Predicting Tunisian mutual fund performance using dynamic panel data model

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Abstract
Purpose – The purpose of this paper is to examine the ability of well known fund characteristics such as the recent past performance, fund size, management fees, fund age, net asset value and fund growth so as to explain Tunisian equity mutual fund performance.

Design/methodology/approach – The sample was split according to investment objectives, and the advanced dynamic panel data approach was used over the period 1999-2006.

Findings – The authors find that past performance and fund size have a positive and significant influence on future performance for all fund categories, irrespective of what performance measure was used. This may indicate the existence of scale economies in the Tunisian equity mutual fund industry. The author also find that the other fund characteristics play an important role in explaining performance, but their impact varies among the fund categories. In all, regression results support the dynamic links between fund characteristics and future performance.

Research limitations/implications – The findings do not take into account the behaviour of fund managers and their ability to extend the investment opportunities set. It seems that there are more complex factors related to the strategic behaviour of the manager and driving differences in performance across funds than previous studies have indicated.

Practical implications – The authors confirm the empirical evidence that historical performance contains some information about future performance and such information may be important to mutual fund investors. It was also found that fund size is positively related to future performance of small fund category as well as of large fund category. This may indicate the existence of scale economies in the Tunisian equity mutual fund industry. In addition, the influence of the other control variables varies among the fund categories, but often is the same as in earlier studies.

Social implications – The paper provides information to foreign investors for investing in Tunisian capital market.

Originality/value – In this regard, the study of literature revealed that the explanation of performance, based on quantitative factors, is often limited to a static approach that involves making estimates resting on multiple regression, regression in cross section and principal component analysis for short periods. However, several empirical studies highlight the impact of past performance on future performance. It seemed essential to enrich the analysis by using a dynamic approach.

Keywords Tunisia, Equity capital, Fund management

Paper type Research paper

I. Introduction

If the study on performance measurement has enabled us to outline managers who have the ability to achieve higher returns relatively to their benchmarks, we must recognise that the interpretation of rankings of funds requires great caution. Indeed, some results

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may be due to either mere luck or bad luck regardless of the quality of management. Thus, further analysis is needed to identify factors related to performance. In this regard, the study of literature revealed that the explanation of performance, based on quantitative factors, is often limited to a static approach that involves making estimates resting on multiple regressions, regression in cross section and principal component analysis for short periods. However, several empirical studies highlight the impact of past performance on future performance. It seemed essential to enrich the analysis by using a dynamic approach. In addition, our study allows us to examine performance of funds invested on Tunisian market, which is characterised as an emerging market[1]. It provides information to foreign investors for investing in Tunisian capital market.

This paper is organised as follows: Section II reviews the literature about the relationship between performance and fund characteristics. We measure performance using Jensen's alpha from a standard market model and lower partial moment capital asset pricing model (LPM-CAPM). Section III describes the methodology. Section IV presents the data and summary of statistics. Section V contains the results of our empirical study. Section VI concludes the study.

II. Literature review: cross-sectional determinants of performance

There are numerous studies that try to identify performance differences across funds and predict mutual fund performance. Their analysis allowed us to raise two key questions about whether the results of collective management industry are or not:

- Related to the value added of the manager?
- Owing to the fund characteristics?

To highlight this difference, the first paragraph reviews studies conducting an empirical analysis of the impact of past performance on future performance. Indeed, beyond the fund's performance, many investors believe that the management quality of a manager is revealed through his past performance, and that is why the impact of past performance has been the subject of numerous publications. In the second paragraph, we discuss the results of studies trying to investigate other factors that may explain mutual fund performance.

II.1. Empirical studies on performance persistence

Performance persistence is an important issue in a number of contexts. The question of whether mutual fund performance persists is crucial in explaining how investors should select funds and how they should develop their investment strategies. Performance persistence "or momentum" also has an important implication for researchers trying to understand the nature of markets.

There is an important number of empirical literature testing the persistence of mutual fund performance. Grinblatt and Titman (1992), Hendricks *et al.* (1993) and Goetzmann and Ibbotson (1994) asserted that past performance of a fund provides useful information for predicting future returns. In addition, they showed that a manager who achieved superior performance over a reference period tends to be more consistently successful. In other words, a fund underperforming other funds, this year is likely to continue underperforming them next year.

Other papers argue that performance persistence may be due to survivor bias. In particular, Brown *et al.* (1992) demonstrate that if fund volatility is constant but varies cross-sectionally, and if funds disappear each period according to whether or not their performance during that period drops into the bottom fraction of funds, then survivorship induces spurious persistence. Hendricks *et al.* (1997) extended this work to show that, conditional on survival, second-period performance is a J-shaped function on first-period performance. On the other hand, Hendricks *et al.* (1993), and Brown and Goetzmann (1995) still found performance persistence of equity mutual funds after controlling for survivorship bias. It should be stressed that this persistence may be due to other risk factors that might affect stock returns, but is not captured by the standard risk-adjusted procedures. This idea appears in the study of Sauer (1997) who finds statistically significant evidence of performance persistence in his sample. But when he splits the funds into investment objectives (growth funds, growth and income funds), performance persistence disappears. However, Carhart (1997) demonstrates that persistence in equity mutual funds appears to be due to the differences in fund fees and exposures to the common factors in stock returns; and thus persistence is greatly reduced after controlling for momentum.

In general, empirical studies suggest that past performance is a most important factor for mutual fund investment decisions. In addition to the articles mentioned above, these studies include Blake *et al.* (1996), Gruber (1996) and Malkiel (1995). By contrast, Jain and wu (2000) conclude that superior performance is not due to skill, and out-performance of funds does not persist.

In addition to past performance, several researchers have suggested that a number of other variables related to fund characteristics might have an impact on performance.

II.2. Fund characteristics and performance

There is strong empirical evidence that some fund-specific characteristics influence performance. This information should be valuable for investors before placing their money in mutual funds.

