**Glamour, Value and the Changing P/E**

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**Abstract**

The fact that value shares outperform glamour shares in the long term has been known for over 50 years. The P/E was the first statistic documented to discriminate between the two. Believers in efficient markets have not been able to convincingly demonstrate that the outperformance of value shares is due to their being fundamentally riskier. Why then do glamour shares remain popular? Equations derived from options theory tell us that there is no particular reason to expect the evolution of the P/E through time to be similar for the two groups. Using data for all US stocks since 1983, we find that glamour shares have a much greater tendency to change P/E decile than value shares. Glamour investors are underestimating this variability by at least 15%. We use TreeAge decision tree software, which has not been applied to problems in finance before, to show that glamour investors cannot rationally expect any windfall as their company’s PE decile changes whatever their horizon. We infer that glamour investors are under-estimating the likelihood of change and are continually surprised.

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**1. Introduction**

The fact that portfolios of value shares, as identified by having a low P/E, give better long-run returns than portfolios of glamour shares was first documented by Nicholson (1960) in a four-page paper in the Financial Analysts Journal and an expanded paper covering other value/glamour identifiers in 1968. His results on the P/E were first confirmed by a finance academic seven years later (Basu (1975)). The fact has been confirmed by many researchers since, using different datasets in different countries over different time periods. Outside the five-year run-up to the dot-com bubble of 2000, no-one has ever reported that low P/E stocks give *poorer* returns than high P/E stocks. This calls into question Fama’s (1998) assertion that the so-called value anomalies could largely be explained away as the result of data mining: at least for the P/E, if its apparent efficacy were due to data mining, one would expect at least some results from the world’s stock markets over decades to show the opposite.

Over the last 50 years there have been many attempts by believers in market efficiency to explain this outperformance as being due to some sort of extra risk. There should be no free lunches in an efficient market. One set of stocks, if it can be distinguished from another set of stocks by publicly-available data, should not be able to outperform the other set unless the first set is somehow more risky. This view was best outlined by Ball (1978), who approached the whole business as an ‘anomaly’ that only needed the appropriate set of risk factors to explain it. Efforts to identify the extra risk that one takes on as one buys a portfolio of low P/E shares have, however, largely been unsuccessful. But efforts to prove the *non*-existence of the extra risk have been inconclusive too. As Dreman (1998) unkindly put it, trying to prove the non-existence of something is like trying to disprove the 18th century theory of phlogiston. Fuller, Huberts and Levinson (1993) did their best to disprove Ball's (1978) argument, including a wide variety of possible explanatory factors for the outperformance of low P/E shares, but the factors included in the model did not account for the superior low P/E returns.

Fama and French’s 1992 and 1993 papers neatly circumvented the problem of the value-glamour split by simply stating that book-to-market was an observed risk factor, since value shares as identified by having a high ratio of book value to market capitalisation give on average better returns than glamour shares. They did not explore whether this was intuitively correct, and indeed intuitively the opposite is the case: an asset-rich firm has something to fall back on in hard times that a firm operating on debt or leased assets does not. Fama and French did however dismiss the P/E and dividend yield statistics: they found them to be dominated by book-to-market as an indicator of value shares. Not having been included in Fama and French’s popular three-factor model has resulted in little research effort being expended on the P/E in recent years.

The most well-known paper to counter Fama and French’s proposal was that of Lakonishok, Schleifer and Vishny (1994). They ascribed the differences in returns between value and glamour shares to investors consistently overestimating the future growth of glamour shares. Glamour stocks grew faster for the first couple of years but after that the growth rates of the two groups were much the same. Lakonishok et al. argued that such strategies provide higher returns because they exploit the sub-optimal behaviour of investors. They found little, if any, support for the view that value strategies were fundamentally riskier. Value stocks outperformed glamour stocks quite consistently and did particularly well in 'bad' states of the world.

One paper that does offer a theoretical justification for the increased riskiness of value firms posited by Fama and French is that of Zhang (2005). He developed a model that could in principle explain why value companies are more risky, and hence show better returns, than glamour stocks. The two main features of Zhang’s model were costly reversibility and the countercyclical price of risk. Costly reversibility implies that firms face higher charges in cutting capital than expanding it. The traditional capital theory assumption of costlessly reversible investment rarely holds true in real life, where for example resale prices of capital goods are likely to be well below the prices paid. The second main plank of Zhang’s model was the countercyclicality of the price of risk. The price of risk can be seen as countercyclical by considering the different experiences of value and glamour firms. In bad times, value firms have more unproductive capital and thus perform worse. In good times, glamour firms invest more, whereas value firms do not need to invest at such a high rate because their previously unproductive capital is becoming productive again. This extra inflexibility of value firms across the economic cycle is what generates the extra risk according to Zhang.

In contrast to the above, this paper’s proposal is based on the behavioral finance literature: the differing experiences of glamour and value investors can be explained quite simply by their own bounded rationality.

Anchoring-and-adjustment was first proposed by Tversky and Kahneman (1974). For example, when subjects were asked to estimate the product of



the median estimate was 2,250; but when presented with



the median estimate was 512. The true answer is 43,320. Later work summarised by Kahneman (2012) indicates two separate effects. Anchoring as adjustment is simple enough: given a question where we are very unsure of the answer, we will grasp at any straw to help us get close. However, this happens even when the subject can see that the anchor was chosen entirely randomly: subjects were asked to spin a roulette wheel that was rigged to stop at 10 or 65, then asked to estimate the percentage of African nations in the UN. Those seeing a result of 10 guessed 25%; those shown 65 gave a median estimate of 45%.

More recently a priming effect has also been demonstrated, where mention of the anchor selectively activates compatible memories. For example, when asked “Is the annual mean temperature in Germany higher or lower than 20C [5C]?”, subjects given the anchor of 20C were better able to recognise flashed-up words associated with summer, such as *beach* or *sun*. Subjects given 5C were better able to recognise winter-type words such as *frost* and *ski*.

The anchoring effect is unusual among psychological phenomena in that it can be accurately measured. For example, visitors at the San Francisco Explorium were asked, “Is the height of the tallest redwood more or less than 1,200 feet [180 feet]?” then “What is your best guess about the height of the tallest redwood?”Those given the high anchor gave median responses of 844 feet; those given the low anchor, 282 feet. The anchoring index is calculated as the ratio of differences

 (1)

When estimates are based solely on the anchors provided, the anchoring index is 100%, and when the anchors have no effect on the guesses the index is zero.

