
Professional Portfolio Managers A Setting for Momentum Strategies

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Abstract: Most real world market participants are professional portfolio managers (PPM) managing money for third parties (e.g. mutual funds, pension funds). Those third parties (investors) usually lack specialized knowledge and therefore may evaluate the PPM performance based on his past results (Performance Based Evaluation - PBE). Under these assumptions, we develop a limits-to-arbitrage model which considers that professional investment is conducted by a relatively small number of highly specialized PPM using other people's capital. In a deductive way, we reach four propositions assessing the effectiveness of momentum strategies. Specifically we show that in a market with PPM subject to positive (negative) PBE, returns would have positive (negative) autocorrelation which is not inconsistent with profitable momentum-based investment strategies.

Keywords: Momentum strategies; Professional portfolio managers; Performance based evaluation

JEL classification: G11,G12,G23

Resumen: En el mundo real, la mayoría de los participantes en los mercados financieros son gestores profesionales de carteras (*professional portfolio managers*, PPM) que administran los fondos de terceras personas (fondos de inversión, fondos de pensiones). Esas terceras personas (inversores) habitualmente carecen de conocimientos financieros específicos y por tanto evaluarán el rendimiento de los PPM teniendo en cuenta únicamente las rentabilidades históricas obtenidas (*Performance Based Evaluation*, PBE). Basándonos en esas hipótesis, presentamos un modelo, en el marco de la literatura de límites al arbitraje, que asume que las decisiones de inversión las toman un número relativamente reducido de PPM que gestionan los fondos de terceros. Presentamos cuatro proposiciones que calibran la posible efectividad de estrategias basadas en "Momentum". Concretamente mostramos que en un mercado financiero con PPM evaluados mediante PBE positiva (negativa), las rentabilidades de los activos presentarían autocorrelación positiva (negativa) lo cual es consistente con la posible existencia de estrategias de inversión rentables basadas en el "Momentum".

Palabras Clave: Estrategias "Momentum"; Gestores profesionales de fondos; Evaluación basada en resultados

Clasificación JEL: G11,G12,G23

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1. INTRODUCTION

Most real world market participants are professional portfolio managers (PPM), which means that they are not managing their own money, but rather managing money for other individuals (e.g. mutual funds, pension funds). This situation generates an agency feature which has relevant consequences, as investors lacking specialized knowledge may evaluate the PPM just based on his past performance (Performance Based Evaluation - PBE). This fact, as suggested by Shleifer and Vishny (1997, SV henceforth), may force arbitrageurs to liquidate their positions before the investment strategy matures and so misprices may not disappear.

The objective of this paper is to extend SV's analysis to the PPM's context, inferring the effectiveness of feedback trading in this setting pointing out a possible source of financial market's inefficiency, namely the momentum effect. The model considers that professional investment is conducted by a relatively small number of highly specialized PPM using other individuals' capital. In a deductive way, we reach four propositions which justify the effectiveness of momentum strategies.

In the finance literature, the source of the success of momentum strategies remains an unsolved puzzle, whether it comes from mispricing due to some market inefficiency, or from compensation for an extra risk taken by the investor. Empirical evidence about momentum is numerous, with many studies focusing on individual countries and regions. The articles of Rouwenhorst (1998, 1999) and Griffin, Ji and Martin (2003) analyze a broad range of countries. They found evidence that momentum profits are statistically and economically significant in developed countries, but weaker for emerging markets. In terms of regions, for European markets momentum is strong while for Asian markets momentum is weaker than the world average.

It is still not clear whether the momentum effect is related to individual stocks or to industrial sectors. Moskowitz and Grinblatt (1999) find that the main determinant of momentum in the US stock market seems to be related with an industry-wide factor. On the other hand Nijman, Swinkels and Verbeek (2004) do not find significant sector or country effects as explanations for momentum in European stocks.

