

The Triumph of Experience Over Hope

November 2022

In 2014 Michael Lewis's *Flash Boys* introduced the public to the frantic practice of high frequency trading. Orders, millions per second, executed at speeds to outpace or even front-run others. A frenetic world about as far away from Lindsell Train's languid approach as possible. Since the book's publication eight years ago, we've bought a grand total of four new stocks for our Global Equity Fund. In the 11 years since the Fund's launch, excluding takeovers we have made just four complete sales. Far from splitting seconds, our since-inception turnover averages at under 4% per annum, giving an implied holding period of over 25 years.

But whilst others may operate in isolation from longer-term events, our time frames expose us to the constant flux of modern life. Think how much has changed over the past 25 years. The millennium bubble and bug, 9/11, smartphones and social media, the GFC, Brexit, and so on. Personal experience emphasises recency, but change is not just a 21st century phenomenon. Over the past 100 years, the shape of industry has transformed completely. In the 1900s railways dominated, making up around two thirds of the US market (according to data compiled by the LBS's Elroy Dimson, Paul Marsh, and Mike Staunton for their landmark *Triumph of the Optimists* book). Today however, railways contribute less than 1%, ceding authority to the internet. Multifarious 'tech' has swelled to a third of the US equity market, with the bulk of this coming from just five businesses (Apple, Microsoft, Alphabet, Amazon, and Tesla at the time of writing), only two of which are older than our implied 25-year time horizon. As Dimson and co. note, "*Of the US firms listed in 1900, more than 80% of their value was in industries that are today small or extinct*". Clearly, we face both disruption and opportunity, each paced to challenge long-term investors like us.

And so, in reviewing our portfolios we must ask, is it rational to make so few changes in a world that changes so much? At the very least all this renovation and revolution threatens the companies trying to navigate it. Several studies document the caustic impact this has on corporate survival. For example, in 2001 McKinsey's Richard Foster and Sarah Kaplan published their influential *Creative Destruction*, estimating the average listed lifespan of a US company at just 15-20 years (down from 30 in the 1970s). More recently, in his 2017 book *Scale*, the Santa Fe physicist Geoffrey West documented the alarmingly high rate of corporate mortality, noting for example that of the 28,853 companies that traded on the US stock market between 1950-2009, almost 80% had vanished over that period. The economist Paul Ormerod (author of *Why Most Things Fail*) summarised the situation by noting, "*I am often asked by would-be entrepreneurs 'How do I build a small firm for myself?' The answer seems obvious: buy a very large one and just wait.*"

Yet, for an investment approach that specifically hunts for rare, exceptional companies, we should be wary of such generalised data. It's the outliers that hold the most interest and scrutinising our portfolios reveals more durability than these studies perhaps imply. For instance, in our Global Equity strategy more than half of our holdings are over 100 years old. Next year Disney will join this list, taking us to 16 centenarians out of 24 holdings. Our oldest is the London Stock Exchange (LSE), which with roots going back to the 17th century is now over 300 years old as a business. These companies are all atypical survivors. They were already around in the gilded age of the railroad tycoons and yet still thrive through today's digital revolution. They sit at the heart of our portfolios, supporting the thesis that old needn't mean decrepit or dilapidated; that these vintage companies still have plenty of life in them.

The LSE is a particularly good example of that, being our eldest, but also top performing holding. We've owned it in our Global Equity Strategy since its 2011 launch and have so far enjoyed more than a 12-fold total return from the shares, comfortably outpacing even the Nasdaq Composite's otherwise impressive six-fold GBP return. And yet unlike the constituents of the tech-heavy index (which have an average listed age of less than 20 years), the LSE was already 313 years old when we started the clock.

But we now have two somewhat jarring narratives to wrestle with - the disruptive backdrop of enormous industrial and technological change, contrasted with the documented longevity of our holdings. To attempt a resolution, we will need a more comprehensive framework to consult. A standard model to compare our businesses to, to ask from a longevity perspective, how unusual they really are.

Fortunately, over the years attempts have been made to construct just such a model. An initial approach was to take an anthropomorphic, life expectancy-based view of corporations. T. Rowe Price Jr. was an early exponent of this view arguing in a series of articles for Barron's in 1939 that growth investors might follow a "*theory of investment, based on the recognition of*

the fact that corporations have life cycles similar to those of humans". More formally, social scientists have borrowed concepts from organisational ecology (a cross-discipline combining evolutionary insights with economics and sociology), arguing that companies, as they age, succumb to a 'liability of senescence' or 'obsolescence'. A 1994 study by David Barron, Elizabeth West, and Michael Hannan provided some support for this idea, noting higher failure rates in older businesses, at least when controlling for size across certain industries.