In the case of the P/E, we propose that investors anchor on the P/E that a share currently has when they first consider it as an investment, and assume it will continue into the future with much the same P/E. They fail to adjust future expectations sufficiently according to mean reversion: a share with a very high P/E due to transient reasons is likely to move back towards the average market P/E next year. Mean reversion in profitability is a powerful force, being estimated by Fama and French (2000) at 38% per annum. This carries over into mean reversion in the reported EPS and P/E. However this 38% is not a simple flat rate: Fama and French find that changes in earnings tend to reverse from one year to the next, large changes of either sign reverse more quickly than small changes, and negative earnings changes reverse more quickly than positive changes. This may help explain the difference in experience of glamour and value investors that we observe below: a high P/E may be the result of one or more large negative earnings changes, and thus it is more likely to reverse and place the company in a different P/E decile.

By how much are investors in glamour shares underestimating the likelihood that their high P/E share will change its P/E? To show the adjustment necessary we follow in principle Keil, Smith and Smith (2004) and Dorsey-Palmateer and Smith (2007), who found that extreme EPS forecasts and extreme interest rate forecasts could both be improved by shrinking them towards the long-term mean.

P/E changes through the years are a difficult stochastic process, but we show the current state of knowledge in Section 2. Due to this analytical complexity we use TreeAge software to run simulations of the Markov process. This software is widely-used in medical cost-benefit analysis (e.g. Menn, Leidl and Holle (2012)), and has also been applied in such areas as nuclear plant breakdown planning (Smith and Borgonovo (2007)) and whether it would be economically sound to fit anti-aircraft missile counter-measures to commercial airliners (von Winterfeldt and O’Sullivan (2006)). However it has not been applied to problems in finance before.

Our results can be stated briefly. Prices, and thus P/Es, of value and glamour shares move differently. For all plausible values of the parameters, value share prices will grow more quickly than those of glamour shares. There is a clear bias in CRSP/Compustat data against loss-making companies before the mid-1980s, so we start our data analysis from 1983. Glamour shares give three times the returns of value shares if they stay in the same decile, but they have a much greater tendency to move deciles. This results in the relative performances reversing, and the familiar value/glamour split where value shares outperform glamour shares by about 7% p.a. Glamour investors appear to be under-estimating the tendency of their shares to change decile by at least 18%, and possibly much more. The Markov simulation shows no very good returns for glamour investors whatever their horizon, but it does demonstrate the superior returns that value investors can expect if they hold for 2-3 years.

The remainder of the paper is organised as follows. The next section describes the current state of knowledge of the P/E as a stochastic variable and whether value and glamour P/Es are likely to evolve differently. Section 3 describes the features of our dataset and methodology. Section 4 presents and analyses the results, Section 5 estimates the anchoring effect and Section 6 covers the Markov model simulations. Section 7 concludes and offers suggestions for further research.

2. The P/E as a Stochastic Variable

The simplest realistic description of how share prices move, at least in the short term, is that of a stochastic variable with geometric Brownian motion, as described by Samuelson (1965):

 (2)

Where each period the share price  changes with a drift rate  and a volatility  that are both proportional to the current share price.

Earnings can also be described as a stochastic process (Chiang, Davidson and Okunev 1997); Li 2003) but the model is more complex as earnings can become negative but share prices cannot:

 (3)

Where  is the change in earnings,  is the net earnings at time  ,  is the rate of adjustment,  is the long-term mean and  is the standard deviation of earnings. This formulation allows considerable flexibility: if  and  , we have mean reversion towards a time-varying mean; if  and  , earnings revert to a stable long-term mean; if  , we have a random walk.

Since both the price and EPS can be modelled as stochastic series with geometric Brownian motion, their ratio  or  will also be a gBm, albeit a complex one. Alcock, Mollee and Wood (2011) derive a stochastic earnings valuation model and make the important point that the standard DCF model is wrong in assuming the P/E to be constant. The DCF model completely ignores the future volatility of earnings as a source of risk. Using numerical methods to solve their system of equations they demonstrate that the P/E is a noisy process, not just a noisy observation of a deterministic process.

2.1 An Application of the Merton Model

Can we expect the prices of value and glamour firms to evolve differently through time? We investigate this using Merton's (1974) model, where a company’s equity is an option on the assets of the company. Here the value  of a company follows geometric Brownian motion

 (4)

that is,

 (5)

The company's debt with face value  is due at time  . Stock price  at time  is the payoff a call option on  with strike price  :

 (6)

The time  value of debt must be less than the initial value of the company:

 (7)

Earnings  account for the increase in company value between times  and  :

 (8)

This allows for negative earnings (losses) when  . (Note that all quantities here are time  values; in particular, the initial value  is worth  at time  .)

We have a value stock when  is large and a glamour stock when  is small. More precisely, we have a value stock when  and a glamour stock when  for some fixed  .

Note that

 (9)

are random variables. This means that becoming either a value or a glamour company at time  are random events, which can happen, respectively, with probabilities

 (10)

We can compute and compare the conditional expectation of the stock price  given that we have a value stock

 (11)

with the conditional expectation of  given that we have a glamour stock

 (12)

If it turns out that

 (13)

it would be consistent the observations that value stock tends outperform glamour stock.

2.2 Detailed calculations

Some parts of these calculations will be quite similar to the derivation of the Black-Scholes formula for the call/put prices. In particular, we shall use the notation

 (14)

and write

 (15)

for the standard normal cumulative distribution function.

Given a fixed number  (the threshold between  large for value stock and small for glamour stock), we define another number

 (16)

This is needed just to make the following formulae look a bit simpler. This is because

 (17)

because  , so  means that  .

First we compute

 (18)

and

 (19)

Next, we compute

 (20)

We have already seen that  means that  , so

 (21)

and we get

 (22)

Finally, we use the equality

 (23)

to compute

 (24)

To this end we evaluate

 (25)

As a result

(26)

2.3 Numerical computations

The formulae derived above for the conditional values  and  are used in Table 1. This confirms that

 (27)

for any value of the threshold parameter  separating value and glamour stocks. This provides some theoretical support for the assertion that the P/Es of value and glamour stocks are likely to evolve differently, but the evolution of the ratio also depends on E which we do not model.

**3. Data and Methodology**

The initial data consisted of the following fields from CRSP/Compustat, annually for all US companies, for as long as the data were available. 1951 is CRSP/Compustat’s base year.

**Ibcom** Income before extraordinary items / available for common stock

**Tcap** Market capitalization

**Ret** Returns, calculated annually.

The availability of earnings, market capitalization and returns data by year can be seen in Charts 1 and 2.

Charts 1 and 2 about here

As can be seen, coverage of loss-making companies is minimal up to 1981 but then rises with some big jumps through the 1980s. There is apparently a survivorship bias against loss-making companies in the early years. In 1983 the proportion of loss-makers jumps from 12% to 18% and thereafter never goes below that. Since the possibility of a company becoming a loss-maker has a major effect on expected returns, we calculate all results in this paper using portfolio formation dates 1983-2009. It should however be recognised that some loss-maker company/years may still be missing from the mid-1980s. This decision to ignore all company/year returns up to 1982 results in the loss of 24,316 company/years, or 18.5% of the total, but only 3.7% of the loss-making company/years.

