Mechanism for extended inversion in the equity premium

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ABSTRACT
Risk preference models are not capable of providing the extended periods of negative equity premium that are found in historical data. We find that productivity increases bias an economy toward deflation, implying monetary intervention should be semi-permanent, and allowing leverage between policy determined lower interest rates and intrinsic business returns to increase the equity premium, or vice versa if rates are increased. As long as productivity is elevated, the effect is maintained in equilibrium. Or if productivity is lowered, the opposite effect can be maintained. Long term growth and portfolio effects prevent equalization via equities. Rational banking and the monetary agent assure debt capital availability if it is not otherwise provided from mixed risk preferences in the market.

KEYWORDS
Equity premium, monetary policy, inflation, deflation, interest rates, productivity, intrinsic growth

INTRODUCTION

Since the introduction of the equity premium puzzle by Mehra and Prescott in 1985 [1], dozens or perhaps hundreds of papers have been published presenting solutions or exposing defects in the proposed solutions. Why is it important, or is it important? Is progress being made, or is it like political parties talking past one another?

As Zheng points out [2], markets funnel household savings to corporations to fuel the production of goods and services and growth of the economy, and provide for future needs of the households. Understanding the price of the equities sold in markets is important for the confidence and smooth function of this key tool in our capitalist system. Ideally, economists have shown, when prices are low (usually after a crisis) both investors and the economy benefit from the flow of capital into markets. But that is exactly when confidence is low, partly because the enduring long term value of equities is misunderstood and distrusted. How do we know that excess returns from equities will persist? That is why the subject is important. It seems a little odd to speak of rational markets if basic principles

that make the prices of stocks different than bonds are not understood even by economists.

And has the puzzle been solved? Not only do Mehra and Prescott say no [3], but Zheng points out a very specific problem with most proposed solutions. Not only do they not fit actual data, even when they seem to work in models, but the equity premium goes negative for long periods [2]. Risk based models offer no explanation for that.

We describe a leverage mechanism that is negatively coupled with monetary policy, which we show is sustainable in equilibrium following productivity growth. This provides the required possibility of extended inversion of the equity premium. Friction mechanisms due to portfolio effects and intrinsic returns prevent equity-side equalization toward policy determined lending rates, and the combination of rational banking and mixed risk preferences maintain the availability of capital. In this light, the expectation that all monetary interventions are temporary may be counterproductive.

In a 2003 retrospective on the equity premium, Mehra and Prescott [3] observe that there was a marked increase in the equity premium after 1933 when the U.S. abandoned the gold standard and made other changes to monetary policy, banking and investment regulation. Very little has appeared to address this. In one paper Gust et. al. [4] do address monetary policy effects but use a shock model, not long term equilibrium which Mehra and Prescott prefer.

Herein we begin a discussion of possible long term effects of monetary policy on the equity premium, presumed to operate by means of friction rather than the more common approach of risk preferences, implying that the equity premium is not entirely a risk premium.

So ingrained is the assumption that the EP is a risk premium, that it is often called the equity *risk* premium. But our approach is consistent with the conclusion of Mehra and Prescott when originally proposing the EP that

> *"…most likely some equilibrium model with a friction will be the one that successfully accounts for the large average equity premium." [1]*

The point of Mehra and Prescott's 1985 paper was precisely that the equity premium did *not* appear to be entirely a risk premium, thus the puzzle. But the search for a risk based explanation has appealed to many investigators because it minimizes the necessity of making revisions to other aspects of market and interest rate theories. The puzzle's persistence suggests otherwise.

Mehra and Prescott devoted a book chapter to *non-risk* based explanations of the equity premium [5] (perversely in a book with "risk premium" in the title), and Mehra with Constantinides and Donaldson proposed a solution to the puzzle using age related *borrowing constraints* (certainly a friction and not a risk premium) in 2002 [6]. Borrowing constraints based on government regulation

and monetary policy (interest rate regulation and bond buying) are much broader than just age related constraints, and should be expected to have a larger effect.