How might corporate survival rates look if we compare them to living organisms? Well, to reflect the above fixed life expectancy assumption, we would need to incorporate mortality rates that *increase* with age. We need a model where a business' generalised chance of failure rises as it matures, as it does for naturally aging organisms. To fit this to a population, we must then call upon a probability density function that represents this feature (of which there are several), with the ubiquitous Gaussian or normal distribution perhaps the most familiar. If we follow Foster and Kaplan's data and assume a 15-year mean life expectancy as the model's input, we can use the Gaussian to construct a 'survival function' for a population of companies. In simple terms, this allows us to plot rates of survival over time, giving us a clear illustration of the chances of such an idealised company making it to a given age. The result of this is the green line presented in Figure 1(a). As you can see from the chart, the drop off in survivors at higher ages is steep, making the chance of a business reaching the ripe old age of 100, essentially zero. Indeed, via this distribution, the likelihood of a business making it past even 35 years (as all but two our portfolio companies already have), is negligibly small at just one in 76 billion. Clearly, this model is of limited use for understanding our portfolio companies, which if viewed through this lens, are reduced to statistical impossibilities. It would appear then that we can comfortably reject this increasing hazard rate approach, as unrepresentative of the world around us.

However, amongst organisational ecologists, there exists an alternative proposal; that any liability of senescence might balance with other, similarly serious business risks earlier on in a company's life, generally termed 'liabilities of newness' and 'adolescence'. The general idea is that times are always tough, not just in old age, given that youth bestows enough challenge (for example limited access to capital, brand recognition, scale, etc.) to counter its benefits (dynamism, innovation, etc.). If correct, this would imply the existence of a *constant* hazard rate, arguing for failure as an ever-present threat throughout corporate life, with its severity independent of age. Mathematically this is represented by an exponentially decaying probability density function which exhibits the important property of self-similarity (the curve has the same shape, no matter which period you look at) and invariance to age. Like the normal distribution and its cousins, exponential decay is a common survival model found in many natural phenomena, including the classic pattern of radioactive decay. Within the context of firm survival, this idea was proposed and empirically tested by Alex Coad in his 2010 study *Investigating the Exponential Age Distribution of Firms*, where the disappearance rate of US companies between 1976-2009 was fit to an exponential function with reasonable success.

Coad's work was extended and updated by one of Geoffrey West's colleagues Madeleine Daepf for a 2015 Interface paper, building what is now perhaps the benchmark study on corporate survival. Crunching through the vast trove of S&P Compustat data dating back to the 1950s, Daepf reaffirmed Coad's exponential distribution, concluding that most businesses, irrespective of their current age, do indeed have an equal chance of failing - and do so with an average life expectancy of just 10 to 15 years (consistent with Foster and Kaplan's data from 2001). The corresponding constant hazard exponential decay survival function is plotted as the blue curve in Figure 1(a).

From each chart, you can see that, via these models, the likelihood of a business getting to 100 is slim. As already noted, it is essentially zero via the normal distribution, but even the exponential curve estimates it as just one in 22,000. The chance of getting past 200, as the LSE has¹, is one in a billion. So according to either regime, our 100-year-old portfolio companies are at best anomalous. The LSE's venerability, if viewed as an 'average' company, would be fiction. Hence, whilst it's nice to think of our companies as being special, one in a billion may be going a little far. The exponential fit works well for most listed businesses, so we've improved upon the biologically inspired normal distribution, however it fails at the extremes. Fine for most use cases, but not so good if that's where our interests (and portfolios) lie. Towards the end of Coad's study, he acknowledges exactly this, noting that "*At the upper tail, the oldest firms are older than the exponential would have predicted. [...] One might even suppose that the popular empirical methodology of excluding extreme observations as 'outliers' may well overlook this upper-tail phenomenon completely.*" Outside our portfolios we might reference other famous antiques, such as Japan's Onsen Keiunkan, reputedly the world's oldest company at 1,317 years young. To put it mildly, its existence would be