Taking annual earnings from 1983 overall, 34.1% of the company/year data points represent losses. Almost all papers investigating the P/E ignore such companies, because the meaning of a negative P/E is problematic. A positive P/E can be rationalised as “this is how many years' earnings investors are prepared to pay for this company”, but that does not apply if the company is making losses. However, occasional periods of losses are an important part of the evolution of any company’s P/E through time. When forming P/E deciles, we therefore divide these negative P/Es into five extra ‘deciles’, making 15 bins in total. (For simplicity we continue to refer to these bins as deciles in the remainder of this paper, although there are 15 of them including the loss-makers.) This should not be taken as implying that a negative P/E has any particular meaning, only that such companies should not be excluded from the analysis.

For each company/year from 1983 that has an Ibcom figure and a market capitalization (Tcap), we calculate the E/P at the company level as

 (28)

The 1,000 factor is because Ibcom is quoted in thousands but Tcap is in millions.

We next apportion decile limits: five bins for the loss-makers in any particular year and ten bins for profitable companies. This 5:10 ratio is chosen because loss-making company/years form 34.1% of the total over all years. For each year, decile numbers are assigned as 01 - 05 for loss-makers and 06 - 15 for profitable companies. Thus glamour companies with the highest P/E (lowest E/P) fall into decile 6 each year and value companies, with the lowest P/E (highest E/P) into decile 15. Since the proportion of loss-makers is different each year, the number of companies in each of the five loss-maker bins will be different from the number of companies in the ten profitable bins. However, the dividing line between making a profit and making a loss seems more important than making all bins the same size and allowing the zero line to move from decile to decile over the years.

Next, we pair each year’s decile number with the decile the company moved to in the following year. If there were no earnings recorded the following year, decile ‘00’ is coded, as the company went into administration, was taken over or otherwise ceased to be quoted. There are thus 15 bins in year 1 and 16 bins in year 2, giving 15\*16=240 possible transitions from one year to the next.

Finally, we calculate the equally-weighted return from each of these 240 possible transitions. Transitions will be more popular in some years than others. For example, 2002 saw a peak in losses as the dot-com bubble burst, with 49.5% of companies reporting losses. In 2001-2 99 companies went from the glamour decile to making losses, whereas in 2002-3 only 60 did. For this reason we calculate the average return for each transition for each year, then average those figures over all years. The alternative would be to take all company/years for a particular transition together and average them, but that would give 2001-2 in the example above 65% more weight than 2002-3.

 (29)

Where there are *n* Rtnab data points recorded for the transition from decile *a* in year *y* to decile *b* in year *y+1*.

**4. Results**

With what probability companies move from their current decile to next year’s decile can be seen in Table 2.

Table 2 about here

For all deciles, the most likely decile to appear in next year is the same decile as this year. A glamour company has a 33.85% chance of becoming a loss-maker next year, compared to 25.38% for a value company. Extreme loss-makers (decile 01) and value companies are the most likely to remain in the same decile next year, at 31.84% and 34.34% respectively. The deciles between them are much more likely to move, with the probability of remaining in the same decile only 15-20%. Extreme loss-makers find it particularly difficult to break out of the spiral: they have only a one in six chance of turning a profit next year, compared to a 27.11% chance of being delisted.

One-year returns by decile transition are shown in Table 3.

Table 3 about here

It is no surprise that the worst loss-makers in decile 01, that either delist or stay in that decile, lose money for their investors. The surprise is that such companies only have to make their losses less severe and excellent returns can be expected: an average +130.88% for loss-makers that move from decile 01 to decile 05 (the least severe loss-makers). Glamour companies that remain glamour companies (06 🡪 06) show excellent returns of +37.25%. Value companies that remain value companies, on the other hand, show some of the poorest returns (+12.27%). From this point of view, it is clear why many investors choose glamour over value: archetypal glamour companies outperform archetypal value companies threefold. On the other hand, glamour shares that start making losses show exceptionally poor returns: -41.32% for decile 06 🡪 01, for example.

The rub, however, is that few companies stay in the same decile into the next year. By multiplying tables 1 and 2 together and summing the result, we get Table 3: the expected return by decile.

Table 4 about here

Table 4 shows the traditional value-glamour split that hundreds of papers have demonstrated using the E/P or other variables to identify value and glamour shares: 7.45% average annual difference in returns between deciles 06 and 15. The apparent superiority of glamour shares over value in Table 2 has reversed itself. This is because of the much greater tendency of glamour shares to cease being glamour shares, and in particular to start making losses.

We look more closely at how the E/Ps change differently depending on the decile in Table 4 and Chart 3. Here we are looking at the ratio of next year’s E/P to this year’s, and we do exclude loss-making companies, as it is difficult to interpret a negative ratio.

Table 5 about here

Chart 3 about here

*A priori* one would expect next year’s E/P to be much the same as this year’s. Since the distributions are highly skewed we comment on the medians rather than the means. For all profitable companies this is indeed the case, with a median ratio of 0.93. This means that next year’s E/P is slightly smaller than this year’s, i.e. next year’s P/E is slightly larger. However this does not hold true for the glamour and value deciles, where Fama and French’s (2000) regression to the mean is very evident. For glamour shares, next year’s E/P is almost twice the current E/P, i.e. the P/E almost halves. If a stock recorded an uncharacteristically high P/E this year, the temporary factors that caused it could well have dissipated in a year’s time, and vice-versa for value shares. The opposite is true for value shares: next year’s P/E is almost twice this year’s P/E.

The distributions of the ratios shown in Chart 3 are also interesting. For all companies considered together one would expect a symmetrical bell curve, with the E/P on average staying close to what it was last year, and extreme changes in either direction being equally unlikely. This appears to roughly be the case for the overall distribution and for value shares. However, for glamour shares there is a pronounced second bulge on the left hand side that value shares do not display. 5.59% of glamour shares have a ratio between -25 and -10, i.e. the company started making losses that were numerically larger than the profits they made the year before (note we cannot say 10-25 times as large, since we are comparing E/Ps and the price is likely to have gone down too). This may be a practical demonstration of the “big bath” syndrome: if the directors see that they are going to make losses, they decide they may as well clear the books in one fell swoop and roll all sorts of other losses into it. But why, if that were the case, is the “big bath” syndrome confined to companies that previously had high P/Es?

**5. Estimating the Anchoring Effect**

As we saw above, glamour shares have a much lesser tendency to remain glamour shares next year than value shares have to remain value shares. This can be seen in Chart 4. If glamour companies stay as glamour companies, they can expect excellent returns of 37.25%, as Table 2 shows. It appears that glamour investors are anchoring on their company’s current P/E and over-estimating the likelihood of it staying that high. By how much are they under-estimating these companies’ tendency to change deciles?