A first observable characteristic that might be related to performance is fees[2]. Grossman and Stiglitz (1980) studied the impact of management fees on performance and they concluded that, if the market were efficient, management fees should recover the costs of generating the necessary information. However, Elton *et al.* (1993) state that if agency problem existed, management fees may exceed information costs, and therefore, managers may become underperformers relatively to their benchmarks.

Ippolito (1989) confirmed the finding of Grossman and Stiglitz (1980): funds charging larger fees also generate higher returns, and both effects are compensated. However, Elton *et al.* (1993) showed that the conclusion of Ippolito is due to some data errors. Correcting for these errors, they argue that funds underperform their benchmarks. A similar result is attained by Malkiel (1995) who showed a statistically significant negative relation between expense ratio and returns for a sample of US equity mutual funds over the period 1971-1991. Indeed, Hooks (1996) found a negative impact of fees on performance for the period 1979-1993. In contrast, Bergeruc (2000) showed that expense ratio, front loads and deferred loads did not influence French mutual funds performance from 1989 to 1997, which indicates that investors do not pay attention to fees or are unaware of the differences across funds and their predictability.

A second characteristic that may also be a determinant of mutual funds performance is size. We can categorise empirical studies into two groups. The first group tests the direct relation between size and performance. The second group shows that this relation is attributed to the existence of economies of scale in the mutual funds industry.

Studies examining the direct impact of size on performance found different results. Golec (1996) and Payne *et al.* (1999) pointed to the existence of a significantly positive relation between the performance of mutual funds and their size. This result indicates that the funds' size helps managers to diversify their portfolios and to share out management fees amongst many investors. This is confirmed by Indro *et al.* (1999). But they showed that the relation sign depends on the total net asset (TNA) under management: an increasing relation between size and return expect exists for the funds in the largest size deciles. In a regression with risk-adjusted returns, a concave relation is found, increasing from small to large funds and decreasing for very large funds. However, Grinblatt and Titman (1989), Dahlquist *et al.* (2000) found that size has a negative influence on performance.

Obviously, there are several reasons why fund size may erode performance in the mutual fund industry. First, when a fund gets extremely large, it becomes more and more difficult to continue delivering high returns if it is unable to deploy its entire capital into its trading strategies. Second, larger funds need more managers, which may make the funds organisation more complex and costly (Dermine and Roller, 1992). This implies that fund size may affect negatively the performance due to liquidity and organisational diseconomies. Indro *et al.* (1999) argue that the trades on information or the implement strategies become more difficult for large funds. Some corroboration of this view is found by other empirical researches, which test whether mutual funds are able to reap economies of scale by increasing their sizes. They examine the relation between management costs and fund size. Latzko (1999) and Wang (2002) showed that economies of scale and scope exist for their sample of mutual funds by estimating a cost function and even using several functional forms. However, they found different results for the optimal size. This finding is confirmed by Dermine and Roller (1992) who documented the existence of economies of scale and scope solely for the smaller French mutual funds and across all fund categories.

Overall, empirical evidence suggests that fund size may have a positive (or negative) impact on future performance due to increasing (or deceasing) returns to scale.

A third characteristic that may also affect performance is fund age[3]. A number of articles, such as Blacke and Timmerman (1998), provide direct evidence that there is a positive relation between age and performance of the UK mutual funds, indicating the existence of economies of experience. This also suggests that old funds enjoy a better visibility. On the other hand, it may indicate survivorship bias as older funds are probably only included in the database if their performance was high.

In addition to these factors, investors may also pay attention to net asset value (NAV) which seems partly conditional to capital flows. The lower it is, the greater the probability of attracting new investors and gain market share. Indeed, it is much of interest to investors who have a high amount to place than those with a much smaller amount. Moreover, a small value asset allows the underwriter to precisely adjust the amount of sales to its liquidity needs. Thus, as noted by Khorana and Serveas (2001), the NAV determines the flexibility of investment.

Finally, beliefs of investors manifested in money flows to mutual funds also seem to contain some information about future performance. Gruber (1996) and Zheng (1999) note that if investors have a great incentive to buy the past performance, and that past performance is informative about future performance, then flows also have an informational content. In addition, Edelen (1999) shows that funds exhibit negative market timing abilities only when they undertake liquidity-motivated trading, proxied for by fund flows.

The expected relationship between flows and future performance is negative. Note that the two explanations of the negative impact of the flow on future performance have been largely asserted by the majority of empirical work (Rakowski, 2003). Indeed, the flow may compel managers either to pursue their optimal investment strategies in case of demand for liquidity at an inappropriate time or make the management of funds rather difficult due to a factor of "diseconomies of scale".

III. Methodology

This paper examines the ability of well-known mutual fund characteristics to explain future performance. We state two new evidences on this issue. First, we use a sample of Tunisian equity mutual funds. Also, to make all performance comparable, we split our sample into investment objectives. Second, we use a different kind of methodology to estimate the parameters of our model.

We now turn to a more detailed description of the variables contained in our model and of the methodology used. In Section III.1, we describe how we construct the dependent variable and the control variables. Thereafter, we present our empirical model. In Section III.2, we explain the methodology used for estimating our model.

III.1. Variables measures and empirical model

We examine the relationship between a fund performance and its past performance as well as other variables that might influence performance. Our dependent variable is performance, $perf_{it}$, of fund i in year t due to the manager ability of stock-picking and market timing. As there is no clear evidence in the literature which performance measure our empirical study should be based on, we use two different measures.

First, we use the standard CAPM that is introduced by Jensen (1968) to value the performance of mutual funds:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p(R_{mt} - R_{ft}) + \zeta_{pt}$$

The coefficient α is defined as the difference between the actual excess return and the expected excess return and is used to reflect the fund manager's skill.