¹Is the LSE really 300 years old? It's a relevant question in the sense that there are many ways to define age (since founding, since listing, since merging, etc.) and this will impact any empirical review of survival. It's a problem wrestled with by all the above studies with most using years as an independent or listed company as a proxy for age. In general, this works, but for outliers such as the LSE (which only demutualised in 2001) it can lead to serious underestimation. As to the company's true heritage, the answer can only be determined by specific inquiry. The exchange's origins lie either with Sir Thomas Gresham's Royal Exchange of 1571, or the 17th century coffeehouses (most famously Jonathan's which from 1698 was used to list and trade commodities) that seeded the formal exchange. More conservatively, the exchange was formally regulated from 1801, so you could argue this as it's official start date; but even that puts it as being well over 200 years old.

entirely implausible as far as the normal or exponential distributions are concerned.

The next step then is to investigate what makes the LSE and our other corporate veterans different. Why do they stand apart? In our view, the answer lies in a deeper understanding of economic 'moats'. Introduced by Buffett, the term reflects the tenacity of a business model and its barriers to competitive entry. Moats ultimately determine the durability of excess returns and are highly coveted. However, whilst many companies claim shelter from some form of moat, they are not all created equally. In our experience, most are built into unstable foundations (technology being a particularly precarious competitive advantage) and ultimately prove transitory. Mean reversion is revered for a reason. Higher turnover strategies perhaps navigate this fade by trading around it, but as long-term investors we need something more durable. Moats that last not just years, but decades.

To return to the example of the LSE, the business evidently has a moat. One that's guaranteed its long survival and helped to protect its remarkably profitable operation. It is a very old marketplace, but the essence of the approach, that of attracting traders to a dominant venue, has proven extremely robust. Customers come because it alone offers them the liquidity, they both require and create, and the resultant network effects buttress the moat. Importantly, the dynamics that support this, strengthen with time. Liquidity leads to engagement and hence more liquidity. The moat deepens with age and with use and becomes self-reinforcing. This is a core principle, that in our experience, the deepest moats, the most durable over long time spans, are those with *self-sustaining* qualities that improve with age. Those without form unstable equilibria, are fragile to permutation and ultimately succumb to entropy.

The challenge then, is to broaden our current frameworks to incorporate this line of thinking. Happily, here we can draw on more external help in the form of a simple but powerful concept, that of the '*Lindy effect*'. First articulated by Benoit Mandelbrot but popularised by Nassim Taleb, this is the observation that the longer something has endured, the longer it is likely to go on enduring.² That the act of survival, itself is a demonstration of survivability.

Quoting Taleb directly, he states that "*Every year that passes without extinction doubles the additional life expectancy. This is an indicator of some robustness. The robustness of an item is proportional to its life, [...] the direct result of 'winner-take-all' effects in longevity*". Taleb's Lindy applies easily to things like literature or music, but it fits more generally to other non-perishable quantities like ideas, philosophies or even religions. And here I argue its relevance for companies and their moats as well. That true, self-reinforcing economic moats that have already endured, are more likely to continue to do so, in part because of their self-sustaining characteristics.

If that's correct, then we must rebuild our survival models. Emphatically, Lindy undermines both prior survival models, dismissing the *increasing* and *constant* hazard assumptions. Instead, we need to adjust our framework to incorporate a *decreasing* hazard rate; to account for the fact that older companies, having already proven themselves, might be *less* likely to fail than younger ones. Can we build this into a formal probability distribution? Mandelbrot and Taleb had hinted at a mathematical articulation of the Lindy concept, but in 2017 the mathematician Iddo Eliazar published the first full workings showing the Lindy effect's formal analogy to a power law or Pareto distribution. It takes some mental agility to note the coincidence of a relation best known for mapping wealth distributions or city sizes to an age dependant probability function, but the link is now well established. Specifically, a power law relation with a Pareto exponent of two delivers the required Lindy effect, whereby current age and future life expectancy are matched. As before, the corresponding survival function can be seen plotted (in orange) in Figure 1(a).

Comparing this distribution to our earlier normal or exponential models the key difference is that whilst the drop off is sharper, the tail is *much* fatter. In truth, this is tricky to discern from a linear plot, so Figure 1(b) redraws the comparison on a logarithmic axis, allowing us to visualise, through the tangled spaghettis, the power law's fat tail much more clearly. The orange power law curve, after its initial steep drop, eventually falls off much more slowly than the other lines as we move up to greater ages.