Various theories have been proposed to explain momentum in stock returns, that is, past winners continue to perform well, and past losers continue to perform poorly. Some of them are based on delay of information diffusion which makes traders to update their beliefs in different points in time. Hong, Terence and Stein (2000) test the gradual-information-diffusion model and establish the result that firm-specific information, especially negative information, diffuses only gradually across the investing public, which generates under reaction and positive return autocorrelations in the short-run. However, if the momentum traders can only implement univariate strategies, their attempt at arbitrage must inevitably lead to overreaction at long horizons.

Other theories about momentum focus on some aspects of investor's behavior, for instance herding by institutional investors. Odean (1998) posits that people are overconfident and this cause markets to under react to the information of rational traders.

In an influential paper, Sentana and Wadhvani (1992, SW henceforth) extend the model of share price determination (Shiller, 1984) that relies on the existence of heterogeneous investors. One important result of their model is that, if there are positive feedback traders, return's autocorrelation should be negative. With negative feedback traders the autocorrelation is positive. This result is

controversial, since positive feedback trading is known as a phenomenon that exacerbates trends, but their model predicts negative autocorrelation. Conversely, negative feedback traders tend to “buck the trend” and their model associates them with positive autocorrelation. The basic assumption in this model is that rational investors would always more than offset the action of feedback traders. The model also allows the coefficient of feedback trading to vary over time, also according to volatility. They propose that negative (positive) feedback trading would appear with low (high) volatilities so that returns would have positive (negative) autocorrelation.

Besides proposing the theoretical model described previously, SW make an empirical investigation of US stock market. They find that hourly stock returns have positive autocorrelation during low volatility periods and negative autocorrelation during high volatility periods. As their theoretical model shows that positive feedback trading is associated with negative autocorrelation and vice-versa, they conclude that feedback trading is associated with volatility. However, it is worth to remember that this conclusion relies on the assumption that rational investors always offset feedback traders. The implication is that this model rules out persistent bubbles in asset pricing. Many other articles make use of the SW model to test empirically feedback trading, relying on this assumption as well. This is the case of Koutmos (1997), Aguirre and Saidi (1999), Koutmos and Saidi (2001), Bohl and Siklos (2004), Laopodis (2005) and Bohl (2006). All of these empirical papers make inferences about positive or negative feedback trading based on the autocorrelation of returns, relying on the SW model.

This paper proposes an alternative three-period model relaxing SW’s assumption that rational investors always offset feedback traders, and our theoretical result is not in line with the one provided by the SW model. Specifically we show that in a market with PPM subject to positive (negative) PBE, returns would have positive (negative) autocorrelation, which is not inconsistent with profitable momentum-based investment strategies.

The novel theoretical model proposed by us justifies the existence of feedback strategies considering the setting of professional portfolio managers (PPM). The consideration of the specific context of the PPM’s context, with its own peculiarities, has been addressed in Fernandes, Peña and Tabak (2008), which focuses on links between strategy, compensation and risk using a behavior-agency-model approach. The objective of this paper is to extend that analysis of the PPM’s context inferring the effectiveness of feedback trading in this setting and so describing a possible source of market’s inefficiency.

This paper is organized as follows. Section 2 introduces the theoretical model. In Section 3 we present the four propositions. Section 4 concludes the paper.

2. THE MODEL

The structure of the model is an extension of SV’s for the professional arbitrage framework. We focus on the market for just one asset, in which we assume there are three types of participants: noise traders, professional portfolio managers (PPM) and individual investors which invest in funds managed by PPM. Professional portfolio managers specialize in working in this market whereas individual investors allocate their resources among competing funds.

