The National and International Graduate Research Conference 2017
March 10, 2017 : Poj Sarasin Building, Khon Kaen University, Thailand

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Time-Varying Skill: An Investigation of UK Mutual Funds

Chatchanok Sripramoch *Dr.Sunti Tirapat**

ABSTRACT

This thesis investigates on time-varying skills of fund managers namely timing skill and picking skill by using holding-based measure of domestic equity open-ended funds in the UK from the period of 2004 to 2013 including a great recession period, 2008 to 2009. In studying on the relation between both skills and business cycle, this thesis finds that fund managers use picking skill and timing skill in expansion more than they use in recession which also means that there is no variation of skills with business cycle. Moreover, comparing top picking skilled funds in expansion and the remain funds, the result shows that top picking skilled funds in expansion unnecessarily have higher timing skill than other funds in the same period. In addition, the study in the great recession or crisis period finds that UK fund managers employ timing skill in crisis more than they use in regular recession while, they have picking skill in crisis a little bit less than they have in regular recession.

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Introduction

An investigation of skills or the outperformance of active fund managers is important because they manage the largest portion of total net asset around the world and charge higher fee than passive fund managers do[1] (Cremers, Ferreira et al. 2014). Although active funds obviously charge higher fees, they ambiguously add higher values than passive fund managers. The findings of skilled managers are necessary for both researchers and investors. For researchers, excess return in mutual fund performance will lead to the rejection of efficient market hypothesis (EMH) due to abnormal gains of informed traders. For investors, if skilled managers in active funds do not exist, investors should invest their money in passive funds and pay lower fees. Nowadays, researchers and investors still keep investigating on skills of active funds. The latest evidence to support skilled funds in the USA is the study of Kacperczyk, Nieuwerburgh et al. (2014). They find the variation in the use of skills over business cycle which is fund managers have picking skill in expansion and have timing skill in recession by using portfolio holdings data. Additionally, Kacperczyk, Nieuwerburgh et al. (2014) state that timing skill can be found only in recession periods and this is the reason behind failures to discover timing skill of many studies. However, time-varying skill in the USA may not hold for other countries because there is still no test for external validity. The result of the variation in picking skill and timing skill over business cycle in U.S. mutual fund cannot be used to make an inference about that in UK mutual funds. Even though, U.S. and UK fund industries have some similar characteristics e.g., high competition and low barrier to entry (Otten and Schweitzer 2002, Khorana, Servaes et al. 2009), they have two main different characteristics namely, tax treatment and investor protection (Cuthbertson, Nitzsche et al. 2010). U.S. mutual funds have different tax treatment of capital gain from UK mutual funds and U.S. investors have stronger protection than UK investors. These different characteristics can lead to different patterns or different levels in using skills of fund managers. Regarding Ferreira, Keswani et al. (2012), they conclude that funds will have high performance if they operate in the country that has a high level of financial development, high market liquidity and strong legal protection for investors.

This thesis use portfolio holdings data to search the skilled managers in UK domestic open-ended equity mutual funds by looking at their sources of skills; timing skill and picking skill, and the pattern of exhibiting skills related to business cycle, especially in the global financial crisis period. UK mutual funds should get more attention because in 2012, its market share, 35% of European AuM, was the largest portion in Europe and its AuM/GDP ratio (282%) was the highest ratio in the world[2] .Moreover, according to Cremers, Ferreira et al. (2014), total shareholder cost of truly active fund in the UK, which is considered as upper bound expenses, is 1.82 times as expensive as that in the USA. Therefore, both the large market share and expensive charges show the importance of studying for the UK mutual fund industry. In addition, for the UK, testing time-varying skill in a crisis period can provide different results

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[1] As of December 2010, 58% and 22% of open-ended equity mutual funds' total net asset around the world belong to truly active fund and explicating indexing fund respectively. Additionally, total shareholder cost, the annual expense ratio plus one-fifth of the front end load, around the world for truly active fund and explicit indexing are 1.66% and 0.35% consequently.

[2] U.S. AuM/GDP ratio is 174%.EFAMA (2014). Asset Management in Europe (7th Annual Report).

