

The Stock Market Model: A New Foundation for Economic and Monetary Policy

by Andrew Smithers

Economic policy aims to preserve stability by keeping inflation stable and unemployment at historically low levels. Decisions about how to achieve these aims are inevitably based on some theory, and these theories fall into two main groups: those which are usually described as neo-Keynesian, and those based on dynamic stochastic general equilibrium (DSGE) models. For all practical purposes, however, this division does not result in central bankers having to choose between different theories when making policy decisions. Several fundamental assumptions are common to both groups, including the view that the day-to-day job of economic management is simple in theory, even if difficult in practice. It is agreed that there is only one equilibrium which must be maintained to preserve stability, and this is the balance between intentions (*ex ante*) to save and to invest. Keynes showed that the economy did not always achieve this balance through prudent adjustments of short-term interest rates; sometimes, in conditions he termed a liquidity trap, it is also necessary to boost demand through fiscal policy by increasing the size of the budget deficit. This conclusion is common to both the neo-Keynesian and DSGE approaches, and they also agree that if this *ex ante* balance between savings and investment is maintained, it is sufficient to achieve stability. Consensus economic theories have therefore been labeled as “one deviation at a time models.”¹

The problem with these single equilibrium models is that this conclusion is not only wrong but dangerous, as it results in monetary policy decisions which destabilize the economy while seeking to stabilize it. Hyman Minsky was sadly correct in remarking that “Modern orthodox

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economics is not and cannot be a basis for a serious approach to economic policy.”² Unfortunately, the efforts of current policy to support demand by preserving the *ex ante* balance between savings and investment have created other forms of instability and greatly increased the risk of another financial crisis.

As Ricardo Caballero observes, “The core approach to macroeconomics, as it is taught in most graduate programmes and as it appears in leading journals, begins with a neoclassical growth model.”³ According to these models, the cost of finance, which is termed the “user cost of capital,” determines the level of business investment. A company will buy plant and equipment if management expects the return on the money spent to match or exceed the user cost of capital, and they will not invest if they expect returns to fall short. These models also assume that this user cost of capital determines asset prices and varies with real short-term interest rates.

While these assumptions are universally agreed upon and are fundamental to consensus models, there are increasing concerns about their validity. They have recently been criticized by Nobel laureate George Akerlof on the grounds that consensus theory has “oversimplified Keynes” and leads to a “lack of attention to financial crashes as a macro topic.”⁴ An intrinsic belief that underlies consensus assumptions is that the user cost of capital cannot be directly measured and thus economists must derive an estimate of it from their models. While this used to be justified by the lack of data on returns from financial markets, empirical data have, over the past thirty years or so, become generally available. Consensus economists, however, have ignored these data—understandably perhaps since they show that the models they use are invalid.

Before these data became available, the models were untestable because the user cost of capital was derived from the models and therefore had to be consistent with them. Consensus economists liked them, as Doyne Farmer observed, “because once you assume equilibrium it is simple to derive results. But on the other hand, if that’s not how the world works it’s not what’s underlying [the] economy, then the whole thing ends up wasting time.”⁵

Thanks to the work of financial archaeologists,⁶ we now have the returns from the various forms of financial capital, in the case of the United States for over two hundred years. Debt comes in a range of different maturities, but financial capital in all its forms can, for simplicity of explanation, be usefully divided into short-term interest rates, long-dated bond yields, and equity returns. We now have reliable and

long-term information on each of these forms of finance, and we can use these data to test the consensus models.

We can, for example, see whether these models have been correct to assume that there is only one equilibrium with which policymakers need to be concerned. When these tests are made, the results are clear: consensus theory and “one deviation at a time” models are unsound; policy based on them not only fails to preserve economic stability but from time to time—and now may be one of those times—the measures taken by central bankers create a high risk of financial crises.

We therefore need to use the data we now have to build a better model, one which can be used to reduce the risk of financial crises. I call this the “stock market model.” The key difference between consensus and stock market models is that consensus models ignore the data on returns to the different forms of financial capital, and the stock market model uses them.

