Asset Returns and Economic Growth

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Abstract

We in America are probably facing a demographic transition—a slowdown in the rate of natural population increase—and possibly facing a slowdown in productivity growth as well. If these two factors do in fact push down the rate of economic growth in the future, is it still prudent to assume that the past performance of assets is an indication of future results? We argue "no." Simple standard closed-economy growth models predict that growth slowdowns are likely to lower the marginal product of capital, and thus the long-run rate of return. Moreover, if you assume that current asset valuations represent rational expectations, simple arithmetic tells us that it is next to impossible for past rates of return to continue through a forthcoming growth slowdown. In standard models, at least, only a large shift in the distribution of income toward capital or very large and persistent current account surpluses—larger and more persistent than those of nineteenth century Britain sustained for generations—give promise for reconciling a slowdown in future economic growth with a continuation of historical asset returns.

I. Introduction

It is difficult to see how real GDP growth in the U.S. in the future can be as rapid as it has been in the past half-century. The Baby Boom is long past: no similar explosion of fertility to boost the rate of labor-force growth from natural increase. The modern feminist revolution is two generations old: there is no reservoir of potential female labor to be added to the paid labor force. Immigration will doubless continue—the U.S. is likely to have only 1/20 of the world's population late in this century, and to still be vastly richer than the world average—but could it proceed at a pace rapid enough to make the labor force grow as fast in the next fifty years as in the past? Productivity growth is a wild card: while we find the arguments of Gordon (2003) for rapid productivity growth very attractive,[2] it is not the consensus view, as is shown most strikingly by the pessimistic projection that very long-run labor productivity growth will average 1.6 percent per year found in the 2005 *Report* of the Trustees of the Social Security System.[3]

A slowing of the rate of real economic growth raises challenges for the financing of social insurance systems that rely on a rapidly-expanding economy to provide high benefit levels for the elderly at relatively low tax rate burdens. An alternative way of

[2] Oliner and Sichel (2003) and Kremer (1993) provide additional reasons to be very optimistic about future productivity growth.

[3] Contrast this with the 2.2 percent per year rate of economy-wide labor productivity growth from the end of 1989 through the first quarter of 2005.

financing such systems is to prefund them, and so projections of future rates of return on capital in general play important roles in economic policy debates. Opinions on many policy issues substantially depend on whether historical rates of return—especially the 6.5% or so average real realized rate of return on equities—are likely to persist: the higher are likely future rates of return, the more attractive become policies that at the margin shift some additional portion of the burden of financing social insurance onto the present and the near future and thus giving their contributions the power to compound over time.

We believe that the argument that slowing economic growth creates a presumption that the burden of financing social insurance[4] should be shifted back in time toward the present is much shakier than many economists recognize. It is our belief that *if* forecasts of slowed real GDP growth come to pass, *then* it is highly likely that future real returns to capital will be significantly below past historical averages. In our view, the links between asset returns and economic growth are strong: the algebra of capital accumulation and the production function and the standard macro-behavioral analytical models economists use as their finger exercises suggest this; and arithmetic suggests this as well, for we cannot see any easy way to reconcile current real bond, stock dividend, and stock earnings yields with the twin assumptions that asset markets are making rational forecasts and that

[4] An argument challenged, for reasons similar to but not exactly aligned with those we discuss here, in Cutler *et al*. (1993).

rationally-expected real rates of return will be as high in the future as they have been in the past half century.

Our basic argument is very simple. Consider a simple chart of the supply and demand for capital in generational perspective. The supply of capital—the amount of asset accumulated by savers—is presumably a normal (if probably steeply-sloped)[5] supply curve, with relative quantities of total savings and thus of capital on the horizontal axis, and with the price of capital—that is, its rate of return—plotted on the vertical axis.

The demand for capital by businesses will, of course, depend on the rate of return demanded by the savers who commit their capital to businesses: the higher is the rate of return required by savers, the lower will be business demand for capital—the more eager will businesses be to substitute labor for capital in production. The demand for capital by businesses depends on many other factors, out of which we single out two:

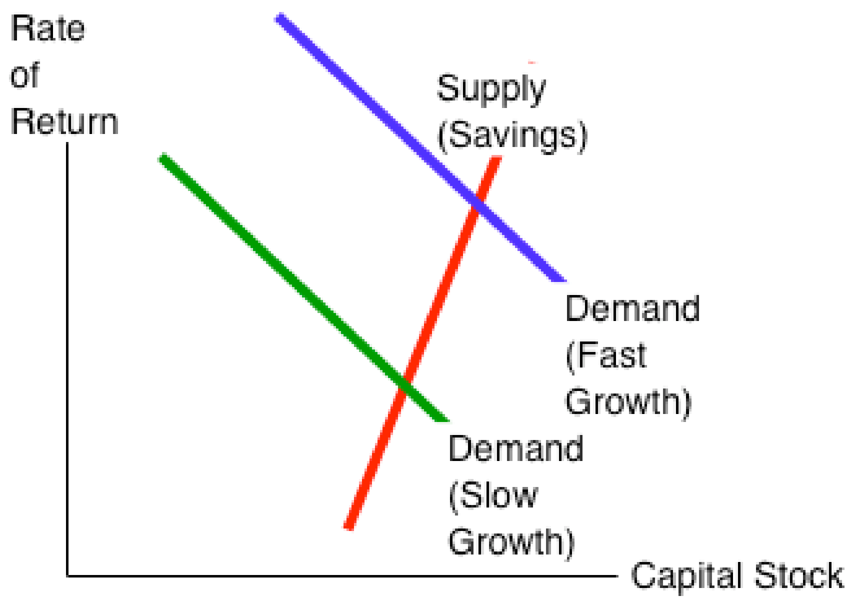
- First, it will depend on the rate of growth of the labor force. Labor and capital are complements. A larger labor force for firms to hire will raise the marginal product

[5] The supply is likely to be steeply sloped because of opposing income and substitution effects. An increase in the rate of return increases the total lifetime wealth of savers, which presumably increases their consumption when young and so diminishes their savings. An increase in the rate of return increases the incentive to save, which presumably increases their savings. The net effect—which we believe to be positive—is likely to be relatively small.

of capital for any given level of the capital stock, and so make businesses willing to pay higher returns in order to get hold of capital.

