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PERSPECTIVES

The Paradox of Wealth

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A recent FAJ *article by Laurence Siegel painted a sunny picture of the world's economic and environmental future. Although the author agrees with Siegel's analysis, his optimism does not extend to security returns; both theory and long-run empirical data support the notion that economic growth* lowers *security returns by reducing impatience for consumption and altering the supply–demand dynamics of capital—the price of living in an increasingly prosperous, safe, healthy, and intellectually gratifying world.*

The headline "Things Generally Getting Better" does not sell a lot of newspapers—not that a lot of newspapers are getting sold these days. In a recent issue of this publication, Laurence Siegel (2012) laid out—in a lapidary mix of agreeable prose, data, and humor—the case for why this unlikely headline has been true over the past few centuries and will continue to be so.

I could not resist making some additional observations on the sustainability of long-term global economic growth and its relationship with security returns. In particular, I assert that in the very long run, an increase in societal wealth and well-being carries a paradoxical cost, namely, a *reduction* in the expected return on both risky and riskless assets—an assertion that also has both a plausible theoretical rationale and no small amount of empirical support.

Although I share Siegel's optimism about technological advances and economic growth, I am not optimistic about security returns.

Security Returns and Pricing Models

Conventional pricing models have little to say about prosperity, technological shocks, and security returns. The oldest and most intuitive pricing model estimates the price of a security, or of a universe of securities, as the sum of its discounted dividends or interest, which, in turn, yields the venerated Gordon equation for an asset's expected return r, in terms of D/P, the dividend-to-price ratio of a stock or the coupon of a fixed-income security, and g, the growth of that yield:

$$r = \frac{D}{P} + g.$$

As always, the devil is in the details. Although at first blush, rapid technological progress might seem to increase g and thus increase expected returns, remember that in the case of equities, g represents the growth of per share earnings. The empirical data suggest that rapid economic growth results in an even faster rise in the number of shares than in aggregate earnings and dividends, and so it actually decreases g and thus—with a constant dividend payout—returns as well.

Dimson, Marsh, and Staunton (2002) and Jeremy Siegel (2007) noted an inverse spatial correlation between economic growth and stock returns. Bernstein and Arnott (2003) found that this seeming disconnect between economic growth and security returns does indeed occur at the level of stock share dilution; although mature, stable nations demonstrated about 2% annual dilution of stock shares, nations that had undergone wartime disruption suffered a dilution of twice that rate. The authors suggested that

> an increased rate of obsolescence [as the result of technological advance] effectively destroys the economic value of plant and equipment as surely as bombs and bullets, with the resultant dilution of per share payouts happening much faster than the technology-driven acceleration of economic growth—if such acceleration exists. (p. 51)

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Speidell, Stein, Owsley, and Kreuter (2005) confirmed this suspicion by finding annual share dilution of up to 30% in Asia's rapidly growing nations. It bears repeating: Strong economic growth, far from propelling asset returns, decreases them.

What about other pricing models? The first factor-based model, the single-factor capital asset pricing model (CAPM) of Sharpe (1964) and Lintner (1965), has fallen out of favor of late as empirical data have increasingly shown that security returns regress flatly, or even negatively, to simple market beta. Multiple-factor models, particularly the Fama–French three-, four-, and five-factor approaches (market, small, value, momentum, and profitability), have had more success in predicting the returns of both individual securities and baskets of securities that share similar factor characteristics (Fama and French 1992, 2006b). The book-to-market factor is especially intriguing in this regard; presumably, rapid economic growth resulting from technological change should, in the aggregate, decrease this value and thus decrease returns, a prediction that points in the same direction as the dilution studies mentioned earlier (Fama and French 1992, 2006a).

In his exhaustive treatment of pricing models and return premiums, Ilmanen (2011) identified additional determinants, including factors for carry, liquidity, skew, and kurtosis, in multiple security universes. His fundamental conclusion about all these factors is at once simple and elegant: Return relates most directly to how an asset, asset class, factor, or strategy behaves in bad states of the world, when cash is most desirable. In plain English, all else being equal, an asset that loses 60% of its value during a panic carries a higher expected return than one that loses 50%.