TWO EQUILIBRIA

Financial market data show that the consensus model is invalid in several ways:

(1) It is incorrect to assume that investment fluctuates with real short-term interest rates. When considering whether investment responds to real or nominal interest rates, Ray C. Fair concludes that “the results are strongly in favor of the nominal interest rate.”⁷

(2) We know from the relationship between changes in interest rates and share prices that the assumption that the user cost of capital varies with short-term interest rates is true only in the short but not in the longer term. As James Mitchell found in 2009:

Given the likely co-dependence of (share) prices, earnings and interest rates, it is necessary to study their relationship simultaneously rather than separately or on a bilateral basis. This can be carried out via multiple regression analysis, specifically using so-called Vector Auto Regressive (VAR) models. . . . In the long run, defined forecast horizons of five years or greater, interest movements do not appear to affect stock prices. This is consistent with the absence of a long run relationship between interest rates and stock prices. . . .⁸

(3) The difference between short-term interest rates and long-dated bond yields is not mean reverting (stationary), so long- and short-term interest rates do not fluctuate together.

(4) The ratio of the returns from long-dated bonds and equities is not stationary.

(5) The real returns on equities appear to be mean reverting. As stationarity cannot be proved, only shown to be probable, this can be denied by those who wish to defend consensus models. But as these models are already invalidated by the above points, this obscurantism cannot be used to defend the validity of consensus models but only to deny the improved understanding that comes from recognizing the stationarity of real equity returns. If this feature of the stock market is accepted, the cost of equity at any time can be calculated, and as we have data on U.S. corporate leverage and debt interest payments, we can calculate the user cost of capital and show that investment does not vary with it.

Financial market returns not only show that the consensus model is invalid, but we can also deduce from them that there are *at least two equilibria* which must be maintained for economic stability, defined as avoiding high levels of unemployment, or inflation, or both at the same time. One is the balance between savings and investment, and the other is the ratio between companies' net worth and their market value, or q ratio.

Short-term changes in near-term interest rates affect share prices, but the impact does not last. This temporary boost to share prices raises the market value of public companies relative to their net worth, which is the current "replacement value" of their assets after deducting the amount financed by debt. (Replacement values are derived by the BEA from surveys of equipment prices.) This is the equity q ratio, which is stationary, and the strength of its mean reversion rises with the level of q .

The upward push to share prices caused by a fall in short-term interest rates comes from their impact on long-dated bond yields and is therefore exacerbated when the gap between short-term interest rates and long-bond yields (the yield curve) narrows. QE does this and has helped to drive q to a record high level.

Because stock market values fall much faster than they rise, and large falls are often accompanied by financial crises, there are therefore at least two separate equilibria which need to be achieved to avoid dangerous economic imbalances. It is not only important to maintain the zero ex ante net savings balance, whose importance was demonstrated by Keynes, but we must also avoid large misalignments between the market value and the net worth of corporate equity, which is q . A major problem, however, is that policies designed to help improve the ex ante net savings balance (such as lowering interest rates) can readily destabi-

lize q . Increases in debt often drive up q , and easy access to debt stimulates excessive financial risk-taking.⁹ It thus seems probable that disequilibria can arise from excess debt as well as high q ratios, suggesting that q and ex ante savings are not the only equilibria which need to be maintained for economic stability. Debt and q , however, generally move together, so we may nonetheless have a “two deviations at a time” economy to manage.

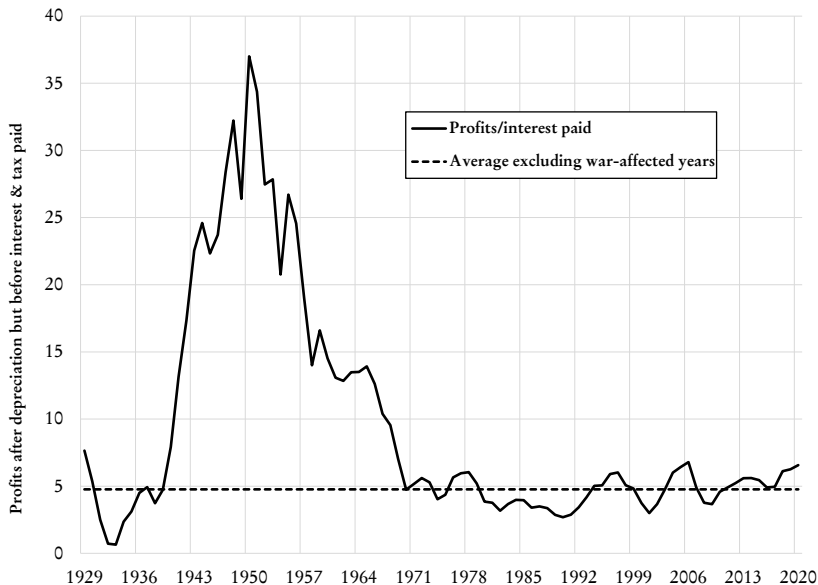
The essential difference between consensus economic models and what I call the stock market model is that neo-Keynesian and DSGE-based models ignore the data on financial market returns, while the stock market model relies heavily on this data. Consensus models are therefore untestable and thus fall on the wrong side of Karl Popper’s famous demarcation between science and nonscience, while the stock market model, by using and testing itself based on these data, justifies its claim to be scientifically valid.¹⁰ In addition, the stock market model shows that several of the assumptions of consensus theory are demonstrably wrong. Consensus economists’ determination to nevertheless stick to accepted assumptions and ignore the evidence that their models are invalid shows that they have much in common with Hobbits, who “liked to have books filled with things that they already knew, set out fair and square with no contradictions.”¹¹