The distribution of glamour companies’ transitions across deciles has very fat tails and so is best modelled using a Cauchy distribution. This ‘pathological’ distribution has a location and a scale parameter, but no mean, variance or any other moments. Its CDF is

 (30)

Where *x0* is the location parameter and  is the scale parameter. Its use has been proposed in finance to model distributions with “fat tails”, e.g. Mandelbrot and Hudson (2008), but take-up has been limited due to its analytical intractability. Truncation of the distribution is necessary due to the facts that deciles lower than 00 or higher than 15 are not possible here. In addition, we keep decile 00 as fixed at the observed probability of 0.0582, since a failure to record any earnings in year 2 is not the same as a definite move to another decile, and we could as well have coded it as decile 99 as 00.

The observed distribution of next year’s E/Ps to deciles and the approximated Cauchy distribution are shown in Chart 5. What scale parameter would be needed for the glamour decile to show average returns? Average annual returns for 1983-2010 were 13.24%. This is achieved by shrinking the scale parameter by 18%, from 2.2150 to 1.8164. This is the third series shown in Chart 5. To put it another way, glamour investors are under-estimating the decile variability of their shares by 18% if they are expecting to get even market average returns. If they expect to get returns equal to those of the value decile (18.35% from Table 3), the Cauchy scale parameter must be reduced by 60%, from 2.2150 to 0.8862.

**6. P/E Changes in a Markov Model**

The flow we have observed of companies through the P/E deciles is complex. In particular, glamour firms tend to rapidly cease being glamour firms and often become loss-makers. However, one could argue that a holder of a glamour firm that falls into losses could look forward to very good returns if the firm returns to profit. Are there any surprises in this complex flow in future years that would explain why the one-year returns for glamour firms are so poor?

To check this we implemented a Markov model using TreeAge decision modelling software. The model is shown in Charts 6 and 7.

Charts 6 and 7 about here

An investor enters with probability 1 at one of the P/E deciles, and then moves in future years through the deciles with the probabilities shown in Table 1. Each move multiplies the current wealth according to the one-year returns in Table 2. This ceases when the company enters the Dead state or the time horizon is reached, when the final wealth is assigned. We repeated this over 10,000 simulations with time horizons varying from one to ten years. The results are shown in Table 6.

Table 6 about here

Shares in the extreme loser decile have respectable mean returns, but the median returns are very poor and the standard deviation of returns is double what it is for the glamour and value deciles. Any good returns from an extreme loser stock depend on the company becoming profitable, or at least stopping making such heavy losses, but each year there is a 27.11+31.84=58.95% chance of the company either ceasing to be quoted or remaining a Loser 1 stock.

There are no particular surprises in the returns of glamour stocks. Both mean and median returns remain at about 11-12% and appreciably below those of value stocks for all except the ten-year horizon. The surprise is in fact in the value stocks: for a one-year holding period the median return is almost 5% below the mean. This indicates that good returns over what a value investor would consider the short holding period of one year depend on the stock being awarded a higher P/E. From Table 1, this is 0.4029 (decile 15 🡪 06 ... 14). It may also explain why value investing is more popular among individuals than fund managers: for a fund manager for whom a one-year horizon is a long time, the poor median returns on value stocks may be decisive in career terms. The best returns are over the two to three year holding period that value investors typically recommend: from Table 5, 21.22% for the second year and 15.02% in year 3. After that they decline to little more than the returns on glamour shares. The value decile’s standard deviation of returns is only slightly more than that of the glamour decile, and not enough to account for the higher returns.

Chart 8 shows the time in state of Table 5’s three initial investments over the nine subsequent years of a ten-year horizon.

Chart 8 about here

It can be seen that heavily loss-making companies find it hard to climb out of their loss-making status, even though good returns may be had simply by becoming less loss-making. The wide spread of glamour shares across deciles in subsequent years is evident: an initial glamour share in fact spends 10% more time as a loss-maker than a value share does. The concentration of value shares in the high E/P (low P/E) range, even over a ten-year holding period, is also clear.

**7. Conclusion**

# Several important results can be reported from this investigation. Using pricing equations based on the Merton (1974) model, where a company’s equity is an option on the assets of the company, we show that there is no particular reason why the expected price of a value company should be the same as that of a glamour company. For all plausible values of the parameters, the price of a value company is higher.

# Our data show that there is a clear bias against recording loss-making firms for all years on CRSP/Compustat before the mid 1980s. Any past conclusions that depend on a view of the whole stock market pre-1980s, rather than just that part of it that is making profits, are therefore in doubt.

This paper’s main result is to offer an explanation for why investors continue to buy glamour shares, even though hundreds of academic papers have documented the superior returns of value shares over decades. There is no need to appeal to elaborate constructions of what constitutes ‘risk’ across the economic cycle: investors may be committing a simple cognitive error. The statistics for shares they see at any particular point of time are taken to be more permanent than they are, and they anchor on them. Applying this heuristic is not so important for value shares, which tend to remain with low P/Es for years. It affects glamour investors much more. Far from the 37.25% returns they may expect to get through their share remaining a glamour share next year, they end up with average returns of only 10.91% and are beaten in their endevors by value investors.

We calculate the amount by which glamour investors are under-estimating this P/E variability as at least 18%, and probably more. Their reason for investing in a subset of the market is presumably because they expect to beat the market average.

For the first time in finance research we apply TreeAge decision analysis software to check whether glamour investors can expect any better returns in future years, as their stock moves through the deciles. None is found. We do however replicate the fact that value shares should be held over 2-3 years if their returns are to be maximised.

We suggest three areas for future research:

1. The equations for the expected prices of value and glamour firms that we derive from the Merton (1974) model in section two are able to show that there is no reason to expect the prices of value and glamour shares to evolve similarly. However we have not demonstrated that the P/E of value shares is likely to get larger quicker for value shares because we have not modelled earnings. The Merton model is also rather primitive in that it is a single-step model. To look at the evolution of E, and hence the P/E, a multi-step model is necessary.

2. We have not addressed whether a company’s P/E has a memory of more than one year. Initial calculations on a handful of companies with long P/E histories indicate that multi-period auto-correlation is not zero. In this case the assumptions of the Markov model do not hold, at least on the level of individual companies.

3. The Markov model we have implemented in TreeAge is relatively simple. It could be expanded to invest in multiple companies simultaneously, rather than just one, but the correlation of returns between companies would then have to be addressed. A company’s transition probabilities could be made to depend on the history of P/Es instead of just the current P/E. Investors could also set stop-losses. The software’s capabilities enable much more complex and realistic models to be programmed, and it is a surprise to us that it has not been used in any finance research before.

