI_{t+1}$ and $\beta\_R\_ROE_{t+1}$ are the coefficients on NSI and ROE in the Fama and MacBeth (1973) cross-sectional regression of expected return in month $t+1$ using a rolling window of the past five years, respectively; $\beta\_VR\_ROE_{t+1}$ and $\beta\_VR\_VROE_{t+1}$ are the coefficients on ROE and VROE in the Fama and MacBeth (1973) cross-sectional regression of expected return volatility in month t+1 using a rolling window of the past five years, respectively. $Avg(ROE)_{t+1}$ is the equal-weighted average of ROE over the past five years for all firms in month t. $Pers(ROE)_{t+1}$ is the ROE persistence estimated by the two-step first-differenced GMM using a rolling window of the past five years. The corresponding t-statistics are reported in parentheses and are calculated from Newey and West (1987) robust standard errors.

Model	Dependent variable	Intercept	t (time trend)	Avg(ROE)	Pers(ROE)	Adj R^2
1	$\beta\_R\_NSI_{t+1}$	0.32	-4.71			0.506
		(1.19)	(-5.25)			
2	$\beta\_R\_NSI_{t+1}$	-1.21		9.23		0.650
		(-14.25)		(9.69)		
3	$\beta\_R\_NSI_{t+1}$	-1.19	-0.05	9.15		0.649
		(-2.79)	(-0.05)	(4.44)		
4	$\beta\_R\_ROE_{t+1}$	13.11	-30.53			0.758
		(10.55)	(-7.85)			
5	$\beta\_R\_ROE_{t+1}$	-0.33			22.05	0.455
		(-0.44)			(4.76)	
6	$\beta\_R\_ROE_{t+1}$	9.58	-25.12		9.13	0.812
		(8.73)	(-7.70)		(5.27)	
7	$\beta\_VR\_ROE_{t+1}$	-2.80	2.86			0.325
		(-9.23)	(3.22)			
8	$\beta\_VR\_ROE_{t+1}$	-1.36			-2.91	0.388
		(-9.13)			(-3.94)	
9	$\beta\_VR\_ROE_{t+1}$	-2.00	1.64		-2.07	0.461
		(-6.66)	(2.28)		(-3.57)	
10	$\beta\_VR\_VROE_{t+1}$	2.63	-6.36			0.553
		(5.94)	(-5.07)			
11	$\beta\_VR\_VROE_{t+1}$	-0.37			5.54	0.484
		(-2.41)			(4.83)	
12	$\beta\_VR\_VROE_{t+1}$	1.37	-4.42		3.27	0.670
		(2.92)	(-3.96)		(3.83)	

Table 5. Time Trend Analysis with Sentiment Measures

This table reports the time trend analysis of the coefficients in the Fama and MacBeth (1973) cross-sectional regression of expected returns with sentiment measures.

$$\beta\_R\_NSI_{it+1} = b_0 + b_1 t + b_2 Avg(ROE)_t + b_3 SENT_t + v_{t+1},$$

where $\beta\_R\_NSI_{t+1}$ is the coefficient on NSI in the Fama and MacBeth (1973) cross-sectional regression of expected return in month t+1 using a rolling window of the past five years. $Avg(ROE)_{t+1}$ is the equal-weighted average of ROE for all firms over the past five years in month t. $SENT_t$ represents the sentiment measures, including the Baker and Wurgler (2006) sentiment index (SENT), the number of IPOs (N_IPO), and the first day's returns of IPOs (R_IPO). All the sentiment measures are averaged over the past five years. The corresponding t-statistics are reported in parentheses and are calculated from Newey and West (1987) robust standard errors.

Model	Intercept	Time trend t	Avg(ROE)	SENT	N_IPO	R_IPO	AdjR^2
1	0.320	-4.712					0.506
	(1.19)	(-5.25)					
2	0.285	-4.539		-0.317			0.589
	(0.98)	(-4.80)		(-1.94)			
3	0.608	-4.981			-0.783		0.544
	(2.12)	(-5.47)			(-1.41)		
4	0.510	-4.909				-0.816	0.524
	(1.33)	(-5.08)				(-0.60)	
5	-1.052	-0.393	7.980	-0.232			0.683
	(-2.22)	(-0.30)	(3.31)	(-1.47)			
6	-1.131	-0.175	8.941		-0.077		0.647
	(-1.75)	(-0.11)	(3.13)		(-0.14)		
7	-1.152	-0.109	9.051			-0.121	0.647
	(-1.74)	(-0.07)	(3.58)			(-0.12)	

Table 6. Unit Root and Cointegration Tests

This table reports results of unit root and cointegration tests on the time series of coefficients in the return and return volatility cross-sectional regressions, and the level and persistence of ROE, which are calculated using a five-year rolling window. Panel A reports the statistics of the unit root tests, including the Dickey-Fuller (DF) *t*-statistic, the Phillips-Perron (PP) ρ-statistic and the τ-statistic for *β_R_NSI, β_R_ROE, β_VR_ROE, β_VR_VROE, Avg*(*ROE*), and *Pers*(*ROE*). Table B reports the Engle-Granger cointegration tests between *β_R_NSI* and *Avg(ROE)*, and between *β_R_ROE* (*β_VR_ROE* or *β_VR_VROE*) and *Pers*(*ROE*). The lag orders in the tests are determined by the minimum Schwarz information criterion (SIC). The 1%, 5%, and 10% critical values for the Dickey-Fuller *t*-tests and the Phillips-Perron τ-tests are -3.447, -2.874, and -2.570, respectively, when a constant is included in the regression, and -3.984, -3.424, and -3.130, respectively, when both a constant and a linear time trend are included. The 1%, 5%, and 10% critical values for the Phillips-Perron ρ-tests are -20.426, -14.000, and -11.200, respectively, when a constant is included in the regression, and -28.716, -21.426, and -18.063, respectively, when both a constant and a linear time trend are included.

Panel A. Unit root tests

	β_R_NSI	*β_R_ROE*	*β_VR_ROE*	*β_VR_VROE*	*Avg*(*ROE*)	*Pers*(*ROE*)
Constant						
DF *t*-statistic	-1.952	-2.199	-3.482	-2.764	-2.294	-2.181
PP ρ-statistic	-6.317	-2.505	-3.934	-1.180	-1.186	-21.423
PP τ-statistic	-1.761	-1.544	-4.265	-1.034	-2.599	-3.329
Lag order	1	2	4	9	1	12
Constant and trend						
DF *t*-statistic	-2.949	-2.085	-2.175	-2.705	-2.772	-2.757
PP ρ-statistic	-14.116	-4.740	-2.330	-0.844	1.584	-31.777
PP τ-statistic	-2.765	-1.431	-2.164	-0.500	1.688	-4.023
Lag order	1	2	4	9	1	12

Panel B. Cointegration tests

	β_R_NSI & *Avg*(*ROE*)	*β_R_ROE* & *Pers*(*ROE*)	*β_VR_ROE* & *Pers*(*ROE*)	*β_VR_VROE* & *Pers*(*ROE*)
DF *t*-statistic	-3.604	-2.816	-2.991	-2.313
PP ρ-statistic	-20.303	-20.583	-16.606	-20.632
PP τ-statistic	-3.412	-3.300	-3.245	-3.249
Lag order	1	12	12	12

Table 7. Fama and Macbeth Cross-Sectional Regression for Subsamples Split by ROE

This table reports the regression coefficients from the Fama and MacBeth (1973) cross-sectional regressions of expected returns for subsamples split by return on equity (ROE) and for the whole sample:

$$R_{it+1} = \gamma_0 + \gamma_1 ROE_{it} + \gamma_2 NSI_{it} + \gamma_3 NSI_{it} \times D\_ROE_{Qit} + Controls_{it} + \varepsilon_{it+1},$$

D_ROE is a dummy variable that equals 1 if firm *i*'s ROE_Q is above the median in quarter t and zero otherwise. NSI is net stock issues, BM is book-to-market equity ratio, SZ is market value in millions, (Ln(SZ)), $RET_{-7,-2}$ is past six-month returns from month *t*-2 to *t*-7, AGE is firm age in years, and I/A is investment-to-assets ratio. The sample period is 1973-2011. The corresponding *t*-statistics are reported in parentheses and are calculated from Newey and West (1987) robust standard errors.