Second, we estimate the LPM-CAPM of Bawa and Lindenberg (1977). This model is based on asymmetric risk management and it has been actively used in risk management in several areas of finance. It was strongly supported by Estrada (2000) who documented its superior power of explaining risk in an emerging market stock such as the Tunisian financial market. The LPM-CAPM is given by:

$$R_{pt} - R_{ft} = \alpha_{1p} + \beta_p^{LPM\,2}(R_{mt} - R_{ft}) + \zeta_{pt}$$

where: β_p^{LPM2} is defined by:

$$\beta_p^{LPM\,2} = \frac{E\left[(R_{pt} - R_{ft})\min(0,\, R_{mt} - R_{ft})\right]}{E(\min 0,\, (R_{mt} - R_{ft}))^2}$$

R_{pt} denotes the rate of return of fund p in year t, R_{ft} denotes the rate of return on the risk-free asset in year t and r_{mt} is the excess-return of the market over the risk-free rate in year t. α_p denotes the Jensen alpha and α_{1p} is the lower partial moment alpha.

Our model also includes a vector of explanatory variables. We particularly examine if various fund attributes such as management fees, fund size, fund age, NAV and flow can explain the future fund performance.

To control the influence of management fees, we add the variable $FEE_{p,t}$ to our model. It represents a percentage of asset management[4]. We also include the log of the age, $lnAGE_{p,t}$, the log of the fund size, $lnTNA_{p,t}$, and the log of the NAV, $lnNAV_{p,t}$, to examine their impact on performance of our sample.

To control the influence of flow, we follow the standard procedure in the literature (Chevalier and Ellison, 1997; Sirri and Tufano, 1998), net relative flows are defined as a net percentage growth of fund assets:

$$FLOW_{it} = \frac{TNA_{it} - TNA_{it-1}}{TNA_{it-1}} - r_{it}$$

where TNA_{it} is the NAV of fund i in year t and r_{it} is the return of fund i in year t. $FLOW_{it}$ reflects the growth of the fund that is not due to return earned on the assets under management but due to new external money. This definition is based on an assumption that all dividends are automatically reinvested in the fund and flows occur at the end of period t.

As discussed before, some fund characteristics such as size, NAV, age, past performance, flow and fees may affect future performance. Consequently, we examine the determinants of Tunisian equity mutual funds by estimating the following multivariate regression:

$$\begin{aligned} perf_{it} = {} & \beta_0 + \beta_1 perf_{it-1} + \beta_2 size_{i,t-1} + \beta_3 age_{i,t-1} + \beta_4 navalue_{i,t-1} \\ & + \beta_5 flow_{i,t-1} + \beta_6 fees_{i,t-1} + \xi_{i,t} \end{aligned} \quad (1)$$

For each performance measure, we test the relation (1). In addition, to allow for the possibility that correlation between explanatory variables exists, we examine the correlation matrix and the variance inflation factor (VIF).

III.2. The applied estimation method

Our model in equation (1) includes as one of the regressors, a lagged dependent variable. In this case, the usual methods such as the fixed effects model and the random effects model generate a biased estimate of the coefficients due to the fact that lagged dependent variable may be correlated with the error term. Bias can result especially when the sample is small. The solution to this problem involves taking the first differences of the original model. The first difference transformation removes both the constant term and the individual effect. This approach was initially proposed by Anderson and Hsiao (1981), who suggested using lagged values of the dependant variable as instruments in the first-order autoregressive panel data models. Arellano and Bond (1991) consider dynamic panel data models with other covariates and suggest the two generalised method of moments (GMM). The GMM procedures gain efficiency by exploiting additional moment restrictions. They use the lags of the levels of the predetermined variables, as well as lags of strictly exogenous regressors as additional instruments. GMM is usually robust to the deviation of the underlying data generation process to violations of heteroskedasticity and normality, insofar as they are asymptotically normal. But they are not always the most efficient estimators. That is why Arellano and Bond (1991) propose two tests of specification:

(1) The test for residual autocorrelation in the first and second order. It is provided by the m_1 and m_2 statistics. They are asymptotically distributed as N(0, 1) under the null hypothesis of no correlation, and have been calculated from residuals in first-differences. So if the errors in levels were uncorrelated, we would except m_1 to be significant, but no m_2.

(2) The Sargan/Hansen test of over-identifying restrictions, which is used to ensure the absence of correlation between instrument variables and residuals. Under the null hypothesis of no correlation between errors and instruments, Sargan statistic is distributed as $\chi^2(n)$ with n equal to the difference between the number of instruments and of right-hand side variables.

In addition to these two tests, the Wald test is also reported to test the joint significance of all variables in the model. Under the null hypothesis of no relationship, Wald statistic is distributed as χ^2.

IV. Data description and summary statistics

Data from several sources is used to explain the performance of Tunisian equity mutual funds. This database contains data on daily returns, daily TNAs under management, and other fund characteristics such as NAV, management fees and starting data for each fund. We compute daily returns by dividing the fund's daily NAV per share by the previous daily's NAV and subtracting one. The NAV data are adjusted to include dividends. Our sample contains all mutual funds that were divided into investment objectives[5] to make all funds performances comparable (Sharpe, 1992). This provides us with the three following different groups; growth founds (over 60 per cent of the portfolio consisting of equities), income founds (20 to 60 per cent of the portfolio consisting of equities) and balanced funds (less than 20 per cent of the portfolio consisting of equities). Our sample period extends from January 1999 to December 2006. We focus on this period for two reasons. First, the number of funds prior to our sample period is relatively low. Second, publicly disseminated data on market indices and on mutual fund NAV (daily frequency) have only been available since 1999, which enabled investors to calculate the relative performance of a fund more easily. We use Tunindex (value-weighted index)[6] and a 13 weeks Tunisian treasury bill to calculate excess market returns and to compute the performance measures using regression for the models described in the previous section. It is also noticeable that our sample changes each year since the funds issued during the period are integrated over time. In addition, mutual funds that have ceased to exist during the period are included in the sample until their closing date. Thus, the analysis does not suffer from survivor bias. Summary statistics describing the total sample of funds appear in Table I. The funds in our sample are classified according to the investment objectives. Summary measures of performance and summary statistics on the fund groups are presented in Table II.

As it can be seen from Table I, the number of funds in our sample grows from 11 in 1999 to 16 in 2006, with a maximum number of 18 in 2004. The average number of funds per year is 15. The size of the average fund in our sample is 7.319 million dinars with a maximum of 14 million dinars in 1999 and a minimum of about 3.44 million dinars in 2002. The mean growth rate due to new money in our sample is 47.33 per cent per year. The age of the mean funds is 7.80 years.