- Second, it will depend on the rate of improvement in the economy's level of technology: better technology—also a complement to capital—will boost business demand: where supply meets demand.

Figure 1
The Capital Stock and the Rate of Return in Generational Perspective



Now what is the effect of a slowdown in economic growth—either a fall in the rate at which the labor force grows, or a fall in the rate at which technology and thus equilibrium labor productivity increases—on this equilibrium? Assume that these changes do not affect the savings of the accumulating generation:[6] then they affect only the demand curve and not the supply curve. Each of them moves the demand curve left: fewer workers reduces the marginal product of capital and hence firm demand for capital; slower productivity growth does the same. The equilibrium capital stock falls, and the rate of return savers can demand and still find businesses willing to invest what they have saved falls as well. Slower economic growth brings with it lower real rates of return.

We make our case in seven additional sections that follow this introduction. Section II lays out what we see as the major issues. Section III discusses how the algebra of the production function and capital accumulation suggests that rates of return and rates of growth are strongly linked. Section IV analyzes the standard very simple macro-behavioral analytical models we economists use for our finger exercises, and finds that they too lead us to not be surprised by a strong positive relationship between economic growth and asset returns. And section V turns to arithmetic: starting from current bond, stock dividend, and stock earnings yields, we find it arithmetically very difficult to construct scenarios in which asset returns are at their historic average values and real GDP growth is markedly slowed.

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[6] As Greg Mankiw points out in his comment on this article, and as we discuss below, in the standard Ramsey model a reduction in the rate of natural increase does affect the savings of the accumulating generation—and shifts the savings supply curve in exactly as much as investment demand shifts in, keeping the real rate of return unchanged. This is because of the powerful bequest motive behind the assumption of an infinitely-lived representative household with utility for a given level of consumption *per capita* that is linear in the size of the household.

Section VI turns to what we regard as the most interesting possibility for escape. In the late nineteenth century slowed growth in the British economy was accompanied by no reduction in returns on British assets as Britain exported capital on a scale relative to the size of its economy never seen before or since (see Edelstein (1973)). Could the U.S. follow the same trajectory? Yes. Is it likely to? Not without a huge boost to national savings.

In section VII we turn to a brief analysis of the equity premium. Once one has conditioned on the level of the capital-output ratio, returns on balanced portfolios in the long run depend only on the physical return to capital and the margins charged by financial intermediaries.[7] They do not depend on the equity premium and the price of risk. But much argument and some analysis of the dilemmas of America's social insurance system points to the large historical value of the equity return premium in America and sees this as a potential source of excess returns.

Section VIII provides our conclusions. We conclude that *if* economic growth over the next century falls as far as forecasts like those contained in the Social Security *Trustees Report* (2005) are envisioning, *then* it is not very likely that asset returns will match historical experience. If the stock market today is significantly overvalued and about to come back to earth, if the distribution of income undergoes a significant shift away from

[7] However, attitudes toward risk do affect the long-run capital-output ratio.

labor and toward capital, or if the United States massively boosts its national savings rate and runs surpluses on the relative scale of pre-World War I Britain for more than twice as long as Britain did—then a real GDP growth slowdown need not entail a significant reduction in asset returns. But these seem to us to be possible scenarios, not the central tendency of the distribution of possible futures that is a real economic forecast.

II. The Issues

We are in all likelihood undergoing a minor demographic transition: from a twentieth century in which the American population's rate of natural increase was high to a twenty-first century in which many suspect that fertility will be at or below zero-population-growth levels. From 1958 to 2004 hours worked grew at 1.6% per year as the entrance of baby-boomers—male and female—and their successors into the labor force vastly outweighed a decline in average hours. The Social Security Administration's 2005 *Trustees Report* is projecting that hours worked will grow at only 0.3% per year from 2015 on.

In addition, some—although far from all (see Oliner and Sichel, 2003; Gordon, 2003; Nordaus, 2005)—are projecting a slowdown in productivity growth. The Social Security Administration sees economy-wide labor productivity growing at only 1.6% per year in

2011 and thereafter. But between 1995 and 2004, economy-wide labor productivity grew at 2.8%, between 1990 and 2004 at 2.2%, and between 1958 and 2004 at 1.9%.[8]

Thus less than a decade from now the forecasters at the Social Security Administration at least see a significant change: a fall of 1.3 percentage points per year in the rate of growth of labor input, and a fall of between 0.3 and 1.2 percentage points, depending on whether one takes the long 1958-2004 or the short 1995-2004 baseline, in labor productivity growth. The total growth slowdown forecast to hit in a decade or less is thus in the range of 1.6-2.5 annual percentage points.

What implications will this growth slowdown—if it comes to pass—have for asset values and returns? One position, taken implicitly by the Social Security Administration and explicitly by others, is that there is no reason to expect asset returns to be lower in the future. Economic growth, after all, is determined by productivity growth and labor force growth in the United States. Asset returns are determined by time preference, the marginal utility of wealth as it declines over time, and attitudes toward risk. Why should

[8] An alternative breakdown would distinguish 1958-73, during which economy-wide labor productivity growth grew at 2.6%; the productivity slowdown period of 1973-95, during which economy-wide productivity grew at 1.0%, and the post-1995 "new economy" period, during which economy-wide productivity growth has been 2.8%. An enormous amount depends on whether we interpret the 1973-95 productivity slowdown period as an anomalous freak disturbance to the economy's normal structure, or as just one of those things we can expect to see every half century or so.

these be connected?[9] Thus, we hear, past asset performance is still the best guide to future returns.

