A Life Cycle Analysis of U.S. Mutual Funds

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Abstract: This study proposes a five-stage asset growth model to describe the life cycle evolution of actively managed equity mutual funds and shows that mutual funds exhibit distinctive performance, size, expense ratios, and asset turnover through stages of incubation, high-growth, low-growth, maturity, and decline. It also investigates the viability of managerial strategies to affect a fund's life cycle evolution and shows that the strategies of changing investment objectives, adding portfolio managers, or downsizing management team do not have a rejuvenation effect. These findings suggest that investors should avoid investing in funds that have evolved to older life cycle stages, as there are few effective strategies that fund advisors can undertake to revive the performance of declining funds.

1. Introduction

This study examines from a corporate life cycle perspective equity mutual funds that are actively managed by portfolio managers.[1] Drawing upon the industrial organization literature, the paper proposes a mutual fund life cycle model that encompasses stages of incubation, high-growth, low-growth, maturity, and decline. Each life cycle stage is defined as a time period associated with a common

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[1] This paper focuses on firm life cycle, which is different from product life cycle (Polli and Cook, 1969; Anderson and Zeithaml, 1984) and industry life cycle (Londregan, 1990).

configuration of variables including performance, growth in asset, expense ratio, and other pertinent characteristics. Within this framework, an investigation is conducted on whether a fund's life cycle is systematically associated with observed variations in performance, flow, and other fund characteristics. In addition, this paper examines the viability of potential rejuvenation strategies to reposition a fund to younger life cycle stages, particularly when the fund is mature or declining.

A number of mutual fund studies use fund age, the number of years since the fund was established, as a proxy for mutual fund life cycle. However, they neither provide consistent evidence that age is negatively related to fund performance nor explain the rationale behind the age effect. For example, Cremers and Petajisto (2007) and Kacperczyk, Sialm and Zheng (2005) document that fund age negatively affects performance while Chen, Hong, Huang and Kubik (2004) and Massa, Reuter and Zitzewitz (2009) do not find such a relation. Empirical evidence shows that industrial firms indeed exhibit distinctive characteristics in terms of operating performance, strategy, organizational structure, and decision-making style as they progress through different life cycle stages.[2] Mutual funds and industrial firms, as two different types of corporate organizations, share a number of common characteristics. They are both economic entities engaged in commercial or industrial enterprise with a goal of maximizing the wealth of owners and shareholders. More importantly, both organizational forms face varying levels of difficulty in regards to reversibility of their life cycle paths.

The literature proposes that industrial firms become more mature because of a shrinking investment opportunity set with positive NPV projects and that firms cannot readily reverse their "aging" process without incurring significant cost. The reason for this difficulty in path reversibility is that many expenditures and investments are in part irreversible. For example, the expenditure in marketing a particular product is irreversible to the extent that a firm will lose the brand value of

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[2] Quinn and Cameron (1980) and Miller and Friesen (1984) provide a literature review on various corporate life cycle models. More recently, Diamond (1991), Berger and Udell (1998) study the financing behavior of industrial firms over their life cycle. Fama and French (2001), Grullon, Michaely and Swaminathan (2002), DeAngelo, DeAngelo and Stulz (2005), Bulan, Subramanian, and Tanlu (2007) find that mature firms are more likely to initiate or increase dividend payout. Cheng, Fung, and Leung (2009) show that the cash dividend payout policies of Mainland Chinese firms are not related to corporate life cycle but closely related to the preferences of controlling shareholders of non-tradable shares. Anthony and Ramesh (1992) and Dickinson (2007) show that a firm's profitability and growth are functions of its life cycle stage. There are numerous studies on bank life cycle including Hunter and Srinivasan (1990), DeYoung and Hasan (1998), Goldberg and White (1998), DeYoung (1998), and DeYoung, Goldberg, and White (1999).

its old product if it changes its product line. Also, a project could be firm-specific and thus not be sold at a price that fully covers investment. Further, since executives' experience and skill is often restricted to certain areas, a firm could lose the value of its investment in human capital if it changes its operating strategy. Thus, once some expenditures or investments are made, a firm either cannot return immediately to its previous state or will incur significant costs in doing so (Baldwin, 1982; Pindyck, 1988, 1991).

Similarly, a mutual fund's life cycle evolution path is not readily reversible because of its investments in marketing and human capital. Fund managers try to identify undervalued stocks, whose market prices are lower than their intrinsic value. As a fund grows, it becomes harder and harder for its managers to be able to invest all their money to those undervalued stocks that the managers can identify. Although the pool of undervalued stocks may change, and thus open new possibilities for finding undervalued stocks, the new money continuously flowing in to chase superior returns will gradually seek out the same opportunities with superior returns. Managers may identify additional investment opportunities through strategies such as changing the fund's investment strategy or objective, but such changes are constrained by the fund's prospectus and a change in the investment objective requires the approval of the majority of fund holders.[3] Also, changing a fund's investment objective will entail other costs. First, a fund has invested in marketing and advertising with respect to the declared investment objective. If the fund changes its investment objective, its brand value related to the old objective could vanish. Second, a manager's experience and skill could be strategy or style specific. His expertise may not be readily transferable if the fund changes its investment objective. Therefore, mutual funds evolve into their older life cycle stages in a general descending manner, and they must incur costs to return to younger stages. This paper is the first attempt that examines mutual fund performance and growth from a classical corporate life cycle perspective that suggests various growth stages over a financial firm's lifespan.

The sample used in this study consists of 2,730 U.S. open-end mutual funds that

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[3] The Investment Company Act of 1940 Section 13(a) states "No registered investment company shall, unless authorized by the vote of a majority of its outstanding voting securities…deviate from its policy in respect of concentration of investments in any particular industry or group of industries as recited in its registration statement, deviate from any investment policy which is changeable only if authorized by shareholder vote, or deviate from any policy recited in its registration statement pursuant to section 8(b)(3)…"

cover the time period 1961-2005. Based on a fund's age, size, and its asset growth rate, a composite score measure is constructed to classify each fund's life cycle stages. The results indicate that the negative life cycle effect on fund performance is both economically and statistically significant. Both risk adjusted returns and market excess returns demonstrate a decreasing pattern upon older stages. These findings are consistent with the proposed mutual fund life cycle model in that mutual funds experience poorer performance at older stages of their life cycles. Other findings are that there are inter-stage differences in total net assets, expense ratio, asset turnover, and the number of distinct stocks held in portfolios.