	Number of funds	Mean TNA In million dinars	Mean growth (%)	Mean NA value	Mean age
Year					
1999	11	14	32.73	122.62	5.80
2000	11	8.37	37.20	114.15	6.80
2001	14	4.504	16.20	107.38	6.70
2002	16	3.44	41.93	95.59	7.03
2003	18	3.619	147.77	96.39	7.37
2004	18	5.141	26.05	96.93	8.43
2005	16	9,285	68.53	101.62	9.60
2006	16	10,198	8.24	80.89	10.60
Average	15	7.319	47.33	101.94	7.80

Notes: This table presents summary statistics of our database covering the years 1999-2006 and containing information on Tunisian equity mutual funds; the indicate variable is first averaged across all observations for a fund; statistics are then presented on these mean values; Column 2 shows the number of funds in our sample; column 3 reports the mean TNA values; TNA are in million dinars. column 4 presents the mean growth in percentage; column 5 contains the mean NAV and Column 6 shows the average age of the funds; funds younger than two years are excluded

Table I. Summary statistics-individual funds

	Growth funds	Income funds	Balanced funds
Average return			
Mean (%)	1.149	2.520	1.463
Minimum (%)	−6.040	−2.60	1.100
Maximum (%)	3.345	3.904	1.706
Standard deviation	0.0100613	0.0045546	0.0020512
Alpha	−0.0005324	−0.0004021	−0.0007205
t-Student	−1.91	−1.84	−2.20
Alpha (LPM)	−0.0003004	0.0002863	−0.0002147
t-Student	−1.83	1.05	−1.02
Bêta	0.342565	0.2647890	0.0169871
R^2	0.391	0.320	0.302
R^2 (LPM)	0.514	0.425	0.499
Mean TNA	8.701	5.182	9.162
Growth (%)	3.581	11.326	116.782
Mean NA value	189.014	67.290	56.691
Mean fees (%)	1.43	1	1.05
Mean age	8.28	6.09	6.60

Notes: This table presents summary measures of performance and summary statistics for each of the three groups of the Tunisian equity mutual funds; it shows the mean and standard deviation of daily returns; it contains mean model parameter estimates and R^{-2} squared for each of the models; alpha (beta) is the intercept (slope) coefficient from the regressions of the fund's return in excess of 13 weeks Tunisian Treasury bill on the excess return of the tunindex value weighted index; the table shows also the mean of TNA value, growth, NAV and age per group

Table II. Summary statistics-fund groups

Table II describes three different performance measures for the funds in our sample. The sample is divided into three groups according to investment objectives. Performance is measured primarily by a fund's mean daily percentage returns. We find that the income funds have higher mean returns of 2.52 per cent than the other two groups. We can also see that standard deviation of daily returns is lower for balanced funds. This finding is not surprising owing to the fact that assets that composed this group are less risky. It also confirms our investment – objectives classification. As a second indication of performance, we compute Jensen's alpha for each group. Our result shows that all average alpha coefficients are negative indicating that the Tunisian mutual funds did not beat Tunindex. In other words, they did not earn superior risk adjusted return. This result confirms earlier research findings that fund manager cannot consistently produce superior returns or beat the market (Jensen, 1968; Ferson and Schadt, 1996; Gruber, 1996). Finally, we estimate the LPM alpha to measure performance. Using R^2, the daily returns of our sample seem to be most explained by LPM-CAPM. As in Pederson and Hwang (2002), for higher frequency returns that are highly non-normal[7], the LPM-CAPM is often chosen instead of the CAPM. Examining performance, a similar result is observed when we use LPM alpha. It does not, however, indicate significant out-performance. Also, important is the observation that the number of funds showing significantly positive alpha increased to four (this number is one for the CAMP)[8].

The averaged statistics aggregated across the three different groups are also given in Table II. We find that balanced funds have the highest mean TNA of 9.162 millions dinars, the highest mean growth of 116.782 per cent and the lowest NAV of 56.691. At first glance, this may indicate that Tunisian investors tend to favour the fund with less risky strategy and lower NAV over our sample period. We can also see that growth funds have the highest mean age of 8.28 years indicating that funds from this group have more prior experience and they seem more visible. They also have the highest mean fees.

V. Empirical results

In this section, we relate the performance of Tunisian equity mutual funds to some of their characteristics. We estimate the model 1 for each group of funds.

To begin this analysis, it is necessary to examine the correlation between the explanatory variables. Results are presented in Table III. We find a strong and significant correlation between fees and size (the correlation coefficient is 0.92 and the VIF is 10.38). Therefore, these two variables are successively included in our model.

We now turn to analyse the estimation of our model for the total sample. Results are presented in Table IV.

We find evidence for a positive and significant influence of past performance on the future fund performance, irrespective of what performance measure we use

	alph	size	age	fees	flow	navalue	Variable	VIF
alph	1.0000						L.size	10.38
size	0.1270	1.0000					L.fees	10.05
age	0.0557	0.0100	1.0000				L.navalue	1.41
fees	0.0533	0.9249	0.0867	1.0000			L.age	1.17
flow	−0.0253	0.1500	0.1319	0.1509	1.0000		L.alph	1.09
navalue	−0.0116	0.1738	−0.3416	−0.0071	−0.0173	1.0000	L.flow	1.06
							Mean VIF	4.19

Notes: Explanatory variables are contained in Column 1; the Pearson correlation coefficients are presented in Column 2; the VIFSare reported in Column 3 and indicate significance; all correlations are based on observations for all Tunisian funds