The first step in our argument will be to identify a friction which will close impede equalization through equity prices, and will show equity prices cannot force long term equity returns much below intrinsic returns, thus equalization must go through the interest rate channel which central banks declare it is their intent to manipulate and regulate.

We then examine the effect of interest rates on equity returns and find a negative coupling which further expands the equity premium. It is this negative coupling that gives our model the ability to explain an inversion in the equity premium.

Various exploits individual rational investors might employ against monetary interference in markets are found to be risk multipliers, thus limiting their application. Historical experiences in different monetary regimes are compared for consistency with our model. Finally, we examine what magnitude of equity premium would be consistent with avoidance of excessive inflation, since excess inflation would presumably reverse central bank policy.

Many studies have pointed out that over longer terms, 20 or 30 year periods, bonds begin to appear as volatile or more volatile than stocks while returning much less. These data are summarized nicely in a book by Fisher [7]. Researchers are often drawn to explanations involving preferences that favor near terms, or that weight near term losses higher than gains. But as Weil points out this only leaves a new puzzle: “Why is the risk-free rate so low if agents are so averse to intertemporal substitution?” [8]

Our investigation is not merely an examination of the effects of regulation on interest rates, as the point was made in 2008 [9] with respect to the 1941-54 period. Herein we examine equilibrium conditions with regard to inflation in an effort to determine the value of interest rates that can be sustained by regulation indefinitely, and the economic causes thereof.

INTRINSIC RETURNS

We take the usual approach to valuing future returns using the appropriate risk adjusted rate R_1 to discount a future payment P_N after N years to a net present value in year 1:

$$NPV_{PN,1} = P_N/(1+R_1)^N$$

The one time future payment is not meant to constrain the investment type to zero-coupon bonds and non-dividend equities, but is simpler. The following analysis would be could be done to include regular interest or dividend payments, but would be more complex.

If a rational investor has the opportunity to secure the future payment P_N for a cost $C_1 \leq NPV_{P,N}$, and does not otherwise need those funds for N years, and does not anticipate a better trade being available in some relevant time period, presumably the investor would make the trade.

If the investment is a financial instrument, the rate of return is determined by contract. But if it is a business activity, it has some intrinsic return on equity which we designate as R_E. We may suppose that the business activity is originally financed at some cost C_0 and the cash value at year N is estimated by $P_N=C_0(1+R_E)^N$. At the formation stage, R_E is a function of costs C_0 and bears no definite relation to risk rate R_1 at which the investment may be resold.

Mehra and Prescott analyze the returns of baskets of equities that collectively have very long lifetimes $L >> N$ of the order of 100 years. In a personal communication, Mehra insisted the use of intervals at least this long was necessary to assure that an equilibrium condition was being examined, not a transient. No realistic investor has so long a time preference N.

Consider a large pool of investors, with new ones entering and old ones retiring, so that the average time preference N for the pool can be presumed to be relatively constant. After a year goes by, the future cash value P_N appears closer and the value should be: $NPV_{PN,2} = P_N/(1+R_1)^{N-1} = NPV_{PN,1}(1+R_1)$.

If this were a debt instrument either terminating in year N, or continuing to earn income at the risk discount rate R_1, that would be the end of the story. But it does neither. The investors collectively see a new interval of N years ranging from 2 to $N+1$, and a new final value $P_{N+1}=C_0(1+R_E)^{N+1}=P_N(1+R_E)$. The investors dutifully compute the net present value of this new "final payment," and discover:

$$NPV_{PN+1,2} = P_{N+1}/(1+R_1)^N = P_N(1+R_E)/(1+R_1)^N = NPV_{PN,1}(1+R_E) \qquad (1)$$

PRICE EQUALIZATION OF INTRINSIC RETURNS

Given that investors in year 2 are willing to pay $NPV_{PN,1}(1+R_E)$, it appears that despite their efforts at correctly computing an equalized price for year 1, this investment has become de-equalized with the risk rate R_1. The price will have to be adjusted upward (assuming $R_E>R_1$) and long term holders will capture this adjustment as a windfall, increasing their returns beyond the expected R_1.