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from testing time-varying skill in other periods. Xydias (2012), who studies the performance persistence of UK funds pre and post-global financial crisis, shows that UK fund performance is persistent in a period before 2008 and in a period after 2011.Furthermore, there is the study of Vidal-García, Vidal et al. (2014), which is evidence of timing skill in recessions around the world by using return-based measure. Although their results include 2007-2008 crisis as one of their recession periods, my study will be further evidence emphasizing more on this crisis period for UK mutual funds. I test timing skill and picking skill using holding-based measure in crisis months separately from the other recession months to see how managers exhibit both skills in that particular period. Testing performance through severe recessions or crisis is the proper time to proof managerial skill of UK active fund managers.

Objectives of the Study

The main objectives of this study are to investigate the variation in using of picking skill and timing skill over business cycle for the UK mutual funds by using portfolio holdings data and to test the impact of great recessions in the UK on the variation in using of picking skill and timing skill.

The Overview of Theoretical Framework

In the UK fund industry, Quigley and Sinquefield (2000) show that average or aggregate active funds cannot beat index fund. However, Cuthbertson, Nitzsche et al. (2008) find that a small subset of the UK active funds can beat the market and can add value to investors. Another aspect to find evidence of managerial skill is to investigate on sources of skill which are picking and timing skill. Some literatures can observe picking skill in the UK. For example, Cuthbertson, Nitzsche et al. (2008) find strong evidence of stock picking skill only for top ranked equity funds. For testing timing skill in the UK funds, the following studies support non-existent timing skill. Byrne, Fletcher et al. (2006) apply regression (parametric) approach for both individual fund and aggregate funds and cannot discover the positive value for conditional market timing. Cuthbertson, Nitzsche et al. (2010) provide the same evidence of no market timing for 675 equity funds in 1975-2002 even though, they use both parametric and non-parametric approaches.

Lately, there are the evidences of the relation between sources of skill and business cycle in the U.S. mutual fund. Ferson and Qian (2004) study variation of market timing with different economic conditions. Kacperczyk, Van Nieuwerburgh et al. (2011) argue that skill originates from ability of adjusting portfolio in consistence with micro and macro fundamental information and they explore time-varying skill in business cycle. Additionally, in 2014, they investigate further on each source of skill and find that managers use timing skill in recession and use picking skill in expansion and they also point that timing skill can be found only in recession period (Kacperczyk, Nieuwerburgh et al. 2014).Vidal-García, Vidal et al. (2014) agree on this point by conditioning on state of business cycle before finding timing ability and they find market timing in recession for 35 countries around the world by using daily returns.

Over all, the variation in using skill over business cycle of U.S. mutual fund: picking skill in expansions and timing skill in recessions, is the latest finding about skill by using holdings data in the USA. In the UK, although there is evidence of using timing skill in recessions by employing return-based measure, there is still a lack of the

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study using holding-based measure to find both picking and market timing skill and their variations over business cycle for UK mutual funds. This thesis will fill this gap and also will be the stress test for Kacperczyk, Nieuwerburgh et al. (2014) by testing time-varying skill through crisis and the impact of crisis on the variation in picking and timing skill using holdings data for UK mutual funds.

Data and Methodology

Data Sources and Samples Selection

This study investigates 295 domestic open-end equity funds excluding index and sector funds in the UK. Monthly portfolio holdings data during January 2004 to December 2013 are available in Morningstar Direct Program database. The benefit of using Morningstar as a source of this data is that this program is free from survivorship bias because the program can show both dead and survivor funds. The criteria for mutual funds' samples are as follows. First, in the open-end fund universe, the UK is selected to be domicile and region of sale to eliminate the offshore funds. Next, equity and UK equity are chosen for global broad category group and for Morningstar category, respectively. After that, eliminate 117 index funds and sector funds to get 1,820 active strategy funds including 1,552 open-ended investment companies and 268 unit trusts. A next step is to pool fund families which have the same fund ID and remove merged funds and funds which were renamed in order to get only one observation fund for the same portfolio holdings data in order to avoid double counting. Furthermore, drop the funds lacking data and having equity proportion less than 80% in current quarter. To prevent incubation bias, the observation months that appear before reported starting year of the fund and funds that have number of stocks in their portfolio less than 10 stocks will be eliminated. Finally, there are 295 funds as sample of the study which can be separated into 11,743 observation months.