Sample	Intercept	ROE	NSI	Ln(BM)	Ln(SZ)	$RET_{-7,-2}$	Ln(AGE)	I/A	NSI×D_ROE
ROE < Median	2.43	2.66	-1.13	0.27	-0.30	-0.49	0.00	-2.27	
	(4.47)	(2.68)	(-3.85)	(2.69)	(-6.25)	(-1.72)	(0.00)	(-8.65)	
ROE > Median	2.46	5.52	-0.77	0.26	-0.22	0.61	0.04	-1.24	
	(5.69)	(4.93)	(-2.74)	(2.66)	(-6.09)	(2.55)	(1.05)	(-4.96)	
Whole sample	2.42	4.45	-1.68	0.17	-0.24	0.12	0.04	-1.78	1.49
	(4.81)	(4.38)	(-5.25)	(2.08)	(-5.95)	(0.47)	(0.76)	(-7.21)	(4.68)

Table 8. Portfolio Analysis for Subsamples Split by ROE

This table reports the raw returns, the Fama and French three-factor alpha (Alpha3), and the Carhart four-factor alphas (Alpha4) on the High-Low portfolio (buying the highest NSI quintile and selling the lowest NSI quintile) for subsamples split by ROE (low, medium, and high). The sample period is 1973-2011. The corresponding *t*-statistics are reported in parentheses and are calculated from Newey and West (1987) robust standard errors.

		Equal-weighted returns						Value-weighted returns						
ROE Rank	NSI Rank	Raw return		Alpha3		Alpha4		Raw return		Alpha3		Alpha4		N
Low	1	1.04	(2.78)	0.12	(0.77)	0.37	(2.16)	0.87	(2.89)	0.16	(0.97)	0.30	(1.84)	134
	2	1.14	(2.69)	0.18	(0.88)	0.52	(2.16)	0.25	(0.69)	-0.61	(-3.51)	-0.45	(-2.47)	239
	3	0.80	(1.81)	-0.14	(-0.70)	0.24	(1.10)	0.47	(1.38)	-0.25	(-1.30)	-0.07	(-0.38)	179
	4	0.71	(1.54)	-0.10	(-0.52)	0.26	(1.22)	0.31	(0.82)	-0.29	(-1.50)	-0.12	(-0.69)	189
	5	0.04	(0.07)	-0.75	(-3.50)	-0.32	(-1.31)	-0.22	(-0.52)	-0.82	(-4.26)	-0.56	(-2.97)	272
	High-Low	-1.00	(-5.03)	-0.88	(-5.41)	-0.69	(-3.98)	-1.09	(-3.73)	-0.97	(-4.18)	-0.86	(-3.63)	.
Medium	1	1.12	(4.06)	0.33	(4.45)	0.44	(5.83)	0.71	(3.07)	0.10	(0.93)	0.19	(1.67)	216
	2	1.11	(3.88)	0.34	(3.95)	0.46	(5.13)	0.68	(2.85)	0.11	(1.01)	0.17	(1.62)	228
	3	0.99	(3.27)	0.21	(2.80)	0.35	(4.63)	0.63	(2.53)	0.08	(0.83)	0.15	(1.45)	214
	4	0.83	(2.70)	0.15	(1.79)	0.32	(3.67)	0.35	(1.31)	-0.10	(-1.08)	0.00	(0.04)	198
	5	0.25	(0.75)	-0.48	(-4.44)	-0.27	(-2.99)	0.04	(0.15)	-0.46	(-3.77)	-0.34	(-3.05)	165
	High-Low	-0.87	(-6.46)	-0.81	(-7.56)	-0.70	(-7.22)	-0.67	(-3.57)	-0.56	(-3.37)	-0.53	(-3.05)	.
High	1	1.38	(5.13)	0.68	(7.15)	0.73	(8.19)	0.67	(3.01)	0.25	(2.95)	0.23	(2.92)	225
	2	1.35	(4.76)	0.65	(6.63)	0.67	(6.80)	0.53	(2.40)	0.19	(1.84)	0.08	(0.74)	189
	3	1.12	(3.83)	0.41	(5.35)	0.46	(5.56)	0.51	(2.13)	0.16	(2.05)	0.11	(1.30)	209
	4	1.09	(3.52)	0.45	(5.59)	0.51	(5.62)	0.70	(2.39)	0.38	(3.60)	0.33	(2.97)	224
	5	0.83	(2.39)	0.14	(1.41)	0.19	(1.82)	0.42	(1.46)	0.01	(0.06)	-0.08	(-0.66)	174
	High-Low	-0.54	(-3.83)	-0.54	(-4.73)	-0.54	(-4.70)	-0.25	(-1.53)	-0.24	(-1.57)	-0.31	(-1.94)	
High-Low	High-Low	0.46	(2.73)	0.34	(1.92)	0.15	(0.85)	0.84	(3.14)	0.73	(2.94)	0.54	(2.15)	

Table 9. Fama and Macbeth Cross-Sectional Regression in Subperiods for Size Subsamples

This table reports the results from the Fama and MacBeth (1973) cross-sectional regressions of expected returns (Panel A) and expected return volatility (Panel B) in subperiods (1973-1984, 1985-1998 and 1999-2011) for size terciles. ROE is return on equity, NSI is net stock issues, BM is book-to-market equity ratio, SZ is market value in millions, (Ln(SZ)), $RET_{-7,-2}$ is past six-month returns from month *t*-2 to *t*-7, AGE is firm age in years, and I/A is investment-to-assets ratio. VROE is volatility of ROE, LEV is leverage, R is raw return, and VR is standard deviation of daily raw returns within a month. All the t-statistics calculated from Newey-West robust standard errors are reported in parentheses.

Panel A: Regressions of expected returns ($R_{it+1} \times 100$)

Size rank	Period	Intercept	ROE	NSI	Ln(BM)	Ln(SZ)	$RET_{-7,-2}$	Ln(AGE)	I/A
Small	1973-1984	3.26	10.70	-0.66	0.10	-0.55	0.57	0.04	-2.19
		(3.26)	(6.82)	(-1.26)	(0.53)	(-5.98)	(1.61)	(0.33)	(-5.56)
	1985-1998	3.46	3.23	-0.91	0.10	-0.58	0.21	-0.03	-1.53
		(5.65)	(7.79)	(-2.74)	(1.10)	(-5.22)	(0.90)	(-0.42)	(-6.91)
	1999-2011	4.06	1.01	-1.80	0.13	-0.52	-0.16	-0.20	-2.09
		(2.92)	(0.85)	(-3.66)	(0.72)	(-3.71)	(-0.31)	(-1.42)	(-3.06)
Medium	1973-1984	1.48	12.97	-1.06	0.51	-0.05	0.86	-0.02	-1.77
		(1.48)	(5.77)	(-1.64)	(3.33)	(-0.49)	(1.45)	(-0.20)	(-5.42)
	1985-1998	1.02	3.00	-0.61	0.13	0.05	0.68	0.00	-0.95
		(1.55)	(3.63)	(-1.33)	(1.22)	(0.53)	(2.35)	(0.04)	(-3.39)
	1999-2011	1.85	1.21	-1.42	0.07	-0.20	0.05	0.06	-0.64
		(1.53)	(1.10)	(-2.06)	(0.54)	(-1.53)	(0.08)	(0.72)	(-1.18)
Large	1973-1984	1.87	12.14	-0.70	0.62	-0.15	-0.35	0.00	-1.52
		(1.74)	(3.23)	(-0.85)	(3.55)	(-1.58)	(-0.42)	(-0.00)	(-2.62)
	1985-1998	0.29	2.59	-0.39	-0.04	0.13	0.44	-0.06	-0.54
		(0.37)	(3.10)	(-1.11)	(-0.29)	(1.39)	(1.18)	(-0.97)	(-1.68)
	1999-2011	1.99	2.99	-1.48	0.16	-0.18	0.33	0.03	0.75
		(1.69)	(1.94)	(-2.22)	(1.14)	(-1.88)	(0.49)	(0.23)	(1.49)