Table III.
Correlation matrix and VIF

Table IV. Influence of fund characteristics on performance for the total sample

	perf = alpha		perf = LPM alpha	
	β_i coefficient SD $t(\beta_i)$ $p\rangle\|t\|$			
	Model (1)	Model (2)	Model (1)	Model (2)
$perf_{t-1}$	0.1641496	0.1734488	0.2613384	0.2594492
	(0.0219649)	(0.020781)	(0.144924)	(0.2056641)
	(7.74)	(8.27)	(2.80)	(1.26)
	(0.000)	(0.000)	(0.041)	(0.207)
$fees_{t-1}$	−0.0018195		−0.0027022	
	(0.0007324)		(0.0013322)	
	(−2.84)		(−2.03)	
	(0.013)		(0.043)	
age_{t-1}	0.0003063	0.0003572	0.0009252	0.0003455
	(0.0002204)	(0.0002126)	(0.0012057)	(0.0011687)
	(1.86)	(1.80)	(2.10)	(2.89)
	(0.063)	(0.071)	(0.036)	(0.004)
NAV_{t-1}	0.0023506	0.00240224	−0.0016762	0.0081482
	(0.0023517)	(0.00023698)	(0.005791)	(0.0054712)
	(1.00)	(1.01)	(−0.28)	(1.49)
	(0.318)	(0.311)	(0.779)	(0.136)
$flow_{t-1}$	0.0022364	0.0056894	0.0023221	0.0003366
	(0.0011248)	(0.0023512)	(0.0012256)	(0.0012256)
	(1.38)	(1.22)	(1.66)	(1.05)
	(0.163)	(0.074)	(0.098)	(0.301)
$size_{t-1}$		0.0019183		0.0006262
		(0.000726)		(0.0012847)
		(2.64)		(2.49)
		(0.008)		(0.008)
Wald test	602.42	602.42	262.75	262.75
	(p = 0.000)	(p = 0.0000)	(p = 0.0000)	(p = 0.0000)
Sargan test	6.167738	6.167738	10.25163	10.25163
	(p = 0.7230)	(p = 0.7230)	(p = 0.3305)	(p = 0.0.3305)
M2	−1.5633	−1.5631	−1.51	−1.50

Notes: Estimation results from the two-step Arellano-Bond dynamic panel-data model as contained in the main text are presented; dependent variable is fund performance; explanatory variables are reported in Column 1; the two performance measures are presented in the first row; numbers between parentheses are, respectively, the standard deviation of β_i coefficient, the t-values which indicates significance at the 5 per cent level and the probability of t-value; the last three rows contain the value of Wald, Sargan and m2 statistics; the probability of each statistic is presented between parentheses; the number of observation is 113

(coeff = 0.1641496 for the alpha and 0.2613384 for the LPM alpha). Therefore, we support the results of earlier studies that historical performance contains some indication about future performance. The slope coefficient on size is also positive and significant suggesting that larger funds are associated with higher performance in the following year (coeff = 0.0019183 for the alpha and 0.0006262 for the LPM alpha). There is also a negative influence of fees on future performance indicating that investors are fee-sensitive (coeff = −0.0018195 for the alpha and −0.0027022 for the LPM alpha).

The impact of fund age is positive, but only significant for the LPM-alpha (coef = 0.0009252). This is consistent with the existence of economies of experience in our mutual fund industry. The fund growth and the NAV have no notable influence. In addition, the impact of flow is positive. These surprising results might be caused by the fact that we use fewer samples than earlier studies. Note also that past performance has a bigger impact on fund, future performance compared to size, age and fees. Overall, we confirm the results of earlier studies.

Finally, we find that our model is moderately successful in relating fund characteristics to the dynamics of performance. The Sargan test of over-identifying restrictions is satisfactory as is the test for AR(2) errors (m2 statistic). In addition, the Wald test confirms the dynamic specification of our model.

We now analyse the influence of fund characteristics on the performance of growth funds. We report our findings in Table V.

We still find strong evidence for a positive impact of past performance on future performance of the growth funds for all performance measures. All of the slope coefficients on past performance are positive and highly significant and confirming that investors are style timers choosing funds that performed well recently. The coefficient for fund size is also positive and significant confirming that funds' size helps a manager to diversify his portfolio and to share out management fees amongst many investors. Most importantly, we find that fees are significantly negatively related to performance of this group. This result is expected to show that growth funds have, on average, the highest management fees during our period. Therefore, funds with higher management fees tend to earn lower performance in the following year. This is also consistent with the idea that investors prefer to allocate capital to funds with lower fees. It is also interesting to note that the slope coefficient of fund age is positive and significant indicating the existence of economies of experience for this fund category (the majority of mutual funds in this category are experienced as important in managing the portfolio of financial assets dated since 1994). Again, the impact of NAV and flows being insignificant means that investors do not pay attention to these variables and consequently they do not affect performance. This may also be due to the existence of status-quo bias in the mutual fund industry.

Finally, the results of the three tests used remain unchanged and confirm the dynamic specification of our model.

We now estimate the above regression for the income funds category. Results are presented in Table VI.

As can be seen from Table VI, there is still strong evidence for a positive and significant influence of past performance on future performance. This confirms again our earlier finding and indicates that last-year performance is an important determinant of Tunisian mutual funds future performance. However, the signs of some coefficients are quite surprising. The fund size has a statistically significant positive influence on performance, while this fund category has the lowest mean TNA values over our period sample. This contradicts the view that larger funds are associated with higher performance due to the economies of scale and scope. In addition, the influence of fees on performance is negative and significant for the Jensen alpha specification, while this group has, on average, the lowest management fees. This also contradicts empirical evidence that funds with higher fees earn lower performance. There is also a strong negative influence of NAV on performance in the LPM alpha specification. This is also