Unfortunately, the data required for these models do not lend themselves to broad historical analysis before the 20th century. The two eras of rapid technological advance for which we do have data—the 1920s–1930s and the 1990s–early 2000s—are not particularly encouraging in terms of security returns. Perhaps the greatest period of technological advance in human history occurred during the second quarter of the 19th century, when the steam engine and steam locomotive increased the speed of transport and the telegraph increased the speed of communication by one and three orders of magnitude, respectively.[1] Extremely fragmentary data suggest that security returns were also less than spectacular in that earlier era (Schwert 1990; Chancellor 2000; Odlyzko 2010).

A Useful Paradigm

In the absence of detailed historical data, a simple thought experiment is useful. Imagine a subsistence-level society plodding along at the precipice of starvation. Such a society has little excess capital—nearly every last basket of grain and every last piece of silver is consumed for food and shelter. But subsistence societies need capital for seed, implements, and housing. In early agrarian societies, the cost of capital was high indeed. A rich farmer could lend his grain or livestock at a prodigious rate of interest—traditionally, a bushel of wheat paid twice over at harvest time—for a 100% return in less than a year. (This "prehistoric interest rate" may be a bit of an overestimate because in the absence of advanced storage and transport facilities, grain will sell for less at harvest time than at planting time.) As a society becomes more productive, wealth slowly accrues in the hands of the fortunate few with grain, domesticated animals, and silver to spare and capital becomes more plentiful—not only in an absolute sense but also, as we have just seen, relative to the need for it.

Although wealthy societies consume more capital than poor societies, my paradigm suggests that as societies get richer, the supply–demand equation shifts in favor of capital's consumers. Archaeologists estimate that the average person in the Stone Age consumed energy at the subsistence level of around 4 kilocalories a day, mainly as foodstuffs, which correlates with the 100% cost of capital per growing/calving season. In ancient Mesopotamia and in the more advanced societies of ancient Greece, energy consumption increased to about 20 kilocalories a day and interest rates decreased slowly to low double-digit levels. By the height of the early Roman Empire around the dawn of the Common Era, daily energy consumption increased to more than 30 kilocalories and prime interest rates fell to as low as 4% (Morris 2010).

After Rome's fall, almost the entire panoply of advanced civil engineering was lost. Energy consumption fell and did not reach Roman levels again in western Europe until approximately 1700. From 400 to 1200, the trace of interest rates disappears entirely (Homer and Sylla 2005).

Between 1200 and 1800, western Europe emerged from the Dark Ages to become the world's wealthiest region—from approximately the subsistence level to three times greater. It is no coincidence that interest rates fell so dramatically during that period (**Figure 1**).

These data suggest a rough reciprocal relationship between real investment return (R) and societal per capita energy consumption (C), in kilocalories per person per day:[2]

$$R \sim \frac{5}{C}.$$

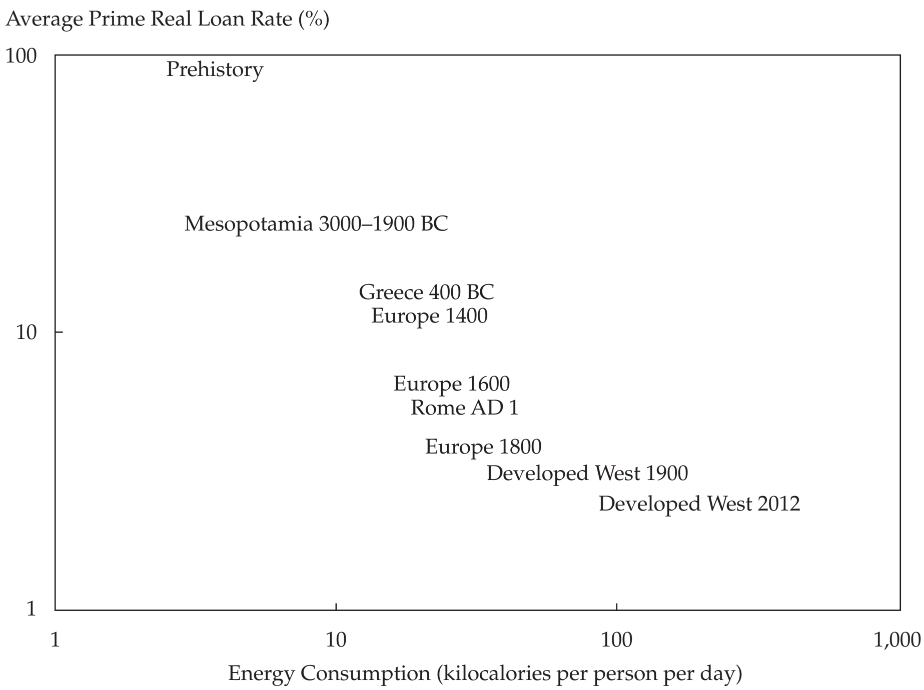
This equation yields a theoretical real investment return of 125% in prehistoric periods, 20% in the early medieval period, and 2% today, which approximates the historical data (**Figure 2**).