Gratifyingly, if we now look at the expected survival figures for older companies, we find that this new distribution does indeed make intellectual room for the LSE and our other holdouts. The chance of making it past 100 years as described by our power law is now one in 10,000 and the probability of reaching 200 years is no longer 1 in a billion, but a much healthier 1 in 40,000. Putting some real-world numbers to this, with an estimated 200 million companies currently in existence, we might

²The term originates with a 1964 article written by Albert Goldman for The New Republic as a "*law established and promulgated by bald-headed, cigar comping know-it-all's who forgather every night at Lindy's*". However, its initial formulation reflected the amount of material comedians had access to and their longevity based on its exhaustion. Mathematician Benoit Mandelbrot devised its modern iteration in his 1982 book The Fractal Geometry of Nature, however it was Nassim Taleb (in 2007's Black Swan and 2012's Antifragile) who expanded, defined, and ultimately popularised the concept. Note, that a necessary condition for Taleb's formulation is non-perishability. A moat must be based on potentially permanent, non-wasting resources. Things like ideas, IP, brands, or networks - not physical, degrading assets like hardware, infrastructure tech (or comedians). It's for this reason that you'll find the former in abundance in our portfolios.

expect to find roughly 20,000 100-year-olds, 5,000 200-year-olds and 2,000 300-year-olds: vs. almost none from our prior models. For comparison, a 2008 study from the Bank of Korea estimated that there were 5,586 extant 200-year-old companies. In other words, we would still expect our survivors to be rare (as in the real world they are), but we now have a much more realistic assessment of their scarcity, allowing us to make better sense of their prospects from here. And so, directly referencing our portfolio, it's worth noting that the average age of the businesses we own is 120 years old. Even via our new model they still represent remarkable success stories - but they are plausible successes too. There are a lot of companies out there to whittle down from, and via Lindy, time not subjective judgement is doing this job for us.³

At this point, it may help to give a further example of these self-reinforcing moats to illustrate the idea, drawing from the consumer franchises side of our portfolio. In our view, strong consumer brands can similarly exhibit Lindy-compatible anti-ageing properties. Consider, that the longer a company invests in its brands through advertising and R&D, the stronger and more resonant they may get. When successful, a self-sustaining feedback loop is established, whereby it becomes ever harder to recreate a heritage-rich brand from scratch, raising barriers to entry, and proportionately increasing its likely lifespan. There are plenty of long-lived portfolio franchises I could reference here, but I've gone with PepsiCo; partly because we have good time-series stats on it (beware data bias!) but also, as I hope will become evident, because Pepsi over its 129 years has succeeded in creating some wonderfully deep moats.