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**Table 1**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| a | X | d+(X) | d-(X) | E(P|value) | E(P|glamour) | Ratio of E(P)s | Annualised difference |
| 0.01 | 123.07 | 0.435218 | 0.323415 | 106.9015 | 84.1277 | 1.27 | 4.91% |
| 0.02 | 124.02 | 0.366463 | 0.254659 | 107.4865 | 84.7479 | 1.27 | 4.87% |
| 0.03 | 124.99 | 0.29683 | 0.185027 | 108.1002 | 85.3680 | 1.27 | 4.83% |
| 0.04 | 125.98 | 0.226302 | 0.114499 | 108.7434 | 85.9873 | 1.26 | 4.81% |
| 0.05 | 126.99 | 0.154858 | 0.043055 | 109.4168 | 86.6049 | 1.26 | 4.79% |
| 0.06 | 128.02 | 0.082479 | -0.02932 | 110.1210 | 87.2198 | 1.26 | 4.77% |
| 0.07 | 129.08 | 0.009143 | -0.10266 | 110.8567 | 87.8311 | 1.26 | 4.77% |
| 0.08 | 130.15 | -0.06517 | -0.17698 | 111.6247 | 88.4375 | 1.26 | 4.77% |
| 0.09 | 131.25 | -0.14049 | -0.25229 | 112.4256 | 89.0379 | 1.26 | 4.78% |
| 0.10 | 132.38 | -0.21683 | -0.32863 | 113.2602 | 89.6310 | 1.26 | 4.79% |
| 0.11 | 133.53 | -0.29421 | -0.40602 | 114.1291 | 90.2153 | 1.27 | 4.81% |
| 0.12 | 134.70 | -0.37267 | -0.48448 | 115.0331 | 90.7895 | 1.27 | 4.85% |
| 0.13 | 135.91 | -0.45223 | -0.56403 | 115.9730 | 91.3519 | 1.27 | 4.89% |
| 0.14 | 137.14 | -0.53291 | -0.64471 | 116.9496 | 91.9010 | 1.27 | 4.94% |
| 0.15 | 138.40 | -0.61474 | -0.72655 | 117.9637 | 92.4352 | 1.28 | 5.00% |
| 0.16 | 139.69 | -0.69775 | -0.80956 | 119.0161 | 92.9528 | 1.28 | 5.07% |
| 0.17 | 141.01 | -0.78198 | -0.89378 | 120.1079 | 93.4520 | 1.29 | 5.15% |
| 0.18 | 142.37 | -0.86744 | -0.97924 | 121.2399 | 93.9313 | 1.29 | 5.24% |
| 0.19 | 143.75 | -0.95417 | -1.06597 | 122.4131 | 94.3890 | 1.30 | 5.34% |
| 0.20 | 145.18 | -1.04221 | -1.15401 | 123.6286 | 94.8236 | 1.30 | 5.45% |

Table 1: Expected prices of value and glamour stocks for various threshold values of E/P *a*. Assumptions are that debt is 30% of company value, company value at time 0 = 100, *r*=4%, µ (drift rate)=5%, σ (annual volatility)=5%, T (company life) = 5 years.

**Table 2**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Year2** | | | | | | | | | | | | | | | | | |  |
| **Year 1** |  |  | NoEP | LoserQ1 |  |  |  | LoserQ5 | Glamour |  |  |  |  |  |  |  |  | Value |  |
|  |  | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | Sum |
| LoserQ1 | 01 | 27.11% | **31.84%** | 13.58% | 6.76% | 4.06% | 2.36% | 2.07% | 1.46% | 1.40% | 0.86% | 1.13% | 0.93% | 0.84% | 0.55% | 1.22% | 3.82% | 100.00% |
|  | 02 | 11.58% | 20.95% | **19.47%** | 13.79% | 9.59% | 5.16% | 3.85% | 2.85% | 1.92% | 1.50% | 1.25% | 1.27% | 1.25% | 1.01% | 1.51% | 3.03% | 100.00% |
|  | 03 | 7.55% | 12.15% | 17.15% | **18.07%** | 13.76% | 7.93% | 5.48% | 3.36% | 2.31% | 1.71% | 1.58% | 1.54% | 1.31% | 1.69% | 1.92% | 2.49% | 100.00% |
|  | 04 | 6.27% | 6.57% | 11.34% | 15.71% | **18.12%** | 12.58% | 7.30% | 4.45% | 3.29% | 2.64% | 1.97% | 1.91% | 1.81% | 1.71% | 1.92% | 2.42% | 100.00% |
| LoserQ5 | 05 | 5.92% | 4.04% | 6.65% | 8.92% | 12.94% | **19.38%** | 13.47% | 6.89% | 4.32% | 3.97% | 2.56% | 2.53% | 2.45% | 1.92% | 1.81% | 2.24% | 100.00% |
| Glamour | 06 | 5.82% | 2.92% | 4.49% | 5.14% | 5.82% | 9.66% | **18.43%** | 13.96% | 8.84% | 6.11% | 4.14% | 3.29% | 3.00% | 2.91% | 2.57% | 2.90% | 100.00% |
|  | 07 | 4.84% | 2.29% | 2.84% | 3.49% | 3.34% | 5.28% | 10.23% | **18.22%** | 14.50% | 9.78% | 6.54% | 5.24% | 4.24% | 3.60% | 2.97% | 2.59% | 100.00% |
|  | 08 | 4.84% | 1.57% | 2.00% | 2.68% | 3.10% | 4.18% | 5.51% | 11.28% | **16.64%** | 14.18% | 10.22% | 7.27% | 5.98% | 4.10% | 3.63% | 2.83% | 100.00% |
|  | 09 | 4.58% | 1.14% | 1.82% | 2.26% | 2.70% | 3.50% | 4.34% | 6.72% | 12.25% | **14.54%** | 13.89% | 11.03% | 7.74% | 5.65% | 4.72% | 3.11% | 100.00% |
|  | 10 | 4.57% | 1.32% | 1.57% | 1.61% | 2.18% | 2.70% | 3.15% | 4.88% | 7.91% | 12.75% | **15.73%** | 13.83% | 10.97% | 8.02% | 5.64% | 3.17% | 100.00% |
|  | 11 | 4.26% | 1.19% | 1.66% | 1.79% | 2.30% | 2.49% | 3.22% | 4.17% | 5.68% | 8.85% | 13.03% | **14.89%** | 13.88% | 11.05% | 7.49% | 4.05% | 100.00% |
|  | 12 | 4.18% | 1.30% | 1.73% | 1.91% | 2.31% | 2.79% | 2.87% | 3.25% | 4.49% | 6.04% | 9.69% | 13.06% | **15.81%** | 14.87% | 10.23% | 5.46% | 100.00% |
|  | 13 | 4.75% | 1.50% | 1.77% | 1.96% | 2.40% | 3.05% | 3.27% | 3.16% | 3.51% | 4.90% | 6.60% | 9.51% | 13.96% | **17.30%** | 15.10% | 7.26% | 100.00% |
|  | 14 | 4.52% | 2.15% | 2.63% | 2.66% | 3.10% | 3.20% | 2.90% | 2.83% | 2.78% | 3.59% | 4.49% | 5.69% | 8.76% | 15.20% | **21.39%** | 14.12% | 100.00% |
| Value | 15 | 5.98% | 5.43% | 4.09% | 3.37% | 3.32% | 3.20% | 3.14% | 2.52% | 2.28% | 2.55% | 2.12% | 3.36% | 4.39% | 6.57% | 13.36% | **34.34%** | 100.00% |