Table 9 – continued

Panel B: Regressions of expected return volatility regressions ($Var(R_{it+1}) \times 100$)

Size rank	Period	Intercept	ROE	VROE	Ln(BM)	Ln(SZ)	$RET_{-7,-2}$	Ln(AGE)	LEV	R_t	VR_t
Low	1973-1984	2.02	-2.77	1.78	0.72	-0.16	-0.32	-0.23	0.00	0.03	0.46
		(27.32)	(-12.94)	(6.85)	(8.06)	(-10.68)	(-9.76)	(-2.83)	(-0.10)	(9.05)	(59.96)
	1985-1998	3.22	-1.38	0.19	0.19	-0.09	-0.39	-0.38	-0.18	0.02	0.56
		(9.68)	(-15.09)	(5.04)	(3.24)	(-3.58)	(-5.80)	(-6.31)	(-22.33)	(11.70)	(27.40)
	1999-2011	5.23	-1.81	0.28	0.28	-0.12	-0.59	-0.25	-0.24	0.03	0.30
		(15.69)	(-15.40)	(13.13)	(2.32)	(-6.32)	(-11.66)	(-2.63)	(-8.49)	(10.37)	(19.03)
Medium	1973-1984	1.46	-1.88	1.81	0.54	-0.13	-0.12	-0.15	0.01	0.02	0.40
		(20.73)	(-11.16)	(8.52)	(16.09)	(-11.86)	(-12.24)	(-1.95)	(1.05)	(5.10)	(52.41)
	1985-1998	2.20	-0.96	0.26	-0.09	-0.13	-0.13	0.02	-0.13	0.00	0.39
		(22.79)	(-13.46)	(2.60)	(-1.40)	(-8.07)	(-12.62)	(0.29)	(-20.28)	(0.41)	(32.41)
	1999-2011	3.01	-1.04	0.26	-0.14	-0.12	-0.19	0.11	-0.13	0.00	0.27
		(24.95)	(-8.60)	(5.19)	(-1.47)	(-5.33)	(-18.52)	(2.22)	(-7.76)	(0.42)	(11.30)
High	1973-1984	1.71	-1.24	2.80	0.23	-0.10	-0.12	-0.07	-0.02	0.00	0.36
		(20.11)	(-3.45)	(6.48)	(6.21)	(-6.40)	(-12.50)	(-1.15)	(-2.64)	(0.79)	(31.74)
	1985-1998	1.89	-0.43	0.19	-0.03	-0.06	-0.10	0.06	-0.09	0.00	0.38
		(35.47)	(-3.98)	(1.43)	(-0.67)	(-5.44)	(-9.56)	(1.45)	(-8.11)	(1.11)	(21.12)
	1999-2011	2.08	-0.81	0.13	-0.27	-0.05	-0.08	0.06	-0.10	0.00	0.33
		(14.83)	(-7.28)	(3.00)	(-5.72)	(-2.71)	(-13.47)	(0.91)	(-8.33)	(-1.43)	(16.31)

Table 10. Fama and Macbeth Cross-Sectional Regression in Subperiods for Book-to-Market Subsamples

This table reports the results from the Fama and MacBeth (1973) cross-sectional regressions of expected returns (Panel A) and expected return volatility (Panel B) in subperiods (1973-1984, 1985-1998 and 1999-2011) for BM terciles. ROE is return on equity, NSI is net stock issues, BM is book-to-market equity ratio, SZ is market value in millions, (Ln(SZ)), $RET_{-7,-2}$ is past six-month returns from month *t*-2 to *t*-7, AGE is firm age in years, and I/A is investment-to-assets ratio. VROE is volatility of ROE, LEV is leverage, R is raw return, and VR is standard deviation of daily raw returns within a month. All the *t*-statistics calculated from Newey-West robust standard errors are reported in parentheses.

Panel A: Regressions of expected returns ($R_{it+1} \times 100$)

BM rank	Period	Intercept	ROE	NSI	Ln(BM)	Ln(SZ)	$RET_{-7,-2}$	Ln(AGE)	I/A
Low	1973-1984	2.57	7.99	-0.32	0.33	-0.37	0.41	0.17	-1.74
		(2.44)	(3.69)	(-0.36)	(1.91)	(-4.10)	(0.58)	(1.44)	(-3.57)
	1985-1998	1.97	2.03	-1.34	0.25	-0.12	0.51	0.09	-1.55
		(3.25)	(5.18)	(-3.22)	(2.79)	(-1.60)	(2.37)	(0.98)	(-6.71)
	1999-2011	2.48	1.66	-1.73	0.13	-0.23	-0.19	0.01	-2.39
		(2.55)	(1.79)	(-2.68)	(1.11)	(-2.75)	(-0.40)	(0.10)	(-4.51)
Medium	1973-1984	2.39	12.37	-1.12	0.24	-0.25	0.49	0.02	-2.28
		(2.55)	(5.99)	(-1.39)	(0.88)	(-3.66)	(1.22)	(0.16)	(-5.98)
	1985-1998	1.97	3.47	-1.03	-0.18	-0.17	0.11	0.09	-1.42
		(3.87)	(3.26)	(-2.48)	(-0.62)	(-2.39)	(0.50)	(1.35)	(-4.62)
	1999-2011	2.31	0.58	-2.05	-0.07	-0.24	-0.13	-0.01	-0.74
		(2.20)	(0.34)	(-3.21)	(-0.38)	(-3.11)	(-0.23)	(-0.07)	(-0.96)
High	1973-1984	2.33	13.77	-1.42	0.45	-0.28	0.12	0.08	-2.10
		(2.59)	(7.14)	(-1.64)	(2.73)	(-4.70)	(0.31)	(0.69)	(-5.24)
	1985-1998	2.72	4.56	0.17	-0.13	-0.31	-0.28	0.02	-1.43
		(4.78)	(4.52)	(0.31)	(-0.76)	(-4.80)	(-0.86)	(0.35)	(-5.40)
	1999-2011	3.28	-0.51	-1.04	0.01	-0.37	-0.14	-0.14	-1.58
		(2.76)	(-0.23)	(-1.95)	(0.03)	(-3.40)	(-0.22)	(-1.26)	(-2.40)

Table 10 – continued

Panel B: Regressions of expected return volatility ($Var(R_{it+1}) \times 100$)