PROFIT MAXIMIZATION AND INVESTMENT: q VERSUS QE

Contrary to one of the key assumptions of consensus models, Ray C. Fair shows that the level of corporate investment responds to changes in nominal rather than real interest rates. This fits with the data on U.S. corporate profits and interest payments, the ratio of which appears to be stationary, except when access to long-dated bond markets was restricted to the government during World War II, as shown in figure 1.

Companies are more exposed to the impact of inflation if they borrow short-dated debt, as the short-term change is many times greater for debt interest payments than for profits. A rise of 1 percentage point in inflation will, if reflected evenly in both nominal interest rates and profits, raise pretax profits by 1 percentage point but would increase interest payments by 50 percent if the short-term nominal rate was previously 2 percent. Companies therefore prefer to borrow long-dated bonds. But they have no incentive to pay more for debt which has a longer life than the equipment in which they are investing, and as the average life of private nonresidential fixed tangible assets is sixteen years

FIGURE 1. U.S. NONFINANCIAL CORPORATION INTEREST COVER



Source: NIPA Table 1.14.

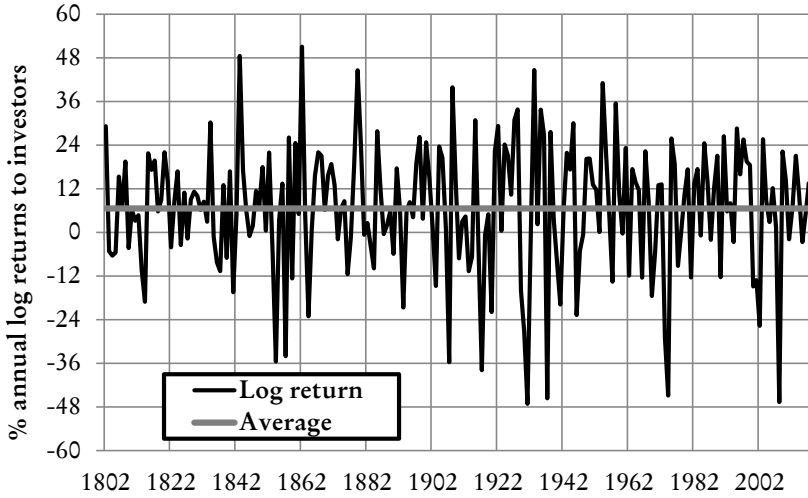
(according to the Bureau of Economic Analysis), the yield curve is essentially flat for longer-dated maturities.

Nominal long-dated bond yields will rise in line with inflation if this inflation is reflected in short-term interest rates and the yield curve is unchanged. If inflation then stabilizes, interest payments will also, while nominal profits will continue to rise more rapidly with the higher rate of inflation. Companies seeking to maintain a stable ratio of interest payments to pre-tax profits will, therefore, initially seek to reduce their leverage and then to increase it as profits rise.

The behavior of equity prices in response to changes in interest rates conflicts with another basic assumption of consensus models: that both the user cost of capital and asset prices vary over all time horizons in line with short-term changes in real interest rates. James Mitchell exposed this assumption as a fallacy by showing that there is a short-term but not a long-term impact on equity prices. This finding also allows for an explanation of the mechanism by which monetary policy designed to stabilize the ex ante net savings balance can create dangerous imbalances in asset prices.