This thesis use monthly interval for portfolio holdings data of domestic open-end equity funds in the UK in order to reduce the problem of using quarterly data regarding the finding of Elton, Gruber et al. (2010). They state that 18.5% of trading will disappear if we use quarterly frequency instead of monthly frequency. Historical monthly total returns of funds and other characteristics namely, total net asset, age, expense Ratio, and turnover ratio, are received from Morningstar. Data Stream program is the source of market returns, stock returns, and market capitalization. Finally, OECD based recession indicator is used to identify recession and expansion months. Therefore, from the period of 2004 to 2013, there are 61 months for expansion periods and 59 months for recession periods including 18 months for a great recession period.

Skill Measures

Picking skill means the ability of fund manager to pick undervalued stocks. Fund manager with picking skill will overweight stocks of which future returns is about to increase and underweight stocks of which future returns is about to decrease. In this thesis, picking skill is measured by calculating the product of portfolio weights deviating from market weights and systematic returns of that stocks held in portfolio. Timing skill means the ability of fund manager to time market movement. Fund manager with timing skill is going to overweight high beta stocks before a market return increases and underweight high beta stocks before the market return decreases. In this study, timing skill is measured by calculating the product of portfolio weights deviating from market weights and

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unsystematic returns of that holdings stocks. This study use $Picking_t^j$ and $Timing_t^j$, hypothetical portfolio returns, as dependent variables in regression model and calculate them as Kacperczyk, Nieuwerburgh et al. (2014) did by separating performance of business returns and performance of overall market returns. So, it means that they are the different version from GT (Grinblatt and Titman 1993) and from CS and CT (Daniel, Grinblatt et al. 1997)[‡]. Moreover, this thesis agree with the skill's definition of Kacperczyk, Nieuwerburgh et al. (2014) stating that "skills mean using public or private information in a way that generate higher risk-adjusted returns". Because nowadays there are overloaded data flowing to the market each day and we have to choose only a small fraction of data to take action. Therefore, this study use an unconditional beta as Kacperczyk, Nieuwerburgh et al. (2014) did which differs from Ferson and Schadt (1996), Becker, Ferson et al. (1999), and Ferson and Khang (2002) who use a conditional beta ignoring the action of fund manager on public information as skill.

$$Picking_t^j = \sum_{i=1}^N (w_{i,t}^j - w_{i,t}^m)(R_{t+1}^i - \beta_{i,t} R_{t+1}^m) \tag{1}$$

$$Timing_t^j = \sum_{i=1}^N (w_{i,t}^j - w_{i,t}^m)(\beta_{i,t} R_{t+1}^m) \tag{2}$$

Where; $\beta_i = \frac{cov(R^i, R^m)}{\sigma_m^2}$

$w_{i,t}^j = \frac{\$ \ holding \ of \ stock \ i \ of \ fund \ j}{\$ total \ value \ of \ fund \ j}$ at the beginning of time t

$w_{i,t}^m = \frac{market \ capitalization \ of \ stock \ i}{total \ market \ cap.}$

In the formulas, R_{t+1}^m is the market return of the next period and $\beta_{i,t}$ is the sensitivity of the stock i's return to the market return getting from running the rolling-window regression on single index model between month t and 12 months prior. Hypothetical picking returns will be based on unsystematic returns portion, $(R_{t+1}^i - \beta_{i,t} R_{t+1}^m)$ and hypothetical timing returns will be based on systematic returns portion of return on stock i, $(\beta_{i,t} R_{t+1}^m)$

Control Variables

Characteristic style variables including size, value, and momentum are control variables in regression model. These variables are the value-weighted score that the score number is received from quintile ranking; 1 for smallest or lowest and 5 for largest or highest. Market capitalization, book-to-market, and 1-year return is ranked in order to get size variable, value variable, and momentum variable respectively, which is similar method to Kacperczyk, Sialm et al. (2005) and Kacperczyk, Nieuwerburgh et al. (2014).

Methodology

Testing the variation of timing skill and picking skill

To test the variation of timing skill and picking skill, winsorize Flow and Turnover are at the 1% level, demean all variables and run pooled regression on equations (3) and (4). All control variables need to be demeaned before running the regression in order to interpret constant as the return of skill in expansion and interpret slope as the

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[‡] $GT_t = \sum_{j=1}^N (\tilde{w}_{j,t-1} - \tilde{w}_{j,t-k-1}) \, \tilde{r}_{j,t}$

Characteristic-Selectivity $= CS_t = \sum_{j=1}^N \tilde{w}_{j,t-1}(\tilde{r}_{j,t} - \tilde{R}_t^{b_{j,t-1}})$