The specialized PPM, using their skills, know the fundamental value of the asset, V , and this information is unknown both by the noise traders and by the individual investors. Let’s consider

three discrete time periods: $t = 0, 1$ and 2 . At time $t = 2$, the value V becomes public knowledge and hence the price at that time is equal to V (there is no long run fundamental risk). For $t = 0$ and 1 , the unitary price at time t is equal to p_t . Let's consider just pessimistic noise traders². In each time period $t = 0$ and 1 , noise traders experience a pessimism shock S_t , which generated for them, in the aggregate, the demand for the asset given by:

$$QN(t) = \frac{V - S_t}{p_t} \tag{1}$$

The pessimism shock can appear for different reasons. An emergent body of research investigates the relationship between equity pricing and fluctuations in mood caused by weather, biorhythms and social events. Specifically, this research argues that there are broadly uniform fluctuations in the mood of people which affect the decision-making process of a large number of investors (noise traders) and equilibrium stock prices are also affected. The general conclusion of this line of literature is that people in positive moods have been found to make more optimistic decisions, and people in negative moods have been found to make more pessimistic decisions (Isen et al, 1978; Johnson and Tversky, 1983; Hirshleifer and Shumway, 2003; Shiller, 2000).

We assume that the supply of the asset is constant. At each time $t = 0$ and 1 , the noise traders shock S_t is observed by the PPM but not by the individual investors. PPM and individual investors are fully rational and so the risk-neutral PPM take position against the mispricing generated by noise traders. The PPM are considered to have limited resources under management F_t at each time ($F_t \ll S_t$) which means that they cannot correct mispricing in a given period³. We consider F_0 exogenously given. At time $t = 0$, PPM do not necessarily want to invest all the available resources F_0 , as they may want to keep some of it to invest in the second period just in the case the mispricing deepens. Let's call the amount effectively invested by the PPM as D_0 . At time $t = 1$, the price of the asset either recovers to V , with probability q , or it does not with probability $(1-q)$. If it recovers, PPM liquidate their positions and keep the cash. If noise traders continue to be confused PPM want to invest all of F_t in the under priced asset. So at each time the PPM's demand for the asset is $QT(t) = D_t/p_t$, and since the aggregate demand for the asset must equal the unit supply, the equilibrium price is given by:

$$QN(t) + QT(t) = 1 \tag{2}$$

and so,

$$p_t = V - S_t + D_t \tag{3}$$

or more specifically,

$$p_0 = V - S_0 + D_0 \tag{4}$$

$$p_1 = V - S_1 + F_1 \tag{5}$$

2 The same analysis can be performed in the case of optimistic noise traders. Conclusions are the same.

3 This is a necessary condition otherwise the misprice would be easily corrected by the arbitrageurs. It's safe to assume this, as there's no consensus about the correct prices among traders and also no coordinated action to reduce mispricing.

So, the price at the end of the first period equals its fundamental value (correct value) minus the noise traders' shock plus the amount invested by the PPM (D_0) in order to take advantage of the mispricing. In the second period, the amount invested by the PPM equals to the total amount available ($D_1 = F_1$).

To complete the description of the model let's characterize the PPM's industry and their relations with the individual investors, which determines F_t . We are considering a competitive funds market where for simplicity all have the same marginal cost (and so they charge equal prices for their services). Individual investors have prior beliefs about the expected return of each fund and, since prices are equal, an investor gives his money to the fund with the highest expected return according to his beliefs. We also assume that all active funds' previous returns are greater than any passive fund so that individual investors always want to invest in active funds.

The key feature of this model is how individual investors update their beliefs about the funds. We assume that investors have no information about the structure of the model determining asset pricing or the investment strategy followed by the PPM. These strategies and models are usually complex and difficult to understand. In fact this is one of the reasons for the investment delegation. As a result, individual investors use simple updating rules based on past performance (PBE), making a *satisficing* decision⁴.

A *satisficing* behavior, as in Lucey and Dowling (2005), happens when a decision-maker looks for a satisfactory, rather than an optimal alternative, if facing a choice situation where it is impossible to optimize, or whether the cost in terms of time and resources of doing so seems burdensome. Furthermore we can say that it is even rational to be irrational in these situations as deliberation and estimation cost more than they are worth.