Notice that we have not yet quantified risk, nor investor time preference N, but already it is impossible to hide the intrinsic business return with a discount pricing model.

Consider an investor who is aware of this difficulty. Assuming this process continues through year N, this "fully aware" rational investor calculates the true

expected cash value in year *N* based on what the investors at that future time will see in the way of earnings for an additional *N* years. We easily arrive at:

$$NPV_{PN+N-1,N} = P_N(1+R_E)^N/(1+R_1)^N = NPV_{PN,1}(1+R_E)^N$$

Depending on *N*, this can be a much higher price, with a somewhat unbelievable *P/E* ratio. But it is still not high enough to effect equalization with the expected risk return. In the very next year, repeating the analysis gives

$$NPV_{PN+1,2} = NPV_{PN,1}(1+R_E)^{N+1}$$

which has the same form as (1), and still no full equalization has taken place. It is easy to see that a "fully aware and rational" investor could conclude that any investment with an intrinsic growth generating capacity in excess of the expected risk rate is worth an infinite amount of money, even if her own time preference value is quite short, as long as she can rely on the rationality of other investors.

It is useful to put these simple formulae in perspective with an example, so the intuitive side of our brains can grasp what is going on. Consider a 10-year bond with a rate of 4% vs. equity with an intrinsic return of 12%. Suppose the risk premium for the equity is 1%, at the upper limit of what Mehra and Prescott find is reasonable [3]. This corresponds to an 8% equity premium of which % is due to risk and 7% is due to the equalization discrepancy, which investors will try to remove. Suppose these are sold in units having $1 par value initially. To equalize the equity at 10 years, its price would become $2.10. Or conversely, equalization could reduce the bond price to 47.6 cents. Extreme but perhaps reasonable.

But if the equity has a life of 100 years then it is worth $1653, or conversely the 10-year bond is quite worthless. The initial P/E ratio of the equity is 13,775. This is not reasonable.

If the intrinsic growth rate is merely ½% higher the equity is worth initially $2581. But if growth stops after only 90 years it is worth only $788. A perfectly efficient market with only rational traders all with relatively short time preferences would make wild swings based on very slight changes in estimates from day to day about what is going to happen over the next century – something that is impossible to know.

We know empirically that investors do not pay such P/E's for 12% growth, and that such extreme price swings are more likely due to large variation in estimates of what will happen over the next 5 to 10 years. The longest analysis the author has seen is the government analysis of pension and medical liabilities, which is carried out to about 50 years.

Experienced money managers have an intuitive grasp of this. In the book by Fisher mentioned earlier we find just following the bond-stock risk comparison data a paragraph elaborating on the idea:

> *"Bonds are fine but they don't represent future earnings." [7]*

In a short term view, 3 to 10 years, high stock prices (P/Es) may lead to lower returns. The equity premium is a 20 year and above phenomenon. Mehra and colleagues speak as if an equity price mechanism could change long term equity returns:

> *"The increase in the demand for equity by the young and the decrease in the demand for equity by the middle-aged work in opposite directions. On balance, the effect is to increase … the equity … return …" [5] (p. 272 top)*

But except as a transient effect due to changing price (P/E), that does not seem to be true.

We conclude that investors are not equalizing equity returns downward toward bond rates over such long intervals by means of prices, and it would be unrealistic to expect the kind of valuations that would be required.

FRICTION vs. 100-YEAR RISK PREMIUM

An issue arises as to how economists should classify the excess premium arising from the mechanism described above. Is the continual appearance of new earnings from outside the common (or average) time preference window a friction to equalization? Or are the outsized returns sacrificed by those who avoid holding equities for century long periods a risk premium?