We take a contrary position. Yes, safe asset returns are equal to the marginal utility of savings, stock market returns are safe asset returns plus the cost of bearing equity risk, and the United States is part of a world economy. Yes, economic growth is equal to productivity growth plus labor force growth. But only in the case of a small open economy with fixed exchange rates are asset returns determined independently of the rate of economic growth. In a large open economy, they are jointly determined and will be linked.[10]

Perhaps an analogy will be helpful. In international trade, the trade balance is the difference between exporters' ability to sell abroad and home demand for imports. In international finance, the trade balance is the difference between national saving and national investment. How can this be? Why should a change in exporters' success at marketing abroad change either national savings or national investment? Great confusion has been caused throughout international economics over how, exactly, to think of the

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[9] Council of Economic Advisers (2005).

[10] Even in a small open economy real returns on assets and rates of economic growth will be linked unless the real exchange rate is fixed. Even perfect arbitrage by mammoth amounts of risk-neutral foreign capital only equalizes expected rates of return at home and abroad *calculated in foreign currency*. With a changing real exchange rate, the rate of return in foreign currency is not the home-denominated rate of return.

connection. We believe that claims that national growth is unconnected with asset returns are a similar failure to grasp the whole problem.

This is an important issue to get straight now because the relative attractiveness of pay-as-you-go versus prefunded social-insurance systems depends to some degree on the gap between the return on capital r and the rate of real economic growth n+g—the sum of the rate of growth of employment n and the rate of growth of labor productivity g. If we are willing to be simple Benthamites with a social welfare function that shamelessly makes interpersonal comparisons of utility, the argument is straightforward. The larger is the rate of economic growth n+g relative to the return on capital r, the more attractive do pay-as-you-go social-insurance systems become. When n+g approaches r, pay-as-you-go systems appear to be very cheap and effective ways of increasing social welfare by passing resources down from the (rich and numerous) future to the (poor and relatively small) present.

By contrast, the larger is r relative to n+g, the greater are the benefits of prefunding social insurance systems. Prefunded systems can use high rates of return and compound interest to reduce the wedge between productivity and after-contribution real wages. They thus sacrifice the possibility of raising social welfare by moving wealth from the richer far future to the near future and the present, but in return they gain by reducing the social insurance tax rate and thus its deadweight loss.

And whenever we make arguments other than those of pure Pareto-preference for why one set of policies is superior to another set, we are all, in our hearts, secret Benthamites.

Thus to the extent that the political debate over the future of social insurance in America is conducted in the language of rational policy analysis, getting the gap between r on the one hand and n+g on the other hand right is important. Policies predicated on a false belief that r is much larger relative to n+g than it is will unduly burden the current and future young, and leave many disappointed when returns on assets turn out to be less than anticipated and prefunding leaves large unexpected holes in financing. Policies predicated on a false belief that n+g is higher relative to r than it in fact is pass up opportunities to lighten the overall tax burden and still provide near-equivalent income security benefits in the long run.

III. Algebra

Let us begin by distinguishing a number of different rates of return. In this paper, we will use r to stand for a physical gross marginal product of capital, and we will assume that it is the product cranked out of a Cobb-Douglas production function;

$$(1) \qquad r = \alpha \frac{Y}{K}$$

We will distinguish this physical-capital rate of gross profit r from the *net* rate of return on a balanced financial portfolio r_f, and from the *net* rate of return on equities r_e.

Only under the assumption of constant depreciation rates δ, constant financial markups, and a constant price and amount of risk is the mapping between these three straightforward. Toward the end of this paper we will briefly consider the equity premium, but otherwise we will assume that depreciation rates, financial markups, and other factors that could vary the wedges between r, r_f,, and r_e are unimportant. Thus we will move back and forth between these three different rates of return: things that raise or lower the return on stocks will also raise or lower the return on bonds and (after the capital stock has adjusted) the physical marginal product of capital as well.

Robert Solow (1956) studied a constant-returns Cobb-Douglas production function with α as the diminishing-returns-to-capital parameter, and with Y, K, L, and E as aggregate output, the capital stock, the supply of labor, and the level of labor-augmenting technology, respectively:

(2) $$Y = K^{\alpha}\left(EL\right)^{1-\alpha}$$

Assume constant rates of labor force growth n, of labor-augmenting technical change g, of depreciation δ, and of gross savings-investment s. In the closed-economy case, in which all of domestic capital K is owned by domestic residents and in which all of national savings goes into increasing the domestic capital stock, we know that along a steady-state growth path of the economy:

(2) $$\frac{K}{Y} = \frac{s}{n + g + \delta}$$

This tells us that along any steady-state growth path:

(3) $$r = \alpha\left(\frac{n + g + \delta}{s}\right)$$

If permanent shocks that reduce n+g cause the economy to transit from one steady growth path to another, the rate of return on capital falls, with the change in r being:

(4) $$\Delta r = \left(\frac{\alpha}{s}\right)(\Delta n + \Delta g)$$

As long as α is greater than or equal to s—that is, as long as the economy is not dynamically inefficient[11]—the reduction in r will be greater than one-for-one. From this algebra, we would expect the roughly1.5% reduction in the rate of real GDP growth that is being forecast by the Social Security Administration to carry with it a greater than 1.5 percentage point reduction in r.

These are steady-state results. How relevant are they for, say, the 75-year standard forecast horizon used in analyses of the Social Security system? In the Solow model, the capital-output ratio approaches its steady-state value at an exponential rate of –(1-

[11] We have every reason to believe that the economy is dynamically efficient. See Abel (1989).

α)(n+g+δ): roughly 3.6% per year. That is a 1/e time of 28 years. After 75 years the capital-output ratio has closed 93 percent of the gap between its initial and its steady-state value.

