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Dose the Firm Life Cycle Matter on Idiosyncratic Risk?

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Abstract. This paper investigates whether the firm life cycle stages will affect the idiosyncratic risk and market risk, and further explores the relation between idiosyncratic risk and expected short-run returns. The subject is the electronics industry of Taiwan listed firms. Findings imply that it is necessary to distinguish firm life cycle for investigating idiosyncratic risk. Idiosyncratic risks of firms in all firm life cycles is negatively related to expected short-run returns, which means investors should hold previous stocks in the maturity stage and stagnant stage with low idiosyncratic risk to earn high expected short-run returns.

Keywords: Idiosyncratic Risk, Firm Life Cycle, Market Risk.

1. Introduction

The previous literature has primarily divided total risk of assets into market risk and idiosyncratic risk[1]. Market risk, also known as systematic risk or non-diversifiable risk, affects the majority of assets in the market, though to differing degrees. Idiosyncratic risk, on the other hand, which is unique to a specific firm and is sometimes called unsystematic risk or diversifiable risk. Ang, Hodrick, Xing, and Zhang (2006, 2009) and Chang and Dong (2006) use the term of idiosyncratic volatility[2]. Firm managers can control idiosyncratic risk by managing adjustments in business strategy, but not market risk. For investors, total risk can be mitigated through portfolio diversification or selecting stocks with low idiosyncratic risk. Recent studies on risk have not only investigated the market risk but have also gradually explored idiosyncratic risk. Such as Ang et al. (2006, 2009) and Lee and Wei (2012) indicate idiosyncratic risk significantly affects expected short-run return (hereafter expected return).

This paper investigates whether the firm life cycle stages will affect the idiosyncratic risk and market risk, and further explores the relation between idiosyncratic risk and expected short-run returns. The subject of focus is the electronics industry of Taiwan listed firms. Previous research identifies a regular pattern of organizational development process, which is like a living organism, have life cycles, because firms will experience distinct periods of startup, growth, maturity, decline, and death (Haire, 1959) and these periods can be segmented the organizational development process into more clear stages (Chandler, 1962), which is called the firm life cycle. According to literature, the firm life cycle is divided into four stages: startup, growth, maturity, and stagnation (Lyden, 1975; Kimberly and Miles, 1980). But Anthony and Ramesh (1992) divide firm life cycle into only three stages because it is difficult to obtain the data from the startup stage. For example, according to Article 4[3] of the Taiwan Stock Exchange Corporation Rules Governing Review of Securities Listings (Amended 2012.01.20), in general, the firm life cycle of listing firms have been transitioned from the startup stage to the growth stage after IPOs. Thus, this research follows Anthony and Ramesh, and divides the firm life cycle into three stages: growth, maturity, and stagnation.

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[1] Term idiosyncratic risk by Campbell et al (2001); Goyal and Sants-Clara (2003); Bali et al. (2005); Wei and Zhang (2005); Ferreira and Laux (2007); Cao et al. (2008); Bali et al. (2008); Mueller (2008); Fu (2009) and Lee and Wei (2012).

[2] Term idiosyncratic volatility by Xu and Malkiel (2003); Chang and Dong (2006); Gaspar and Massa (2006); Guo and Savickas (2008a); Guo and Savickas (2008b); Bali and Cakici (2008); Ang et al. (2006, 2009); Jiang et al. (2009) and Laidroo (2011).

[3] Where an issuing company applying for the listing of its stock meets the criteria listed below, the Taiwan Stock Exchange Corporation (TWSE) will agree to list its stock: duration of corporate existence, amount of capital stock, profitability and dispersion of shareholdings. Especially, it shall have been incorporated and registered under the Company Act for at least 3 years at the time of the application for listing; provided.

2. Literature Review

Several previous studies find that there are essential differences between different firm life cycle stages will affect their management and constitution of firms. For example, there are smaller firm size (Chandler, 1962), larger profitability fluctuations (Grullon, Michaely and Swaminathan, 2002) and insufficient experience and capabilities of management (Chok and Sun, 2007) in the growth stage than in the mature stage and stagnant stage. These different characteristics of firms in different firm life cycle stages will lead to different levels for both idiosyncratic risk and market risk. Anthony and Ramesh (1992) and Black (1998) describe the growth stage as having the characteristics of "three highs" and "two lows": high sales growth, high capital expenditures, and high research and development as a percentage of sales together with low dividends payout ratios and low seniority. These characteristics may lead to relatively high volatility in stock returns (Paster and Veronesi, 2003; Apedjinou and Vassalou, 2004; and Jiang, Xu, and Yao, 2009). Besides, Paster and Veronesi (2003) point out that firm in different firm life cycle stages will affect the idiosyncratic risks. Therefore, we expect that there are diversities affecting the patterns of idiosyncratic risk and market risk in different firm life cycle stage, which is the first motive in this paper.