Perhaps it is not critical what we call it. But consider a thought experiment, which can be very nearly carried out. Thirty year bonds and mortgages do exist, and their risk rates are only very slightly above 10-year rates. Ninety nine year leases also exist, and the rates there are not extreme either. But the risks of bonds or leases over such times are comparable to equity risks. So our experience does not seem to encompass an extreme premium based only on time. This favors calling the matter “friction,” or perhaps more descriptively “distant earnings friction.”

PERPETUAL PORTFOLIOS

There is a second factor to consider in choosing a name which is that the equity premium is not calculated based on a single company, or even a fixed portfolio of companies. It is usually based on whole markets or indices, in which individual companies come and go.

One might take the view that most companies will pass away in a 100-year period. Data on this will be explored further in in the next section. If so, then the total return on many companies over long periods is nearly zero. However, we will demonstrate that a portfolio can be mechanically constructed which achieves a positive return even when composed of assets that have negative return over a fixed lifetime.

To do this we assume companies pay no dividends, so that the initial investment is entirely lost if held long enough. For simplicity all companies are identical, with a lifetime of 20 years, and a share price growth rate of 12% (presumably based on underlying earnings growth) until suddenly and without warning going out of business with a total loss of all assets. An algorithm mechanically adds one new company every year, selling proportional amounts of all existing holdings to fund the addition, and taking no account of lifetimes. The algorithm always incurs a full and unanticipated loss when a company ceases. Table 1 shows the results of a 20 year simulation starting with 20 companies at different stages of life, which is long enough for all the initial holdings to fail. Only the first 5 holdings are shown, and the aggregates.

Despite the fact that the individual returns over time of all component assets are zero, the portfolio produces a sustainable 6.67% return for these conditions. In order to guarantee this, it is only necessary that the average return (percent) be greater than the inverse of the average lifetime.

PERMANENT PORTFOLIO SIMULATOR:
Initially 20 equities (first 5 shown), lifetime 20 years, growth 12% while active
See http://mc1soft.com/papers/PerpetualPortfolio.htm

year	equity1	equity2	equity3	equity4	equity5	#stocks	capital	annual return	average annual return
1	$5.00	$5.00	$5.00	$5.00	$5.00	20	$100.00	0.00%	0.00%
2	$0.00	$5.33	$5.33	$5.33	$5.33	20	$106.67	6.67%	6.67%
3	$0.00	$0.00	$5.69	$5.69	$5.69	20	$113.78	6.67%	6.67%
4	$0.00	$0.00	$0.00	$6.07	$6.07	20	$121.36	6.67%	6.67%
5	$0.00	$0.00	$0.00	$0.00	$6.47	20	$129.45	6.67%	6.67%
6	$0.00	$0.00	$0.00	$0.00	$0.00	20	$138.08	6.67%	6.67%
					. . .				
19	$0.00	$0.00	$0.00	$0.00	$0.00	20	$319.53	6.67%	6.67%
20	$0.00	$0.00	$0.00	$0.00	$0.00	20	$340.84	6.67%	6.67%

Table 1 – Returns from a Perpetual Portfolio

The individual equities in this example are not good investments to buy-and-hold. They are at best short term trading bets. But a mechanically managed buy-and-hold portfolio of them is a perfectly sound long term investment. Even for such short lifetimes, less than half the best annual growth of 12% is sacrificed to mortality.

The risk of the portfolio is poorly correlated with the risk of the component assets. The portfolio is in fact worth much more than the sum of its asset values. The worth comes from the addition (in pseudo-random fashion, not due to some intelligence) of new assets each year, at least some of which will add additional life to the portfolio.