BM rank	Period	Intercept	ROE	VROE	Ln(BM)	Ln(SZ)	$RET_{-7,-2}$	Ln(AGE)	LEV	R_t	VR_t
Low	1973-1984	1.74	-2.33	1.67	0.44	-0.24	-0.18	-0.23	0.03	0.01	0.42
		(22.26)	(-12.72)	(6.78)	(10.11)	(-13.06)	(-13.10)	(-3.04)	(1.87)	(3.77)	(47.26)
	1985-1998	2.70	-1.03	0.16	0.09	-0.08	-0.27	-0.34	-0.02	0.02	0.53
		(20.00)	(-12.95)	(3.90)	(3.01)	(-4.24)	(-17.64)	(-6.46)	(-1.64)	(7.28)	(19.25)
	1999-2011	3.72	-1.36	0.16	-0.16	-0.15	-0.30	-0.20	-0.07	0.02	0.31
		(22.22)	(-15.20)	(5.98)	(-2.07)	(-14.65)	(-22.80)	(-2.82)	(-3.69)	(5.13)	(17.43)
Medium	1973-1984	1.49	-2.95	2.32	0.54	-0.19	-0.17	-0.14	0.04	0.02	0.48
		(21.21)	(-13.78)	(11.64)	(9.24)	(-10.28)	(-9.59)	(-2.38)	(2.36)	(9.08)	(44.66)
	1985-1998	2.38	-2.05	0.33	0.12	-0.18	-0.23	-0.27	-0.08	0.02	0.57
		(18.72)	(-14.02)	(5.39)	(3.08)	(-7.39)	(-10.00)	(-5.98)	(-5.59)	(9.90)	(37.40)
	1999-2011	3.54	-2.64	0.53	0.22	-0.22	-0.31	-0.13	-0.09	0.02	0.33
		(17.75)	(-12.46)	(11.32)	(2.23)	(-6.68)	(-16.00)	(-1.49)	(-4.92)	(8.89)	(18.45)
High	1973-1984	1.51	-3.19	3.25	0.71	0.07	-0.20	-0.20	0.02	0.03	0.45
		(25.46)	(-15.48)	(6.76)	(9.96)	(1.98)	(-9.01)	(-2.38)	(1.69)	(8.99)	(34.52)
	1985-1998	2.41	-2.61	0.37	0.29	-0.04	-0.23	-0.30	-0.16	0.02	0.61
		(12.53)	(-13.93)	(3.88)	(5.23)	(-1.60)	(-6.25)	(-5.36)	(-21.07)	(12.63)	(29.08)
	1999-2011	3.91	-3.32	0.75	0.48	0.03	-0.38	-0.21	-0.14	0.03	0.35
		(14.56)	(-14.91)	(6.47)	(4.43)	(0.79)	(-10.96)	(-2.20)	(-6.38)	(9.07)	(19.89)

Table 11. Fama and Macbeth Cross-Sectional Regression in Subperiods for Age Subsamples

This table reports the results from the Fama and MacBeth (1973) cross-sectional regressions of expected returns (Panel A) and expected return volatility (Panel B) in subperiods (1973-1984, 1985-1998 and 1999-2011) for age terciles. ROE is return on equity, NSI is net stock issues, BM is book-to-market equity ratio, SZ is market value in millions, (Ln(SZ)), $RET_{-7,-2}$ is past six-month returns from month *t*-2 to *t*-7, AGE is firm age in years, and I/A is investment-to-assets ratio. VROE is volatility of ROE, LEV is leverage, R is raw return, and VR is standard deviation of daily raw returns within a month. All the t-statistics calculated from Newey-West robust standard errors are reported in parentheses.

Panel A: Regressions of expected returns ($R_{it+1} \times 100$)

Age rank	Period	Intercept	ROE	NSI	Ln(BM)	Ln(SZ)	$RET_{-7,-2}$	Ln(AGE)	I/A
Young	1973-1984	0.10	6.80	1.39	0.15	-0.46	1.33	8.90	-2.16
		(0.03)	(2.36)	(1.54)	(0.72)	(-4.99)	(2.34)	(1.02)	(-3.63)
	1985-1998	3.03	2.34	-1.13	0.13	-0.33	0.26	-0.25	-1.44
		(5.94)	(4.35)	(-2.80)	(1.18)	(-3.96)	(1.16)	(-1.07)	(-5.56)
	1999-2011	3.56	1.19	-1.90	0.14	-0.46	-0.08	0.09	-2.61
		(2.47)	(1.07)	(-3.85)	(0.95)	(-3.03)	(-0.15)	(0.50)	(-3.14)
Medium	1973-1984	1.09	12.07	-1.17	0.29	-0.35	0.49	0.74	-2.45
		(0.97)	(6.97)	(-1.59)	(1.95)	(-4.74)	(1.09)	(2.00)	(-5.71)
	1985-1998	2.45	3.59	-0.49	0.10	-0.27	0.10	0.07	-1.76
		(3.03)	(5.78)	(-1.40)	(0.79)	(-3.69)	(0.40)	(0.40)	(-6.34)
	1999-2011	2.32	1.04	-1.81	0.05	-0.28	-0.05	0.13	-1.39
		(1.75)	(0.88)	(-3.36)	(0.30)	(-3.15)	(-0.09)	(0.70)	(-2.29)
Old	1973-1984	2.42	11.37	-1.26	0.37	-0.23	0.06	-0.01	-1.47
		(2.77)	(5.33)	(-1.88)	(2.30)	(-3.24)	(0.14)	(-0.10)	(-4.52)
	1985-1998	1.76	3.20	-0.82	0.09	-0.06	0.23	-0.03	-1.13
		(3.65)	(2.64)	(-1.74)	(0.91)	(-1.06)	(0.93)	(-0.30)	(-4.20)
	1999-2011	2.32	1.67	-1.33	0.22	-0.17	-0.32	-0.11	-0.38
		(2.15)	(1.20)	(-1.64)	(1.70)	(-3.84)	(-0.48)	(-0.58)	(-0.70)

Table 11 – continued

Panel B: Regressions of expected return volatility ($Var(R_{it+1}) \times 100$)

Age rank	Period	Intercept	ROE	VROE	Ln(BM)	Ln(SZ)	$RET_{-7,-2}$	Ln(AGE)	LEV	R_t	VR_t
Young	1973-1984	2.34	-2.64	0.31	0.49	-0.23	-0.19	-0.20	-0.61	0.02	0.41
		(5.24)	(-6.25)	(0.34)	(6.32)	(-10.50)	(-11.43)	(-1.90)	(-1.04)	(5.78)	(15.95)
	1985-1998	3.17	-1.31	0.12	0.17	-0.07	-0.37	-0.42	0.03	0.02	0.51
		(11.57)	(-12.06)	(2.47)	(2.46)	(-2.57)	(-7.62)	(-8.52)	(0.83)	(7.61)	(41.17)
	1999-2011	4.64	-1.51	0.22	0.04	-0.12	-0.44	-0.23	-0.14	0.02	0.30
		(16.99)	(-12.78)	(5.96)	(0.28)	(-5.15)	(-13.43)	(-2.77)	(-4.26)	(8.32)	(16.90)
Medium	1973-1984	1.72	-3.11	2.25	0.66	-0.16	-0.21	-0.23	0.04	0.02	0.45
		(9.44)	(-8.95)	(5.73)	(10.67)	(-10.30)	(-9.93)	(-3.02)	(0.62)	(7.44)	(40.04)
	1985-1998	2.57	-1.32	0.20	0.06	-0.07	-0.25	-0.33	-0.10	0.02	0.59
		(13.97)	(-13.86)	(4.98)	(0.99)	(-2.89)	(-7.68)	(-5.64)	(-4.52)	(8.22)	(22.63)
	1999-2011	3.95	-1.73	0.28	0.13	-0.12	-0.36	-0.21	-0.10	0.02	0.33
		(18.93)	(-13.17)	(10.66)	(1.47)	(-6.38)	(-16.63)	(-2.47)	(-2.76)	(7.43)	(19.31)
Old	1973-1984	1.62	-2.53	2.84	0.43	-0.11	-0.15	-0.14	-0.01	0.02	0.47
		(37.55)	(-15.54)	(9.14)	(11.95)	(-16.09)	(-13.58)	(-2.70)	(-2.94)	(7.75)	(34.46)
	1985-1998	1.72	-1.58	0.42	0.25	-0.13	-0.17	-0.16	-0.02	0.02	0.61
		(11.14)	(-13.86)	(6.87)	(4.95)	(-8.17)	(-15.38)	(-3.60)	(-0.82)	(13.74)	(26.90)
	1999-2011	3.00	-1.99	0.40	0.32	-0.10	-0.23	-0.09	-0.10	0.02	0.39
		(19.38)	(-14.91)	(7.27)	(3.87)	(-5.09)	(-13.94)	(-1.08)	(-2.84)	(6.88)	(18.72)