The main contents of theoretical studies on this issue are the firm life cycle stages division and differences of characteristics in different stage of the life cycle have used both single and multi factors. Anthony and Ramesh (1992) and Black (1998) identify five factors: percent sales growth (*SG*), capital expenditure as a percentage of sales (*CER*), research and development as a percentage of sales (*RDR*), annual dividend as a percentage of income before extraordinary items and discontinued operations (*DP*), and age of the firm (*AGE*) — hereafter referred to as the five factors. This paper uses these five factors to form a comprehensive index that identifies the different firm life cycle stages.

This paper further explores the relation between idiosyncratic risk and expected returns in different firm life cycle stages, which is the second motive of this paper. The relation between idiosyncratic risk and expected returns in different firm life cycle stages has not been explored in previous literature. Jiang and Lee (2006) and Chen, Chollete, and Ray (2010) find a significantly positive relation between the estimated conditional idiosyncratic volatilities and expected returns, which means high idiosyncratic risks with high expected returns. On the other hand, Ang et al. (2009) follow Ang et al. (2006) to continue challenging the observation of "high risks with high expected returns." They find that monthly stock returns are negatively correlated with one-month lagged idiosyncratic volatilities in the 23 developed markets covered by Morgan Stanley Capital International (MSCI) that is "high risks with low expected returns. This paper further explores whether the relation between idiosyncratic risk and expected returns is difference in different firm life cycle stages. Understanding the relation between idiosyncratic risk and expected returns is also important for investors. For example, Ang et al. (2006, 2009) demonstrate "high idiosyncratic risks with low expected returns," which means investors should hold previous stocks with low idiosyncratic risk to earn high expected returns. However, the relation between idiosyncratic risk and expected returns in different firm life cycle stages has not been explored in literature. The question is whether the correlation between "high idiosyncratic risks with high expected returns," which has been widely accepted for decades, will be challenged if "high idiosyncratic risks with low expected returns" is supported (Lee and Wei, 2012).

3. Empirical Model

This paper adopted to measure idiosyncratic risk by references Xu and Malkiel (2003), revises Ang et al. (2006, 2009), and employs Chang and Dong's (2006) direct decomposition method. The cause is that most high frequency excess stock returns are generally heteroskedastic. Ignoring the influence of this phenomenon could lead to inefficient parameter estimates.

3.1. Measuring Idiosyncratic Risk

Ang et al. (2006, 2009) use the standard deviation of the residuals from one month for one stock to obtain the idiosyncratic risk associated with that stock.

$$IR_{i,n}^{j} = \sqrt{\sum_{k=1}^{t} \varepsilon_{i,t-k} = \overline{\varepsilon_{i,t}} \Big/ t\text{-}1} \quad (1)$$

In the Equation 1,*i, t, j* represent firm *i,* month *t* and year *j* respectively, ε is the residual. $\overline{\varepsilon_{i,t}}$ is the average value of the residuals on one trading day in one month. *IR* is the idiosyncratic risk. Where *n* is 0, 1, or 2 are represent the firms in growth stage, mature stage, and stagnant stage, respectively.

3.2. Equation for estimating the relation between idiosyncratic risk and stock returns

$$ER_{i,t} = \alpha_{i,t} + BX + \beta_{IR} IR_{i,t\text{-}1,n} + \varepsilon_{i,t} \quad (2)$$

In the Equation 2, *i* and *t* represent data for firm *i* during month *t*. *ER* is the rate of excess return**,** calculated by subtracting the risk-free interest rate from the original stock returns[4]. α refers to Jensen's α and represents abnormal stock returns. ε represents the error term. *X* is the vector of the explanatory variables, and *B* is the corresponding coefficient vector. We use returns to estimate monthly idiosyncratic risk following the approach adopted in this stream of literature. Fama and French (1992) three-factor model (hereafter 3-F) as well as the momentum factor of Carhart (1997). (Hereafter 4-F)

4. Empirical result and robust test

4.1. Empirical result

Our main findings are as follows: (1) Table 1 shows the "*High idiosyncratic risk in the growth stage*" hypothesis is supported. Due to the growth stage as having the characteristics of "three highs" (high sales growth, high capital expenditures, and high research and development as a percentage of sales) and "two lows" (low dividends payout ratios and low seniority in long-run), the idiosyncratic risk in growth stage is significant higher than in mature stage and stagnant stage, but there is no significant difference between mature stage and stagnant stage; (2) Table 2 shows the "*High idiosyncratic risk accompanies with low expected return*" hypothesis is also supported. The idiosyncratic risks of all the companies in all firm life cycle stages (growth stage, mature stage and stagnant stage)[5] are negatively correlated with expected short-run returns. This result is consistent with Ang et al. (2006, 2009). However, this paper adds to consider the different firm life cycle stages.