Characteristic Timing $= CT_t = \sum_{j=1}^N (\tilde{w}_{j,t-1} \tilde{R}_t^{b_{j,t-1}} - \tilde{w}_{j,t-k-1} \tilde{R}_t^{b_{j,t-k-1}})$

return of skills in recession. Additionally, pooled regression in R program will be used with clustering standard error because the error term may have linear correlation with funds and time.

$$\text{Picking}_j^t = \alpha_0 + \alpha_1 \text{Recession}_t + \alpha_2 \text{Log(Age)}_j^t + \alpha_3 \text{Log(TNA)}_j^t +$$

$$\alpha_4 \text{Expense}_j^t + \alpha_5 \text{Turnover}_j^t + \alpha_6 \text{Flow}_j^t + \alpha_7 \text{Load}_j^t +$$

$$\alpha_8 \text{Team}_j^t + \alpha_9 \text{Tracking}_j^t + \varepsilon_j^t \tag{3}$$

$$\text{Timing}_j^t = \alpha_0 + \alpha_1 \text{Recession}_t + \alpha_2 \text{Log(Age)}_j^t + \alpha_3 \text{Log(TNA)}_j^t +$$

$$\alpha_4 \text{Expense}_j^t + \alpha_5 \text{Turnover}_j^t + \alpha_6 \text{Flow}_j^t + \alpha_7 \text{Load}_j^t +$$

$$\alpha_8 \text{Team}_j^t + \alpha_9 \text{Tracking}_j^t + \varepsilon_j^t \tag{4}$$

Testing timing skill and picking skill of top skilled managers

To test timing skill and picking skill of top skilled managers, pooled regressions are run with adding *Top* as a dummy variable for a superior group of picking skill in expansion. First, to form the top group of skilled managers, all funds' observation months are separated into recession months' subsample and expansion months' subsample. Second, the cross-sectional distribution is formed within expansion subsample by using picking skill value. Then, choose top 25% of the value from distribution and count the number of months for each fund appearing in this group and then calculate it in percentage of total months of each fund. Top skilled fund is assigned to the funds which are in the top quartile of this fraction ranking. Finally, pooled regression is run on model (5) in R program for each subsample months.

$$\text{Picking}_j^t = \alpha_0 + \alpha_1 \text{Top}_j^t + \alpha_2 \text{Log(Age)}_j^t + \alpha_3 \text{Log(TNA)}_j^t +$$

$$\alpha_4 \text{Expense}_j^t + \alpha_5 \text{Turnover}_j^t + \alpha_6 \text{Flow}_j^t + \alpha_7 \text{Load}_j^t +$$

$$\alpha_8 \text{Team}_j^t + \alpha_9 \text{Tracking}_j^t + \varepsilon_j^t \tag{5}$$

Where Top_j^t equals to 1 if fund j is in the top picking skilled group and 0 otherwise. Picking_j^t is the picking return or timing return.

Testing the characteristics of top skilled fund in the UK

To disclose the characteristics of superior picking skilled funds in expansion in the UK, fund-level data will be use including, age, total net asset, expense ratio, turnover ratio, flow, portfolio dispersion, stock number, and industry. The first five characteristics are the same data as the previous research question use. Portfolio dispersion indicating the concentration of the portfolio of fund is calculated by using Herfindahl index of portfolio's weight in deviation from the market's weight. Stock number shows the number of stocks that fund managers hold in their portfolios. Industry concentration indicates the industry concentration of fund's portfolio and is measured by using Herfindahl index of portfolio weights in a given industry in deviation from the market portfolio's weights. These characteristics of top picking skilled group is identified by using average, standard deviation, and median value for each characteristic and these values is compared between top picking skilled funds and the remain funds.

$$\text{Herfindahl index} = \sum_{i=1}^{n}(w_i - m_i)^2 \tag{6}$$

Testing timing skill and picking skill in crisis

To investigate the use of picking skill and timing skill of fund manager in severe recession like crisis period comparing to regular recession, interaction term is added, Recession*Crisis, which equals to 1 if the observation

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months are in recessions and in great recession and 0 otherwise, and run pooled regression on equation 7 and 8. Great recession in the UK is in the period between the second quarter of 2008 and the third quarter of 2009.