The economic historian T.S. Ashton (1967) approvingly quoted the governor of the East India Company, Sir Josiah Child, who observed, nearly a

Figure 1. Interest Rates in Europe, 1200–1800

Data source: Homer and Sylla (2005).

Figure 2. Historical Log-Log Plot of High-Quality Loan Rates vs. Per Capita Daily Energy Consumption



Data sources: Homer and Sylla (2005); Morris (2010).

century before the Industrial Revolution, that "all countries are at this day richer or poorer in exact proportion to what they pay, and have usually paid, for the Interest of Money" (p. 9; in fairness, Child's arrow of causation pointed from low interest rates to wealth, not in the opposite direction). After first cautioning against unifactorial explanations of prosperity, Ashton (1967) went on to emphasize the importance of borrowing costs:

> If we seek—it would be wrong to do so—for a single reason why the pace of economic development quickened about the middle of the eighteenth century, it is to low interest rates we must look. The deep mines, solidly built factories, well-constructed canals, and the houses of the Industrial Revolution were the products of relatively cheap capital. (pp. 9–10)

Although today we seek the wellsprings of asset returns in terms of pricing models and intertemporal substitution, Irving Fisher (1977) framed this quest with a far more down-to-earth term generations ago: *impatience*. In even plainer terms—a cheeseburger now or two tomorrow? Your indifference curve for cheeseburgers depends on how hungry and, to a lesser extent, how healthy and well housed you are at the moment—in short, how impatient you are for the cheeseburger.

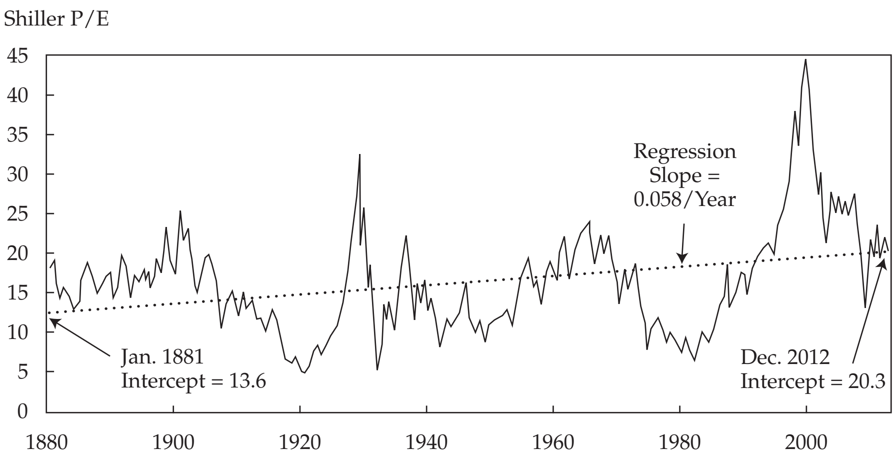
In the ancient and medieval worlds, generally starving and poorly housed populations with short life expectancies were highly "impatient" for capital and consumption and thus demanded higher interest rates for their capital than did the better-fed, better-housed, and longer-lived modern populations. But no matter how we explain things—whether in terms of impatience/intertemporal substitution or in terms of the supply–demand status of capital—the effect is identical: The further the world population dwells above the subsistence level, the lower its cost of capital.