In this simple Solow set-up, only three things can operate to prevent a permanent downward shock to n+g from reducing the rate of return on capital r. Perhaps the depreciation rate δ could fall. We have been unable to think of a coherent reason why a reduction in labor force growth n or labor productivity growth g should independently carry with it a reduction in the depreciation rate δ. (However, the reduction in r could plausibly carry with it an extension of the economic lives of equipment and buildings, and so carry with it a partially offsetting fall in δ that would moderate the decline in r.) Perhaps the production function could shift to increase the capital share of income α. We have been unable to think of a coherent reason why a reduction in labor force growth n or labor productivity growth g should independently carry with it a reduction in the depreciation rate δ.

Last, perhaps a permanent downward shock to n+g could also carry with it a reduction in the savings rate s. If it were the case that:

$$(5) \qquad ds = -\left(\frac{s}{n+g+\delta}\right)(dn + dg)$$

then the rate of return r would be constant. There is a reason to think that a fall in the labor force growth rate n would carry with it a reduction in s: an economy with slower labor force growth is an older economy with relatively fewer young people and, presumably—if the young do the bulk of the savings—a lower savings rate. (A decline in g, however, would tend to work the other way: the income effect would tend to raise s.) Are such effects plausibly large enough to keep the rate of return on capital constant as the rate of economic growth? To assess that we need to model savings decisions, which requires that we move from algebra to analysis.

IV. Analysis

The Ramsey Model

Move from Robert Solow (1956) to Ramsey-Cass-Koopmans (see Romer (2000)). Consider a version of this Ramsey model in which the representative household has the utility function:

$$(6) \qquad \sum_{t=0}^{\infty}(1+\beta)^{-t}\big(U(C_t)\big)N_t^{1-\lambda}$$

Where β is the pure rate of time preference, C_t is consumption per household member, and N_t is the number of members of the representative household, growing according to:

$$(7) \qquad N_{t+1} = (1+n)N_t$$

In the standard Ramsey-model setup as presented in Romer (2000), the parameter λ is equal to zero: the household utility function is:

$$(8) \qquad \sum_{t=0}^{\infty}(1+\beta)^{-t}\left(U\left(C_t\right)\right)N_t$$

This choice drives the result that changes in labor-force growth do not have long-run effects on steady-state capital/output ratios or rates of return. But, to us at least, this assumption seems artificial. If it is indeed the case that the utility function is (6) above, then the more members of the household the merrier: household utility is linear in the number of people in the household but suffers diminishing returns in per-capita consumption. A household with this utility function that had control over its own fertility would choose to grow as rapidly as possible: that would be the way to make individual units of consumption contribute as much as possible to total household utility.
It seems reasonable to allow λ to be greater than zero, and so have a utility function which has diminishing returns both with respect to household per-capita consumption and with respect to household size.

There is yet another reason to be uncomfortable with the assumption that λ=0. If the term, "golden rule" were not already taken in the growth theory literature, we would use it here, for λ=0 requires that those household makers making decisions in period t love others (the new household members joining in period t+1) as they love themselves. They assemble the household utility function by treating the personal utility that others receive in the future from their per capita consumption as the equivalent of their own personal utility. But we can't call this the "golden rule," all we can do is call this *perfect familial altruism*. If λ>0 but less than one, there is *imperfect familial altruism*—those making period-t decisions care about the personal utility of extra family members in period t+1, but not as much as they care about their own. And if λ=1, period t decision-makers act as if they care only about their own personal utility. We are comfortable with altruism; we are uncomfortable with *perfect familial altruism*.

To the extent that changes in population growth are due to changes in rates of international migration, the assumption that λ=0 is not defensible. The representative agent in period t regards the future-period utility of unrelated strangers of different nationality who migrate into the country on an equal footing as her own utility, or the utility of her direct descendants.[12]

In this version of the Ramsey-Cass-Koopmans model, the first-order condition for the representative household's consumption-savings decision is:

$$(9) \qquad U'(C_t)dC_t = \frac{(1+n)^{1-\lambda}}{(1+\beta)}U'(C_{t+1})dC_{t+1}$$

If the household faces a net rate of return on financial investments of r_f, then:

[12] Approximately 0.3% per year of the slowdown in labor-force growth projected by the Social Security *Trustees'* Report is due to a slowdown in immigration.

(10) $$\frac{1+r_f}{1+n} dC_t = dC_{t+1}$$

because period t+1 resources must be split among more members of the expanded household.

For log utility, we then have:

(11) $$\frac{C_{t+1}}{C_t} = \frac{(1+n)^{1-\lambda}(1+r_f)}{(1+n)(1+\beta)}$$

Along the economy's steady-state growth path with per-worker consumption growing at the rate of labor augmentation g, this becomes:

(12) $$r_f = (1+g)(1+n)^{\lambda}(1+\beta) - 1$$

And in the continuous-time limit:

(13) $$r_f = \beta + g + \lambda n$$

Looking across steady-state growth paths, reductions in the rate of output per worker growth g reduce r_f one-for-one in the case of log utility. (They reduce r_f by a multiplicative factor γ of the change in g in the case of constant relative risk aversion utility: $U(C_t) = [(C_t)^{1-\gamma}]/[1-\gamma]$.) Reductions in the rate of labor force growth n also reduce r_f

except in the case of $\lambda=0$. If $\lambda>0$ but less than one, slower rates of labor force growth reduce r_f, less than one-for-one. And if $\lambda=1$, period t decision-makers are not altruistic at all: they act as if they care only about their own personal utility, and reductions in n reduce r_f one-for-one— the same amount as do reductions in g.

In the case of the Ramsey model, the fact that the model's dynamics attract it to a balanced-growth steady state and the assumption of the representative agent all by themselves nail down the relationship between economic growth and asset returns. In steady-state per capita consumption is growing at rate g, and so the relative marginal utility of per capita consumption one period in the future is:

$$(14) \qquad (1+\beta)^{-1}(1+g)^{-1}$$

in the case of log utility. And the rate at which per-capita consumption can be carried forward in time is:

$$(15) \qquad (1+r_f)(1+n)^{-\lambda}$$

To drive the rate of return on capital r_f away from:

$$(16) \qquad r_f = (1+g)(1+n)^{\lambda}(1+\beta)-1$$

requires that the consumption of those agents marginal in making the period-t consumption-savings decision grow at a rate different than per-capita consumption growth. This requires heterogeneous agents. And the simplest suitable model with heterogeneous agents is the Diamond model.