The information as to which companies to hold is provide free to investors, mostly by Standard & Poor's but also other public index compilers. Investors can at low cost purchase an Exchange Traded Fund which closely tracks the index. The author cannot account for why such information is free, except that it would be somewhat difficult to hide. Oddly enough, proprietary or closed-end funds often trade at a discount to net asset value. But these public indexes are mechanically set up to acquire or dispose their shares in public markets at a price which is equal to the underlying transaction value with very small fees for service.

If investors attempt to push prices of the indices up to what they are worth in 100-year terms that would produce an extreme bubble in which the components would be individually overvalued. Such valuations would attract short sellers to the more vulnerable companies, who would essentially "fight" with the portfolio investors over valuation. One can find evidence of such actions almost every day in the financial press.

If a disagreement, fight or resistance is the appropriate description for something, then "friction" also seems appropriate and similar. Therefore the author suggests using the concept of friction rather than risk premium. If we were to use the concept of risk, then risk of what? The real risk to the portfolio is that the short sellers might not appear, driving portfolio prices up to the point that returns are not all that good and investing in individual companies is a losing proposition. In that case who would even start individual companies?

The equity premium has been discovered using aggregate data, and equities are priced individually based on their return and risk expectations. There is a friction between individual and aggregate valuations.

EQUALIZATION BY COMPETITION

There is another effect which acts directly on business returns rather than on the price of returns, and which *can* bring about equalization – competition, enticed by superior returns. It can take a while for competition to develop. Perhaps

engineers and designers must be recruited and trained, and investors must be persuaded that they have some advantage in costs or ingenuity over older companies. The first group will try to maintain its advantage through intellectual property if available, and through contracts and temporary pricing tactics. History shows that effective monopolies do often hold off competition.

Since 1958 the average tenure of a firm on the S&P 500 dropped from 61 years to 18 years in 2012 [10]. When a corporation ceases to maintain growth, generally its value drops. It often faces bankruptcy or buyout at a low price compared to former high growth values. Most of its value is lost. If the tenure is 18 years, the growth life is probably significantly less. Two methods were considered for calculating the loss rate from this churn. A simple method is to withdraw all earnings (and price growth). This produces a $1/T_G$ loss rate, where T_G is the growth lifetime. But it is naïve from a portfolio management standpoint, as it defeats compounding. A computer model (using the same code as in the previous section) was made of a portfolio in which new stocks were added each year and enough of existing investments were sold to give equal weight to the newcomer. No other sell criteria were used, since from an efficient market perspective we cannot know in advance when companies are at the end of their lifetime. The result of this portfolio run over 50 and 100 year periods was extremely close to the $1/T_G$ loss rate as company lifetimes were decreased. A plot of the result is shown in Figure 1.

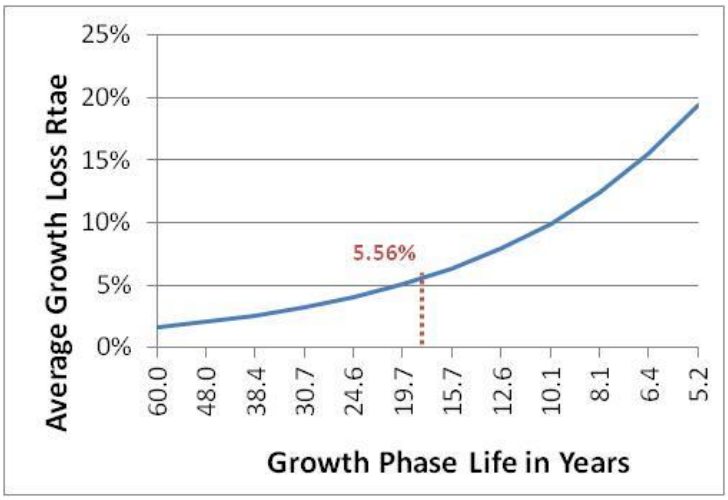

Fig. 1 – Loss Rate from Corporate End of Growth Lifetime

More than half of the lifetime decrease, to an average of 25 years, occurred by 1980, which under our assumptions of zero value at the end of life would be a 4% penalty to growth. The Equity Premium (EP) declined 1.5% during that time (see Figure 2 below), but the earlier value includes the entire period to 2012. The EP is not a reliable measure for the short periods necessary to make a definite correlation with company lifetimes, but there is no doubt it was on average higher in the earlier part of the period of Figure 2. Shorter corporate

lifetimes, which we suppose to be due to competition, could well be eroding the EP.

