INSIGHT

THE GREATEST WEALTH IS **YOUR PEACE OF MIND...**

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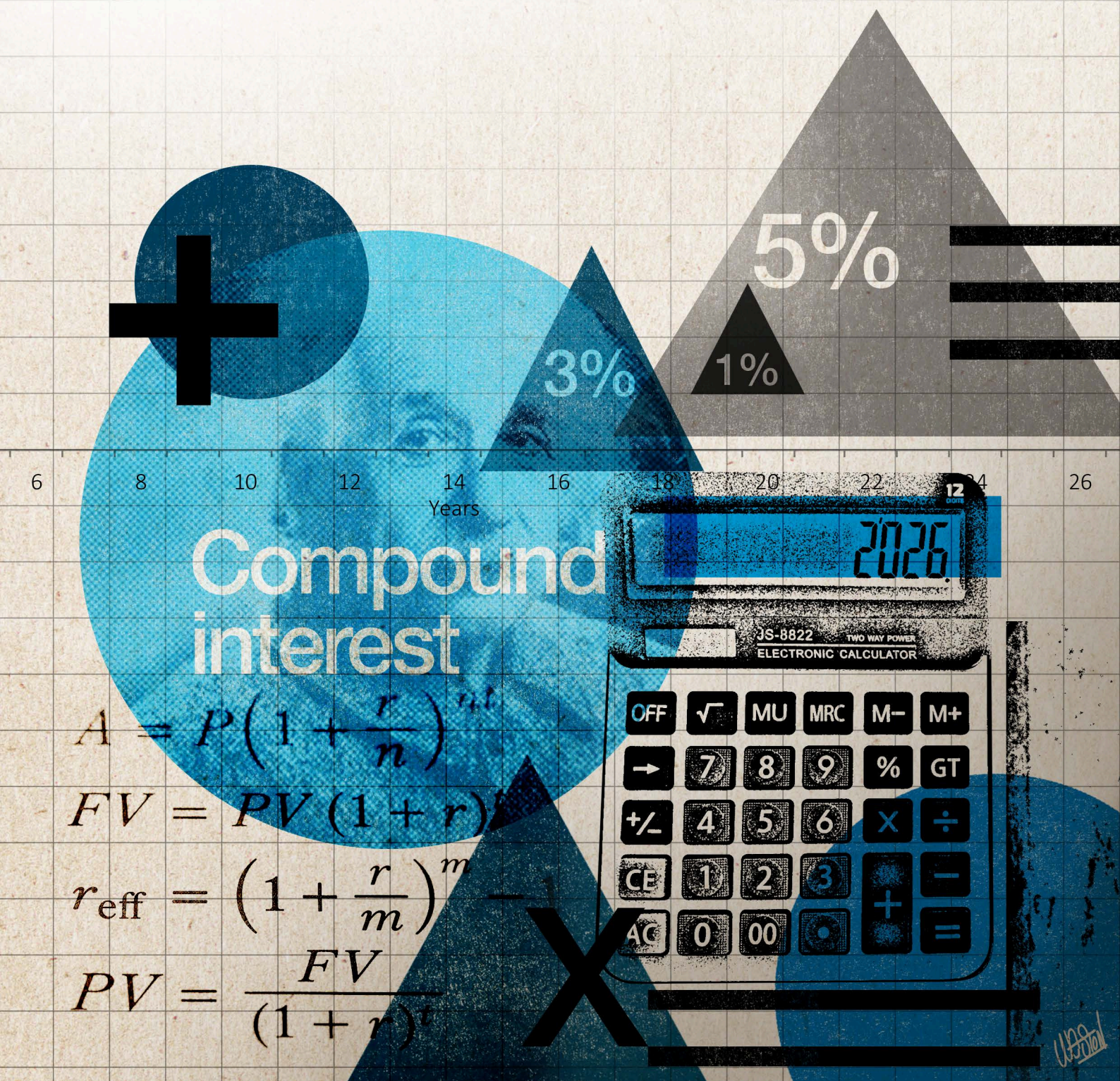
Investing:
The maths that matters



Investing: The maths that matters

> Compound interest is the eighth wonder of the world.
> He who understands it, earns it ... he who doesn't ... pays it.
>
> **Often attributed to Albert Einstein**

1. Deathbed regrets

Few people are likely to reach the end of their lives wishing they had done more maths at school. Yet plenty might wish they had thought a little more carefully about their long-term finances. The two subjects are more closely linked than perhaps we would like.

For many, double maths on a Monday morning was not the ideal start to the week. Trigonometry, calculus, algebra, or simply 'sums' were things to be endured, crammed for an exam and then, ideally, forgotten.

Fortunately for savers, successful investing does not require advanced mathematics. But a little basic maths can provide some powerful insights into how money behaves over long periods of time. Be brave, read on.

2. Basic maths in financial planning

Financial planning, at its simplest, involves balancing the resources we have today with what we might need in the future. That requires us to think about how much to save, how long we have to invest, the returns we might reasonably expect, inflation, taxes, costs and eventually how much we can sustainably spend.