	perf = alpha		perf = LPM alpha	
	β_i coefficient SD $t(\beta_i)$ $p\rangle\|t\|$			
	Model (1)	Model (2)	Model (1)	Model (2)
$perf_{t-1}$	0.4859342 (0.5796456) (8.27) (0.000)	0.0228221 (0.4808824) (2.64) (0.008)	0.3277512 (0.3390868) (2.90) (0.031)	0.3277515 (0.3390866) (2.97) (0.034)
$fees_{t-1}$	−0.0084593 (0.0034463) (−2.45) (0.014)		−0.0092691 (0.0027898) (−3.32) (0.001)	
age_{t-1}	0.0011715 (0.0024289) (0.48) (0.630)	0.0011715 (0.0024289) (0.48) (0.630)	0.000282 (0.0035778) (2.08) (0.037)	0.0036961 (0.0027136) (2.36) (0.003)
NAV_{t-1}	0.0084916 (0.0114401) (0.74) (0.458)	0.0165966 (0.010448) (1.59) (0.112)	0.0111596 (0.0074896) (1.49) (0.136)	0.0111596 (0.0074896) (1.49) (0.136)
$flow_{t-1}$	0.0003063 (0.0002204) (1.39) (0.165)	0.0023506 (0.0023517) (1.00) (0.318)	0.0044692 (0.0039121) (1.14) (0.253)	0.0086617 (0.0045525) (1.90) (0.057)
$size_{t-1}$		0.0114129 (0.0027904) (4.09) (0.000)		0.0092691 (0.0027898) (3.32) (0.001)
Wald test	52.19 ($p = 0.0000$)	52.19 ($p = 0.0000$)	58.81 ($p = 0.0000$)	58.81 ($p = 0.0000$)
Sargan test	6.941692 ($p = 0.6432$)	6.941692 ($p = 0.6432$)	6.514737 (p = 0.6875)	6.514728 ($p = 0.6875$)
M2	−0.42678	0.31309	−0.40419	−0.40418

Notes: Estimation results from the two-step Arellano-Bond dynamic panel-data model as contained in the main text are presented; dependent variable is fund performance; explanatory variables are reported in Column 1; the two performance measures are presented in the first row; numbers between parentheses are, respectively, the standard deviation of β_i coefficient, the t-values which indicates significance at the 5 per cent level and the probability of t-value; the last three rows contain the value of Wald, Sargan and m2 statistics; the probability of each statistic is presented between parentheses; the number of observation is 49

Table V. Influence of fund characteristics on performance for the growth funds

inconsistent with our prediction that fund with lower NAV may have great potential market. In addition, the future performance of income funds is less sensitive to their age and flows. The influence of these variables is insignificant for all performance measures.

Finally, the test statistics, shown in Table VI, indicate that our model is successful in relating income funds characteristics to the dynamics of their performance.

In a final step, we now analyse the determinants of balanced funds performance. Estimation results of our model are presented in Table VII.

	perf = alpha		perf = LPM alpha	
	β_i coefficient SD $t(\beta_i)$ $p\rangle\|t\|$			
	Model (1)	Model (2)	Model (1)	Model (2)
$perf_{t-1}$	0.3414571 (0.0169667) (20.13) (0.000)	0.370294 (0.175316) (21.12) (0.000)	0.3406161 (0.0172204) (19.78) (0.000)	0.3045777 (0.0479443) (6.35) (0.000)
$fees_{t-1}$	−0.001934 (0.0006684) (−2.89) (0.004)		−0.0028426 (0.0004146) (−1.86) (0.161)	
age_{t-1}	0.0003176 (0.0007196) (0.44) (0.659)	0.0003865 (0.0005167) (0.75) (0.454)	0.000773 (0.0009904) (0.78) (0.435)	0.0005741 (0.0006665) (0.86) (0.389)
NAV_{t-1}	0.0024162 (0.0044938) (0.54) (0.591)	0.0049579 (0.0054782) (0.91) (0.365)	−0.0063198 (0.0016914) (−3.74) (0.000)	0.0032929 (0.0059246) (0.0.56) (0.578)
$flow_{t-1}$	0.2594492 (0.2056641) (1.26) (0.207)	0.0006262 (0.0012847) (0.49) (0.626)	0.0003455 (0.0011687) (0.30) (0.767)	0.0081482 (0.0054712) (1.49) (0.136)
$size_{t-1}$		0.0015208 (0.0007241) (2.10) (0.036)		0.0017114 (0.0012471) (2.37) (0.022)
Wald test	44.43 ($p = 0.0000$)	44.47 ($p = 0.0000$)	55.47 ($p = 0.0000$)	55.37 ($p = 0.0000$)
Sargan test	9.385134 ($p = 0.4025$)	9.385134 ($p = 0.4025$)	11.1 ($p = 0.2689$)	11.1 ($p = 0.2689$)
M2	−1.6387	−1.6177	−1.4841	−1.4740

Notes: Estimation results from the two-step Arellano-Bond dynamic panel-data model as contained in the main text are presented; dependent variable is fund performance; explanatory variables are reported in Column 1; the two performance measures are presented in the first row; numbers between parentheses are, respectively, the standard deviation of β_i coefficient, the *t*-values which indicates significance at the 5 per cent level and the probability of *t*-value; the last three rows contain the value of Wald, Sargan and m2 statistics; the probability of each statistic is presented between parentheses; the number of observation is 34

Table VI.
Influence of fund characteristics on performance for the income funds

The empirical results of our model show that past performance is significantly positively related to future performance. This also confirms our earlier results, and indicates that recent historical performance contains some information about future performance. As expected, the impact of fund size remains positive and significant suggesting that larger funds tend to earn higher adjusted-risk return due to the economies of scale and scope. In addition, all estimations produce statistically positive and significant impact of previous year's fund flow on performance. We find this surprising as that this fund category has,