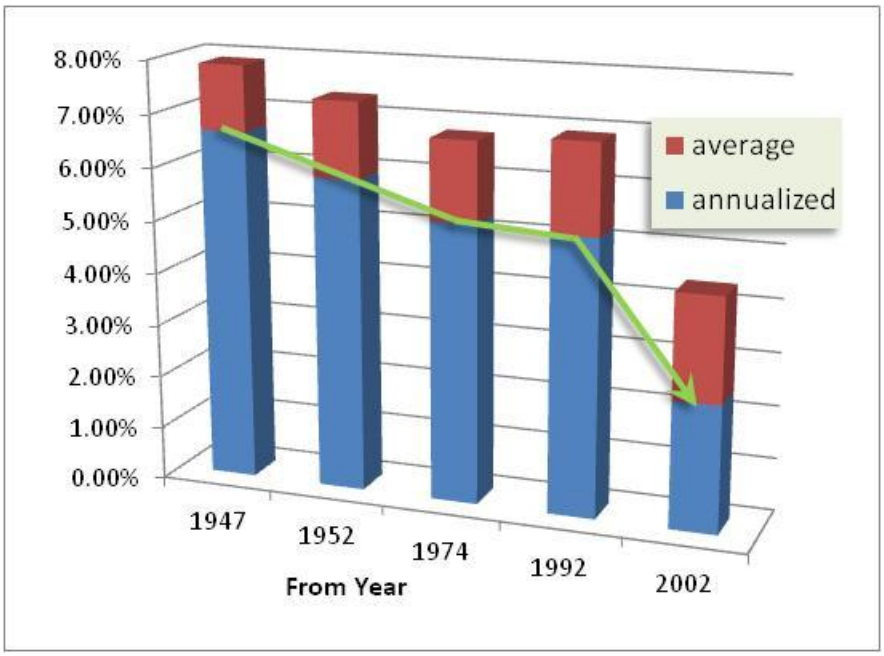

Fig. 2 – S&P 500 vs. 3-mo. T-bill Equity Premium through 2012

More recent drops in corporate tenure on indices are easier to understand because our memory of context is fresh. Companies of the appliance, food, electronics and media boom of the 1950s through 1980s dropped out of the index, replaced by Internet businesses in many cases, with a few specialty retailers and some genetics and health, and also super-discount chains. One might suspect that global trade had a role, but that is beyond the scope of this paper and the evidence is not on the surface.

The point is that the existence of an equity premium attracts capital to new issues. The shorter corporate lifetime becomes, the greater the incentive to rotate fresh companies into a portfolio. Since companies exiting the index do not typically have zero value as in the computer simulation, the 5.56% estimate for end of lifetime loss is high. The 4.2% loss in EP between the 1947 to 2012 period and the 2002 to 2012 period is similar in magnitude. The lifetime loss rate is real, and the EP would have had to have pressures to increase from other sources to compensate for the lifetime losses. The lifetime losses may well be a component of EP loss, and may well represent rate equalization pressure.

The implication of this, if true, is that the objectives of the Fed, specifically employment objectives, are being circumvented in a hidden way. Lifetime employment is no longer an option if companies don't last that long. Workers experience income losses (lower returns on education) by the same formula. With student loan debt increasing, they face unfavorable economic prospects compared to earlier generations of workers. The area could use more study.