Fortunately, a good financial planner, aided by modern cashflow-modelling tools, can deal with much of the mathematical heavy lifting.

Yet, understanding a few of the principles that sit behind the calculations remains useful. One of the most important is compounding.

Retirement maths

Funding retirement can involve some daunting numbers. A portfolio of around £1 million, for example, might support an initial retirement income in the region of £30,000-£40,000 a year, although the appropriate figure will depend heavily on individual circumstances. Building a portfolio of that size takes time and regular saving. The table on the next page shows the monthly contribution required over different time horizons and at a range of assumed real (after inflation) returns. Starting earlier makes an enormous difference.

	After-inflation rate of return				
Saving period	1%	2%	3%	4%	5%
10 years	£7,900	£7,500	£7,200	£6,800	£6,500
20 years	£3,800	£3,400	£3,100	£2,700	£2,500
30 years	£2,400	£2,000	£1,700	£1,500	£1,200

Table 1: Approximate monthly contribution required to build £1,000,000

Source: Albion Strategic Consulting. Contribution assumed at end of month. Figures rounded to nearest £100.

Fortunately, time can do some of the heavy lifting. Compounding means that returns themselves begin earning returns or, as Benjamin Franklin put it, 'The money that money earns, earns money'. The earlier you start, the longer you give the maths to work in your favour. One of the greatest financial gifts that grandparents and parents can pass to the younger generation is the understanding of compounding and the need to start investing early.

3. An insight into market returns

The tyranny of big numbers and the power of small numbers

No financial press report these days is complete without some mind-boggling numbers: 'US government debt hits $40tn…' and 'NVIDIA $493bn valuation wipeout' – a couple of recent examples (Financial Times). This leads to a tendency in some to become blasé about small numbers, and even a little disappointed in them - 'my portfolio only returned 3% above inflation last year'. Yet the small numbers really do matter and are meaningful.

Imagine three portfolios delivering annual returns, after inflation, of 1%, 3% and 5% over 30 years. £100,000 invested in each would grow in purchasing power to around £135,000, £243,000 and £432,000, respectively. What appear to be relatively small differences in annual returns can, when compounded over long periods, lead to very large differences in financial outcomes.

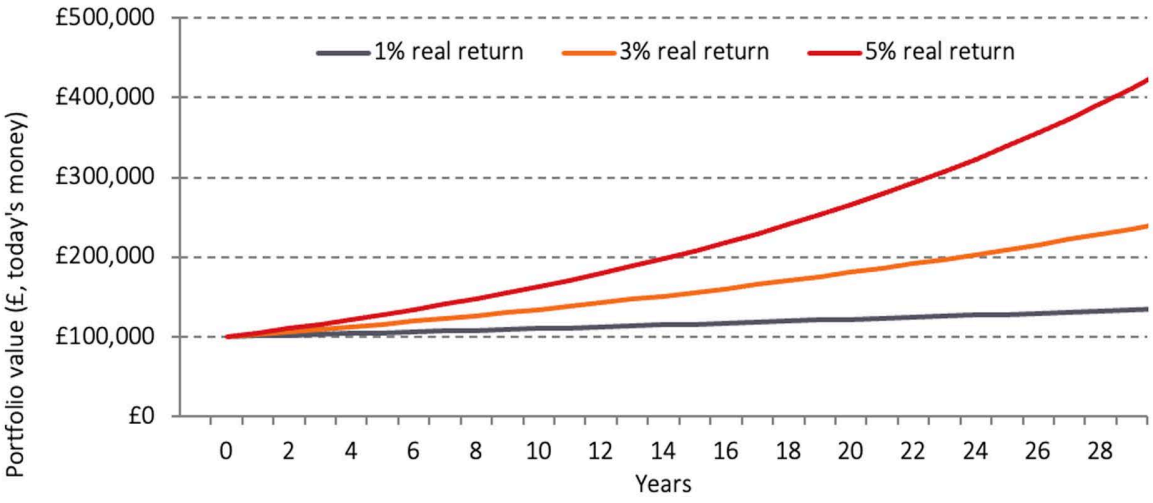


Figure 1: Compounding is a powerful concept

Source: Albion Strategic Consulting

History provides a useful reminder that ‘get rich slow’ is a pretty good slogan for investing. Trying to turn long-term market returns into a ‘get rich quick’ strategy usually requires taking risks that sensible investors would be wise to avoid. The good news is that apparently modest returns have a powerful ally: time. Do not despair. The maths gets better from here.

The ‘Rule of 72’ at work

The difficulty is that calculating compound returns in your head is not particularly easy. Fortunately, there is a useful rule of thumb: the Rule of 72.

Take the annual compound rate of return and divide it into 72. The answer provides a reasonable approximation of the number of years it will take to double your money.

Compound return	1%	2%	3%	4%	5%
Approximate years to double	72	36	24	18	14

Table 2: Years to double your money at different rates of return
Source: Albion Strategic Consulting

Although, it is wise to remember that investment returns do not come in straight lines, and the investment journey is likely to be increasingly bumpy the higher the return target. Alternatively, the Rule of 72 can be used to establish what rate of return is required to double your money over a specific number of years.