So, individual investor searching for a *satisficing* decision can use one of the two following simple rules. Firstly, under these informational assumptions, funds which experience relatively poor returns in a given period lose market share to those with better returns (positive feedback). This behavior is suggested in SV. According to this, recent empirical research has pointed out that people's decision-making is guided by the images and associated feelings that are induced by the decision-making process, what's called 'affect heuristic' (Slovic et al, 2002). So funds that experienced gains (losses) in the past, form a positive (negative) image which is incorporated by the individual investors biasing their decision-making process of future investments in favour of (against) these funds. A survey by Shefrin (2001) of equity market professionals found that they appeared to predict the future price performance of a company's equity based on their image of the company, showing that this 'affect heuristic' may be present even among PPM. Karceski (2002) also found that mutual fund investors chase returns through time, precipitating unusually large aggregate cash inflows into mutual funds just after dramatic market run-ups.

Secondly, the individual investor may believe in a reverting schema and so funds which experience relatively poor returns in a given period, gain market share to those with better returns (negative feedback). Robert Shiller (2001) posits for instance that mostly investors think that the market will rise in the following day after a fall. This phenomena is also known as the "gambler's fallacy". We consider that both situations can happen, but even considering so, momentum strategies can add value.

4 This is also called returns-chasing behavior (Karceski, 2002).



One direct consequence of the previous two investment strategies is that while positive feedback trading is usually considered as a destabilizing behavior, since it exacerbates market movements, negative feedback trading tends to smooth market movements. Let's call C the amount of resources, which individual investors deposit or withdraw in period 1. Clearly, in order to take into account the PBE, we can consider C given by:

$$\begin{aligned}
 & C = ab \{ \text{total cash available in period 1} \} \\
 & \text{say} \\
 & C = ab(D_0 r_0 + (F_0 - D_0)) \\
 & \text{where} \\
 & \begin{cases} b = 1 & , \text{ if } r_0 \geq 1 \\ b = -1 & , \text{ if } r_0 < 1 \end{cases}
 \end{aligned} \tag{6}$$

Observe that “ a ” can be considered the relevance of PBE to the individual investors. Notice that “ a ” indicates how influent is PBE in the investor’s decision to deposit or withdraw money from the fund, its sign indicating whether he is a positive feedback trader (trend follower) or negative feedback trader (mean reverser). Also, r_0 is the previous fund return $r_0 = (p_1/p_0)$ observed by the individual investors, from $t = 0$ to the beginning of $t = 1$. Hence the supply of funds in period 1, adapted to our case is given by.

$$\begin{aligned}
 & F_1 = D_0 r_0 + (F_0 - D_0) + C = (D_0 r_0 + (F_0 - D_0))(1 + ab) \\
 & \text{with} \\
 & \begin{cases} a = 0, & \text{no feedback} \\ a < 0, & \text{negative feedback} \\ a > 0, & \text{positive feedback} \end{cases}
 \end{aligned} \tag{7}$$

To complete the model let's specify the PPM's optimization problem, and as we consider that the fees charged to the individual investors are usually proportional to the resources available, we state that the PPM's problem is to choose a level of investment D_0 to maximize the expected total resources at $t = 2$, which is given by⁵:

$$EW = q(1 + ab) \left(D_0 \frac{V}{p_0} + (F_0 - D_0) \right) + (1 - q)(1 + ab) (D_0 r_0 + (F_0 - D_0)) \frac{V}{p_1} \tag{8}$$

The first term which multiplies “ q ” refers to the case when $p_1 = V$ (i.e. the price recovers to its fundamental value in the beginning of period 1). The second term refers to the case when the