In summary, equalization by competition probably is occurring, but could not have removed more than half the EP, and recent trends indicate the lifetime is stabilizing at its current level. So a significant puzzle remains, and we move on to consider the bond price or debt interest path.

A SIMPLIFIED MODEL OF MONETARY EFFECTS

Monetary agents are the creation of social and political forces, not of rational investors or efficient markets, and we will take two approaches to understanding their mandates, powers and effects. First we will quantify the effect of interest rates on business returns using a one industry one rate-of-return economy into which we introduce a second higher-return business. Later we will present historical discussion.

We examine a hypothetical agrarian economy with farmers, lenders, and a monetary agent who creates and manages money for this economy, which we call the land of Zo.

In its pre-equity state of development, Zo's farmers must borrow the money to buy seed and pay for labor to produce crops. Zo's lenders demand a return of 6%. Each year the farmers price their harvest so as to cover expenses, including repayment of the loans. There is only one commodity in Zo, food, and the farmers keep back whatever they need out of their harvest, and this is their consumption. We purposely ignore seasonal or annual variations in production since only an equilibrium model is required to address the equity premium.

It is easy to see a couple of scenarios depending on the relative power of labor and lenders. If the lenders spend their 6% return consuming the farm products, then there will be no inflation, and they will get the real return they desire, but they will not increase their wealth (unless they are hoarding food).

If the farms are very productive, *or* if there are a small number of wealthy lenders, then the lenders may not need to spend 6% in consumption. Wealth will transfer to the lenders until, one year, there is not enough money owned by others in Zo to pay the 6% return. Some farmers will default. If the lenders do not change their expectations, they will add the default rate to the 6% and demand a higher rate so as to obtain a 6% rate after losses. What happens next depends on relative power.

If the farmers or labor have more power, they will organize and collectively raise prices and limit supply, producing inflation.

There might be situations in which farmers and labor do not have such power. Perhaps they are not trustful of one another, or some of them live very far away, or some food is imported from other countries. Then power shifts to the lenders and they gradually confiscate farm assets and reduce farmers and laborers alike

to subsistence wages. Some of them may simply remain unemployed and become beggars or live on welfare, if there is any.

The monetary agent, charged with stabilizing prices and ensuring full employment, is compelled to act in either scenario. Lenders will argue for tight money so that debts are not relieved by inflation. Farmers and labor will advocate for loose money with which to repay their debts and to finance production.

It is interesting to note that this "hypothetical" scenario dominated American politics in the 2nd half of the 19th century. The U.S. was on a bimetallic standard, silver and gold. Discoveries of large new silver deposits were inflating silver currency. In 1873 the U.S. effectively went on a gold standard inside the country. Farm interests lobbied for the re-introduction of silver currency for the reasons attributed to the farmers and laborers of Zo. Eastern banking interests lobbied for gold, and wished to extend the standard to cover foreign transactions, making trade simpler with England which had adopted a gold standard. We'll discuss the conclusion of this debate in a following section.

Meanwhile we can draw several conclusions regarding pre-equity Zo. First is the counter-intuitive observation that in the case of hoarding lenders if the monetary agent printed enough money to cover the 6% returns demanded by the lenders, there would be no inflation. The monetary agent could print money at a rate matching the rate at which lenders were removing and hoarding money.

In the case where lenders are hoarding and farmers and labor have some power, if the monetary agent does not increase the money supply, there are likely to be shortages of goods and cost-driven inflation despite ample production capacity, unless there are foreign suppliers or other factors weakening farmers and labor.

It is also possible for the monetary agent to print but not unconditionally distribute new money, but instead to lend it at low rates to the farmers. Technically, this money would return to the monetary agent and not add to the money supply. However, unless the monetary agent sets a rate of zero interest, more is returned than is loaned, and the monetary agent finds itself in the same situation as the lender, and must spend the interest it receives or watch the impoverishment of the population. The prospects for Zo are rather sad, but roughly correspond to the feudal systems that developed in much of the pre-industrial world.