The Diamond Model

In the overlapping-generations Diamond model, each agent lives for two periods, works and saves when young, and earns returns on capital and spends when old. Thus for a given generation that is young in period t, their per-capita labor income when young w_t, their per-capita consumption when young c_{yt}, their per-capita consumption when old c_{ot+1}, the *net* rate of return on capital r_{t+1}, and the economy's period-t+1 per-capita capital stock k_{t+1} are all linked:

$$w_t = c_{yt} + k_{t+1} \tag{17}$$

$$c_{ot+1} = (1 + r_{t+1})k_{t+1} \tag{18}$$

With a Cobb-Douglas production function, output per (young) capita when the period-t generation are young—in period t—is:

$$y_t = E_t^{1-\alpha}\left(\frac{k_t}{1+n}\right)^{\alpha} \tag{19}$$

where E is our measure of the efficiency of labor, growing at proportional rate g each period, and where the (1+n) appears in the denominator because n is the per-generation rate of population growth. With this production function, labor income is a constant fraction of output per capita:

(20) $$w_t = (1-\alpha)y_t$$

And the real return on capital will be the residual—capital income divided by the capital stock:

(21) $$r_t = \frac{\alpha y_t}{(1+n)k_t} = \alpha E_t^{1-\alpha} k_t^{\alpha-1}(1+n)^{1-\alpha}$$

Once again take time-separable log utility for our utility function:

(22) $$U = \ln(c_{yt}) + \frac{\ln(c_{ot+1})}{1+\beta}$$

And look for steady-states in capital per effective worker by requiring that:

(23) $$k_t = E_t k^*$$

From this, we get the steady-state first-order condition:

(24) $$\frac{1}{c_{yt}} = \frac{(1+r)}{(1+\beta)} \frac{1}{c_{ot+1}}$$

The model can be solved by substituting in the budget constraint:

(25) $$\frac{1}{\left[(1-\alpha)E^{1-\alpha}\left(\frac{k_t}{1+n}\right)^{\alpha} - k_{t+1}\right]} = \frac{(1+r)}{(1+\beta)} \frac{1}{(1+r)k_{t+1}}$$

to get:

(26) $$\frac{1}{\left[\frac{1-\alpha}{1+g}\left(\frac{k*}{1+n}\right)^{\alpha} - k*\right]} = \frac{1}{(1+\beta)k*}$$

which leads us to:

(27) $$k* = \left(\frac{(1-\alpha)}{(1+g)(1+n)^{\alpha}(2+\beta)}\right)^{\left(\frac{1}{1-\alpha}\right)}$$

Recalling that $r = \alpha k*^{\alpha-1}(1+n)^{1-\alpha}$:

(28) $$r = \left(\frac{\alpha(1+g)(1+n)(2+\beta)}{(1-\alpha)}\right)$$

The lower is the rate of productivity growth g, the lower is the rate of return on capital r.

The lower is the rate of labor force and population growth n, the lower is the rate of return on capital r—and this time the effect of lower population growth is the same as the effect of lower productivity growth.

Analysis: Conclusion

Thus in the Diamond overlapping-generations model as well as in the Ramsey model and the Solow model, slower economic growth comes with lower net returns on capital. In both the Diamond and the Ramsey model, there is reason to think that reductions in labor productivity growth have a greater effect on rates of return than do reductions in labor force growth:

- In the basic Solow algebra, the reduction in gross returns r is proportional to (α/s) times the reduction in growth.

- In the Diamond model, the reduction in net returns r_f is equal to $(\alpha/(1-\alpha))$ times the reduction in labor productivity growth g and times the reduction in labor force growth n.

- In the Ramsey model, the reduction in r_f is equal (with log utility) to the reduction in labor productivity growth g and, to first order, to λ times the reduction in labor force growth n (where λ is the degree to which familial altruism is imperfect).

At some level, the same thing is going on in all three setups—in the simple algebra of Solow and in the analyses of Ramsey and Diamond. Reductions in economic growth in these setups are all declines in the rate of growth of effective labor relative to the capital stock provided by previous investments. Effective labor becomes relatively scarcer, and capital becomes relatively more abundant. The terms of trade move against capital—and so the return to capital falls.

Why, then, does a fall in labor force growth not reduce rates of return in the Ramsey model in the case of perfect familial altruism, $\lambda=0$? Because a reduction in population growth also reduces the utility value of moving consumption forward in time—an important component of the value of saving in the Ramsey model with perfect familial altruism comes from the possibility of dividing the saving among more people in the future and thus escaping the diminishing marginal utility of consumption. Thus the marginal household utility of saving falls in the Ramsey model when population growth falls. This fall reduces the effective supply of capital by as much as the fall in the rate of population growth reduces the effective supply of labor. To the extent that a slowdown in economic growth is driven by a reduction in the rate of immigration, this Ramsey-model representative-agent effect is not an effect that we want the model to have: perfect familial altruism is not an assumption that anyone would wish to make.

These models say that there is some economic reason to believe that a slowdown in economic growth would carry a reduction in asset returns with it. These models are the standard models that economics graduate students and their professors use for their finger exercises. They are oversimplified. They are abstract. They are ruthlessly narrow in their conceptions of human motivation and institutional detail. Are they relevant to the real world? Are they telling us something that we should hear when we try to forecast the long run future?

V. Arithmetic

Earnings and Returns

Jeremy Siegel (2005) calculates that the ratio of stock prices to properly-adjusted corporate earnings is approximately 19. With earnings equal to 5.23% of share prices, he asserts that this is an estimate of the long-run real expected rate of return on stocks. The sum of dividend payouts, net buybacks, and investment financed by net retained earnings must add up to 5.23%[13] percent of today's stock values. Returns to investors are payouts—dividends and net buybacks—plus the value of investments financed by net retained earnings.