5 At the beginning of period 2, when the investment made in $t = 1$ matures.

price recovers to V just in the beginning of period $t = 2$. The first order condition of the trader's optimization problem is the following:

$$\begin{aligned}
 EW &= q(1+ab)\left(D_0 \frac{V}{p_0} + (F_0 - D_0)\right) + (1-q)(1+ab)(D_0 r_0 + (F_0 - D_0))\frac{V}{p_1} \\
 \frac{\partial EW}{\partial D_0} &= q(1+ab)\left(\frac{V}{p_0} - 1\right) + (1-q)(1+ab)(r_0 - 1)\frac{V}{p_1} \\
 \therefore q\left(\frac{V}{p_0} - 1\right) + (1-q)(r_0 - 1)\frac{V}{p_1} &\leq 0 \tag{9}
 \end{aligned}$$

The previous result is equivalent to [Eq. 8] in SV, and holds with strictly inequality if q is high, if p_0 is low relative to V or if p_1 is too low relative to p_0 . In this case the PPM prefers to be fully invested in the initial period and so $D_0 = F_0$ (extreme situation), no matter the value of a . In order to simplify the further analysis we will focus on this situation where one PPM is fully invested in $t = 0$. Then the expression for the total resources available for investment by the PPM's can be written as:

$$\begin{aligned}
 F_1 &= (F_0 r_0)(1+ab) \\
 \text{with } \left\{ \begin{array}{l} a = 0, \text{ no feedback} \\ a < 0, \text{ negative feedback} \\ a > 0, \text{ positive feedback} \end{array} \right. & \tag{10}
 \end{aligned}$$

$$r_0 = \frac{V - S_1 + F_1}{V - S_0 + F_0}$$

Recall that . Now let's analyze the case when $a > 0$ (positive feedback individual investors). If $r_0 = 1$, say the PPM earns a zero net return ($r_0 - 1$), he gains $(1+a)$ funds under management. If $r_0 < 1$, the PPM realizes two sources of losses: the first as a result of the negative net return and the second as a consequence of individual investors withdrawals based on PBE and then $F_1 = (1-a) F_0 r_0$. If $r_0 > 1$, the PPM realizes two sources of gains: the first as a result of the positive net return and the second as a consequence of individual investors deposits based on PBE and then $F_1 = (1+a)(F_0 r_0)$. Some empirical work support the existence of PBE as suggested in SV, for example, mutual fund managers lose funds under management when they perform poorly, and vice-versa. Traders ideally invest based on expected returns but individual investors tend to use PBE, raising the important principal-agent relationship of this model.

In our framework let's analyze the first period ($t = 0$). As we are considering pessimistic noise traders, suppose that in aggregate they generate a shock S_0 in the fundamental value V and observing this difference, the PPM, using the resources available (F_0), invest in the asset and so the final price is given by:

$$p_0 = V - S_0 + F_0 \tag{11}$$

At period $t = 1$, three possible states of nature can happen. The noise traders can be more, equal or less pessimists about that asset. The case where they are just the same pessimistic is trivial as $S_0 = S_1$, $r_0 = 1$ and $F_0 = F_1$. The interesting aspects appear in the other situations. If the noise traders, by any reason, are in aggregate more pessimistic than in the first period, say $S_1 > S_0$, this would imply a greater mispricing ($V - S_1$) which the PPM would like to take advantage of. The problem is that as the mispricing increased, the past return was lower than one ($r_0 < 1$ so $b = -1$) which not just reduce the available resources based on it, but also some of the individual investors, observing the poor performance, would withdraw their money, and so $F_1 \ll F_0$, decreasing the demand for the asset. As a consequence, the final price after the correction provided by the PPM would be:

$$p_1 = V - S_1 + F_1 \quad (12)$$

with,
$$S_1 > S_0 \text{ and } F_1 \ll F_0 \quad (13)$$

so
$$p_1 \ll p_0 \quad (14)$$

If the noise traders are in aggregate less pessimistic than in the first period, say $S_1 < S_0$, this would imply a smaller mispricing ($V - S_1$) which the PPM would like to take advantage of. In this case, the past return was greater than one ($r_0 > 1$ so $b = 1$) which not just increase the available resources based on it, but also some of the individual investors, observing the good performance, would deposit more money, and so $F_1 \gg F_0$. As a consequence, the final price after the correction provided by the professional investors would be:

$$p_1 = V - S_1 + F_1 \quad (15)$$

with,
$$S_1 < S_0 \text{ and } F_1 \gg F_0 \quad (16)$$

so
$$p_1 \gg p_0 \quad (17)$$

This positive feedback process implies that the mispricing tends to be even greater (smaller) if $S_1 > S_0$ ($S_1 < S_0$) implying a more likely poor (good) return in the period. Then positive feedback strategies consisting of buying assets after prices rise and selling after prices fall are likely to add value. At $t = 2$ as V is known to anyone, $S_2 = 0$ and $p_2 = V$. Recall that,

$$p_1 = V - S_1 + (F_0 r_0)(1 + ab) \quad (18)$$

so

$$\frac{\partial p_1}{\partial r_0} = -\frac{\partial S_1}{\partial r_0} + (1 + ab)F_0 \quad (19)$$

as

$$\frac{\partial S_1}{\partial r_0} = \frac{\partial(V - r_0(V - S_0))}{\partial r_0} = -(V - S_0) < 0 \quad (20)$$

then

$$\frac{\partial p_1}{\partial r_0} = V - S_0 + (1 + ab)F_0 \quad (21)$$

as

$$V - S_0 > 0 \quad \text{and} \quad F_0 + abF_0 \geq 0 \quad (22)$$

then

$$\frac{\partial p_1}{\partial r_0} > 0 \quad (23)$$

From the last result, we can see an evidence of returns positive autocorrelation, which indicates the profitability of return chasing strategies for a specific asset⁶.

Now if we consider $a < 0$ (negative feedback individual investors), if $r_0 = 1$, say the PPM earns a zero net return, similar to the previous case, he loses $(1-a)$ funds under management. If $r_0 < 1$, the fund realizes one source of loss as a result of the negative return, but as individual investors believe in a recover of its returns, they would deposit some money based on negative PBE. If $r_0 > 1$, the fund realizes one source of gain as a result of the positive, but as individual investors believe in a falling returns, they would withdraw some money based on negative PBE.

Let's consider what happens in the first period ($t = 0$). As PBE just takes place in the second period the prior results still hold in this case:

$$p_0 = V - S_0 + F_0 \quad (24)$$

At period $t = 1$, again three possible states of nature can happen. The noise traders can be more, equal or less pessimists about that asset. The case where they are just the same pessimistic is trivial as $S_0 = S_1$, $r_0 = 1$ and $F_0 = F_1$. If the noise traders, by any reason, are in aggregate more pessimistic than in the first period, say $S_1 > S_0$, this would imply a greater mispricing ($V - S_1$) which

6 Considering a set of assets, a momentum strategy would be also profitable as winners would remain winners and losers would remain losers. It is worth noting that the SW model predicts negative autocorrelation when investors are positive feedback traders, which is exactly the contrary of the above result.

the PPM would like to take advantage of. As the mispricing increased, the past return was negative which reduces the available resources based on it, but conversely some of the individual investors, observing the poor performance, would deposit their money believing in the return's recovery. As we have two contrasting pressures on the available resources, it's possible to identify the exactly value of "a"⁷ which would lead to the same available resources in $t = 1$. This value is given by:

$$a^* = (r_0 - 1) \frac{1}{r_0} \tag{25}$$

If the value of "a" is negative and greater or equal than a^* then $F_1 \leq F_0$. So, the final price after the correction provided by the professional investors would be:

$$p_1 = V - S_1 + F_1 \tag{26}$$

with, $S_1 > S_0$ and $F_1 \leq F_0$ (27)

so $p_1 < p_0$ (28)

If $a < a^*$, so $F_1 > F_0$, increasing the demand for the asset. As a consequence, the final price after the correction provided by the professional investors would depend on the difference between $(F_1 - F_0)$ and $(S_1 - S_0)$, and then it's not possible to implement a feedback strategy.