To investigate the effectiveness of alternative strategies that fund families have pursued to rejuvenate fund growth, the present study compares stage transition matrices of those funds that neither changed investment objectives, nor added portfolio managers or subtracted managers with those funds that have changed investment objectives, hired more managers, or reduced managers. The results show that the latter three strategies are not likely to raise the transition probability to younger life cycle stages. These findings suggest that there are few strategies that fund advisors can adopt to effectively revive a declining fund. As a result, investors should avoid investing in funds that have evolved into their older life cycle stages.

This paper proceeds as follows. Section 2 proposes a five-stage mutual fund life cycle model. Section 3 addresses the data and the method to classify funds into various life cycle stages. Section 4 presents summary statistics of the sample funds and then investigates the effects of life cycle stage on fund performance and the effectiveness of alternative strategies that fund families have pursued to rejuvenate fund growth. Section 5 concludes the paper.

2.   A Mutual Fund Life Cycle Model

The industrial organization literature argues that firms become more mature because of a diminishing investment opportunity set. Mutual fund studies such as Chen, Hong, Huang and Kubik (2002) and Berk and Green (2004) demonstrate that growth in fund assets will lead to poorer fund performance.   Based on these studies, this paper posits that a mutual fund's life cycle evolution is driven by its investment opportunity set, which is the pool of undervalued stocks identified by the manager. This opportunity set is dynamic and its size depends mainly on the assets under management, the manager's skill and learning capability, and all undervalued stocks

available in the market.[4] If the investment opportunity set shrinks due to the dynamic changes in the three factors mentioned above, fund managers are likely to experience declining performance, which in turn would lead to decreasing net fund flows. Thus, the fund descends to older life stages. This section proposes a five-stage growth model to describe the life cycle evolution of equity mutual funds that are actively managed by money managers.

2.1 The incubation stage

Fund families open new funds when the potential to generate additional fee income is substantial (Khorana and Servaes, 1999). According to Arteaga, Ciccotello and Grant (1998), fund families use two alternative strategies to develop new funds, incubation and selective attention. Under the incubation strategy, fund families raise seed money internally to start a number of small funds and run them in private. After running these seed funds for a while, fund families will open those funds with good track records to the public but terminate those poorly performing funds. Under the second approach, fund families open new funds to the public without an incubation period but subsidize operating expenses.

Fund families determine several key characteristics of a new fund. Massa (1998, 2003) argues that fund families open a series of funds with various styles and fee structures to exploit investor heterogeneity. Nanda, Narayanan and Warther (2000) develop a model in which managers set the mutual fund fee structures to maximize the captured rent, taking into account the effect on fund flows. Bar, Kempf and Ruenzi (2011) show that the choice of management is a strategic decision made at the fund family level. Fund families also have power over fund governance. As shown by Tufano and Sevick (1997), fund sponsors select a new fund's initial independent board members, who accept high service fees from the sponsors and therefore could fail to act in the best interests of fund investors.

2.2 The high-growth stage

After opening to the public, new funds generally begin a high-growth phase that is associated with good performance and large fund inflow. Blake and Timmermann (1998) study 2,300 U.K. open-end mutual funds and find evidence that funds weakly

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[4] Managers' luck also plays a role in generating fund return. Since a manager can experience both good and bad luck occasionally, luck effect could be captured in an i.i.d. error term. In the section of empirical analysis, the net returns are adjusted by S&P500 to minimize the effect of luck.

outperform their peers during their first year after public offerings. Two factors could contribute to the high returns achieved at the high-growth stage. First, funds at this stage are small. Portfolio managers only invest in the stocks and industries for which they have informational advantage, which brings forth high returns (Kacperczyk, Sialm and Zheng, 2005). Second, fund families subsidize new funds and give them preference in the allocation of valuable resources. For example, Zweig (1996) and Arteaga, Ciccotello and Grant (1998) mention that new funds obtain preferential allocations of underpriced IPOs. Gaspar, Massa and Matos (2006) investigate strategic cross-fund subsidization and find that fund families allocate relatively more underpriced IPOs to high fee, high performance and young funds. Since young funds have relatively small size, a favorable allocation of profitable investment opportunities leads to superior performance.

2.3 The low-growth stage

Portfolio managers of actively managed funds seek to identify lucrative investment opportunities, through the purchase of undervalued stocks. When a fund is very young, its investment opportunity set is large because its total net assets under management is small. As new money continuously flows in to chase superior return, it will gradually seek out the same opportunities with superior return and thus the relative size of the investment opportunity set shrinks. As a result, returns decline and the fund descends to the low-growth stage with declining net fund flow.

2.4 The maturity stage

Funds in the maturity stage are usually larger and older than those in the low-growth stage. The increasing complexity of investment task from growing assets leads to increasing transaction costs because of the lessened flexibility that comes with holding larger positions (Perold and Salomon, 1991; Beckers and Vaughan, 2001; Pollet and Wilson, 2008; Edelen, Evans, and Kadlec, 2007). As managers continue to invest in the same undervalued stocks, large purchases will push prices up and thus lower the expected returns. Wermers (2003) find strong evidence that flow-related addition to existing positions push stock prices up, especially among growth-oriented funds. Prior studies also find that the aggregate purchases of the same stock by many funds will increase the stock price. Hong, Kubik and Stein (2005) show that fund managers are buying the same stocks due to word-of-mouth effects. Wermers (1999) find empirical evidence that mutual fund

herding speeds up the incorporation of new information in stock prices.

A manager's incentive to retain and attract assets under management contributes to the poorer performance over the fund's life cycle. Jensen's (1986) free cash flow theory suggests that managers of industrial firms with large free cash flows are more likely to diversify in value-destroying projects after exhausting all profitable investment opportunities. This is analogous to the mutual fund industry. Because the managerial compensation is linked to the total assets under management, managers who have "free" money at hand have a propensity for over-investment and thus could adopt passive investment strategies when they have exhausted all lucrative investment opportunities. Chen, Hong, Huang and Kubik (2002) and Berk and Green (2004) argue that managers invest a larger portion of fund assets in benchmark portfolios as funds grow. Chen et al. (2002) further argue that the rationale behind this behavior is that managers no longer care about maximizing fund returns after the fund reaches a certain size. A potential explanation for managers losing interest in maximizing returns could be that the managers realize that they are unable to find more undervalued stocks.