Firms that have traditionally paid out roughly 60 percent of their accounting profits through dividends and buybacks and that rely on retained earnings to finance a substantial share of increases in their capital stocks have little room to boost risk-adjusted returns by massively expand payouts unless they could do so without crippling their

[13] Note that there is an 0.3 percent per year wedge between the GDP deflator and the CPI. Siegel's 5.23 percent per year rate of return is a 4.93 percent per year real rate of return in the CPI-basis numbers used by the Social Security Administration.

earnings growth—that is, unless a good deal of today's retained earnings are wasted. Firms similarly have little room to boost risk-adjusted rates of return on their equity by cutting back on payouts unless there are very large wedges between rates of return on retained and reinvested earnings and rates of return in the market—that is, unless firms have been mammothly underinvesting.

Current earnings yields thus suggest that the stock market is in accord with the logic of our algebra and analysis: it is not anticipating the 6.5 percent per year or so real returns on the stock market realized over the past half century.

But reported accounting earnings are not true Haig-Simons earnings. There is good reason to believe that returns on retained earnings are higher than market returns.[14] And it is at least plausible that the wedge between market returns and returns on retained earnings depends on the rate of economic growth: faster growth means higher demand and greater profits if returns to scale are increasing. So the argument that earnings yields do not support high expected equity returns needs to be shored up by an explicit look ahead at how payouts and values might evolve.[15]

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[14] See Hubbard (1998).

[15] See Baker (1997) for the first argument along these lines of which we are aware.

Dividend Yields, Returns, and Growth

Begin with the identity that is the Gordon equation for equity prices:

(29) $$P = \frac{D}{r_e - g}$$

Where D are the dividends paid on a stock or an index, P is the corresponding price, r_e is the expected real rate of return *on equities*, and g is the expected permanent real growth rate of dividends. This is a standard way to approach the determinants of equity prices as a whole (see Campbell and Shiller, 1988). In this framework, the real rate of return on equities is:

(30) $$r_e = \frac{D}{P} + g$$

Returns on an index of stocks differ from the current dividend yield plus the growth rate of economy-wide corporate earnings for two important reasons:

- First, g will be less than the growth rate of economy-wide corporate earnings because those earnings are the earnings of newly-created companies not in the index last period. Corporate earnings are a return to entrepreneurship as well as capital, hence the rate of growth of economy-wide earnings will in general outstrip those of the earnings of the companies represented in a stock index.

- Second, dividends are not the only way firms pump cash to shareholders. Stock buybacks decrease the equity base, and thus push the rate of growth of the earnings on the index (as opposed to the earnings of the companies in the index) up.

It is convenient to think of both of these factors as affecting the payout ratio rather than the growth rate, and to replace (2) above with:

$$r_e = \frac{D+B}{P} + g \tag{31}$$

where B are net share buybacks—buybacks less IPOs.[16]

The 2005 *Trustees Report* of the Social Security System projects a long-run real GDP growth rate of 1.9 percent per year on a GDP-deflator basis (Table V.B2). It projects that labor and capital shares remain constant in the long-run.[17] With a gap of 0.3 percentage points between between the CPI and the GDP deflator (Table V.B1), and with an

[16] Subtracting IPOs ensures that the ratio of total economy-wide earnings to the earnings of companies in the index does not grow. Adding gross buybacks takes account of the anti-dilution effects of narrowing the equity base of companies currently in the index.

[17] The assumption of constant income share follows from the derivation of real wage growth from productivity growth, which is discussed on pages 85-88 of the *Trustees' Report*.

auxiliary assumption that capital structures are in balance, this is an implicit forecast that the variable g in the Gordon equation will be 1.6 percent per year. Current dividend yields on the S&P 500 are 1.9% per year. Current net stock buybacks are 1.0% per year. Long-run dividend growth g is 1.6% per year. The sum of these is 4.5% per year. That's the expected real rate of return r in the Gordon equation. It is significantly lower than the 6.5% real rate of return that is our historical experience with the American stock market.

Possible Ways Out

Are there ways to escape from this arithmetic of earnings and payouts? Yes. The U.S. economy is not on a steady state growth path. Three potential ways out seem most worth exploring:

- Perhaps the stock market is currently overvalued, and will decline and so significantly raise payout yields.

- Perhaps payout growth will be unusually rapid in the near term before slowing to its long-term forecast trend rate of 1.6% per year.

- Perhaps the distribution of world investment will shift in a way allowing U.S. companies to earn greater and greater shares of their profits abroad.

The first possibility is advocated by Peter Diamond (2000). A decline in the stock market relative to the economy's growth trend of 40% would carry payout yields up to the 4.9% consistent with a long-run real return of 6.5% per year and real profit and dividend growth (on a CPI basis) of 1.6% per year. Such a scenario is certainly possible: it was the stock market's experience between the late 1960s and the early 1980s. But we have a hard time seeing at as the central tendency of the distribution of possible futures.[18]

The second possibility requires payouts—both dividends and net stock buybacks—to grow rapidly in the near term to validate a subsequent real growth rate of 1.6% per year and a current expected real return of 6.5% per year. If such growth were to be concentrated in the next decade, the real payouts of the companies in the S&P index would have to grow at an average of 8.6% per year. Over the past fifty years, the earnings on the S&P 500 have grown at an average rate of 2.1% per year. It could happen: perhaps we are in the middle of a permanent shift in the distribution of income away from labor and toward capital. But, once again, we regard these as unlikely scenarios, not as the central tendency of the distribution of possible futures that is a rational forecast.

The third way out is the one that we regard as the most interesting possibility.