Table 2: Transition probabilities between E/P deciles, all US companies 1983-2009

**Table 3**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Year 2** | | | | | | | | | | | | | | | | | |
| **Year 1** |  |  | NoEP | LoserQ1 |  |  |  | LoserQ5 | Glamour |  |  |  |  |  |  |  |  | Value |
|  |  | 00 | 01 | 02 |  | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 |
| LoserQ1 | 01 | -28.67% | **-13.37%** | 31.68% | 70.35% | 118.73% | 130.88% | 84.68% | 90.85% | 128.12% | 106.47% | 75.73% | 60.24% | 78.22% | 25.25% | 61.28% | 36.15% |
|  | 02 | -22.25% | -33.28% | **0.50%** | 29.36% | 68.07% | 106.96% | 64.26% | 48.82% | 72.24% | 71.67% | 78.48% | 27.90% | 35.51% | 47.61% | 60.14% | 38.35% |
|  | 03 | -9.00% | -38.98% | -21.64% | **10.36%** | 34.65% | 74.65% | 57.49% | 50.61% | 62.87% | 43.22% | 35.42% | 29.57% | 41.19% | 14.24% | 6.29% | 23.19% |
|  | 04 | 7.58% | -44.72% | -25.34% | -4.77% | **11.39%** | 46.72% | 42.13% | 36.36% | 28.90% | 32.68% | 31.74% | 15.83% | 23.52% | 25.18% | 26.54% | 11.23% |
| LoserQ5 | 05 | 8.91% | -43.08% | -25.67% | -13.01% | -2.89% | **41.98%** | 34.31% | 22.15% | 23.14% | 23.02% | 14.69% | 10.85% | 17.23% | 14.69% | 21.77% | -5.43% |
| Glamour | 06 | 8.67% | -41.32% | -23.71% | -7.12% | -5.92% | 14.32% | **37.25%** | 20.75% | 12.41% | 10.02% | 12.90% | 4.61% | 2.54% | 2.30% | -3.90% | -6.88% |
|  | 07 | 28.84% | -44.65% | -18.75% | -10.07% | -7.57% | 5.98% | 43.46% | **34.61%** | 11.24% | 2.72% | -0.75% | 0.40% | -5.69% | -6.44% | -4.65% | -11.57% |
|  | 08 | 17.24% | -45.63% | -21.94% | -18.32% | -2.46% | 0.37% | 41.90% | 48.86% | **28.57%** | 12.31% | 1.61% | -0.81% | -4.25% | -9.09% | -10.88% | -12.94% |
|  | 09 | 14.53% | -39.51% | -25.34% | -11.08% | -0.55% | 9.89% | 31.55% | 47.40% | 38.52% | **24.34%** | 10.13% | 3.41% | -3.36% | -7.33% | -11.53% | -12.28% |
|  | 10 | 17.79% | -40.08% | -28.45% | -11.63% | -3.84% | 1.95% | 30.60% | 43.20% | 42.46% | 28.12% | **19.72%** | 10.54% | 1.85% | -2.74% | -9.71% | -11.61% |
|  | 11 | 26.55% | -36.86% | -16.31% | -8.46% | 1.63% | 7.36% | 23.98% | 46.74% | 40.61% | 34.22% | 25.70% | **18.11%** | 7.67% | 0.99% | -5.80% | -12.70% |
|  | 12 | 25.89% | -39.96% | -22.45% | -12.75% | -2.81% | 9.88% | 26.20% | 39.98% | 41.54% | 40.61% | 32.31% | 24.42% | **16.32%** | 6.85% | -0.60% | -6.89% |
|  | 13 | 24.45% | -38.49% | -13.75% | -8.08% | -2.24% | 17.23% | 32.62% | 36.79% | 43.24% | 37.85% | 35.85% | 31.37% | 24.31% | **15.49%** | 6.38% | -6.44% |
|  | 14 | 40.98% | -30.87% | -9.92% | -5.86% | 4.99% | 23.77% | 30.12% | 28.41% | 43.02% | 36.62% | 44.48% | 40.20% | 33.79% | 23.55% | **13.67%** | -1.98% |
| Value | 15 | 13.69% | -26.62% | -11.94% | 5.30% | 9.56% | 17.08% | 22.75% | 49.96% | 41.58% | 38.40% | 36.05% | 41.01% | 39.71% | 36.98% | 29.96% | **12.27%** |

Table 2: One-year average returns for each decile transition, all US companies 1983-2009