Funds obtain lower average returns in the maturity stage than in the low-growth stage because of larger trading costs, declining-profit opportunities, and overinvestment. As a result, the average fund inflows are lower than they were in the growth stages but fund outflows are higher. As new investment flows in continuously, total assets under management increases and reaches the peak at the stage of maturity. The expense ratio decreases from the high-growth to the maturity stage because it is usually contracted as a fixed percentage of the assets under management. Meanwhile, the asset turnover ratio decreases because larger fund size imposes less flexibility in changing holding positions and hence portfolio managers have less incentive to trade.

2.5. The decline stage

Because of large trading costs, absence of profitable opportunities, and severe overinvestment, mutual funds at the stage of decline experience extremely poor performance and large cash outflows, which comes with extremely high asset turnover because portfolio managers have to sell their holdings for fund redemption. Decreased fund size is associated with an expense ratio higher than that in the maturity stage where fund size is larger.

Fund families have incentives to create and market "star" funds but eliminate

poorly performing funds, and thus they would terminate small funds with declining returns by merger or liquidation (Jayaraman, Khorana and Nelling, 2002; Zhao, 2005; Ding, 2006). However, termination may not be the optimal strategy for all declining funds. Liquidating a fund will forfeit the management fee and the intangible assets in marketing and sales channel; merging a fund with another fund may raise such an issue that some investors may not like the new one and thus redeem their shares. In addition, fund families could not just open a new fund instantly to replace a declining fund because it is hard for fund investors to accept the new-born without a good tracking record. Therefore, for some funds with high termination costs, fund families have strong incentives to adopt some rejuvenation strategies in order to retain fund investors and receive a larger amount of management fee. Fund investors also benefit from rejuvenating a declining fund as they do not have to transfer to other funds in case of termination and therefore avoid potential re-searching and transferring costs. If decline-stage funds successfully adopt some suitable strategies, they will achieve better performance and resume growth, which is a win-win situation to the fund family and fund holders.

3. Sample and Data

The main data set is constructed by merging the survivorship-bias-free mutual fund database from the Center for Research in Security Prices (CRSP) with the Thomson Financial mutual fund holding database. The CRSP mutual fund database includes information on mutual fund monthly returns, total net assets (TNA), inception dates, fee structure, fund investment objectives, asset turnover ratios, managers' names (starts from 1992), and other fund characteristics. The Thomson Financial mutual fund database provides quarterly or semiannual holdings of most U.S. equity mutual funds. The two databases are merged with MFLINKS data set from Wharton Research Data Services (WRDS). To be included in the final sample, several criteria are employed. First, each fund in the sample must have operated for at least three years.[5] Second, to focus on actively managed equity funds that invest mainly in the U.S. stock markets, balanced, bond, index, international, and sector funds are excluded from the sample. Then, portfolio holdings in bonds, ADRs, foreign and preferred stocks, and other funds are excluded. The final sample of 2,730 mutual funds covers the period from January 1961 to December 2005.

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[5] Funds with a history that is shorter than three years are unlikely to exhibit distinctive life cycle stages. An earlier version of this paper included in the sample funds that were terminated within three years and found similar results.

It is common in the mutual fund industry that funds compare their net returns to the market. To be consistent with this practice, this study examines the S&P500 excess return, which is the reported monthly return minus the return of the S&P500 index. To control for the risk profile of the portfolio, it also examines the monthly alpha using the three-factor model of Fama and French (1993, 1996). The monthly alphas are computed "out-of-sample" using 24-month rolling windows ending in the prior month. For example, January alpha is the fund's actual return in January minus the sum product of the beta coefficients (estimated from the 24-month window ending in December) and factors returns in January. Because one fund could have multiple share classes, the total net assets of a fund are computed as the summation of the total net assets in each share class. Weighting each share class by its total net assets, this paper constructs the value-weighted averages of monthly returns, expense ratios, asset turnover ratio, and fee structure at the fund level. The monthly net fund flows is defined as $[TNA_t - TNA_{t-1} \cdot (1 + r_t)]/TNA_t$, where TNA is a fund's total net assets at the end of the month and r_t is the net return in month t. stock number refers to the number of distinct stocks held in the portfolio. Manager number is defined as the number of portfolio managers running the fund. For those funds listed as "team," "committee," or "multiple," this study follows Chen et al. (2002) and set manager number to four.

Using a good instrument for mutual fund life cycle is critical in empirical research. The industrial organization literature argues that firm age, size, or asset growth rate can be used as a proxy for firm life cycle. According to Churchill and Lewis (1983), the age of an organization alone is unlikely to provide a valid reflection of its life cycle. To use information contained in all three life cycle proxies, this study constructs a composite-score measure to classify a mutual fund's life cycle stages using fund age, size, and its annual asset growth rate. The annual asset growth rate is defined as the change in TNA over one calendar year divided by TNA at the beginning of the year.

First, all fund-year observations are sorted by age in ascending order into quartiles. For a given fund-year observation, its age rank is matched to the age quartile cells located in the second row of the matching table illustrated in Appendix A based on the assumption that funds in early stages usually have young age. The matched cell will gain one point. Second, all fund-year observations are sorted by size in ascending order into quartiles and then matched to the size quartile cells located in the third row of the matching table. The matched cell will gain one point.

This matching procedure is based on the assumption that funds in early stages usually have smaller size. However, since fund size will decline after the maturity stage, it would be inappropriate to assign the decline stage to funds in the fourth size quartile because funds in the fourth quartile will have the largest size. A reasonable way to handle this issue is to let both cells under maturity and decline stages earn one point if the size rank locates at the third or fourth quartiles. Finally, a sort by annual asset growth rate in ascending order is conducted in order to match the growth rank of each fund-year observation to the cells in the fourth row of the table, with the assumption that funds in earlier stages usually have higher annual growth. The matched cell will gain one point.