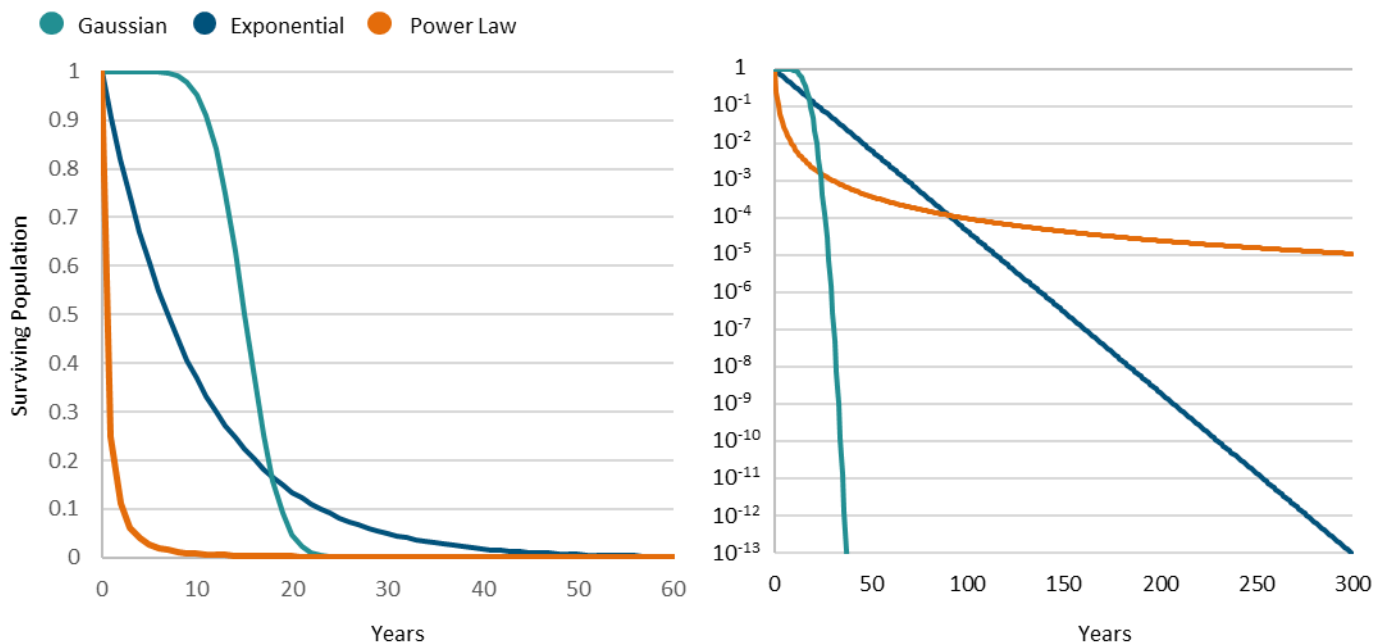


Figure 1: (a) linear and (b) logarithmic axis plots showing the cumulative parametric survival functions corresponding to three theoretical regimes. The green line shows the survival function for an increasing hazard normal distribution with a mean of 15 years and a standard deviation of 3. The line in blue shows the survival function for a constant hazard exponential decay curve with a decay constant λ of 0.1 years⁻¹ (corresponding to a mean lifetime of 10 years or a half-life of 6.9). The line in orange shows the survival function for a decreasing hazard power law distribution corresponding to a Pareto exponent of 2.

With Pepsi Cola you get the flagship soft drinks brand, which is both global and generational, but you also get the Frito-Lay salty snacks portfolio assembled alongside it, claiming nearly 40% of the global market. That's ten-times greater than the nearest competitor and likely higher than the next 65 competitors combined. These are exceptionally strong global brands with market shares to match; the long-term empirical result being Pepsi's dividend record which over the past 66 years (as far back as we've been able to go) has compounded at an annualised rate of 10%. Pepsi is no 'in at the ground floor' start-up today, but it wasn't six decades ago either. Early growth investor Philip Fisher put it well when in 1958 (two years into Pepsi's current winning streak) he wrote of "companies which in spite of outstanding prospects of major further growth are so financially strong, with roots going so deep into the economic soil, that they qualify under the general classification of 'institutional stocks'". PepsiCo fits this description well.

³Interestingly, a 2002 paper from economists William Cook and Paul Ormerod also explored power law distributions as a way to map firm demise, using the six million-strong American Office of Advocacy database (covering the period from 1989-1997) for empirical grounding. Whilst they didn't discuss the underlying dynamics, they did draw a fascinating parallel with evolutionary survival. Biological extinction events are also thought to follow a power law distribution with an exponent of two and it seems highly likely that the survival-of-fittest fate of species also follows Lindy. Sadly, here too failure is the norm with 99% of all species that have ever existed now extinct.

So, to connect back to our original question: Yes, despite the disruption out there, some companies do merit multi-decade holding periods. For the true long-term Pepsi investor, if you had bought back in 1980 (when Bloomberg's pricing data begins, and the company was already 87 years old) you'd today be looking at more than a 370-fold USD total return. Ten times that of the MSCI World. Like the LSE, Pepsi's moat has both defined its survival, and allowed it to protect high internal rates of return over long period of time. Pepsi's core profitability as expressed through its return on equity has averaged 35% over the three decades we have on record; more than double the equivalent peak figure for the MSCI World. Effective long-term compounding creates immense value but requires both survival and the persistence of high rates of return on reinvestment. Both stem from deep and self-sustaining moats. PepsiCo demonstrably delivers this; the dividend it paid out in 2021 alone, would have been enough to buy the whole company three-times over at its 1980 share price.

For those wanting a clear practical application from all of this, I'll finish this note by arguing the relevance of these models from a valuation perspective. Observing that across markets, there seems to be little if any evidence of a survivability premium. That at mid-20s earnings multiples, neither the LSE nor Pepsi appear to be priced for greatness despite everything they've already achieved. Look at Figure 2 and you'll see this fits a general pattern. Here I've plotted the approximate age of each company (given by the number of years since listing) in the MSCI index against their price to earnings multiples. You'll see no obvious positive correlation, and no evidence that you are having to pay up for longevity.