If the noise traders are in aggregate less pessimistic than in the first period, say $S_1 < S_0$, this would imply a smaller mispricing $(V - S_1)$ which the PPM would like to take advantage of. In this case, the past return was positive which increases the available resources based on it. On the other hand, some of the individual investors, observing the good performance, would withdraw some money. Again we have two contrasting pressures on the available resources and, it's possible to identify the exactly value of "a" which would lead to the same available resources in $t = 1$. This value is given by:

$$a^* = (1 - r_0) \frac{1}{r_0} \tag{29}$$

If the value of "a" is negative and greater or equal then a^* then $F_0 \leq F_1$. So, the final price after the correction provided by the professional investors would be:

$$p_1 = V - S_1 + F_1 \tag{30}$$

with, $S_1 < S_0$ and $F_0 \leq F_1$ (31)

so $p_1 > p_0$ (32)

7 The value of "a" which neutralizes the effect of returns

If $a < a^*$, so $F_1 > F_0$, increasing the demand for the asset. As a consequence, the final price after the correction provided by the professional investors would depend on the difference between $(F_1 - F_0)$ and $(S_1 - S_0)$, and it wouldn't be profitable to implement a feedback strategy.

To sum up, considering “ a ” negative and greater than a^* , the good (bad) previous return more than compensate the money withdraw (deposit) and so the following return tends also to be good (bad). Then positive feedback strategies consisting of buying assets after prices rise and selling after prices fall are likely to add value. The interesting result is that the previous conclusion holds even if $a = 0$ (PBE is not used), as a consequence of the limited resources assumption.

If “ a ” is negative and smaller than a^* then the good (bad) previous return is smaller than the money withdraw (deposit) and so the following return will depend on the difference between $(F_1 - F_0)$ and $(S_1 - S_0)$. In this case, feedback strategies don't add value. But if the value of “ a ” is negative and very small $(F_1 - F_0)$ tends to dominate $(S_1 - S_0)$, and negative feedback strategies add value. At $t = 2$ as V is known to anyone, $S_2 = 0$ and $p_2 = V$.

3. PROPOSITIONS

Summing up the previous discussion the four propositions are as follows:

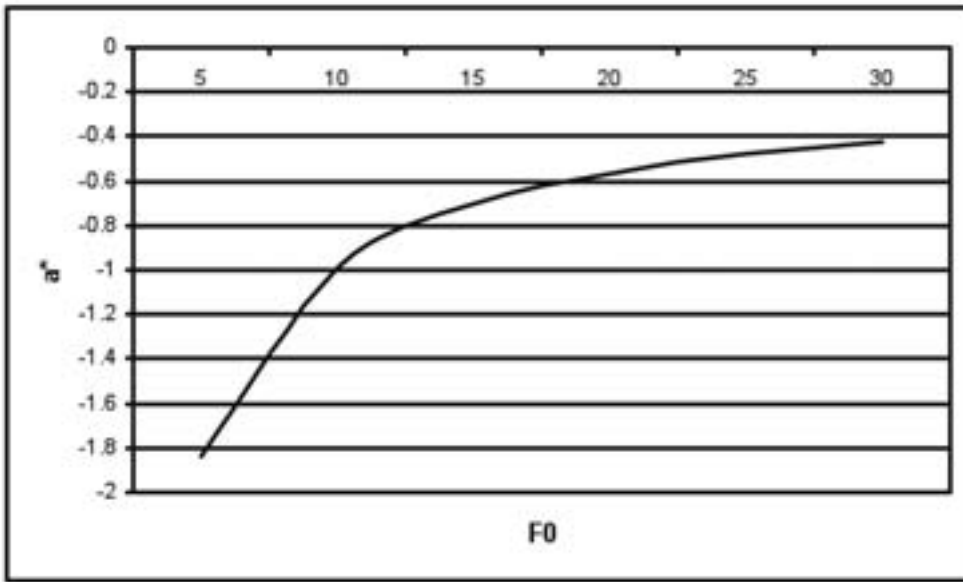
Proposition One: *In a market where the most relevant participants are professional portfolio managers evaluated via positive PBE ($a > 0$), if a price fall is observed then it tends to fall even further in the following period. Conversely if a price rise is observed then it tends to rise even more in the next period.*