After these three matching steps for a given fund-year, all points under the same life cycle stage column are aggregated to obtain a composite score for each stage. The stage with the highest score will be assigned to that fund-year. In a case in which three stages have the same highest score, the stage in the middle is chosen. The incubation stage is not examined in empirical analysis because the information before funds were open to the public is not available.

4.   Empirical Analysis

After the composite-score measure is used to classify a fund's life cycle stages, for each age-year the percentage of funds located in different life cycle stages is computed and then reported in Table 1. The results indicate that in general funds located in the high-growth stage when they were very young and proceeded to older life cycle stages as they were aging. Very few funds were able to hold at the high-growth or low-growth stages after age 15.

4.1 Stage transition matrices

Is it possible that a mature or declining fund can revive to earlier life cycle stages? To find answers to this question, this study examines the stage transition matrices reported in Table 2 to gain more insights into the process of mutual fund life cycle evolution. The transition matrix is used to describe the process of a Markov Chain and each row indicates the transition probabilities from a given state to other states. P1, P4, and P9, respectively, indicate the stage transition matrices of the second, fifth, and tenth year. It is observed from P1 that for funds that locate in the high-growth stage, 56% (the first number in P1 table) remain in the same stage next year, 38% drop to the low-growth stage, 4% descend to the maturity stage, and only

2% devolve to the decline stage. As shown in P4, after four years only 12% of the funds remain in the high-growth stage, 38% fall to the low-growth stage, 38% reach the maturity stage, and 12% devolve to the stage of decline. After nine years, only 2% of the funds remain in the high-growth stage, 21% descend to the low-growth stage, 51% devolve to the maturity stage, and 26% drop to the decline stage. These stage transition patterns indicate that funds progress smoothly from young to older life cycle stages, which is consistent with the findings in Table 1.

Table 1
Mutual fund percentages in four life cycle stages

This table reports the percentage of mutual funds located in four life cycle stages (high-growth, low-growth, maturity, and decline) for each age-year. *Fund Age* is the number of years since the fund was opened to the public. The percentage value is computed as the number of funds in the same life cycle stage and of the same age divided by the total number of funds of the same age.

Fund Age	High-growth	Low-growth	Maturity	Decline	Fund Age	High-growth	Low-growth	Maturity	Decline
1	80	8	6	6	26	0	3	45	52
2	77	11	6	6	27	0	0	44	56
3	74	14	8	4	28	0	1	42	57
4	58	21	12	9	29	0	1	40	59
5	4	81	15	0	30	0	0	40	60
6	3	79	18	0	31	0	2	47	51
7	2	75	23	0	32	0	1	46	53
8	1	21	63	15	33	0	1	52	47
9	2	16	66	16	34	0	1	50	49
10	2	16	66	18	35	0	1	47	52
11	1	15	65	19	36	0	0	47	53
12	1	13	67	19	37	0	1	42	57
13	1	13	67	18	38	0	0	43	57
14	1	14	69	16	39	0	0	35	65
15	0	4	44	52	40	0	0	40	60
16	1	3	44	52	41	0	2	47	51
17	0	2	45	53	42	0	0	51	49
18	0	2	43	55	43	0	0	51	49
19	1	1	42	56	44	0	0	53	47
20	1	1	41	57	45	0	0	71	29
21	1	1	40	58	46	0	0	58	42
22	1	2	39	58	47	0	0	50	50
23	1	1	44	54	48	0	0	50	50
24	1	2	51	46	49	0	0	33	67
25	0	1	50	49	50	0	0	29	71

Table 2
Life cycle stage transition matrices
This table reports stage transition matrices of all sample funds that cover the time period from 1961 to 2005. P1, P4, and P9, respectively, indicate stage transition matrices of the second, fifth, and tenth year. Each row shows the transition probabilities from the current stage (the first column) to the life cycle stages of high-growth, low-growth, maturity, and decline.

		High Growth	Low Growth	Maturity	Decline
	High Growth	0.56	0.38	0.04	0.02
P1	Low Growth	0.02	0.65	0.29	0.04
	Maturity	0.00	0.08	0.78	0.14
	Decline	0.01	0.02	0.21	0.76

		High Growth	Low Growth	Maturity	Decline
	High Growth	0.12	0.38	0.38	0.12
P4	Low Growth	0.02	0.28	0.51	0.19
	Maturity	0.01	0.15	0.56	0.28
	Decline	0.01	0.11	0.44	0.44

		High Growth	Low Growth	Maturity	Decline
	High Growth	0.02	0.21	0.51	0.26
P9	Low Growth	0.02	0.17	0.52	0.29
	Maturity	0.01	0.16	0.51	0.32
	Decline	0.01	0.15	0.50	0.34

Further, the stage transition matrices indicate that declining funds do not necessarily stay forever in the decline stage. Some of the declining funds rejuvenate and reposition to younger life cycle stages. The percentage of declining funds that remain in the decline stage after one year is 76% (the last number in P1 table). This number drops to 44% after four years and 34% after nine years. This evidence suggests that declining funds may re-grow or revive.

4.2 Characteristics of various life cycle stages

Are mutual funds life cycle stages associated with different fund characteristics? Table 3 presents the summary statistics of sample funds in each life cycle stage. All variables are winsorized at one and the 99th percentile to cutoff the outliers. The S&P500 excess returns exhibit a declining trend over life cycle stages, 26 basis points in high-growth, 27 points in low-growth, 18 points in maturity, but zero point in the decline stage. The risk adjusted alphas indicates a consistent pattern, 6 basis points in high-growth, -5 points in low-growth, -10 points in maturity, and - 24 points

in the decline stage.

Table 3
Summary statistics

This table reports the means of fund characteristics of all sample funds that covers the time period 1961-2005. *S&P500 excess return* is the reported monthly return minus the return of the S&P500 index. *Three-factor Alpha* is the monthly alpha based on Fama and French (1993, 1996) and computed out-of-sample using 24-month windows ending a month prior to each month. *Expense ratio* is the total annual management fees and expenses divided by total net assets. *Monthly fund flows* is the new fund flow into the fund over a month divided by the total net assets at the beginning of the month. *Total load* is the total front-end, deferred and rear-end charges divided by new investments. *Turnover ratio* is the minimum of aggregated annual sales or purchases of securities, divided by the average 12-month total net assets. *Total net assets* (TNA) is the net asset of the fund after all expenses. *Holding Stock number* is the number of distinct domestic stocks held in the portfolio. *Fund Age* is the number of years since the fund was opened to the public. All variables are winsorized at one and the 99th percentile. P-values of t-test are reported in parentheses. *** denotes significant difference from zero at the 1% level.