	perf = alpha		perf = LPM alpha	
	β_i coefficient SD $t(\beta_i)$ $p\rangle\lvert t\rvert$			
	Model (1)	Model (2)	Model (1)	Model (2)
$perf_{t-1}$	0.0229781	0.0175079	0.0436732	7.926716
	(0.1833996)	(0.491491)	(0.0594062)	(4.979031)
	(2.48)	(0.36)	(7.47)	(1.59)
	(0.013)	(0.722)	(0.000)	(0.111)
$fees_{t-1}$	−0.0001568		−0.0001131	
	(0.0000908)		(0.0000799)	
	(−0.75)		(−0.78)	
	(0.0454)		(0.435)	
age_{t-1}	0.0000612	0.0000481	0.0000228	0.0749773
	(0.0001242)	(0.0000865)	(0.0001124)	(0.035173)
	(0.49)	(0.56)	(0.20)	(0.12)
	(0.622)	(0.578)	(0.839)	(0.904)
NAV_{t-1}	0.121155	0.0065156	0.0116769	0.1645306
	(0.0025536)	(0.0022478)	(0.002436)	(0.341797)
	(4.74)	(2.90)	(4.79)	(0.48)
	(0.000)	(0.004)	(0.000)	(0.630)
$flow_{t-1}$	0.3406161	0.0028426	0.0063198	0.229617
	(0.172204)	(0.0004146)	(0.0016914)	(0.0028187)
	(19.78)	(6.86)	(3.74)	(8.15)
	(0.000)	(0.000)	(0.000)	(0.000)
$size_{t-1}$		0.0001789		0.0022885
		(0.0000549)		(0.011354)
		(2.89)		(20.13)
		(0.004)		(0.000)
	24.60	24.60	25.82	24.62
Wald test	($p = 0.0001$)	($p = 0.0001$)	($p = 0.0000$)	($p = 0.0000$)
Sargan test	7.903837	7.90384	8.873637	8.873637
	($p = 0.4429$)	($p = 0.4428$)	($p = 0.3531$)	($p = 0.3531$)
M2	−1.5654	−1.5566	−1.6263	−1.6261

Notes: Estimation results from the two-step Arellano-Bond dynamic panel-data model as contained in the main text are presented; dependent variable is fund performance; explanatory variables are reported in Column 1; the two performance measures are presented in the first row; numbers between parentheses are, respectively, the standard deviation of β_i coefficient, the t-values which indicates significance at the 5 per cent level and the probability of t-value; the last three rows contain the value of Wald, Sargan and m2 statistics; the probability of each statistic is presented between parentheses; the number of observation is 30

Table VII.
Influence of fund characteristics on performance for the balanced funds

on average, the highest flow during our period, and indicates that funds with greater flow are associated with higher performance in the following year. As such, our result is inconsistent with the findings of Edelen (1999). We can explain this finding by the fact that we use fewer samples than earlier studies, and consequently new external money may help managers to diversify more their portfolio and share out management fees amongst many investors. There is also a positive and significant influence of NAV on future performance. This is in line with our prediction based on earlier studies that funds with lower NAV are expected to attract new investors, especially small ones. Age and fees are then insignificant in all specifications.

It is also interesting to note that the averaged statistics, given in Table VII, confirm the dynamic specification of our model.

VI. Conclusion

The purpose of this paper is to identify readily available ex ante fund characteristics that can affect future performance of Tunisian equity mutual funds. We particularly examine the ability of well-known mutual fund characteristics, such as the recent past performance, fund size, management fees, fund age, NAV and fund growth to explain the variation of performance across the different Tunisian fund categories. To do this, we use the dynamic panel data approach of Arellano and Bond (1991) that we enable to take into account the correlation that may exist between the lagged dependent variable and the error term.

Our main result is that there is a positive and significant relationship between last-year performance and future performance, irrespective of what performance measure we use and for all fund categories. This confirms the empirical evidence that historical performance contains some information about future performance and such information may be important to mutual fund investors. We also find that fund size is positively related to future performance of small fund category as well as of large fund category. This may indicate the existence of scale economies in the Tunisian equity mutual fund industry. In addition, the influence of the other control variables varies among the fund categories, but is often the same as in earlier studies.

Our final finding is that the averaged test statistics indicate that our model is moderately successful in relating Tunisian fund characteristics to the dynamics of their performance among all of the fund categories.

The results of this paper show that fund characteristics play an important role in determining differences in performance across funds. The findings do not take into account the behaviour of fund managers and their ability to extend the investment opportunities set. It seems that there are more complex factors related to the strategic behaviour of the manager and driving differences in performance across funds than previous studies have indicated. How mutual fund managers' behaviour can affect performance is indeed an open question for future research.

Notes

1. Emerging markets are called "less developed countries". They include the countries in the region of Southeast Asia, Latin America, Africa and the Middle East. Tunisia belongs to this category because it has embarked on economic development and reform programs, and has begun to open up its market and emerge to the global scene. It has also some particular characteristics as for emerging markets such as non-normal returns, less liquid market, high level of risk and less-market capitalisation.
2. Ferris and Chance (1987) argue that fees are composed of three modalities: management fees, front loads and deferred loads.
3. Empirical literature has devoted little attention to this issue for the mutual fund industry.
4. Regarding the front loads or the deferred loads (components of fees), the Tunisian investor is not required by the mutual funds to pay these loads to encourage them to choose the equity

investment, which is currently less favoured, compared to the money market or to the obligation market.

5. Investment objectives reports were determined from consultation of mutual fund prospectuses and information obtained through the management company Cofib Capital Finances.
6. Tunindex is a widely used measure of the general Tunisian stock market. Managers and investors often use it as a benchmark when evaluating investment performance.
7. To test the normality, we compute the statistics of skewness, kurtosis and Bera-Jarque. Our results reject normality at the 5 per cent level.
8. Results showing the number of funds for each model that produced significantly negative and positive estimates are not reported in Table II. They are available from the authors only upon request.

References

Anderson, T.W. and Hsiao, C. (1981), "Estimation of dynamic models with error components", *Journal of American Statistical Association*, Vol. 76, pp. 598-606.

Arellano, M. and Bond, S. (1991), "Some tests of specification for panel data: Monte Carol evidence and an application to employment equations", *Review of Economic Studies*, Vol. 58, pp. 277-97.

Bawa, V. and Lindenberg, E. (1977), "Capital market equilibrium in a mean-lower partial moment framework", *Journal of Financial Economics*, Vol. 5, pp. 89-200.

Bergeruc, L. (2000), "Determinants of French equity mutual fund performance", *Financial Review*, Vol. 125, pp. 18-30.

Blake, C., Elton, E. and Gruber, M. (1996), "Survivorship bias and mutual fund performance", *The Review of Financial Studies*, Vol. 9, pp. 1097-120.

Blake, D. and Timmerman, A. (1998), "The birth and death processes of mutual funds", *European Finance Review*, Vol. 2, pp. 57-77.