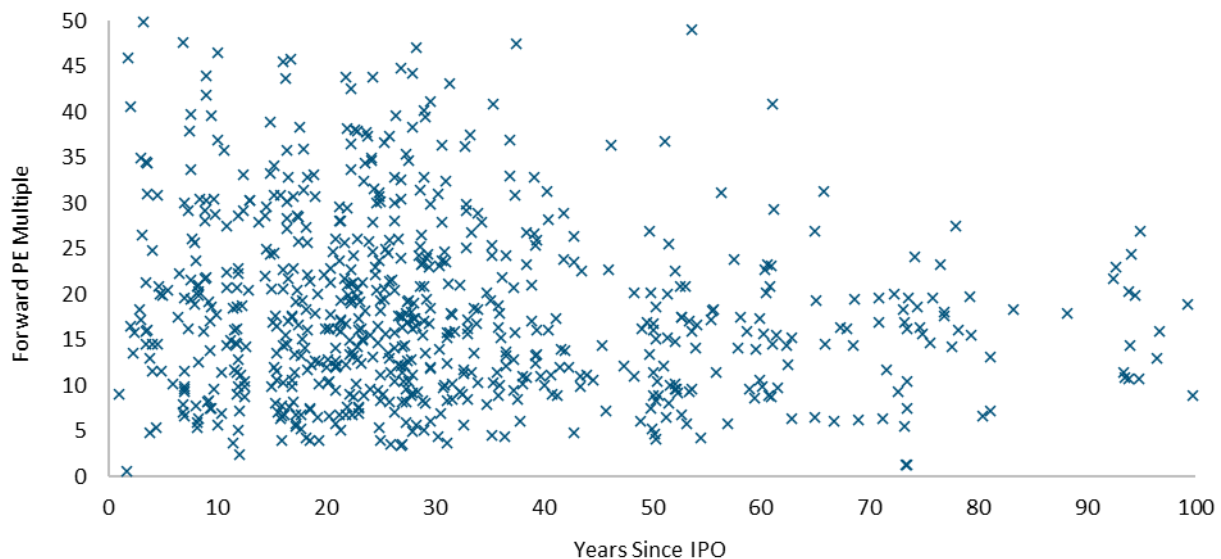


Figure 2. Scatter chart showing the 764 members of the MSCI World index for which Bloomberg provides age data, plotting their forward PE multiples against the number of years since IPO (used here as a rough proxy for company age). Data sampled 10th October 2022.

It's unclear to us why. Perhaps older companies simply aren't as exciting as their younger, shinier competitors? Perhaps markets, assuming mean reversion, distrust the likes of Pepsi or the LSE as outliers? If the above Gaussian distribution was applicable, then this would indeed be a fair assumption. Normally distributed quantities like height, IQ or (to an approximation) biological life-expectancy do indeed mean revert across populations. Under such a regime, statistical anomalies tend not to last, and it makes sense to dismiss irregularities as temporary. However, those governed by Lindy-consistent power laws will experience the opposite effect. Outliers will not fall back in line, but over time tend to even greater extremes.

Whatever the views of other investors, the reality is that Pepsi typically trades within a range of PEs that rarely exceeds its current modest market premium. And yet as we've just seen, this is a business that over a century from founding, still earns an internal rate of return double that of the average business. In our view it should be worth a lot more than the average business. I've written more comprehensively on this in the past, but I want to briefly show here that there is an important valuation consequence of using the wrong survival models for these rare, deep-moated companies. For example, if we adopt the constant hazard exponential model, then Pepsi, like any other average business would from this point on have around 10-15 years of life left in it. What does that mean for its intrinsic value? If we assume PepsiCo continues to grow at its historic 10% rate over this time horizon and calculate its value via a simple two-stage discounted cashflow model or DCF (for example with a stage-one growth of 10%, followed by a 2.5% terminal rate, discounted at 9%, implying a 15x exit multiple), we output a valuation very close to the stock's current mid-20s earnings multiple.