$$Timing_{it} = \alpha_0 + \alpha_1 Recession_t + \alpha_2 Recession_t * Great_t + \alpha_3 Log(Age)_{it} + \alpha_4 Log(TNA)_{it}$$

$$+ \alpha_5 ExpRatio_{it} + \alpha_6 TurnRatio_{it} + \alpha_7 Flow_{it} + \alpha_8 Size_{it} + \alpha_9 Value_{it}$$

$$+ \alpha_{10} Momentum_{it} + \varepsilon_{it} \tag{7}$$

$$Picking_{it} = \alpha_0 + \alpha_1 Recession_t + \alpha_2 Recession_t * Great_t + \alpha_3 Log(Age)_{it} + \alpha_4 Log(TNA)_{it}$$

$$+ \alpha_5 ExpRatio_{it} + \alpha_6 TurnRatio_{it} + \alpha_7 Flow_{it} + \alpha_8 Size_{it} + \alpha_9 Value_{it}$$

$$+ \alpha_{10} Momentum_{it} + \varepsilon_{it} \tag{8}$$

Results and Discussion

I. The variation of timing skill and picking skill

The results in table 1 shows that fund managers statistically significantly have timing skill and picking skill in recession less than they have in expansion by 0.41% and 0.55% per month, respectively. In more details, the return per month of timing skill in expansion and in recession equal to -0.59% and -1% and the return per month of picking skill in expansion and in recession equal to 0.05% and -0.5%, respectively. Therefore, timing skill and picking skill have negative relation with recession. In addition, the result can be concluded that fund managers use picking skill and timing skill in expansion more than in recession also meaning that fund managers in the UK do not vary their uses of skills with business cycle like US fund managers do. As a result, the previous finding of Kacperczyk, Nieuwerburgh et al. (2014), which is fund managers use timing skill more in recession and use picking skill more in expansion, does not exist in the UK. Besides, this finding is inconsistent with the finding of Vidal-García, Vidal et al. (2014), who show positive relation between timing skill and recessions of UK mutual funds.

Table 1 *: Timing skill and Picking Skill with Business Cycle

Picking and *Timing* are explained variable calculated from equation *(1)* and *(2)* by using 12-month rolling window beta. *Recession* is explanatory variables which equal to 1 for every month that specify in recession periods and 0 otherwise. *Log(Age)* is age in year of fund in term of natural logarithm. *Log(TNA)* is total net asset of fund in term of natural logarithm. *ExpRatio* is expense ratio *(% per year)* of fund. *TurnRatio* is turnover ratio *(% per year)* of fund. *Flow* is growth rate of fund's new money. *Size*, *Value*, and *Momentum* variables are the proxy of funds' style with the 3 dimensions depended on the average scores of holding stock in fund's portfolio in that month and sorted into quintile along each characteristics. Demean all control variable, winsorize*Flow* and *TurnRatio* at the 1% level and run pooled regression with clustering standard deviation by fund and time.

	Timing		Timing		Picking		Picking	
Intercept	-0.0059		0.0053	***	0.0005		0.0039	***
	(0.006)		(0.000)		(0.003)		(0.000)	
Recession	-0.0041	***	-0.0044	***	-0.0055	***	-0.0046	***
	(0.000)		(0.000)		(0.000)		(0.000)	
log(Age)	0.0003	.			0.0003	.		
	(0.000)				(0.000)			
log(TNA)	-0.0005	***			0.0000			

	(0.000)			*(0.000)*		
ExpRatio	0.0201			0.0066		
	(0.028)			*(0.051)*		
TurnRatio	-0.0004	***		-0.0003		
	(0.000)			*(0.000)*		
Flow	0.0066	*		0.0007		
	(0.003)			*(0.002)*		
Size	0.0039	***		-0.0028	***	
	(0.001)			*(0.001)*		
Value	0.0053	***		-0.0003		
	(0.001)			*(0.001)*		
Momentum	-0.0017	.		0.0048	***	
	(0.001)			*(0.001)*		
Observations	11743		11743	11743		11743

Significant level: 0 '***', 0.001 '**', 0.01 '*', 0.05 '.', 0.1 ' '

II. Timing skill and picking skill of top skilled managers

The table 2 shows that top picking skilled funds in expansion, who statistically significantly have higher picking return than other funds by 0.55% per month or 3.6% per year, have higher picking skill and timing skill in recession than other funds by 0.32% per month with statistical significance and by 0.08% per month with non-statistical significance, respectively, but they have a little lower timing skill in expansion than others by 0.01% per month with non-statistical significance. These results can be inferred that fund managers are good at picking stock in both expansion and recession periods with statistical significance and also are skilled in timing the market in recession with non-statistical significance and can be summarized that fund managers in top picking skilled group in expansion are not the same funds as fund managers in top timing skilled group in recession.