Years to double	5	10	20	30
Approximate return required	14.5%	7.0%	3.5%	2.5%

Table 3: Rate of return to double your money over a specified time horizon
Source: Albion Strategic Consulting. Rounded to nearest 0.5%.

Avoiding cost leakage becomes important

Costs compound just as returns do. Product fees, taxes and unnecessary investment activity can all reduce the return an investor ultimately keeps. So too can poor investor behaviour, particularly moving in and out of markets in response to the inevitable periods of uncertainty. Less activity is often better. Capturing as much of the market return as possible is what matters because, as the figure on the following page illustrates, even seemingly small differences in annual returns can compound into substantial differences over an investment lifetime.

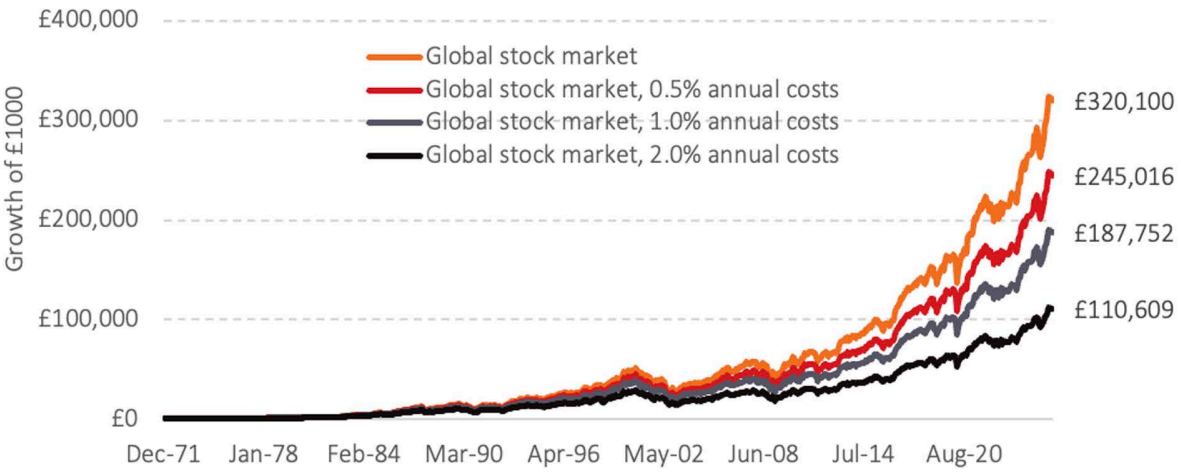


Figure 2: Compounding costs makes a big difference – the impact on stock returns

Source: Albion Strategic Consulting. Period: 01/72 - 12/25. Equities: Albion World Stock Market Research Index. Returns in GBP. See smartersuccess.net/indices for more information.

Do not underestimate inflation

The Rule of 72 works in reverse too, providing a useful insight into the damage that inflation can inflict on the purchasing power of our wealth. Even relatively low rates of inflation can have a surprisingly large impact when compounded over long periods. This is particularly relevant for those holding substantial amounts in cash, or relying on income that does not rise with inflation.

The table below reveals an uncomfortable fact: even inflation rates around the levels commonly targeted by central banks – say, 2-3% - can, given enough time, halve the purchasing power of money quicker than most might expect. At higher rates of inflation, that erosion happens much more quickly. Protecting the real value of wealth is therefore an important consideration for any long-term investor.

Annual inflation	1%	2%	3%	4%	5%
Approximate years for purchasing power to halve	72	36	24	18	14

Table 4: The erosion of purchasing power of capital by inflation

Source: Albion Strategic Consulting

4. The maths of diversification

The next piece of maths is equally simple, but has important implications for portfolio construction. As the table on the following page illustrates, two portfolios can have the same average return but quite different compound returns (i.e. the true returns achieved over the period). By diversifying sensibly across markets and asset classes, investors can avoid unnecessary concentration and potentially reduce the range of outcomes experienced along the way. Lower volatility, all else being equal, means less drag on compound returns. Over long periods, even small differences can matter.

	Year 1 return	Year 2 return	Average annual return (arithmetic)	Compound annual return (geometric)	Value at end of year 2
Portfolio A	-25%	+25%	0%	-3.2%	£9,375
Portfolio B	-10%	+10%	0%	-0.5%	£9,900

Table 5: Reducing volatility in a portfolio pays

Source: Albion Strategic Consulting

5. Conclusions we can draw from the maths

The maths leaves us with some simple but important lessons: give compounding time to work; recognise that small differences matter; minimise unnecessary costs; protect purchasing power from inflation; and diversify sensibly.

These are some of the principles that sit at the heart of the portfolios we build for clients. Just as importantly, build a portfolio that an investor can stick with when markets inevitably become uncomfortable.

Just as you may have wished at school, we have kept the maths lesson brief. But hopefully it demonstrates that a little basic maths can go a surprisingly long way when investing. Maths rocks!

Other notes and risk warnings

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