Brown, S.J. and Goetzmann, W. (1995), "Performance persistence", *Journal of Finance*, Vol. 50, pp. 679-98.

Brown, S.J., Goetzmann, W., Ibbotson, R. and Ross, S. (1992), "Survivorship bias in performance studies", *Review of Financial Studies*, Vol. 4, pp. 553-80.

Carhart, M. (1997), "On persistence in mutual fund performance", *Journal of Finance*, Vol. 52, pp. 57-82.

Chevalier, J. and Ellison, G. (1997), "Risk taking by mutual funds as a response to incentives", *Journal of Political Economy*, Vol. 105, pp. 1167-200.

Dahlquist, M., Engstrom, P. and Soderlind, P. (2000), "Performance and characteristics of Swedish mutual fund", *Journal of Financial and Quantitative Analysis*, Vol. 35 No. 3, pp. 409-23.

Dermine, J. and Roller, L.H. (1992), "Economies of scale and scope in French mutual funds", *Journal of Financial Intermediation*, Vol. 2, pp. 83-93.

Edelen, R.M. (1999), "Investor flows and the assessed performance of open-end mutual funds", *Journal of Financial Economics*, Vol. 53, pp. 439-66.

Elton, E., Gruber, M., Das, S. and Hlavka, M. (1993), "Efficiency with costly information: a reinterpretation of evidence from managed portfolios", *Review of Financial Studies*, Vol. 6 No. 3, pp. 1-22.

Estrada, J. (2000), "The cost of equity in emerging markets: a downside risk approach", *Emerging Markets Quarterly*, Fall, pp. 19-30.

Ferris, P. and Chance, D.M. (1987), "The effect of 12b-1 plans on mutual fund expense ratios: a note", *Journal of Finance*, Vol. 42 No. 4, pp. 1077-81.

Ferson, W.E. and Schadt, R. (1996), "Measuring fund strategy and performance in changing economic conditions", *Journal of Finance*, Vol. 51, pp. 425-62.

Goetzmann, W. and Ibbotson, R. (1994), "Do winners repeat? Patterns in mutual fund performance", *Journal of Portfolio Management*, Vol. 20, pp. 9-18.

Golec, J. (1996), "The effect of mutual fund managers' characteristics on their portfolio performance, risk and fees", *Financial Services Review*, Vol. 5 No. 2, pp. 133-48.

Grinblatt, M. and Titman, S. (1989), "Portfolio performance evaluation: old issues and new insights", *The Review of Financial Studies*, Vol. 2, pp. 393-416.

Grinblatt, M. and Titman, S. (1992), "The persistence of mutual fund performance", *Journal of Finance*, Vol. 45 No. 5, pp. 1977-84.

Grossman, S. and Stiglitz, J. (1980), "On the impossibility of informationally efficient markets", *American Economic Review*, Vol. 70, pp. 393-408.

Gruber, M. (1996), "Another puzzle: the growth in actively managed mutual funds", *Journal of Finance*, Vol. 51, pp. 783-810.

Hendricks, D., Patel, J. and Zeckhauser, R. (1993), "Hot hands in mutual funds: short-run persistence of relative performance, 1974-1988", *Journal of Finance*, Vol. 48 No. 1, pp. 93-130.

Hendricks, D., Patel, J. and Zeckhauser, R. (1997), "The j-shape of performance persistence given survivor bias", *Review of Economics and Statistics*, Vol. 79 No. 2, pp. 161-6.

Hooks, J.A. (1996), "The effect of loads and expenses on open-end mutual fund returns", *Journal of Business Research*, Vol. 36, pp. 199-202.

Indro, D.C., Jiang, C.J., Hu, M.Y. and Lee, W.Y. (1999), "Mutual fund performance: does fund size matter?", *Financial Analysts Journal*, Vol. 55, May-June, pp. 74-87.

Ippolito, R.A. (1989), "Efficiency with costly information: a study of mutual fund performance, 1965-1984", *Quarterly Journal of Economics*, Vol. , pp. 104-23.

Jain, P.C. and Wu, J.S. (2000), "Truth in mutual fund advertising: evidence on future performance and fund flows", *Journal of Finance*, Vol. 55, pp. 937-58.

Jensen, M. (1968), "The performance of mutual funds in the period 1945-1964", *Journal of Finance*, Vol. 23 No. 2, pp. 389-416.

Khorana, A. and Servaes, H.S. (2001), "An examination of competition and investor behavior in the mutual fund industry", working paper, Georgia Institute of Technology and London Business School, London.

Latzko, D.A. (1999), "Economies of scale in mutual fund administration", *Journal of Financial Research*, Vol. 22, pp. 331-9.

Malkiel, B. (1995), "Returns from investing in equity funds", *Journal of Finance*, Vol. 50, pp. 549-72.

Payne, T.H., Parther, L. and Bertin, W. (1999), "Value creation and determinants of equity fund performance", *Journal of Business Research*, Vol. 45, pp. 69-74.

Pederson, C.S. and Hwang, S. (20022001), "Best practice risk measurement in emerging markets: empirical test of asymmetric alternatives to CAPM", working paper, Georgia institute of Technology and London Business School, London.

Rakowski, D. (2003), "Fund flow volatility and performance", working paper, Georgia State University, Atlanta, GA.

Sauer, D.A. (1997), "The impact of social responsibility screens on investment performance: evidence from the domini 400 social indexes and domini equity mutual fund", *Review of Financial Economics*, Vol. 6 No. 2, pp. 137-49.

Sharpe, W.F. (1992), "Asset allocation: management style and performance measurement", *Journal of Portfolio Management*, Vol. 18, Winter, pp. 7-19.

Sirri, E. and Tufano, P. (1998), "Costly search and mutual fund flow", *Journal of Finance*, Vol. 35, pp. 1589-622.

Wang, J. (2002), *Economies of scale in mutual fund administration: an empirical study on US market*, working paper, The Department of Economics, University of Wisconsin, Madison, WI.

Zheng, L. (1999), "Is money smart? A study of mutual fund investor's fund selection ability", *Journal of Finance*, Vol. 54, pp. 901-33.

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