Equity q , which is the ratio of stock market value to net worth, is mean reverting through changes in share prices rather than in net worth.¹² Declines in short-term interest rates push up share prices while having much less impact on net worth, but they only push up q on a

FIGURE 2. ANNUAL REAL RETURNS OF U.S. EQUITIES



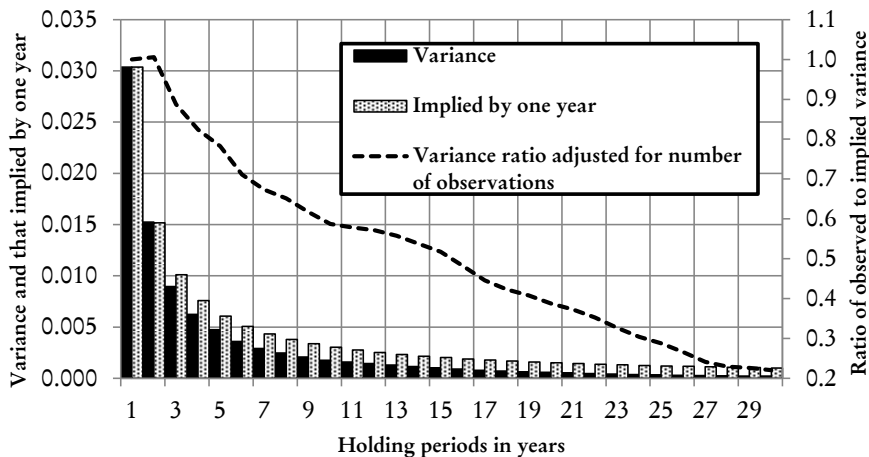
Sources: Jeremy Siegel, Elroy Dimson, Paul Marsh, and Mike Staunton; S&P 500 and Bureau of Labor Statistics.

temporary basis. The effect on share prices, and therefore q levels, is short-lived. Stocks' subsequent retreat is nevertheless dangerous because share prices fall much faster than they rise, and sharp falls are often accompanied by financial crises. Short-term interest rates impact share prices via their effect on long-dated bond yields; hence this effect is exacerbated if the yield curve is flattened, as it has been through the Fed's bond buying under quantitative easing.

There is a third major divergence between the assumptions on which consensus models depend and the data for financial market returns, which show that real returns on equities are stationary. Figure 2 shows the historic data for real returns in the United States measured in log percentages, which avoids the apparent distortions that appear to the eye if ordinary percentages are used. With log percentages, a fall balanced by a subsequent rise of the same amount leaves the average and trend unchanged. The close similarity of these two measures indicates the high probability that these returns are mean reverting.

One result of mean reversion is that after a prolonged period of high returns, future returns are likely to be poor, while above average returns are likely to follow a sustained period of poor ones. Mathematically, this results in real returns exhibiting negative serial correlation, and from this we can also test the strength of mean reversion over different time horizons, which is shown in figure 3.

FIGURE 3. ANNUAL VOLATILITY AND RETURNS OF U.S. EQUITIES, 1801–2018



Source: Jeremy Siegel, Elroy Dimson, Paul Marsh, and Mike Staunton; S&P 500 and Bureau of Labor Statistics.

In the absence of two major exogenous shocks—government expropriation (e.g., Russia in 1917) and massive capital losses from war (as in Germany and Japan in 1945)—real equity returns are stationary in every geographical equity market. This is shown both by those returns and by their negative serial correlation.¹³

Cheap markets are ones which provide investors with above average returns. By looking at these returns, we can assess the market's value at any time in history. Cheap markets do not necessarily rise in the following year, and over any number of years the return will depend as much on the market's value at the end of the period as at the beginning. As it is the starting value that we need, we must not use a set number of years to measure returns but average them for every subsequent year after the starting date. Happily, we only need thirty years of subsequent returns to do this, as the values that result from using more years barely differ. We should not, however, use shorter time periods as the results from these can differ significantly. We can therefore value the market with the use of hindsight if we have thirty years of subsequent returns and can thus assess the value of the U.S. stock market by this method from 1801 to 1991.