Table 2: Top Skilled Managers with Business Cycle

Top is a dummy variable for a superior group of skilled manager whose picking skill in expansion is in the highest 25th percentile of the picking skill distribution. Pooled regression is run on model (5) with standard error clustering by fund and time for each subsample months; expansion subsample and recession subsample.

	Timing				Picking			
	Expansion		Recession		Expansion		Recession	
Intercept	0.0059	.	-0.0160	**	0.0001		-0.0039	
	(0.004)		*(0.006)*		*(0.003)*		*(0.004)*	
Top	-0.0001		0.0008		0.0055	***	0.0032	**
	(0.001)		*(0.002)*		*(0.001)*		*(0.001)*	
log(Age)	0.0001		0.0008	.	0.0002		0.0006	*
	(0.000)		*(0.000)*		*(0.000)*		*(0.000)*	
log(TNA)	-0.0004	***	-0.0008	***	0.0000		-0.0001	
	(0.000)		*(0.000)*		*(0.000)*		*(0.000)*	

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ExpRatio	0.0007		0.1251		0.0118		0.0107
	(0.044)		(0.077)		(0.036)		(0.071)
TurnRatio	-0.0003	.	-0.0015		-0.0002		-0.0011
	(0.000)		(0.001)		(0.000)		(0.001)
Flow	0.0030		0.0146	.	-0.0005		-0.0026
	(0.003)		(0.008)		(0.002)		(0.004)
Size	-0.0032	***	0.0159	***	-0.0021	*	0.0003
	(0.001)		(0.002)		(0.001)		(0.001)
Value	0.0010		0.0074	***	-0.0013		-0.0036 ***
	(0.001)		(0.002)		(0.001)		(0.001)
Momentum	0.0057	***	-0.0154	***	0.0043	***	0.0019 .
	(0.001)		(0.002)		(0.001)		(0.001)
Observations	7842		3901		7842		3901

Significant level: 0 '***', 0.001 '**', 0.01 '*', 0.05 '.', 0.1 ' '

III. The characteristics of top skilled fund in the UK

Table 3 shows that top picking skilled group is younger by 4 years, has smaller size by 206.51 million pound, collects more expense ratio by 0.23% per year, has more turnover ratio by 0.98% per year, has more inflow with positive value than another group, has higher portfolio dispersion, and has less number of stocks in portfolio. These characteristics of top picking skilled funds in the UK are the same in the US (Kacperczyk, Nieuwerburgh et al. 2014) regardless of time period of sample. However, there is one different characteristic which is UK top skilled managers have less industry dispersion, while US top skilled managers have higher industry dispersion than other funds.

Table 3: The Characteristic of Top Skilled and Non-Top Skilled Funds

Top equals to 1 if funds is in a superior group of skilled manager whose picking skill in expansion is in the highest 25th percentile of the picking skill distribution and 0 otherwise. *Age, TNA, Expense Ratio, Turnover Ratio* and *Flow* are the same as described in Table 1. *Portfolio Dispersion* is measured by using Herfindahl index of portfolio's weight in deviation from the market's weight. *Stock number* shows the number of stocks that fund managers hold in their portfolios. *Industry Concentration* indicates the industry concentration of fund's portfolio and is measured by using Herfindahl index of portfolio weights in a given industry in deviation from the market portfolio's weights. Top1 – Top0 is mean value of top which equals to 1 minus mean of top which equals to 0. Statistical significance of the different can see from p-value.