**Table 4**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Year 2** | | | | | | | | | | | | | | | | | | |
| **Year 1** |  |  | NoEP | LoserQ1 |  |  |  | LoserQ5 | Glamour |  |  |  |  |  |  |  |  | Value | **Sum** |
|  |  | 00 | 01 | 02 |  | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | **E(Rtn)** |
| LoserQ1 | 01 | -7.77% | -4.26% | 4.30% | 4.76% | 4.82% | 3.09% | 1.75% | 1.33% | 1.79% | 0.92% | 0.86% | 0.56% | 0.66% | 0.14% | 0.75% | 1.38% | **15.07%** |
|  | 02 | -2.58% | -6.97% | 0.10% | 4.05% | 6.52% | 5.52% | 2.47% | 1.39% | 1.39% | 1.08% | 0.98% | 0.36% | 0.44% | 0.48% | 0.91% | 1.16% | **17.31%** |
|  | 03 | -0.68% | -4.74% | -3.71% | 1.87% | 4.77% | 5.92% | 3.15% | 1.70% | 1.45% | 0.74% | 0.56% | 0.46% | 0.54% | 0.24% | 0.12% | 0.58% | **12.97%** |
|  | 04 | 0.47% | -2.94% | -2.87% | -0.75% | 2.06% | 5.88% | 3.07% | 1.62% | 0.95% | 0.86% | 0.62% | 0.30% | 0.42% | 0.43% | 0.51% | 0.27% | **10.92%** |
| LoserQ5 | 05 | 0.53% | -1.74% | -1.71% | -1.16% | -0.37% | 8.13% | 4.62% | 1.53% | 1.00% | 0.91% | 0.38% | 0.27% | 0.42% | 0.28% | 0.39% | -0.12% | **13.36%** |
| Glamour | 06 | 0.50% | -1.21% | -1.06% | -0.37% | -0.34% | 1.38% | 6.87% | 2.90% | 1.10% | 0.61% | 0.53% | 0.15% | 0.08% | 0.07% | -0.10% | -0.20% | **10.91%** |
|  | 07 | 1.40% | -1.02% | -0.53% | -0.35% | -0.25% | 0.32% | 4.45% | 6.31% | 1.63% | 0.27% | -0.05% | 0.02% | -0.24% | -0.23% | -0.14% | -0.30% | **11.27%** |
|  | 08 | 0.83% | -0.72% | -0.44% | -0.49% | -0.08% | 0.02% | 2.31% | 5.51% | 4.75% | 1.75% | 0.17% | -0.06% | -0.25% | -0.37% | -0.39% | -0.37% | **12.16%** |
|  | 09 | 0.66% | -0.45% | -0.46% | -0.25% | -0.01% | 0.35% | 1.37% | 3.19% | 4.72% | 3.54% | 1.41% | 0.38% | -0.26% | -0.41% | -0.54% | -0.38% | **12.83%** |
|  | 10 | 0.81% | -0.53% | -0.45% | -0.19% | -0.08% | 0.05% | 0.96% | 2.11% | 3.36% | 3.58% | 3.10% | 1.46% | 0.20% | -0.22% | -0.55% | -0.37% | **13.27%** |
|  | 11 | 1.13% | -0.44% | -0.27% | -0.15% | 0.04% | 0.18% | 0.77% | 1.95% | 2.31% | 3.03% | 3.35% | 2.70% | 1.06% | 0.11% | -0.43% | -0.51% | **14.81%** |
|  | 12 | 1.08% | -0.52% | -0.39% | -0.24% | -0.06% | 0.28% | 0.75% | 1.30% | 1.86% | 2.45% | 3.13% | 3.19% | 2.58% | 1.02% | -0.06% | -0.38% | **15.99%** |
|  | 13 | 1.16% | -0.58% | -0.24% | -0.16% | -0.05% | 0.53% | 1.07% | 1.16% | 1.52% | 1.86% | 2.37% | 2.98% | 3.39% | 2.68% | 0.96% | -0.47% | **18.18%** |
|  | 14 | 1.85% | -0.66% | -0.26% | -0.16% | 0.15% | 0.76% | 0.87% | 0.80% | 1.20% | 1.31% | 2.00% | 2.29% | 2.96% | 3.58% | 2.92% | -0.28% | **19.34%** |
| Value | 15 | 0.82% | -1.44% | -0.49% | 0.18% | 0.32% | 0.55% | 0.71% | 1.26% | 0.95% | 0.98% | 0.76% | 1.38% | 1.74% | 2.43% | 4.00% | 4.21% | **18.35%** |

Table 3: Expected one-year returns for each decile, all US companies 1983-2009

**Table 5**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Glamour decile | Value decile | All profitable companies |
| Median | 1.91 | 0.56 | 0.93 |
| Mean | -13.76 | 0.01 | -1.24 |
| Standard Deviation | 406.69 | 4.32 | 128.56 |
| Skewness | -20.43 | -17.38 | -64.44 |
| Kurtosis | 1207.84 | 800.64 | 12031.81 |

Table 4: Summary statistics for (next year's E/P expressed as a proportion of the current E/P), all US companies with positive earnings, the glamour decile and the value decile, 1983-2009

**Table 6**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Investment horizon (years) | | | | |
|  | 1 | 2 | 3 | 5 | 10 |
| $1,000 initial investment in Loser1 decile | | | | | |
| Mean | $1,153.48 | $1,294.48 | $1,434.26 | $1,732.93 | $2,701.08 |
| Compound return of mean | 15.35% | 13.78% | 12.77% | 11.62% | 10.45% |
| Median | $866.30 | $1,039.48 | $1,028.93 | $1,028.93 | $1,023.81 |
| Compound return of median | -13.37% | 1.95% | 0.96% | 0.57% | 0.24% |
| Standard Deviation | $488.12 | $687.82 | $882.13 | $1,337.04 | $2,990.90 |
|  | | | | | |
| $1,000 initial investment in Glamour decile | | | | | |
| Mean | $1,110.56 | $1,237.16 | $1,396.43 | $1,734.44 | $2,868.92 |
| Compound return of mean | 11.06% | 11.23% | 11.77% | 11.64% | 11.11% |
| Median | $1,124.10 | $1,245.06 | $1,392.50 | $1,694.42 | $2,435.11 |
| Compound return of median | 12.41% | 11.58% | 11.67% | 11.12% | 9.31% |
| Standard Deviation | $178.88 | $307.79 | $431.04 | $731.77 | $2,022.03 |
|  | | | | | |
| $1,000 initial investment in Value decile | | | | | |
| Mean | $1,184.45 | $1,364.12 | $1,554.29 | $1,957.38 | $3,246.61 |
| Compound return of mean | 18.45% | 16.80% | 15.84% | 14.38% | 12.50% |
| Median | $1,136.90 | $1,378.11 | $1,585.10 | $1,981.57 | $2,795.90 |
| Compound return of median | 13.69% | 17.39% | 16.60% | 14.66% | 10.83% |
| Standard Deviation | $175.38 | $319.73 | $474.47 | $816.42 | $2,268.31 |

Table 5: Mean and median returns over 10,000 trials and holding periods of one to ten years, starting in three different deciles

**Chart 1**



Figure 1: Number of profitable and loss-making companies on CRSP/Compustat by year, all US companies 1951-2010

**Chart 2: Percentage of Loss-Makers**



Figure 2: Percentage of loss-makers on CRSP/Compustat by year, all US companies 1951-2010

**Chart 3**



Figure 3: Distribution of next year's E/P expressed as a proportion of the current E/P, all US companies 1983-2009

**Chart4**



Figure 4: Distribution of value and glamour companies across deciles in year 2, all US companies 1983-2010

**Chart 5**



Figure 5: Distribution of next year's E/P across deciles for glamour shares: observed, approximated by a truncated Cauchy distribution, and with the scale parameter reduced by 18% so as to give returns equal to that for all shares. All US companies 1983-2009