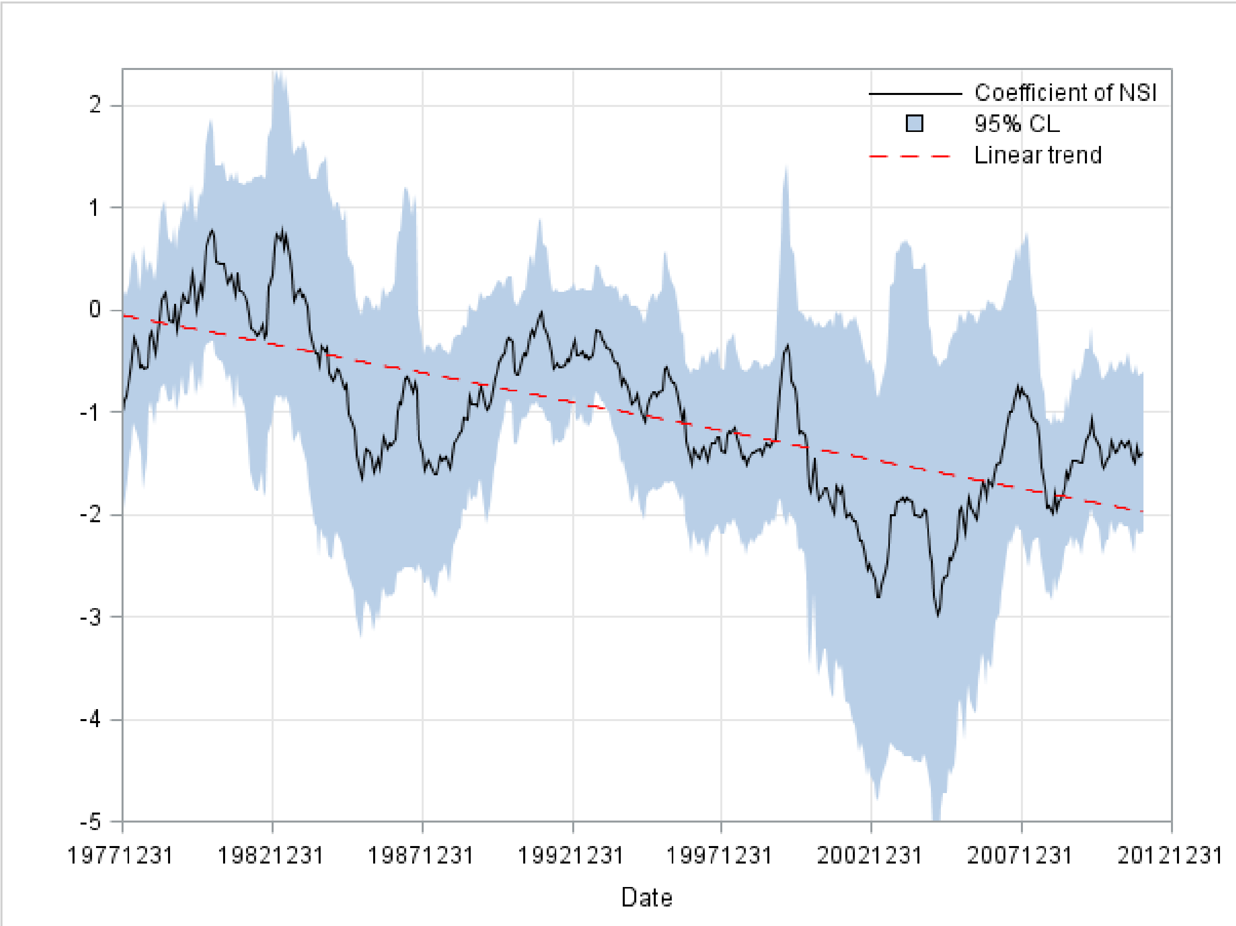

Figure 1. Regression coefficients on NSI in the Fama and Macbeth cross-sectional regression of expected returns

This figure plots the regression coefficients (the black solid line) and the 95% confidence interval of NSI in the Fama and MacBeth (1973) cross-sectional regression of expected returns using a rolling window of the past five years. The red dashed line shows the linear trend of the regression coefficients of NSI.

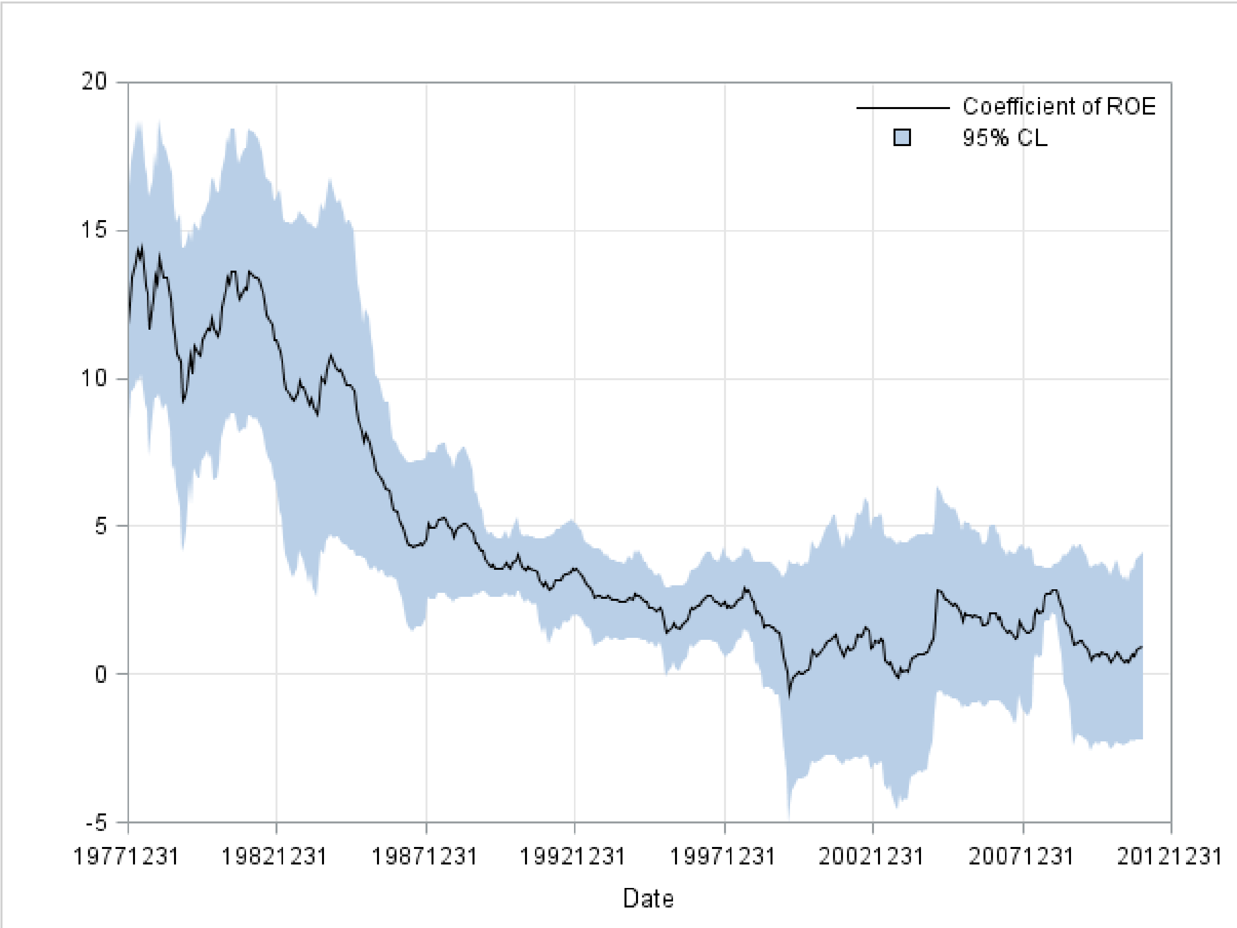

Figure 2. Regression coefficients of ROE in the Fama and Macbeth cross-sectional regression of expected returns

This figure plots the regression coefficients and the 95% confidence interval of ROE in the Fama and MacBeth (1973) cross-sectional regression of expected returns using a rolling window of the past five years.