[18] Certainly no investment advisor who anticipates that real equity returns will average –0.6% per year over the next decade has any business suggesting that their clients shift their portfolio in the direction of equities. If the U.S. government is the advisor and relatively young future beneficiaries of Social Security are the clients…

VI. The Open-Economy Case

Return to the steady-state Gordon equity-valuation equation, where P is the price of a stock index, D and B are dividends and net buybacks, respectively, and g_k is the permanent rate of growth of payouts, of earnings, and of the value of the capital stock:

(32) $$r_e = \frac{D+B}{P} + g_k$$

In the open-economy case g_k is not the rate of growth of the domestic corporate capital stock. It is the rate of growth of the capital stock owned by American companies. If foreign companies on net invest in America—if the U.S. on average runs a current account deficit—then the rate of growth of the earnings of American companies in our domestic stock-market index will be slower than the rate of growth of economy-wide earnings and of real GDP. The open economy will then deepen rather than resolve the problem of combining slow expected growth with high expected returns. If it is American companies that on net invest abroad—then the rate of growth of the capital stock and thus the earnings of companies in the index will be larger than the rate of growth of the domestic economy g.

How much larger? If we look over spans of time long enough for adjustment costs in investment not to be a major factor, then the value of the capital stock will be proportional to the size of the capital stock.[19] If we assume in addition that companies maintain stable debt-equity ratios, then we have:

(33) $$g_k = g + x\left(\frac{Y}{K}\right)$$

where x is that component of the current-account surplus (as a share of GDP) that corresponds to American companies' net investments abroad,[20] and Y/K is the current output-to-corporate capital ratio.

Here, again, we return to arithmetic. Our rate of equity return is:

(34) $$r_e = \frac{D + B}{P} + g + x\left(\frac{Y}{K}\right)$$

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[19] Note that we here dismiss the possibility that investments overseas might provide higher risk-adjusted rates of return in the long run than domestic investments: Tobin's q=1 both here and abroad. The BEA reports that as of the end of 2003 the market value of foreign direct investment in the United States is $9,166.7 billion, compared to direct investment abroad by U.S. corporations of $6,369.7 billion, yet the associated income flows are about the same. We attribute this to a difference in risk. The experience of nineteenth century British investors with such landmarks of effective corporate governance as the Erie Railroad suggests that while there are supernormal returns to be earned in the course of rapid economic development, people with offices separated by oceans are unlikely to be the ones who reap them.

[20] The phrase "corresponds to American companies' net investment abroad" is needed to abstract from current-account deficits that finance net government consumption or net household consumption

From section VI, this is:

(35) $$r_e = 4.5\% + x\left(\frac{Y}{K}\right)$$

For a capital-output ratio of 3, we then have:

(36) $$x = 3(r_e - 4.5\%)$$

Determine how much you want the rate of return on equities to exceed the 4.5% per year closed-economy benchmark case, and triple that: that is the current-account surplus associated with net corporate investment overseas needed to produce the higher return.

Note that, for a constant rate of return, the needed surplus grows over time. In equation (37), Y/K is not the physical domestic output-to-capital ratio: it is the ratio of domestic output to total American company-owned capital—including capital overseas. As overseas assets mount, the needed surplus for constant payout yields mounts as well.

Such enormous current-account surpluses are possible. Great Britain had them in the quarter-century before World War I, when it ceased to be the workshop of and became for a little while the financier of the world (see Edelstein (1973)). Slowing economic growth in the late Victorian and Edwardian eras and reduced investment relative to national savings was cause (or consequence, or both?) of the direction of Britons' saving and of British companies' investment overseas. We, however, see no signs that the United States will undertake a similar trajectory over the next several generations. And we are impressed by the scale: to be consistent with current payout yields, the 1.9% per year forecast real GDP growth rate, and 6.5% returns the current account surplus produced by American net corporate investment abroad would have to begin at 6% of GDP, and grow thereafter.

Could such large outward levels of net corporate investment abroad be consistent with relatively balanced overall trade—could they be offset by large net portfolio investment inside the United States? Not without additional forces at work. The reason is that the open-economy savings-investment identity:

$$S - NX = I \tag{37}$$

is an identity. Consider the three uses that such large inward portfolio investments could have:

1. They could be used to purchase securities newly-issued by American businesses that are used to finance investment here in the United States. The flow of inward portfolio investment would add as much to domestic investment as the outward-directed flow of corporate investment would have subtracted. There would be no slowdown in the rate of growth of the domestic capital stock. Thus the rising domestic capital-output ratio would push down rates of return at home. Since

foreigners are making these large portfolio investments in the United States, this fall in home rates of return would associated with a similar fall in foreign rates of return as well.

2. They could be used to purchase securities newly-issued by American businesses that are used to finance investment abroad. In this case, gross FDI by domestic firms has to be large enough to absorb the difference between domestic I and domestic S, and so slow down the rate of growth of the domestic capital stock, and in addition to neutralize the portfolio capital inflow. We are thus back to square 1.

3. They could be used to purchase already-existing assets purchased from Americans, who then do not reinvest the proceeds either in expanding the domestic capital stock or in further funding American investment abroad, but who consume the proceeds.[21] This means massive dissaving by those who sell their assets to foreigners: a large fall in S. In his comment on our paper, Gregory Mankiw writes that:

[21] This is the possibility that Greg Mankiw stresses in his comments on our paper: that if domestic savings rates fall sharply, the reduction in the rate of growth of the domestic capital stock required to keep rates of return high can be accomplished without a large current account surplus.

The assumption that America could cope with slowing economic growth and maintain domestic asset returns at high historical average levels by diverting capital overseas rests, to some degree, on the belief that the United States is a small open economy: that U.S. investments abroad induced by a domestic growth slowdown will raise the rate of return here while not lowering rates of return there. But the U.S. is not a small open economy. It is a large open economy. Blanchard, Giavazzi, and Sa's (2005) estimates are that U.S. financial assets are currently half of the world total. This share will fall over time. But fast enough to make the assumption that the U.S. is a small open economy a reasonable approximation?

Once again, we see a possible scenario but not the central tendency of the distribution of possible futures that is a forecast.