**Chart 6**

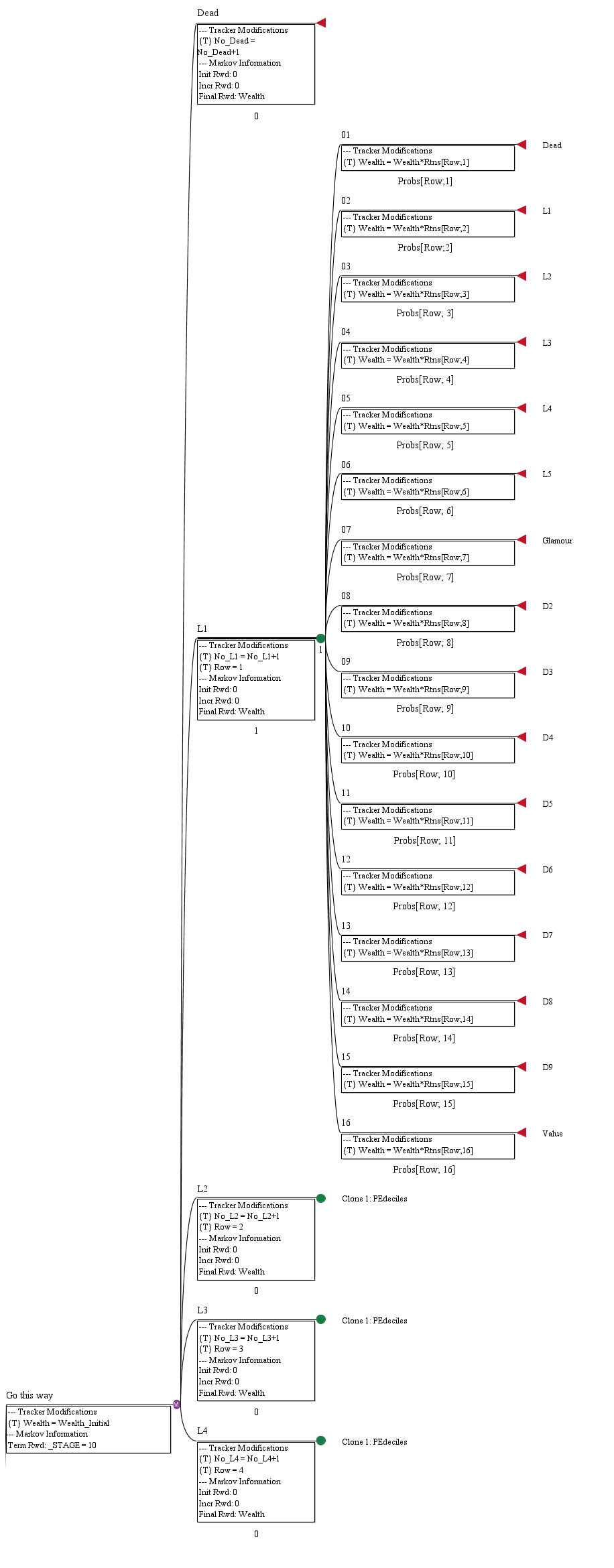


Figure 6: Markov model of the moves between P/E deciles. In this example the investor starts with an L1 stock (the most extreme loser stocks) with probability 1, but then may move next year to any one of the other 15 states, depending on the lookup in the table of transition probabilities as in Table 1. States L5, Glamour, D2-D9 and Value are omitted due to scale limitations.

**Chart 7**

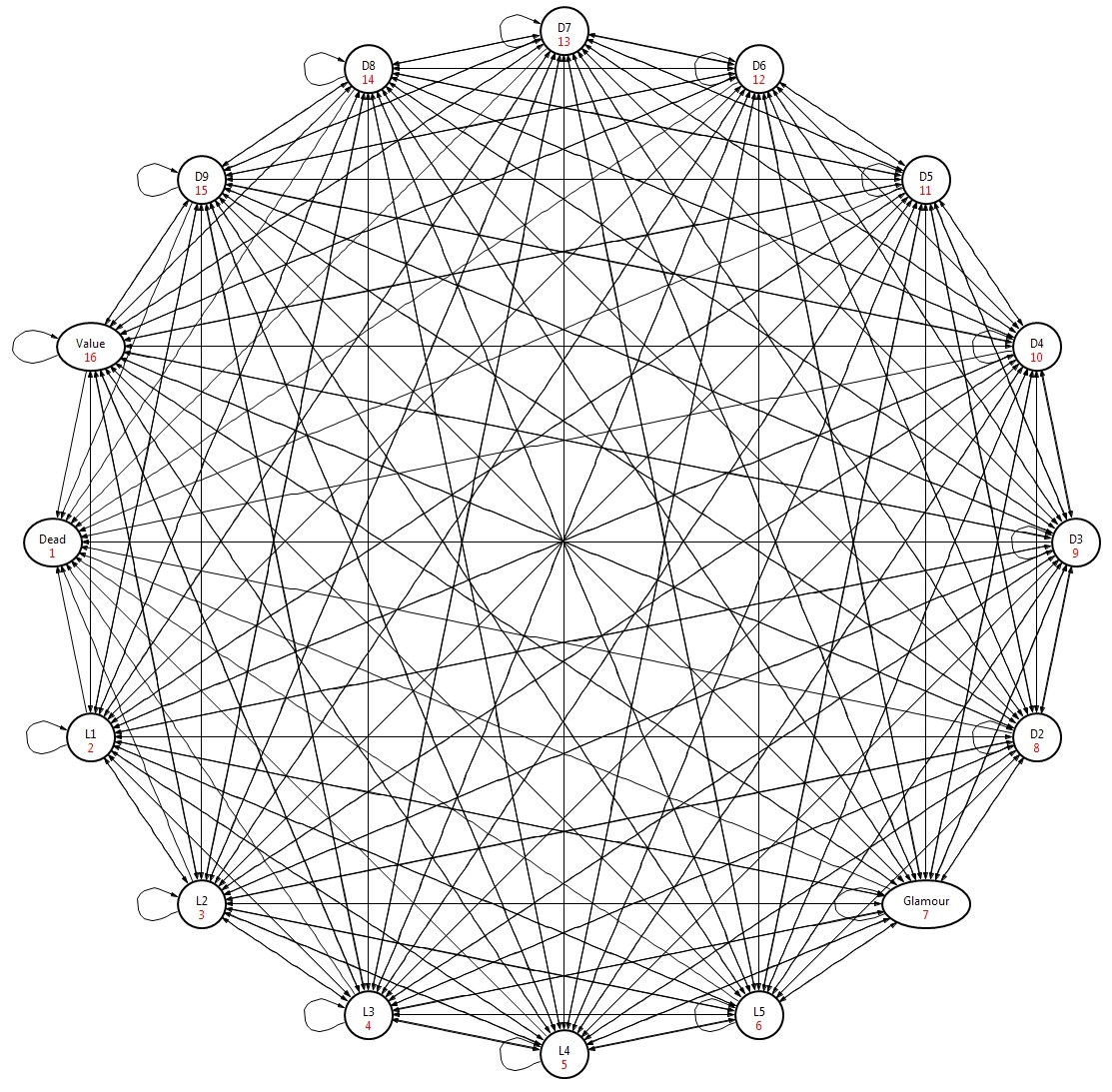


Figure 7: Markov model state transition diagram. The investor enters a chosen state with probability 1 (chooses which P/E decile to buy into). Each state may return to the same state next year or move to any of the other 15 states, except for the Dead state which terminates.

**Chart 8**



Figure 8: Average time in state over the nine subsequent years of a ten-year horizon for initial investments in the extreme loser, glamour and value deciles