Proposition Two: *In a market where the most relevant participants are professional portfolio managers evaluated via negative PBE, considering “ a ” negative and $a < a^*$, if a price fall is observed then it tends to rise in the following period. Conversely if a price rise is observed then it tends to fall in the next period.*

Proposition Three: *In a market where the most relevant participants are professional portfolio managers evaluated via positive (negative) PBE, positive (negative) momentum strategies are likely to be valuable.*

Finally, given V, S_0, F_0 , and a S_1 distribution function, it's possible to calculate a value of a^* such that if the observed $a > a^*$, positive feedback strategies add value and if $a < a^*$, negative feedback strategies add value. For instance if we consider: $V = 100, S_0 = 40, F_0 = 20$ and $S_1 \rightarrow N(40, 10)$, then solving we obtain $a^* = -0.5656$. Considering $F_0 = 5$, all else the same, we find $a^* = -1.8385$. On Figure 1 it can be seen the value of a^* for different values of F_0 .

Figure 1



So if the value of F_0 is lower (higher), all else the same, and so the ratio F_0/S_0 is lower (higher), the noise traders are relatively more (less) powerful, then the value of a^* is lower (higher) and the likelihood of finding valuable positive feedback strategies is higher (lower).

Proposition Four: *In a market where the most relevant participants are professional portfolio managers evaluated via negative PBE and noise traders are more (less) powerful then positive momentum strategies are more (less) likely to be valuable.*

4. CONCLUSIONS

This paper proposes a theoretical model to justify the existence of feedback strategies considering the setting of professional portfolio managers. In this sense, we considered that professional investment is conducted by a relatively small number of highly specialized PPM using other people’s capital. In a deductive way, we reached four propositions which justify the effectiveness of momentum strategies.

The first one posits that in a market where the most relevant participants are professional portfolio investors using positive performance based evaluation (PBE), say $a > 0$, if a price fall is observed then it tends to fall even further in the following period. Conversely if a price rise is observed then it tends to rise even more in the next period. Therefore we should observe positive return’s autocorrelation. On the other hand, our proposition two captures the case when negative PBE is used ($a < 0$). In this case, considering “ a ” negative and $a < a^*$ (a^* is the value of “ a ” such that the funds available remain constant), if a price fall is observed then it tends to rise in

the following period. Conversely if a price rise is observed then it tends to fall in the next period. Therefore we should observe negative return's autocorrelation

As further possible extensions to the present paper we would suggest an empirical test of the presented propositions and to take into account a measure of risk (e.g. volatility) in the model to check the link between volatility and return autocorrelations.

As a direct consequence of the previous two propositions, in a market where the most relevant participants are professional portfolio investors using positive (negative) performance based evaluation (PBE), positive (negative) momentum strategies are likely to be valuable. Also, we show that if noise traders are more (less) powerful then, positive momentum strategies are more (less) likely to be valuable.

One important issue raised by our theoretical framework is whether the theoretical results of the SW model which associates positive (negative) feedback trading with negative (positive) serial autocorrelations of returns are valid in all cases. It is worth noting that persistent bubbles in asset prices are not allowed in this kind of model. However, our model gives different results by relaxing the assumption that rational investors are always able to offset instantaneously noise traders and bring market to fundamentals.

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