If, however we defer to Lindy's power law and assume that Pepsi continues growing in proportion to its past, then self-evidently we must embrace some very different valuations. To give specific examples, extending the vital growth period up to

say 30, or even 50 years, has a dramatic impact on the business' warranted PE multiple, taking us to mid-30s or even high-50s figures. And whilst it's perfectly reasonable to question the idea of five further decades of double-digit growth, bear in mind that Pepsi has already achieved this for at least the last six. DCFs are blunt instruments, but at the very least I'd argue that if there is a mispricing here, then it's not a commonly exploited one.

There's not a lot of external research on this, but a few studies do support this idea; a notable example being the Jay Ritter's classic University of Florida reference study (*Initial Public Offerings: Updated Statistics*, 2022) quantifying the heuristic underperformance of new IPOs. Here he shows that since 1980 of the over 8,000 US firms that have IPO'd, their subsequent three-year returns underperformed the market by an annualised 2.4%. Another is a 2015 Dimson, Marsh, and Staunton study, detailing the long-term outperformance of older UK companies (those over 20 years vs. those younger than three between 1980-2014), which again found that the more venerable constituents beat the youngsters, in this case by a ratio of three to one. Third is a 2019 paper from Guo et al., which follows the typically academic finance hunt for a 'risk factor' and finds older companies outperforming in a long-short portfolio by 4% p.a., overcoming a 'known' size effect.

In closing however, I want to acknowledge an obvious criticism to all of this, that clearly there is survivorship bias at play. It's all very well to look back at dividend and share price stats from now successful companies, like the LSE or Pepsi, but how do you pick the winners beforehand? How do you predict this before the event? And, that I would argue is precisely the point. That working this out in advance is extremely hard, if not impossible - so why try? Why not embrace the inevitable survivor bias, and only pick from a universe of companies that have already succeeded? Work on the basis that their age and permanence make them more reliable, more durable, and that you have time on your side as an empirical judge of this. And so, when we look at our portfolio of successful survivors, we view their best years as still ahead of them. They are all in possession of deep and deepening moats, based around unique heritage-enriched brands, IP, and self-reinforcing networks. We have owned all but four for over a decade already and hope to still own most a decade from now as well.

James Bullock, Portfolio Manager

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Sources: Michael Lewis, 2014 Flash Boys, W. W. Norton & Company. Elroy Dimson, Paul Marsh & Mike Staunton, 2002 Triumph of the Optimists, Princeton University Press; 2021 Global Investment Returns Yearbook, Credit Suisse; 2015 Industries: Their Rise & Fall, Credit Suisse. Richard Foster & Sarah Kaplan, 2001 Creative Destruction, Broadway Business. Geoffrey West, 2017 Scale, Penguin Random House. Paul Ormerod, 2005 Why Most Things Fail, Faber & Faber. T. Rowe Price Jr, 1939 Picking 'Growth' Stocks, Barron's. David Barron, Elizabeth West & Michael Hannan, 1994 A Time to Grow and a Time to Die: Growth and Mortality of Credit Unions in New York City, 1914-1990, American Journal of Sociology. Alex Coad, 2010 Investigating the Exponential Age Distribution of Firms, Economics. Madeleine Daepf, Marcus Hamilton, Geoffrey West & Luís Bettencourt, 2015 The Mortality of Companies, J. R. Soc Interface. Ranald Michie, 1999 The London Stock Exchange: A History, OUP. Benoit Mandelbrot, 1982 The Fractal Geometry of Nature, W. H. Freeman and Co.. Nassim Taleb, 2007 The Black Swan, Random House; 2012 Antifragile, Penguin; 2018 Skin in the Game, Random House. Albert Goldman, 1964 Lindy's Law, The New Republic. Iddo Eliazar, 2017 Lindy's Law, Physica A. Kim Jae-kyoung, 2008 Centennial Firms Dry up in Korea, The Korea Times. William Cook & Paul Ormerod, 2002 Power Law Distribution of the Frequency of Demises of US Firms, Volterra Consulting. Philip Arthur Fisher, 1958 Common Stocks and Uncommon Profits, Wiley. Jay Ritter, 2022 Initial Public Offerings: Updated Statistics, University of Florida. Danqiao Guo, Phelim Boyle, Chengguo Weng & Tony Wirjanto, 2019 Age Matters, SSRN. LSE, PepsiCo, Bloomberg, Nasdaq & MSCI, November 2022.

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LTL 000-270-8 28 November 2022.

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