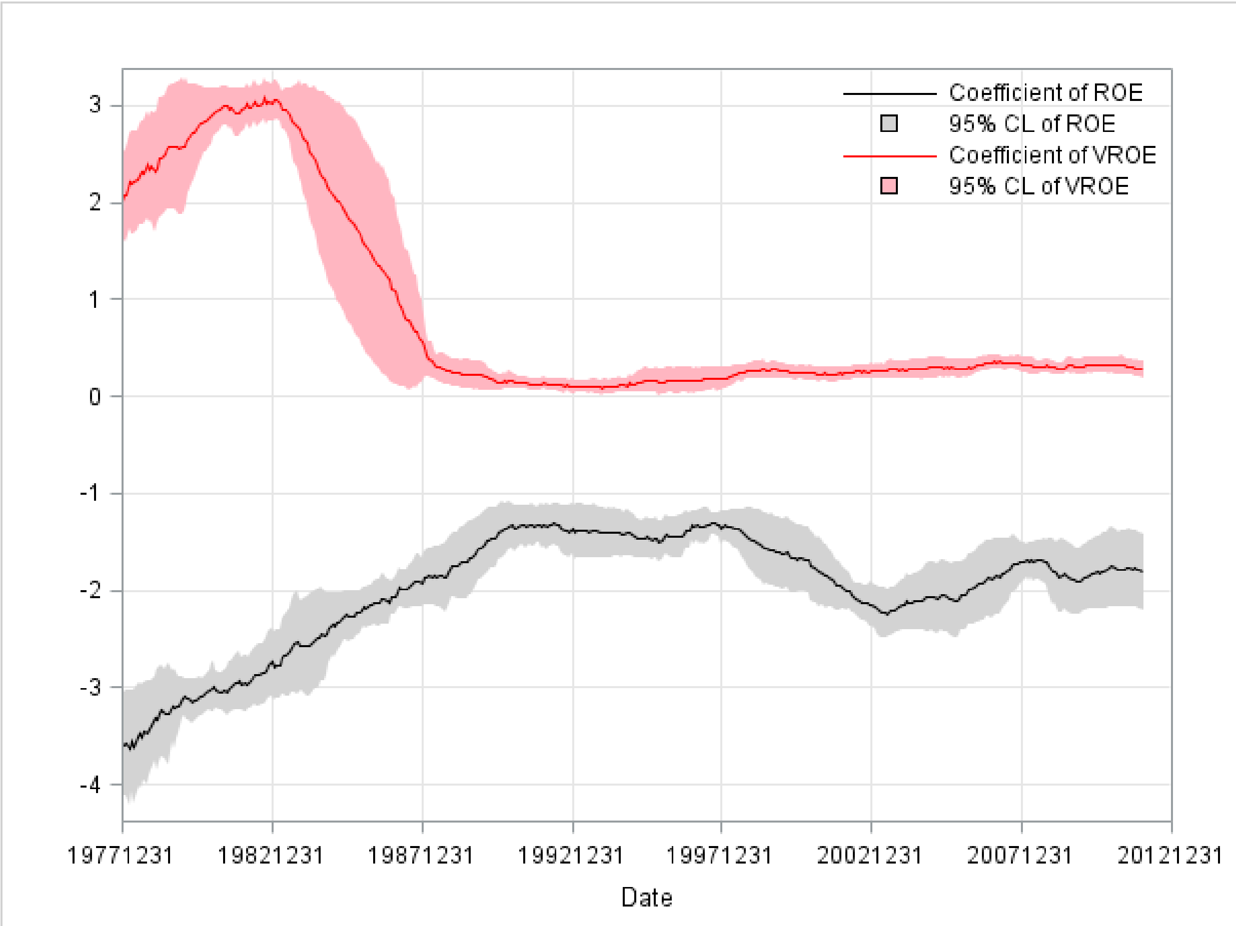

Figure 3. Regression coefficients of ROE and VROE in the Fama and Macbeth cross- sectional regression of expected return volatility

This figure plots the regression coefficients and the 95% confidence interval of ROE and VROE in the Fama and MacBeth (1973) cross-sectional regression of expected return volatility using a rolling window of past five years.

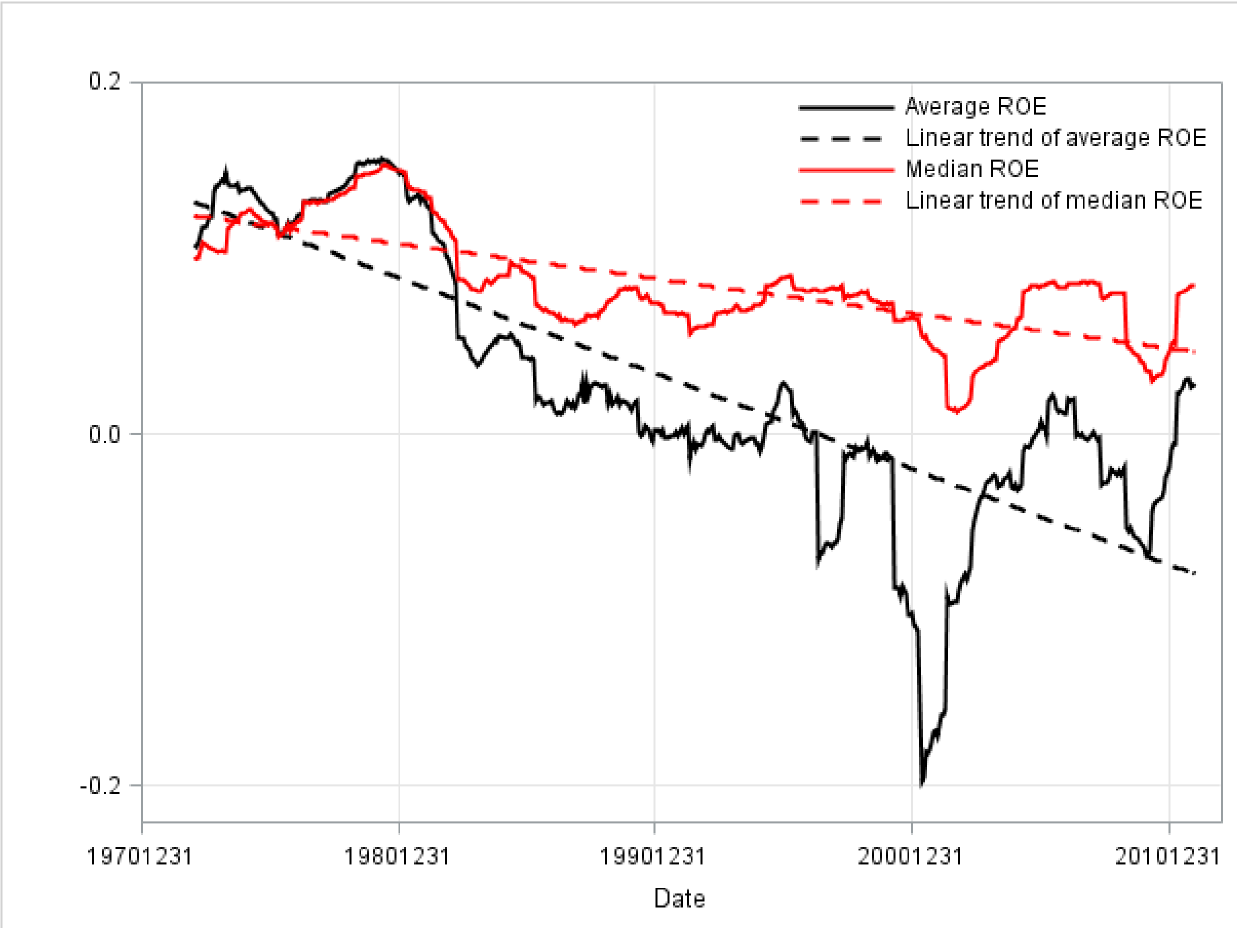

Figure 4. Time series of average ROE
This figure plots the time series of average annual ROE (the black solid line) during 1973-2011. The red dashed line shows the linear trend of average ROE.