Variable	High-growth	Low-growth	Maturity	Decline
S&P500 Excess Return	0.0026	0.0027	0.0018	0.0000
	(0.00)***	(0.00)***	(0.00)***	(0.78)
Three-factor Alpha	0.0006	-0.0005	-0.0010	-0.0024
	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Expense Ratio	0.0144	0.0133	0.0121	0.0128
	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Monthly Fund Flows	0.0526	0.0129	0.0021	-0.0129
	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Total Load	0.0142	0.0165	0.0186	0.0197
	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Turnover Ratio	1.15	0.93	0.81	0.92
	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Total Net Assets (million)	125	275	1605	537
	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Holding Stock Number	76	80	98	70
	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Fund Age (year)	2.7	6.3	13.1	18.3
	(0.00)***	(0.00)***	(0.00)***	(0.00)***

Statistics reported in Table 3 also indicate that mutual funds charge varying expense ratio over life cycle stages. The average expense ratio varies from 1.44% in the high-growth stage to 1.33% in the low-growth stage, 1.21% in the maturity stage, and 1.28% in the stage of decline. This finding is consistent with prior studies in that expense ratio decreases in fund size (Malhotra and McLeod, 1997; Lazko, 1999; Rea, Reid, and Millar, 1999; LaPlante, 2001; Warner and Wu, 2011). The annual asset turnover ratio exhibits a declining pattern over the high-growth, low-growth and maturity stages. This finding implies that a shrinking investment opportunity set

leads to less flexibility in changing holding positions, and hence managers have less incentive to trade. However, in the decline stage the average asset turnover jumps to 92%. One potential reason for this high asset turnover could be that managers have to sell their holdings because of a large amount of fund redemption.

It is noted that the number of stocks in portfolio shifts between life cycle stages. The stock number increases from the high-growth to the maturity stage but decreases afterwards. The average fund size in the decline stage is $537 million versus $125 million in the high-growth stage, but the holding stock numbers in these two stages are 70 and 76, respectively. This finding is consistent with the life cycle model which suggests that managers are the most constrained by a shrinking investment opportunity set at the decline stage.

The observed dynamics in performance, size, expense ratio, and asset turnover are consistent with the proposed mutual fund evolution model. This evidence suggests that actively managed mutual funds have various life cycle stages that are associated with different fund characteristics that are aligned to the changes of the operating environment.

4.3 Mutual fund performance and life cycle stages

This section investigates whether the declining performance over life cycle stages observed in Table 3 is simply determined by fund size. To be specific, performance over fund life cycle is examined while holding size constant across life cycle stages. The fund observations are categorized into three groups with the total net assets between 50-70, 100-120, and 200-220 million. Then, the average return is computed for each life cycle stage and for each size category.

Table 4 shows the dynamics of performance while holding the fund size in real dollar value constant across life cycle stages. Although the size remains around $60 (110, 210) million, the market excess returns monotonically decrease over life cycle stages. The alphas show a similar decreasing pattern, the difference between the maturity and decline stages are not statistically significant though. The results indicate that, holding fund size constant, performance still declines when funds descend to later life cycle stages. In sum, the evidence indicates that the declining performance over life cycle stages cannot be simply explained by the scale effect.

Table 4
Life cycle effects on fund performance

This table reports the means of S&P500 excess returns and three factor alphas in each life cycle stage. *S&P500 excess return* is the reported monthly return minus the return of the S&P500 index. *Three-factor Alpha* is the monthly alpha based on Fama and French (1993, 1996) and computed out-of-sample using 24-month windows ending a month prior to each month. P-values of t-test are reported in parentheses. *, **, *** denote significant differences from zero at the 10%, 5%, and 1% levels.

Stage	Fund Size (million)	S&P500 Excess Return	p-value	Three-factor Alpha	p-value
High Growth	59	0.0041	(0.00)***	0.0027	(0.00)***
Low Growth	60	0.0037	(0.00)***	-0.0006	(0.09)*
Maturity	60	0.0018	(0.00)***	-0.0021	(0.00)***
Decline	60	0.0000	(0.92)	-0.0016	(0.00)***
High Growth	110	0.0035	(0.00)***	0.0001	(0.87)
Low Growth	110	0.0024	(0.00)***	0.0000	(0.95)
Maturity	109	0.0017	(0.00)***	-0.0023	(0.00)***
Decline	110	-0.0003	(0.57)	-0.0019	(0.00)***
High Growth	210	0.0029	(0.05)**	0.0043	(0.00)***
Low Growth	210	0.0024	(0.00)***	0.0005	(0.34)
Maturity	210	0.0017	(0.06)*	-0.0020	(0.00)***
Decline	210	-0.0008	(0.32)	-0.0021	(0.00)***

4.4 Rejuvenation strategy

When a fund reaches older stages in its life cycle, performance becomes poorer and asset growth declines. Fund families have high incentives to reboot growth because the management fee is usually a percentage of the assets under management. As proposed by Canals (2001), managers can pursue corporate growth from a dual perspective, the internal dimension of resources and capabilities and the external dimension of markets and customers. To obtain growth in regards to the external dimension, fund families can employ rejuvenation strategies such as increasing advertising, reducing fees, and creating multiple share classes. Prior studies such as Sirri and Tufano (1996), Jain and Wu (2000), and Barber, Odean and Zheng (2005)

find that increasing marketing expenses can attract more fund flows. Christoffersen (2001) find evidence that poorly performing funds waive fees to adjust net returns to investors. As described in Nanda, Wang and Zheng (2009), mutual funds tend to create multiple share classes to attract investors with different preferences for fee structure.

The investigation of rejuvenation strategies performed in this study focuses on the internal dimension of growth, resources and capabilities. Fund families are willing to pursue some strategies to increase a fund's resources and also enhance its capabilities to identify additional investment opportunities, and thus improve fund performance and attract more fund flows. One of these strategies is to close the fund to avoid scale diseconomies. Nevertheless, earlier studies find that closing a fund does not protect its performance (Zhao, 2004; Bris, Gulen, Kadiyala and Rau, 2007). Another potential strategy is to hire more portfolio managers, a step that could help generate more investment ideas. Or, fund families can downsize the management team if the difficulty of collaboration between portfolio managers imposes significant cost (Chen et al., 2002). The last potential strategy examined in this study is to change the investment objective. By changing a fund's investment objective, managers could obtain an expanded investment opportunity set and more flexibility in choosing securities.