Because real returns on equity and q are mean reverting, we can value the stock market not only by hindsight but by reference to q and cyclically adjusted price-to-earnings ratios. Both q and cyclically adjusted price-to-earnings (CAPE) track the fluctuations in value shown by

hindsight, though q does so more closely, as is shown by the R^2 correlations with the values shown by hindsight calculations. These are 0.80 for q and 0.52 for CAPE. These close correlations not only demonstrate the validity of these methods but also the reliability of the data on which they are based.

The cost of a bond when held to maturity is the same as its return. Equities are irredeemable, but because their returns are stationary, we can measure their long-term performance by dividing their average real long-term return, which is around 6.5 percent, by their current hindsight value. Thus when equities are three times overpriced, the cost of raising equity capital is one-third of the long-term return, which is approximately 2.2 percent. If, as consensus models assume, companies sought to maximize the present value of their net worth—conventional profit maximization—they would invest more when capital is cheap than when it is expensive. But they do not, as shown by testing returns using the method described above.

Profit maximization follows from the consensus economic assumption that shareholders are concerned with the present value of their companies' net worth, and that managements aim to run their companies to maximize this value. This strikes me as implausible, and I am yet to encounter anyone, who like me has worked in financial markets, who disagrees. In my experience, both shareholders and managers are concerned with the present value of their companies, but they focus more on the value which is shown by the stock market, not net worth. In other words, increasing q is in practice often more important than increasing investment or maximizing profits to grow net worth.

Furthermore, although both managers and shareholders share this concern with stock market values, they do not have the same interests or behavior. The existence of these different interests is ignored or denied by consensus economics. But this “corporate veil” is impermeable, and modeling the economy thus requires a clear separation between the public, household, and business sectors, not just between public and private. Shareholders and business managers differ in their concerns and in their areas of action. Corporate managements decide on leverage, the level of investment, and how much cash they distribute to shareholders through dividends, buybacks, and debt-financed takeovers, or obtain from them by new equity issues. The household sector decides on its purchases and sales of financial assets and thus on its portfolio preference, which is the proportion of its long-term savings that it seeks to hold in equities or bonds. The interaction between these two groups of

decision-makers determines the equilibrium levels of returns on long-dated bonds and equities.

Fifty years ago, Robin Marris questioned the assumptions needed for profit maximization and suggested that it was more likely that those who run companies make their decisions based on their own interests—in economic terminology, their own utility functions—not on those of shareholders.¹⁴ Consensus models ignored this idea, but we now have the data needed to judge between the two views. The data show clearly that Marris was correct.

While managers have many concerns, they are particularly anxious to keep their jobs and like to be paid well. The two main threats to their jobs are takeovers and large falls in share prices. Underleveraged companies are vulnerable to debt-financed takeovers, and overleveraged ones are at risk of needing an injection of equity in recessions. Shareholders are largely indifferent to payout ratios, but dislike rights issues. Hence both too much and too little debt present risks for management, and we should therefore expect to find that companies maintain, on average, stable leverage ratios over time. The data shown in figure 1 confirm this hypothesis.

In the short term, bond and share prices fluctuate as the optimism of managers and shareholders varies. The vast resources of the financial securities industry have been flung at predicting these swings or reducing their volatility, to little avail. It thus seems that short-term price movements are just noise in the statistical sense and to obtain information on how markets operate, we must find the signals that are provided by the longer-term data, notably the stationarity of real equity returns and the shape of the yield curve.

The relationship between long- and short-term interest rates depends on investors' portfolio preferences,¹⁵ with the flatness of the slope for long-dated maturities following from the average life of fixed produced business assets. The stationarity of equity returns follows from the relative price elasticity of bonds and equities. The demand and supply of each of these asset classes varies over time, with changes in the government fiscal policy, the age of the population, the retirement age, how soon people enter the workforce, and the share of pension schemes which are based on defined benefits or contributions. These changes in demand and supply must result in changes in their relative returns either through bond or equity yields changing, and this depends on the ease with which a change in price alters their returns or, in economic terms, their relative price elasticities. As bonds give only half or a third of the returns available from equities, it is bond yields, not those of equities, that adjust

to changes in the relative demand, which thus allows the real returns on shares to be stationary.