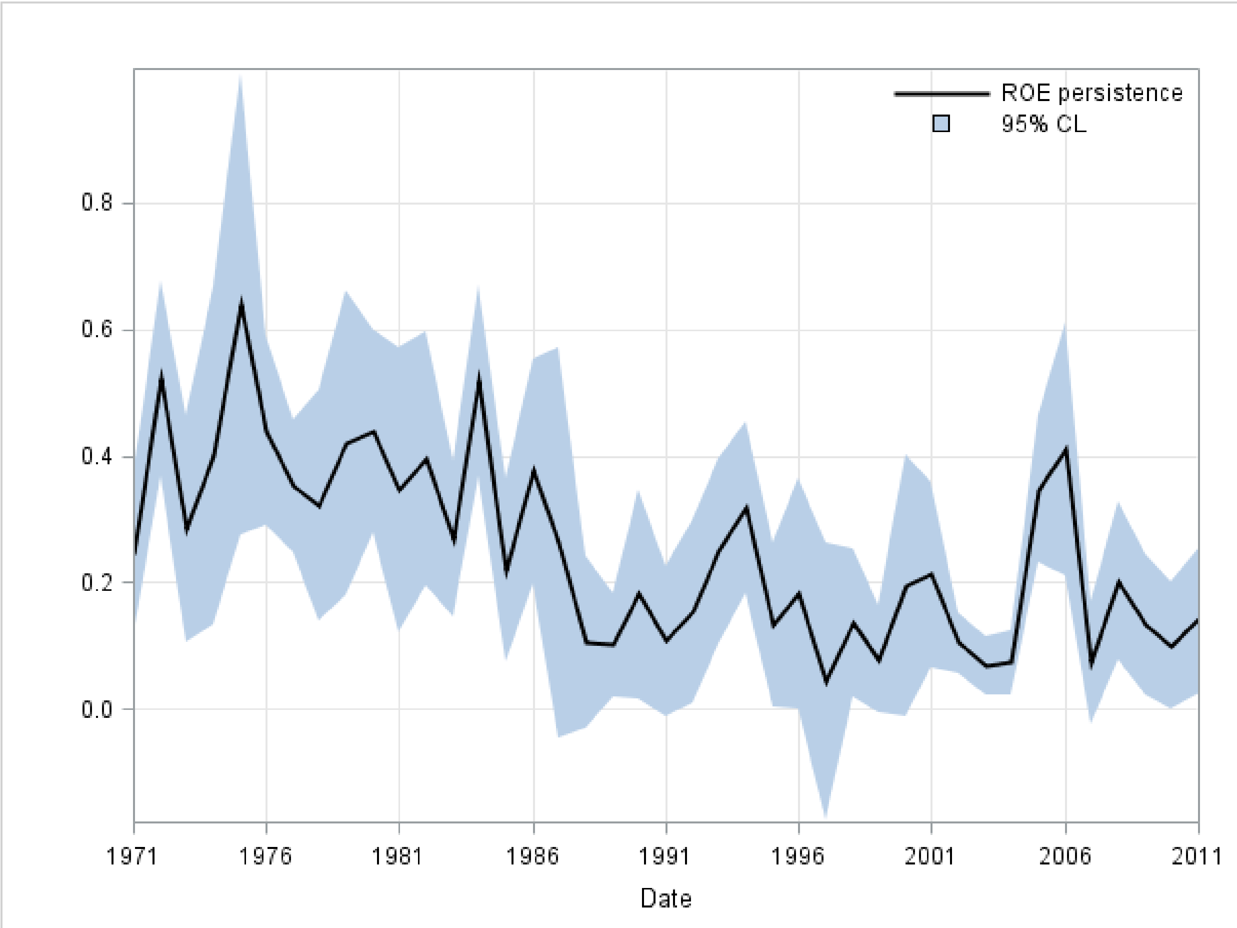

Figure 5. Time series of ROE persistence
This figure plots the coefficients and the 95% confidence interval of ROE persistence estimated by the two-step first-differenced GMM using a rolling window of past five years.

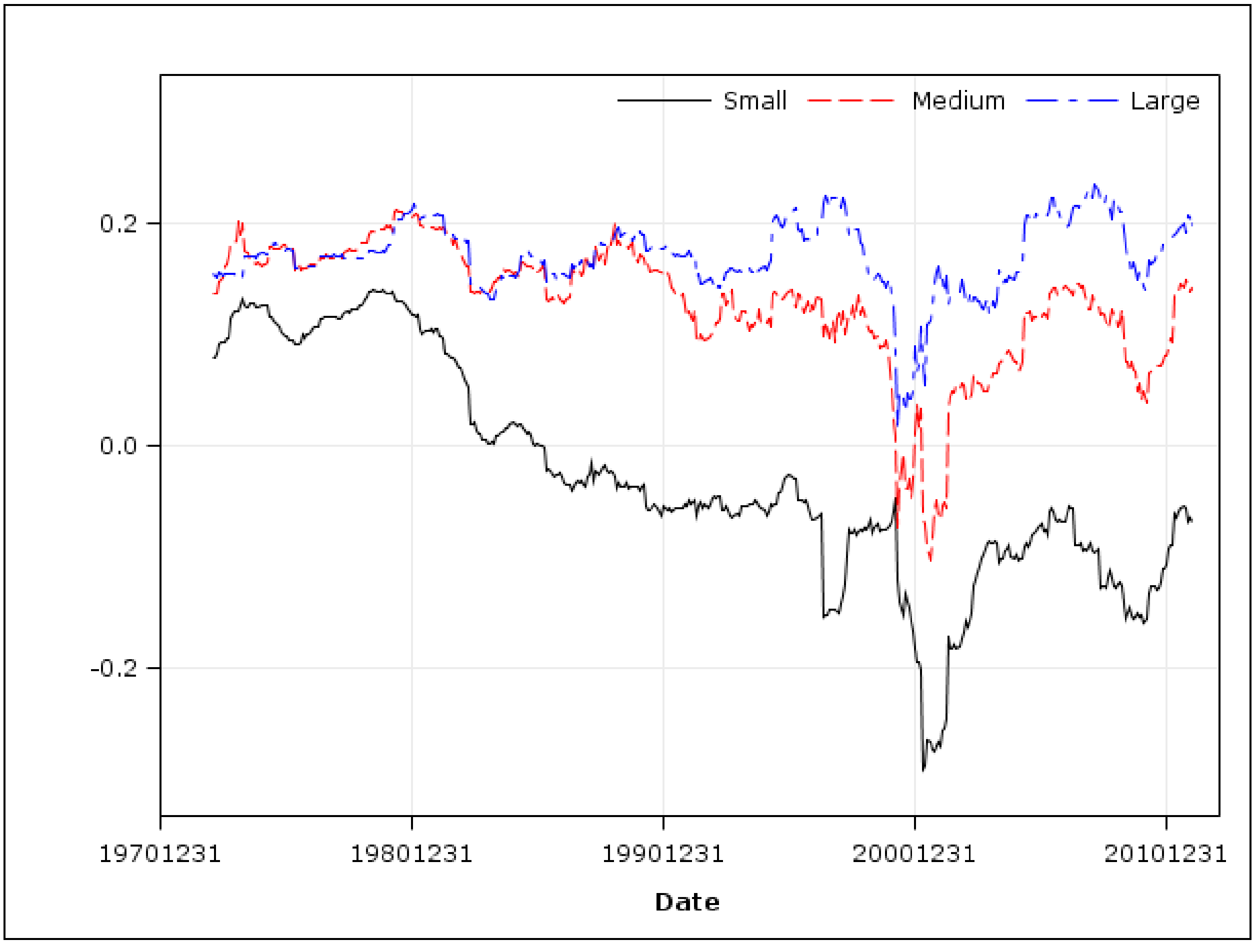

Figure 6. Time-series average of ROE for size subsamples
This figure plots the time series of average annual ROE for size subsamples during 1973-2011.