To be specific, a comparison of stage transition matrices is made between no-strategy funds as a reference group that have not adopted any one of those three strategies and those funds that ever adopted one of the three strategies. If these three rejuvenation strategies work, mutual funds that changed their investment objectives or the size of the management team should in the subsequent years have higher transition probabilities to younger life cycle stages than do the reference group. The sample used includes 2,229 funds covering the time period from 1993 through 2005. In this sample, 983 funds have not changed their investment objectives, hired more managers, or reduced managers in the management team within the time period. There are 233 events of exclusively changing objective, 1,428 events of adding managers, and 863 events of reducing portfolio managers. This subset sample also excludes funds that have adopted two strategies in the same year and that have adopted different strategies in successive years to avoid confounding effect.

Table 5 presents the second (P1) and fourth-year (P3) stage transition matrices of no-strategy funds (in Panel A), those of funds that changed the investment objectives (in Panel B), those of funds that hired more portfolio managers (in Panel

C), and those of funds that reduced portfolio managers (in Panel D). Although the analysis focuses on the fourth-year transition matrices, the comparisons upon the second-year provide similar results.

Table 5
Life cycle stage transition matrices and rejuvenation strategies

This table reports the stage transition matrices of four groups of sample funds. The first group includes funds that neither changed investment objective nor hired more portfolio managers, or reduced managers. The second group includes fund that changed objectives only. The third group consists of sample funds that hired more managers only and the last group includes funds that adopted the strategy of reducing portfolio managers. P1 and P3 refer to the stage transition matrices of the second and fourth year after the strategies were adopted. Each row shows the transition probabilities from the current stage (the first column) to the stage of high-growth (HG), low-growth (LG), maturity (MA), and decline (DE).

Panel A: no-strategy

		HG	LG	MA	DE			HG	LG	MA	DE
	HG	0.57	0.37	0.04	0.02		HG	0.20	0.46	0.27	0.07
P1	LG	0.02	0.68	0.26	0.04	P3	LG	0.03	0.39	0.45	0.13
	MA	0.01	0.09	0.78	0.12		MA	0.02	0.17	0.59	0.22
	DE	0.01	0.02	0.21	0.76		DE	0.02	0.10	0.39	0.49

Panel B: Changing objective

		HG	LG	MA	DE			HG	LG	MA	DE
	HG	0.59	0.32	0.06	0.03		HG	0.21	0.41	0.27	0.11
P1	LG	0.02	0.67	0.26	0.05		LG	0	0.37	0.45	0.18
	MA	0.00	0.09	0.77	0.14		MA	0	0.16	0.55	0.29
	DE	0.00	0.05	0.12	0.83		DE	0	0.11	0.26	0.63

Panel C: Adding manager

		HG	LG	MA	DE			HG	LG	MA	DE
	HG	0.54	0.41	0.04	0.01		HG	0.18	0.46	0.29	0.07
P1	LG	0.04	0.65	0.28	0.03	P3	LG	0.04	0.35	0.47	0.14
	MA	0.00	0.08	0.78	0.14		MA	0.01	0.14	0.58	0.27
	DE	0.01	0.02	0.19	0.78		DE	0.01	0.08	0.37	0.54

Panel D: Reducing manager

		HG	LG	MA	DE			HG	LG	MA	DE
	HG	0.56	0.38	0.04	0.02		HG	0.19	0.42	0.30	0.10
P1	LG	0.02	0.62	0.32	0.04	P3	LG	0.02	0.30	0.49	0.19
	MA	0.00	0.06	0.74	0.20		MA	0.00	0.10	0.55	0.35
	DE	0.00	0.01	0.23	0.76		DE	0.00	0.05	0.40	0.55

The similarity of P3 in Panel A and Panel B indicates that there is not significant

rejuvenation effect by changing a fund's investment objective. When funds are in the low-growth stage, changing their investment objectives has 0% probability to jump to high-growth stage after 3 years, while 3% of no-strategy funds would move up to high growth stage. At maturity stage, changing-objective funds obtain 16% (0+0.16) probability to move to earlier stages, compared to 19% (0.02+0.17) for no-strategy funds. At decline stage, totally 63% of funds that changed style remain "declining" compared to totally 49% for no-strategy funds. It seems that this specific restructuring strategy cannot revive the fund and even make things worse. Likewise, there is no solid evidence of rejuvenation effect from the strategy of adding or reducing portfolio managers.

5.   Conclusion

Drawing upon the industrial organization literature, this paper proposes a mutual fund life cycle model that consists of stages of incubation, high-growth, low-growth, maturity, and decline. Within this framework, it investigates whether a fund's life cycle is systematically associated with observed variations in performance, flows, and other characteristics and finds solid empirical evidence that is consistent with the mutual fund life cycle model.

There are inter-stage differences in performance, fund size, expense ratio, and number of stocks held in the portfolios. The asset turnover decreases over the high-growth, low-growth, and maturity stages, but increases abnormally at the stage of decline. Net fund flow monotonically decreases over the life cycle stages. Controlling for scale, the life cycle effect drives the poorer performance across life cycle stages.

The paper also investigates the effectiveness of alternative strategies pursued by fund families to rejuvenate fund growth by comparing the stage transition matrices of no-strategy funds with those of funds that have changed objective, hired more managers, or reduced managers. However, there is no solid evidence that these strategies are effective in rejuvenating fund growth.

This study provides several implications for both practitioners and academics. First, like industrial firms, mutual funds exhibit distinctive characteristics such as operating performance, management strategy, asset turnover, and fee structure as they progress through different life cycle stages. The proposed mutual fund growth model offers a new framework to investigate potential dynamic relations among

variables of interest. Second, fund investors should realize that a fund's life cycle evolution path is not readily reversible. A fund may re-grow by increasing advertising and reducing fees to attract more fund flows. However, there is less a fund family (or fund advisor) can do regarding increasing a fund's internal resources and capabilities to identify investment opportunities. The empirical evidence suggests that there are significant costs if a fund changes its investment objective or restructures the management team by adding or reducing portfolio managers. Fund investors should avoid investing in those funds that have evolved to older life cycle stages, as there are few effective strategies that fund advisors can take to revive the funds.