The relative elasticity of equities and bonds explains the stationarity of real equity returns, but not the large gap which exists between the average long-term returns of bonds and equities. The latter must depend on the extent to which investors demand higher returns on equities to offset their volatility. Though bonds have differing repayment dates, their returns, if the bond is held to maturity, do not vary, while the returns on equities fluctuate even, as figure 3 shows, if held for twenty years. Shares typically give relatively high returns but are very volatile in the short term. They are therefore only suitable for long-term investors, who are mostly those who save for their retirement and for whom long-dated bonds are the main alternative. The extent to which investors require higher returns in exchange for accepting less certainty on the return depends on their aversion to risk. It seems that populations benefit from including individuals with varying degrees of risk aversion.

The risk aversion of households varies in the short term as optimism waxes and wanes, but over time it is stable. If there were no changes in government debt or foreigners' holdings, the leverage of businesses would have to match the households' ownership of debt and equity. The equilibrium level of bond yields therefore varies with government borrowing, methods of pension funding, and demographic changes. In the short-term, bond yields will also fluctuate with short-term changes in interest rates and the yield curve. Companies and households will, however, differ in their response. Lower bond yields will cause companies to increase their debt levels relative to their net worth, but with unchanged investment preferences; households will seek to have unchanged ratios of debt and equity assets measured at current market prices. Declines in bond yields thus have the short-term—but as James Mitchell showed, only short-term—impact of raising share prices relative to the ratio of market value to net worth, which is q . This ratio is, however, mean reverting, and the boost given to share prices is only temporary. Monetary policy designed to support demand and keep ex ante savings in balance can therefore destabilize the economy by driving up q .

CONSENSUS MODELS LEAD TO UNSOUND POLICY

Consensus models are wrong to assume that there is only one equilibrium that must be maintained to ensure economic stability, and

economic policy based on this error readily creates the conditions in which financial crises become probable. High levels of q are not only unstable; they are dangerous, because they often lead to rapid market falls and financial crises.

Since there are at least two disequilibria, we need at least two policy tools to deal with them. The question is whether the two that we have, fiscal and monetary policy, are sufficient, or whether we need a third. If so, what it should be?

Monetary policy regularly creates dangerous levels of q . Fiscal policy, on the other hand, doesn't obviously do this, and we would be in a less parlous position today if in recent years greater reliance had been placed on increasing the budget deficit rather than putting so much emphasis on monetary policy and, in particular, using QE.

Relying solely on rising budget deficits, however, raises serious long-term problems. If monetary policy is neutral, such that short-term interest rates are unchanged, these deficits must be funded by the issue of either long-dated government bonds or short-term borrowings. If funded, the supply of bonds will accelerate, and without any change in household portfolio preference, the yield curve will steepen and corporate leverage will fall, a process known as crowding out. Crowding out reduces the trend growth rate of the economy unless two conditions are met: that the rise in the fiscal deficit must result only from increased government investment; and that this investment must be as efficient as private sector investment.

Large, continuous fiscal deficits lead to ever-rising ratios of government debt to national output. If this debt is funded through long-term bonds, it is likely to become a self-reinforcing process and accelerate as crowding out slows the growth of output. If the fiscal deficits are not funded, on the other hand, then banks, households, or companies must increase their ownership of short-term government or central bank liabilities, and either the money supply or the monetary base will expand. This will occur more slowly than has been the case with QE, but the longer-term impact is likely to be similar. The rise in the monetary base has been followed by a sharp rise in money supply and inflation. Opinion is, to put it mildly, divided over whether this is the result of QE or accidental and whether rises in money supply cause inflation.

Whatever view is taken, relying on fiscal policy alone to solve an ex ante imbalance in the private sector is likely to create major problems, and it would be better if we had another policy tool that we could use to avoid these problems in addition to monetary and fiscal policy.

Happily, such a tool is available through shifting the burden of taxation from investment to consumption.

We know that fluctuations in the corporate income tax rate have not been associated with changes in the real return on equity. There was, for example, no federal corporate income tax in the nineteenth century, but it has been levied, often at high levels, since 1919, and the real return on equity was the same in the nineteenth century as it has been since. Reductions in the revenue from corporation tax matched by rises in taxes on household incomes or consumption would leave the budget deficit unchanged. But, if the tax reductions are properly targeted to incentivize investment, they would counter imbalances in private sector *ex ante* net savings without the need for either fiscal or monetary stimuli.