	Top = 1			Top = 0			Diff	
	Mean	Stdev.	Median	Mean	Stdev.	Median	Top1-Top0	p-value

Age (Years)	14.67	12.73	9.86	18.41	13.33	16.57	-3.74	0.00000
TNA (Mil.£)	170.48	265.17	69.49	376.99	1,186.91	87.50	-206.51	0.00000
Expense Ratio (%)	1.54	0.01	1.58	1.32	0.01	1.46	0.23	0.00000
Turnover Ratio (%)	35.63	0.99	19.92	34.64	1.02	18.13	0.98	0.66790
Flow (%)	1.23	0.09	-0.03	-0.27	0.07	-0.48	1.50	0.00000
Portfolio Dispersion	1.57	0.01	1.44	1.02	0.01	0.96	0.55	0.00000
Stock Number	70.08	35.82	60.00	73.65	71.93	52.00	-3.57	0.01659
Industry Concentration	3.84	0.03	3.00	7.03	0.04	7.41	-3.19	0.00000

IV. Timing skill and picking skill in crisis

From table 4, the result is that UK fund managers statistically significantly use timing skill in crisis period more than they use in regular recession periods by 0.19% per month but they have picking skill in crisis a little less than they have in recession by 0.01% per month. The results in this section do not support positive relation between timing skill and recessions for UK mutual fund (Vidal-García, Vidal et al. 2014). Moreover, although the persistent performance of UK funds disappear during crisis year in 2008-2011 as the study of Xydias (2012), this thesis shows that UK fund manager use higher timing skill in crisis than other recession.

Table 4: Timing Skill and Picking Skill in Crisis

*Recession*Crisis* equals to 1 if the observation months are in recessions and in great recession. Great recession or crisis is defined for months from April 2008 to September 2009 and 0 otherwise. Other variables are the same as described in Table 1. Pooled regression with clustering standard deviation by fund and time is used.

	Timing		Picking	
Intercept	-0.0061	*	0.0005	
	(0.006)		(0.003)	
Recession	-0.0041	***	-0.0055	***
	(0.000)		(0.000)	
*Recession*Crisis*	0.0019	**	-0.0001	
	(0.001)		(0.000)	
log(Age)	0.0003		0.0003	.
	(0.000)		(0.000)	
log(TNA)	-0.0005	***	0.0000	
	(0.000)		(0.000)	
ExpRatio	0.0194		0.0067	
	(0.028)		(0.052)	
TurnRatio	-0.0004	.	-0.0003	.
	(0.000)		(0.000)	
Flow	0.0068	*	0.0007	
	(0.003)		(0.002)	

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Size	0.0039	***	-0.0028	***
	(0.001)		(0.001)	
Value	0.0053	***	-0.0003	
	(0.001)		(0.001)	
Momentum	-0.0017	*	0.0048	***
	(0.001)		(0.001)	
Observations	11743		11743	

Significant level: 0 '***', 0.001 '**', 0.01 '*', 0.05 '.', 0.1 ' '

Conclusions

This thesis employs the holding-based measure to investigate the variation of using picking skill and timing skill of fund with business cycle and to compare the uses of these skills between regular recessions and crisis period of UK funds. The sample used in this study are 295 domestic open-end equity funds from January 2004 to December 2013 including a great recession period between April 2008 and September 2009. Therefore, this thesis will be the stress test and external validity test of Kacperczyk, Nieuwerburgh et al. (2014) for UK fund industry. The findings is that fund managers statistically significantly have both picking skill and timing skill in expansion more than they have in recession, So there is no variation of picking skill and timing skill with business cycle in UK mutual fund industry.

Furthermore, if I assign top picking skilled group as the group of fund managers with the highest 25th percentile of the picking skill distribution in expansion period, the study shows that top picking skill group has a little lower timing skill in expansion than the other groups which means that fund managers in top picking skilled group in expansion are not the same funds as fund managers in top timing skilled group in recession. Another result is that in recession, top picking skilled group has better picking and timing skill than the other groups. In addition, this thesis also discloses the characteristics of top picking skilled funds including younger age, smaller AUM, more expense ratio, more turnover ratio, more new money inflow, higher portfolio dispersion, less number of stock holding, and lower industry concentration of portfolio than the remain funds.

To investigate skill in crisis period, this thesis finds that UK fund managers statistically significantly have more timing skill and have a little lower picking skill in crisis period than they have these skills in regular recession. Overall, this thesis is the evidence of UK equity open-end fund to support top skilled fund manager in the aspect of studying in source of skills and the linkage between skills and the state of economy by finding that top picking skilled funds have positive timing and picking skills over business cycle and top picking skilled use timing skill in crisis more than they use in regular recession.

Lohitanon, Mr.Sarawut Iranoppaiboon and Mr.Kongkhun Limsamutchaiyaporn for their a lot of help. Finally, I must express my gratitude to my family for always being there for me.

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