References

Anderson, Carl R., and Carl P. Zeithaml, 1984, Stage of the product life cycle, business strategy, and business performance, Academy of Management Journal 27, 5-24.

Anthony, Joseph H., and K Ramesh, 1992, Association between accounting performance measures and   stock prices: a test of the life cycle hypothesis, Journal of Accounting and Finance 15, 203-227.

Arteaga, Kenneth R., Conrad S. Ciccotello, and C. Terry Grant, 1998, New equity funds: marketing and performance, Financial Analyst Journal 54, 43-49.

Baldwin, Carliss Y., 1982, Optimal sequential investment when capital is not readily reversible,   Journal of Finance 37, 763-782.

Bar, Michaela, Alexanda Kempf, and Stefan Ruenzi, 2011, Is a Team different from the sum of its parts? Evidence from the mutual fund managers, Review of Finance 15, 359-396.

Barber, Brad M., Terrance Odean, and Lu Zheng, 2005, Out of sight, out of mind:

the effects of expenses on mutual fund flows, Journal of Business 78, 2095-2119.

Beckers, Stan, and Greg Vaughan, 2001, Small is beautiful. Journal of Portfolio Management 27, 9-17.

Berger, Allen N., and Gregory F. Udell, 1998, The economics of small business finance: the roles of private equity and debt markets in the financial growth cycle, Journal of Banking and Finance 22, 613-673.

Berk, Jonathan B., and Richard C. Green, 2004, Mutual fund flows and performance in rational markets, Journal of Political Economy 112, 1269-1295.

Blake, David, and Allan Timmermann, 1998, Mutual fund performance: Evidence from the UK, European Finance Review 2, 57-77.

Bris, Arturo, Huseyin Gulen, Padma Kadiyala, and P. Ragharendra Rau, 2007, Good stewards, cheap talkers, or family men? The impact of mutual fund closures on fund managers, flows, fees, and performance, Review of Financial Studies 20, 953-982.

Bulan, Laarni, Narayanan Subramanian, and Lloyd Tanlu, 2007, On the timing of dividend initiations, Financial Management 36, 31-65.

Canals, Jordi, 2001, How to think about corporate growth? European Management Journal 19, 587-598.

Chen, Joseph, Harrison Hong, Ming Huang, and Jeffrey D. Kubik, 2002, Does fund size erode mutual fund performance? The role of liquidity and organization, American Economic Review 94, 1276-1302.

Cheng, Louis, T. W., Hung-Gay Fung, and T. Y. Leung, 2009, Why do poorly performing firms pay cash dividends in Mainland China?, International Review of Accounting, Banking, and Finance 1, 55-75.

Christoffersen, Susan E.K., 2001, Why do money fund managers voluntarily waive their fees? Journal of Finance 56, 1117-1140.

Churchill, Neil C., and Virginia L. Lewis, 1983, The five stages of small business growth, Harvard Business Review 61, 30-35.

Cremers, Martijn, and Antti Petajisto, 2009, How active is your fund managers? A new measure that predicts performance. Review of Financial Studies 22, 3329-3365.

DeAngelo, Harry, Linda DeAngelo, and Rene M. Stulz, 2006, Dividend policy and the earned/contributed capital mix: a test of the life-cycle theory, Journal of Financial Economics 81, 227-254.

DeYoung, Robert, 1998, Comments on de novo banks and lending to small businesses, Journal of Banking and Finance 22, 868-872.

DeYoung, Robert, and Iftekhar Hasan, 1998, The performance of de novo banks: a profit efficiency approach, Journal of Banking and Finance 22, 565-587.

DeYoung, Robert, Lawrence G. Goldberg, and Lawrence J. White, 1999, Youth, adolescence, and maturity of banks: Credit availability to small business in an era of banking consolidation, Journal of Banking and Finance 23, 463-492.

Diamond, Douglas W., 1991, Monitoring and reputation: the choice between bank loans and directly placed debt, Journal of Political Economy 99, 689-721.

Dickinson, Victoria, 2007, Cash flow patterns as a proxy for firm life cycle, Working paper. University of Florida.

Ding, Bill, 2006, "Mutual fund mergers: a long-term analysis," Working paper. State University   of New York at Albany.

Edelen, Roger M., Richard B. Evans, and Greg B. Kadlec, 2007, Scale effects in mutual fund performance: the role of trading costs, Working paper. ReFlow Management, LLC.

Fama, Eugene F., and Kenneth R. French, 1993, Common risk factors in the returns on stocks and bonds, Journal of Financial Economics 33, 3-56.

Fama, Eugene F., and Kenneth R. French, 1996, Multifactor explanations of asset pricing anomalies, Journal of Finance 51, 55-84.

Fama, Eugene F., and Kenneth R. French, 2001, Disappearing dividends: changing firm characteristics or lower propensity to pay? Journal of Financial Economics 60, 3-44.

Gaspar, Jose-Miguel, Massimo Masaa, and Pedro Matos, 2006, Favoritism in mutual fund families? Evidence on strategic cross-fund subsidization, Journal of Finance 61, 73-104.

Goldberg, Lawrence G., and Lawrence J. White, 1998, De novo banks and lending to small business: an empirical analysis, Journal of Banking and Finance 22, 851-867.

Grullon, Gustavo, Roni Michaely, and Bhaskaran Swaminathan, 2002, Are dividend changes a sign of   firm maturity? Journal of Business 75 (3), 387-424.

Hong, Harrison, Jeffrey D. Kubik, and Jeremy C. Stein, 2005, The neighbor's portfolio: word-of-mouth effects in the holdings and trades of money managers, Journal of Finance 60, 2801-2824.

Hunter, William C., and Aruna Srinivasan, 1990, Determinants of de novo bank performance, Economics Review, Federal Reserve Bank of Atlanta 75, 14-25.

Jain, Prem C., and Joanna Shuang Wu, 2000, Truth in mutual fund advertising: evidence on future performance and fund flows, Journal of Finance 55, 937-958.