Occurring over centuries, this process is embedded in a raucous cacophony of market noise—some of it generated by titanic macroeconomic events, some by Keynes's "animal spirits," and some by the synergistic interaction between these two factors. The familiar 10-year cyclically adjusted price-to-earnings ratio (CAPE) series of U.S. stocks by Robert Shiller (the longest continuous series of high-quality equity valuation data) suggests that over the past 132 years, earnings multiples have expanded, with an average annual regression slope of 0.058. In other words, this widely followed ratio seems to increase by one point every 17 years or so; the intercept of this trendline was 13.6 in 1881 and 20.3 at year-end 2012, at which point the actual value was 21.3 (**Figure 3**).

As we have seen, it takes centuries for wealth to drive up security valuations and, by implication, drive down security returns. Shiller's series is not quite long enough to demonstrate this phenomenon convincingly. For the previously noted positive regression slope, the *t*-statistic for the 14 independent 10-year CAPE data points is only 1.65—close, but no cigar. Perhaps in another century or two, we will know for sure whether there has been a secular rise in the valuations of U.S. equities and, therefore, a fall in their expected returns, in the same way that loan rates have obviously decreased over the millennia.

The noisiness of this process cannot be overestimated. As early as the late 1600s, a bubble in English diving companies drove down the cost of capital in the London markets as low as in the recent technology bubble (Chancellor 2000). Contrariwise, as recently as 1974, the entire U.K. stock market could have been purchased with a few years' worth of Saudi Arabian oil flows. U.S. equities sold at

Figure 3. Shiller P/E with Temporal Regression Slope



Data source: www.econ.yale.edu/~shiller/data/ie_data.xls.

single-digit multiples in 1982, and during the most recent financial crisis, several corners of the world's stock markets could still reasonably have been called cheap. At some point in the next few decades, investors will almost certainly have opportunities, given adequate fortitude and cash, to purchase securities at near historically low prices, but it seems likely that these windows will be more fleeting than in the past.

Conclusion

Far from being the investor's friends, rapid technological advancement and the attendant wealth it produces are a triple-barreled destroyer of returns by (1) increasing societal wealth (through increased industrial productivity) and hence decreasing the cost of capital by decreasing impatience, adjusting pricing factors, and/or increasing the supply of capital; (2) encouraging enthusiasm among, and capital flows from, gullible investors; and (3) diluting shares as a result of the increase in share issuance required to capitalize new forms of technology and rapidly growing or rebuilding economies.

Given today's low cost of capital, some might predict a higher-than-normal likelihood of a future crash in the prices of debt and equity followed by persistently low prices and higher returns. I see this scenario as unlikely. In any event, the net effects of this pessimistic scenario (a crash in prices followed by higher returns) and of the optimistic one (no crash with persistently low returns) are approximately equivalent. The preference for one over the other depends on the time horizon of future inflows and outflows; those investors and institutions that are net savers anticipating net liabilities in the distant future will prefer the crash/higher-return scenario, whereas those with more immediate liabilities will prefer the more serene low-return scenario.

Although we might envy the rich rewards to capital in the ancient and medieval eras, who among us in their right mind would willingly step into a time machine and give up the comfort, safety, and intellectual rewards of our modern society just to improve their portfolio return? Of what use is investment success in a world of mayhem, disease, high infant mortality, and drastically shortened life expectancies?

As technology makes the world ever wealthier, the returns on both riskless and risky assets will of necessity fall. Pray that the naysayers are wrong and that both processes continue.

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This article qualifies for 0.5 CE credit.

Notes

1. As a practical matter, it took several minutes to transmit a transcontinental telegram, versus about a week for the Pony Express to deliver a letter.
2. For a time series of approximate per capita energy consumption in both the East and the West, see Morris (2010, p. 628).

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