Table 1 Firm Life Cycle and Risk

Life cycle stages	N	*TR*	*β*	*IR*
G	209	0.024	1.302	0.118
M	724	0.019	1.225	0.097
S	97	0.016	1.246	0.095
t-value		(2.76)[c]	(0.84)	(3.66)[c]

Note: 1. *G, M,* and *S* are the growth stage, mature stage and stagnant stage under the comprehensive five-factor model. 2. *TR, β,* and *IR* are total risk, market risk, and idiosyncratic risk. 3. a, b, and c represent significance at the 10%, 5%, and 1% levels, respectively.

Table 2 Idiosyncratic risk and expected next-period returns in firm life cycles

Panel A: Full sample for firm life cycle and 3-F model						
α_0	β_{EMR}	β_{SIZE}	β_{BM}	β_{IR}	*Adj* R^2	N

[4] This paper uses the first-month bank deposit interest rate as the risk-free interest rate.

[5] Shleifer and Vishny (1997) indicate that the arbitrageur is risk averse in the short run so the risk-averse arbitrageur concentrates their portfolios on low idiosyncratic risk stocks, which causes low idiosyncratic risk stocks with high trading volume in the short run

	0.26	0.97	0.00	-0.18	-1.37		0.35	1030
	(1.07)	(13.85) [c]	(0.49)	(-7.62) [c]	(-4.89) [c]			
Panel B: Differentiated Firm Life Cycle Stages and 3-F model								
G	1.04	0.88	-0.02	-0.31	-1.21		0.28	209
	(1.74) [a]	(4.43) [c]	(-0.96)	(-4.15) [c]	(-1.93) [a]			
M	0.21	1.03	0.01	-0.14	-1.74		0.36	724
	(0.75)	(12.91) [c]	(-0.55)	(-5.76) [c]	(-5.01) [c]			
S	0.92	0.56	-0.02	-0.30	-1.52		0.46	97
	(1.24)	(2.93) [c]	(-0.65)	(-3.66) [c]	(-1.99) [b]			
Panel C: Full Sample for Firm Life Cycle and 4-F model								
	α_0	β_{EMR}	β_{SIZE}	β_{BM}	β_{MOM}	β_{IR}	*Adj* R^2	N
	0.06	0.99	0.01	-0.18	-0.12	-0.94	0.356	1030
	(0.23)	(14.25) [c]	(1.33)	(-7.93) [c]	(-4.13) [c]	(-3.16) [c]		
Panel D: Differentiated Firm Life Cycle Stages and 4-F Model								
G	0.91	0.90	-0.02	-0.31	-0.06	-0.98	0.44	209
	(1.47)	(4.50) [c]	(-0.71)	(-4.16) [c]	(-0.85)	(-1.44) [a]		
M	-0.01	1.04	0.02	-0.15	-0.14	-1.22	0.37	724
	(-0.03)	(13.22) [c]	(-1.32)	(-6.13) [c]	(-3.98) [c]	(-3.32) [c]		
S	0.78	0.59	-0.01	-0.31	-0.12	-1.38	0.47	97
	(1.05)	(3.09) [c]	(-0.40)	(-3.81) [c]	(-1.37)	(-1.81) [a]		

Note: 1. This table presents the regression coefficients. The numbers in parentheses are the t-statistics, and a, b, and c represent 10%, 5%, and 1% significance levels, respectively. 2. *G, M,* and *S* represent the growth stage, mature stage, and stagnant stage, respectively.

5. Conclusion

The implications of this paper are as following. (1). It is necessary to distinguish firm life cycle for investigating idiosyncratic risk because idiosyncratic risk is higher in the growth stage than in the maturity stage and stagnant stage, which means idiosyncratic risk is probably associated with firm life cycle; (2). Idiosyncratic risks of firms in all firm life cycles is negatively related to expected short-run returns, which means investors should hold previous stocks in the maturity stage and stagnant stage with low idiosyncratic risk to earn high expected short-run returns.

6. Reference

[1] Anthony, J. H., & Ramesh, k. 1992. Association between accounting performance measures and stock prices: A test of the life cycle hypothesis. *Journal of Accounting and Economics*, 15 (2): 203.

[2] Ang, A., Hodrick, R. J., Xing, Y., & Zhang X. 2006. The cross-section of volatility and expected returns. *Journal of Finance*, 61 (1): 259-299.

[3] Ang, A., Hodrick, R.J., Xing, Y., & Zhang X. 2009. High idiosyncratic volatility and low returns, international and further U.S. evidence. *Journal of Financial Economics*, 91 (1): 1-23.