Jayaraman, Narayanan., Ajay Khorana, and Edward Nelling, 2002, An analysis of the determinants and shareholder wealth effects of mutual fund mergers, Journal of Finance 57, 1521-1551.

Jensen, Michael, 1986, Agency costs on free cash flow, corporate finance, and takeover, American Economic Review 76, 323-329.

Kacperczyk, Marcin., Clemens Sialm, and Lu Zheng, 2005, On the industry concentration of actively managed equity mutual funds, Journal of Finance 60, 1983-2011.

Khorana, Ajay, and Henri Servaes, 1999, The determinants of mutual fund starts, Review of Financial studies 12, 1043-1074.

LaPlante, Michele, 2001, Influences and trends in mutual fund expense ratios, Journal of Financial Research 24, 45-63.

Lazko, David A., 1999, Economies of scale in mutual fund administration, Journal of Financial Research 22, 331-339.

Malhotra, D.K., and Robert W. McLeod, 1997, An empirical analysis of mutual fund expenses, Journal of Financial Research 20, 175-190.

Massa, Massimo, 1998, Why so many mutual funds? Mutual fund families, market segmentation and financial performance, Working paper, INSEAD.

Massa, Massimo, 2003, How do family strategies affect fund performance? When performance-maximization is not the only game in tow, Journal of Financial Economics 67, 249-304.

Massa, Massimo, Jonathan Reuter, and Eric Zitzewitz, 2009, When should firms share credit with employees? Evidence from anonymously managed mutual funds, Journal of Financial Economics 95, 400-424.

Miller, Danny, and Peter H. Friesen, 1984, A longitudinal study of the corporate life cycle, Management Science 30, 1161-1183.

Nanda, Vikram K., M.P. Narayanan, and Vincent A. Warther, 2000, Liquidity, investment ability, and mutual fund structure, Journal of Financial Economics 57, 417-443.

Nanda Vikram K., Z. Jay Wang, and Lu Zheng, 2009, The ABCs of mutual funds: on the introduction of multiple share classes, Journal of Financial Intermediation 18, 329-361.

Perold, Andre F., and Robert S. Salomon, 1991, The right amount of assets under management, Financial Analysts Journal 47, 31-39.

Pindyck, Robert S., 1988, Irreversible investment, capacity choice, and the value of the firm, American Economic Review 78, 969-985.

Pindyck, Robert S., 1991, Irreversibility, uncertainty, and investment, Journal of Economic Literature 29, 1110-1148.

Pollet, Joshua M., and Mungo Wilson, 2008, How does size affect mutual fund behavior? Journal of Finance 63, 2941-2969.

Polli, Rolando, and Victor Cook, 1969, Validity of the product life cycle, Journal of Business 42, 385-400.

Quinn, Robert E., and Kim Cameron, 1983, Organizational life cycles and shifting criteria of effectiveness: some preliminary evidence, Management Science 29, 33-51.

Rea, John D., Brian K. Reid, and Kimberlee W. Millar, 1999, Operating expense ratios, assets, and economies of scale in equity mutual funds, Investment Company Institute Perspective 5.

Sirri, Erik R., and Peter Tufano, 1996, Costly search and mutual fund inflows, Journal of Finance 53, 1589-1622.

Tufano, Peter, and Matthew Sevick, 1997, Board structure and fee-setting in the U.S. mutual fund industry, Journal of Financial Economics 46, 321-355.

Warner, Jerold B., and Joanna Shuang Wu, 2011, Why do mutual fund advisory

contracts change? Performance, growth, and spillover effects. Journal of Finance 66, 271-306.

Wermers, Russ, 1999, Mutual fund herding and the impact on stock prices, Journal of Finance, 54, 581-622.

Wermers, Russ, 2003, Is money really "smart"? New evidence on the relation between mutual fund flows, manager behavior, and performance persistence, Working paper. University of Maryland.

Zweig, Jason, 1996, When to take a wild ride, Money (July), 96-99.

Zhao, Xinge, 2004, Why are some mutual funds closed to new investors? Journal of Banking and Finance 28, 1867-1887.

Zhao, Xinge, 2005, Exit decisions in the U.S. mutual fund industry, Journal of Business 78, 1365-1401.

Appendix A
Mutual fund life cycle stage matching table

This appendix describes the matching table used to classify mutual fund life cycle stages. First, all fund-year observations are sorted by age in ascending order into quartiles. For a given fund-year observation, its age rank is matched to the age quartile cells located in the second row of the matching table based on the assumption that funds in early stages usually have young age. The matched cell will gain one point. Second, all fund-year observations are sorted by size in ascending order into quartiles and then matched to the size quartile cells located in the third row of the matching table. The matched cell will gain one point. This matching procedure is based on the assumption that funds in early stages usually have smaller size. However, since fund size will decline after the maturity stage, it would be inappropriate to assign the decline stage to funds in the fourth size quartile because funds in the fourth quartile will have the largest size. A reasonable way to handle this issue is to let both cells under maturity and decline stages earn one point if the size rank locates at the third or fourth quartiles. Finally, a sort by annual asset growth rate in ascending order is conducted in order to match the growth rank of each fund-year observation to the cells in the fourth row of the table, with the assumption that funds in earlier stages usually have higher annual growth. The matched cell will gain one point. After these three matching steps for a given fund-year, all points under the same life cycle stage column are aggregated to obtain a composite score for each stage. The stage with the highest score will be assigned to that fund-year. In a case in which three stages have the same highest score, the stage in the middle is chosen. The incubation stage is not examined in empirical analysis because the information

before funds were open to the public is not available.

Variable	High Growth	Low Growth	Maturity	Decline
Age	1st quartile	2nd quartile	3rd quartile	4th quartile
Size	1st quartile	2nd quartile	3rd & 4th quartile	3rd & 4th quartile
Growth Rate	4th quartile	3rd quartile	2nd quartile	1st quartile

Example: ABC fund, age = 25 years (3rd quartile), TNA = 500 million (3rd quartile), annual growth rate = 8.5% (3rd quartile). This fund-year observation will be classified to maturity stage based on the above matching table.

Variable	High Growth	Low Growth	Maturity	Decline
Age			1	
Size			1	1
Growth Rate		1		
Sum	0	1	2	1