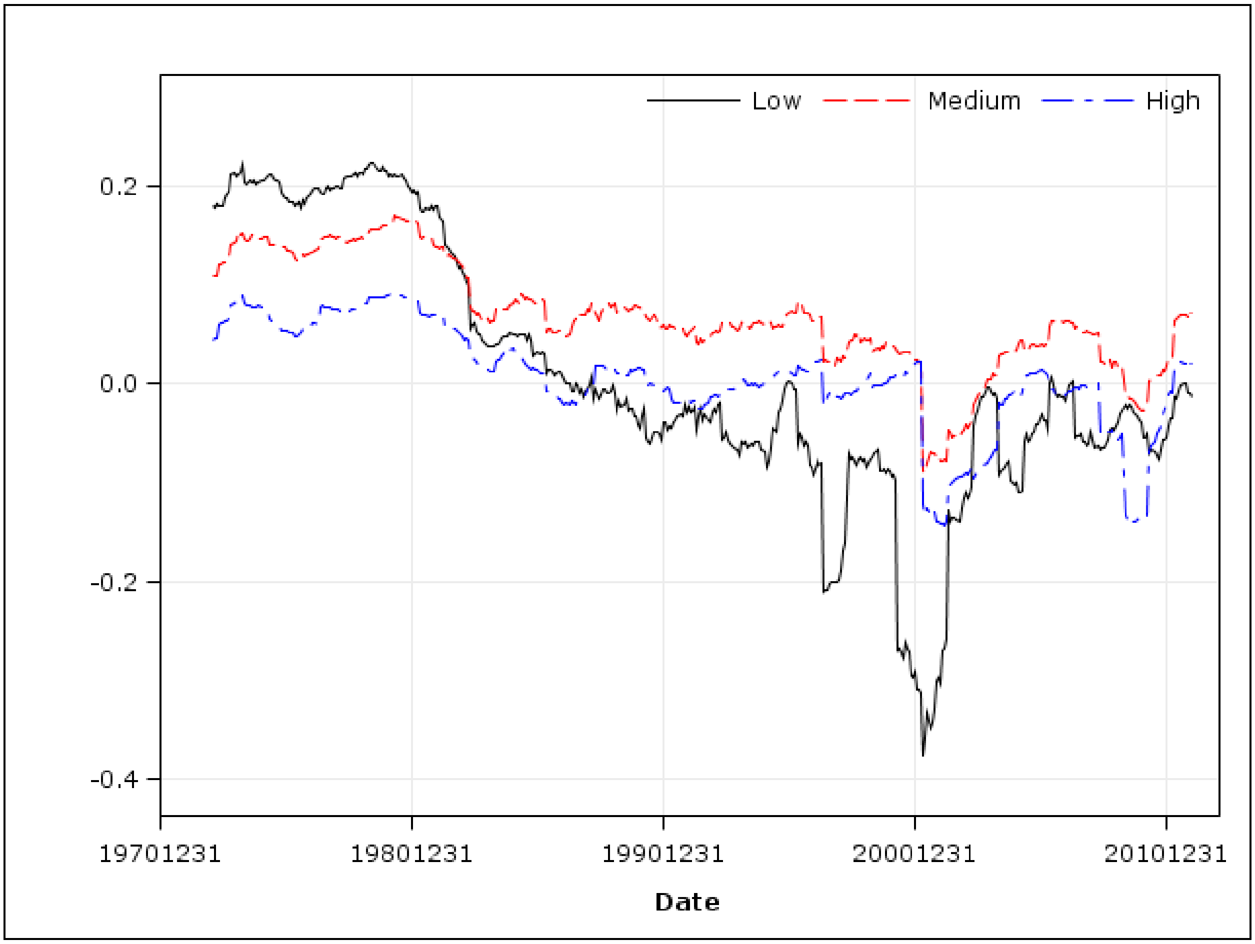

Figure 7. Time-series average of ROE for BM subsamples
This figure plots the time series of averages annual ROE for BM subsamples during 1973-2011.

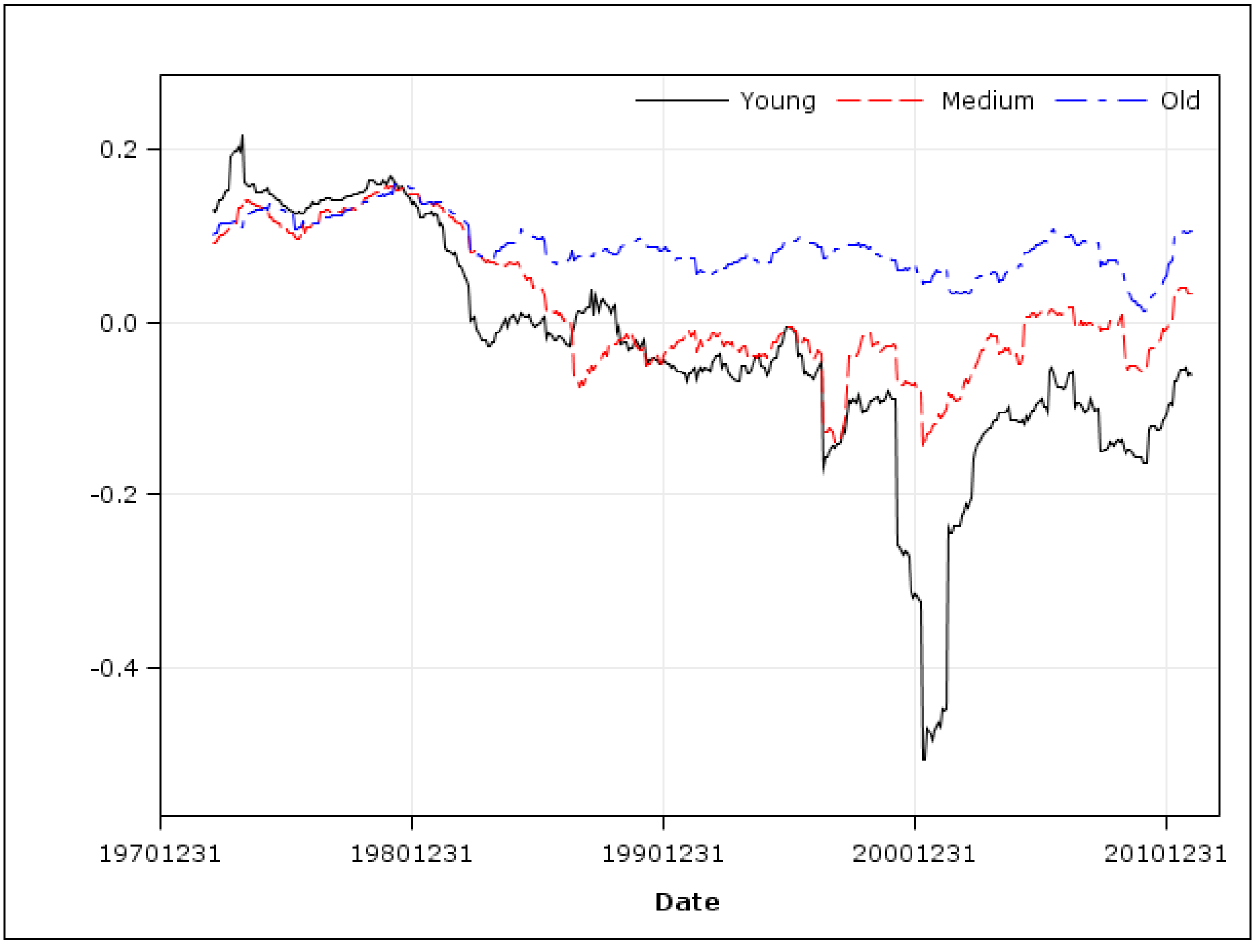

Figure 8. Time-series average of ROE for age subsamples
This figure plots the time series of averages annual ROE for age subsamples during 1973-2011.