[4] Apedjinou, K., & Maria V. 2004. *Corporate innovation, price momentum, and equity returns*. *Working paper*, Columbia University.

[5] Bali, T., Cakici, N., 2010. World market risk, country-specific risk and expected returns in international stock markets. Journal of Banking and Finance 34 (3): 1152–1165.

[6] Bali, T. G., Cakici, N., & Lery, H. 2008. A model-independent measure of aggregate idiosyncratic risk. *Journal of Empirical Finance*, 15 (5): 878-896.

[7] Bali, T. G., Cakici, N., Yan, X., & Zhang, Z. 2005. Does idiosyncratic risk really matter? *Journal of Finance*, 60 (2): 905-929.

[8] Black, E. L. 1998. Which is more value relevant: Earnings or cash flows? a life cycle examination. *Journal of*

Financial Statement Analysts, 4 (1): 40-56.

[9] Campbell, J.Y., Lettau, M., Malkiel, B.G., & Xu, Y., 2001. Have individual stocks become more volatile? An empirical exploration of idiosyncratic risk. *Journal of Finance*, 56 (1): 1-43.

[10] Cao, C., Simin, T., & Zhao J. 2008. Can growth options explain the trend in idiosyncratic risk? *Review of Financial Studies*, 21 (6): 2599-2633.

[11] Carhart, M. M. 1997. On persistence in mutual fund performance. *Journal of Finance*, 52 (1): 57-82.

[12] Chandler, A.D. 1962. *Strategy and Structure. Cambridge*, Mass, M.I.T. Press.

[13] Chang, E. C., & Dong, S. 2006. Idiosyncratic volatility, fundamentals, and institutional herding, Evidence from the Japanese stock market. *Pacific-Basin Finance Journal*, 14 (2): 135-154.

[14] Chen, J., L. Chollete and R. Ray (2010), Financial Distress and Idiosyncratic Volatility: An Empirical Investigation, Journal of Financial Markets, 13(2), 249-247.

[15] Chok, J. I., & Sun, Q. 2007. Determinants of idiosyncratic volatility for biotech IPO firms. *Financial Management*, 36 (4): 107 - 122.

[16] Engle, R. & Ng, V. 1993. Measurement and testing of the impact of news on volatility. *Journal of Finance*, 48 (5): 1749-1778

[17] Fama, E .F., & French, K.R. 1993. Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33 (1): 3-56.

[18] Ferreira, M. A. & Laux, P.A. 2007. Corporate governance, idiosyncratic risk, and information flow. *Journal of Finance*, 62 (2): 951-989.

[19] Fu, F. 2009. Idiosyncratic risk and cross-section of expected stock returns. *Journal of Financial Economics*, 91 (1): 24-37.

[20] Grullon, G., Michaely, R. & Swaminathan, B. 2002. Are dividend changes a sign of firm maturity? *Journal of Business*, 75 (3): 387-424.

[21] Guo, H. & Savickas, R. 2008a. Average idiosyncratic volatility in G7 countries. *Review of Financial Studies*, 21 (3): 1259-1296.

[22] Guo, H. & Savickas, R. 2008b. Forecasting foreign exchange rates using idiosyncratic volatility. *Journal of Banking and Finance*, 32 (7): 1322-1332.

[23] Goyal, A., & Santa-Clara, P. 2003. Idiosyncratic volatility matters! *Journal of Finance*, 58 (2): 975-1008.

[24] Haire, M. 1959. *Biological models and empirical history of the growth of organizations, modern organizational theory*. New York, John Wiley and Sons.

[25] Jiang, X., & Lee, B.S. 2006. The dynamic relation between returns and idiosyncratic volatility. *Financial Management*, 35 (1): 43-65.

[26] Jiang, G., Xu, D., & Yao, T. 2009. The information content of idiosyncratic volatility. *Journal of Financial and Quantitative Analysis*, 44 (1): 1-28.

[27] Kimberley, J. R. & Miles, R. H. 1980. The organizational life cycle. San Francisco, Jossey-Bass.

[28] Lee, J. S. and Wei, C. Y. 2012. Sources of listing and idiosyncratic risk. *Emerging Markets Finance & Trade*, July-August. Forthcoming.

[29] Pastor, L., & Veronesi, P. (2003). Stock valuation and learning about profitability. *Journal of Finance*, 58 (5): 1749-1789.

[30] Wei, S.X., & Zhang, C. 2005. Idiosyncratic risk does not matter: A re-examination of the relationship between average returns and average volatilities. *Journal of Banking and Finance*, 29 (3): 603-621.

[31] Xu, Y., & Malkiel, B.G. 2003. Investigating the behavior of idiosyncratic volatility. *Journal of Business*, 76 (4): 613-644.