VII. The Equity Premium

Economists do not have a good explanation of the equity premium. Rajnish Mehra and Edward Prescott (1985) is entitled, "The Equity Premium: A Puzzle," for good reason. Stocks have outperformed fixed-income assets by more than 5% per year as far back as we can see. As Martin Feldstein has said in conversation, it's as if the market's attitude toward systematic equity risk is that of a rich 65 year old male with a not-very-healthy lifestyle whose doctor has told him that he is likely to live less than a decade. Yet we believe that properly-structured markets should—and can—mobilize a much deeper set of risk-bearers with a much greater risk tolerance. That they do not appear to have done so is a significant mystery. We find ourselves convinced by Mehra (2003) that the equity premium remains a puzzle, unexplained by rational agents in maximizing models.

It is quite possible that a substantial part of the equity premium is a thing of the past, not the future.[22] In the distant past fear of railroad and other "robber baron" scandals, and in the more recent past the memory of the Great Depression kept some excessively averse to stocks. In addition, the U.S. had remarkably good economic luck, as is stressed by Shiller (2005). And, over time—as people realized that their predecessors had been excessively averse to equity risk—rising price-dividend ratios pushed a further wedge between stock and bond returns. But today the arithmetic of section VI gives us stock returns of 4.6%: an equity premium of perhaps 2.5 percentage points, not 5.

To the extent to which this past behavioral anomaly was the result of an excess fear of stocks and an excess attachment to bonds, it is not clear that its erosion should have an impact on the expected return on a balanced portfolio. The simplest, crudest, and most extremely ad-hoc model of the equity premium would embed the stock-vs-bond investment decision in the simplest possible Diamond-like OLG model, with the capital stock each period being the wealth accumulated when young by the old, retired generation. Assume that each generation, when it saves, invests a share e_h of its savings in equities and a share $1-e_h$ in bonds. Firms, however, are unhappy with such a capital

[22] In conversation Randall Cohen has been an especially forceful advocate of this point of view.

structure. Unwilling to run significant risks of bankruptcy, they are unwilling to commit less than a share e_f, where $e_f > e_h$ of their payouts to equity. A smaller cushion—in the sense that a smaller cyclical decline in relative profits would run the risk of missing bond payments and an appointment with a bankrupty court—is simply unacceptable to entrenched managers.

If a physical unit of savings when young yields returns to physical capital *1+r* when the savers are old, the rates of return on equity and debt are then:

(38) $$1 + r_e = (1 + r)\left(\frac{e_f}{e_h}\right)$$

(39) $$1 + r_d = (1 + r)\left(\frac{1 - e_f}{1 - e_h}\right)$$

with the equity premium being:

(40) $$\frac{1 + r_e}{1 + r_d} = \frac{(e_h/(1 - e_h))}{(e_f/(1 - e_f))}$$

In this excessively-simple framework it does seem highly plausible that e_h has fallen with greater household willingness to hold equity—because of institutional changes, the fading memory of 1929, two decades of fabulous bull markets, and increased financial sophistication on the part of households.

Thus even if there were no reasons connected with slowing growth to expect lower returns on capital, one might well anticipate lower returns on equity in the future than in the past. And we have seen institutional changes that we would expect, from a behavioral perspective, to boost the share of financial assets channeled to equities (see Barberis and Thaler (2003)).

A lower rate of return on the assets in a balanced portfolio has powerful implications on issues of economic policy. A lower equity premium seems to us at least to have powerful implications for one issue: whether there is a large market failure in the stock market's apparent failure to mobilize society's risk-bearing capacity, and whether a government-run social insurance scheme can and should attempt to profit from (and thus repair) this failure to mobilize society's risk-bearing resources. The government has the greatest ability to manage systematic risk of any agent in the economy. If others are not picking up their share—and if as a result there are properly adjusted excess returns to be earned by the government's taking a direct position itself or assuming an indirect position by reinsuring individuals' social-insurance accounts—why should the government not do so?

The difference between the economists of the coast and the economists of the interior is that the first specialize in thinking up clever schemes to repair apparent market failures and the second specialize in thinking up clever reasons why apparent market failures are not really so. Even though we are from the coasts, we find that there are enough reasons to believe that the equity premium will be smaller in the future than in the past to wish that attempts to exploit the equity premium be implemented slowly and gingerly.

VIII. Conclusion

We believe that there are strong reasons to think that over the long run rates of return on assets are correlated and connected with rates of economic growth. We would expect the reduction in asset returns to be greater for reductions in productivity growth than for reductions in labor force growth. We think that reductions in asset returns could be offset and neutralized by other factors—if capital expropriates some of what has been labor's share of income, if today's stock market values are not sober reflections of likely returns but are elevated by irrational exuberance, or if the United States cuts its consumption beneath its production for generations and follows Britain's pre-WWI trajectory as supplier of capital to the world. Nevertheless, we see these as unlikely (though possible) scenarios. We do not take any of them—or some combination—to be the central tendency of the distribution of possible futures that is a proper economic forecast.

What, some have asked, is the relationship between our arithmetic demonstrations that equity returns as high in the future as in the past are unlikely and our analytical arguments that rates of return and rates of growth are likely to move together? We see these two strands as reinforcing each other. Returns must be consistent with the savings decisions of households, the investment decisions of firms, and the technologies of production. But it is also the case that returns must also equal payout yields plus capital gains—and that only in stock market bubbles can capital gains divorce themselves from economic growth, and then only for a little while.

Powerful economic forces work to make sure that what the economy's behavioral relationships produce is consistent with its equilibrium flow-of-funds conditions. That is the logic that applies here: If slower economic growth reduces the arena for the profitable deployment of capital, rates of return will fall until less capital is deployed. By how much will they fall? Until—in steady state—payout yields plus retained earnings are equal to profits, and retained earnings are no larger than the sustainable growth of the capital stock permits.

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Figure 1
The Capital Stock and the Rate of Return in Generational Perspective