The revenue from corporation tax does not depend solely on the headline rate, but on inflation, which effectively reduces allowances for depreciation, and on tax credits. In the UK, the rate of corporation tax is being raised, but the revenue from it will probably fall due to the introduction of tax credits for tangible investment. If well designed, these tax credits will raise profits after tax, and thus earnings per share, for companies which invest heavily. (These specifically targeted policies need to be distinguished from tax reductions that reward companies whether they invest or not.) As management bonuses are heavily dependent, either directly or via share prices, on this metric, tax credits will have the added benefit of reversing the disincentive to invest that the introduction of modern remuneration methods has fostered.¹⁶

The failure of consensus economics to use the data we have on the returns from short-term debt, long-dated bonds, and equities has resulted in their models being incompatible with the data and thus demonstrably wrong. The conclusion of these models—that the only equilibrium which needs to be achieved for economic stability is the net *ex ante* savings balance—is also incorrect. By relying on these faulty models, monetary policy results in periodic financial crises. In contrast, by using the data on the returns from these separate financial asset classes, the stock market model demonstrates that there is more than one equilibrium needed to maintain economic stability and shows how this can be achieved.

We have so far failed to appreciate the inadequacies of “one deviation at a time models” despite the severity of the 2008 crisis. I hope that we do not now suffer another financial crisis, though recent policies have made the risks of one high. Whatever the short-term

outlook, we need to reduce the long-term risks of such recurrent crises, and to do this we must discard current economic models and build on another foundation, one which is consistent with the data on returns from financial capital in its various forms. ^A

NOTES

- ¹ Ricardo Cabellero, “Macroeconomics after the Crisis: Time to Deal with the Pretense-of-Knowledge Syndrome,” *Journal of Economic Perspectives* 24, no. 4 (Fall 2010): 85–102.
- ² Hyman P. Minsky, *Stabilizing an Unstable Economy* (New York: McGraw-Hill, 2008).
- ³ Caballero, “Macroeconomics after the Crisis.”
- ⁴ George Akerlof, “What They Were Thinking Then: The Consequences for Macroeconomics during the Past 60 Years,” *Journal of Economic Perspectives* 33, no. 4 (Fall 2019): 171–86.
- ⁵ Quoted in Sabine Hossenfelder, *Lost in Math: How Beauty Leads Physics Astray* (New York: Basic Books, 2018). Doyne Farmer is director of the Complexity Economics Programme at the Institute for New Economic Thinking at the Oxford Martin School.
- ⁶ See, for example, Jeremy Siegel, *Stocks for the Long Run* (New York: McGraw-Hill, 1994); Elroy Dimson, Paul Marsh, and Mike Staunton, *Triumph of the Optimists: 101 Years of Global Investment Returns* (Princeton: Princeton University Press, 2002).
- ⁷ Ray C. Fair, “Reflections on Macroeconomic Modelling,” *B.E. Journal of Macroeconomics* 15, no. 1 (2014): 445–66.
- ⁸ James Mitchell, “Interest Rates, Profits and Share Prices,” in Andrew Smithers, *Wall Street Revalued: Imperfect Markets and Inept Central Bankers* (Chichester, UK: John Wiley & Sons, 2009), Appendix 3.
- ⁹ For example, in the carry trade, see: Andrew Smithers, “The Rise of Carry and Macroeconomic Risk,” *American Affairs* 5, no. 2 (Summer 2021): 46–59.
- ¹⁰ Karl Popper, *The Logic of Scientific Discovery* (London: Hutchinson, 1959).
- ¹¹ J. R. R. Tolkien, *The Lord of the Rings*, part 1: *The Fellowship of the Ring* (London: Allen & Unwin, 1954).
- ¹² Andrew Smithers and Stephen Wright, *Valuing Wall Street: Protecting Wealth in Turbulent Markets* (New York: McGraw-Hill, 2000).
- ¹³ Andrew Smithers, *The Economics of the Stock Market* (Oxford: Oxford University Press, 2022).
- ¹⁴ Robin Marris, *The Economic Theory of “Managerial Capitalism”* (London: Macmillan, 1964).
- ¹⁵ Dimitri Vayanos, “A Preferred Habitat Model of the Term Structure of Interest Rates,” *Econometrica* 89, no. 1 (January 2021): 77–112.
- ¹⁶ For a fuller description of the perverse impact of modern management remuneration systems, see: Andrew Smithers “Savings Glut or Investment Dearth?,” *American Affairs* 4, no. 4 (Winter 2020): 36–45; Andrew Smithers, *Productivity and the Bonus Culture* (Oxford: Oxford University Press, 2019).