If the monetary agent lends at a low rate while the lenders are hoarding, the economy and jobs are saved, but the lenders seeing their returns drop are not likely to be persuaded to quit hoarding.

If the monetary agent mistakenly lends at a low rate while the lenders are spending all their returns, then demand-driven inflation would be the likely outcome.

If the monetary agent does not act while the lenders are hoarding, and labor does not have the power to demand sustainable wages, then the shortage of money produces deflation, default, and unemployment.

Even in this simple economy with only farming and lending, the essential features and causes of action of a modern monetary agent are apparent. Notice that inflation is of two different kinds, and whether the response to a certain set of conditions is inflation or deflation depends on the relative political power of labor and lenders.

EFFECTS OF INDUSTRIALIZATION AND EQUITY

Suppose there are some engineers who begin to develop technology that reduces labor and increases yield in agricultural production. Based on the usefulness of their equipment and seeds to farmers, and thus the price farmers will pay for the improvements, these innovators find that they can make an 8% return on the money they must pay for materials and labor, even after also hiring an executive and a marketing agent. They quickly realize they could make much more money if not limited to their own funds. There is money available from lenders at 6%.

The lenders are not sure what they would wind up owning if the engineers defaulted. Unlike farmers, the engineers have no land. And the engineers, having seen the plight of the farmers, are leery of being in a position where they might default. An accommodation is reached in which lenders will only match the funds the engineers already have. In other words, the engineers must come up with 50% equity. This equity is fundamentally different than debt. It cannot result in default. And it constitutes a buffer which prevents default.

If, for example, there is a 5% default or loss rate in this new industry, due to bad luck, factory problems, bad designs and so forth, then figured as a ratio to equity rather than total capital, this doubles to a 10% default rate, which we might well call “risk.” But unless the default happens all in one firm, it is possible the debt may not be touched.

This is intended to be a simple numerical example, but nonetheless realistic. 6% was a typical bond rate during the early part of the 19th century when there was no equity premium. Railroad bonds were sold as 6% bonds for the transcontinental railroad. As of 2011, 45% of the capital of American companies was debt [11], and 1/3rd of that was short term money market [12], so the 50% equity assumption is also reasonably realistic.

What is the total return on equity for this new industry? There is a direct 8% return on the equity, plus an excess return of 2% on the same amount of debt capital which can be distributed to the equity owners, giving a total return of 10%.

What is the effect of these high returns on the economy of Zo? According the assumptions of rational investing, the returns must equalize. We have already seen that the structural 8% return cannot equalize downward. Therefore lenders will demand more. They will not be able to get 10%, however. Every 1% additional they demand lowers the return on equity 1% in this example. The most they can get is 8% because that is the breakeven point for the engineers, and they are not willing borrow at that rate. There is no profit. We might suppose, hypothetically, that about 1% is the least margin for which the engineers will go to the trouble of borrowing. This would imply they might borrow at 7.5%, giving equity owners a return of 8.5%.

However, that could leave the farmers paying 7.5%. And it could leave the lenders hoarding even more since they now enjoy a higher return. The farmers would have to raise prices, and there would be inflation, or if they do not have pricing power there would be default and deflation and unemployment. In one case or another, it is soon necessary for the monetary agent to intervene.

To find the optimal intervention, we must make some assumptions about the relative size of the new industry. Suppose it is ¼ of the economy. Suppose the monetary agent decides to simply force the average return on capital back to the former 6% level. If the monetary agent lends at 4% (which it might do through bank intermediaries by offering them a slightly lower "prime" rate), then the leveraged industrial return on equity will be 12% (1/4 of the economy), and the debt return will be 4% by definition (3/4 of the economy), for an average capital return of ¼ (12%) + ¾ (4%) = 6%.

If lenders become diversified investors, cap-weighted in debt and equity, they can have the same return as before, and if they consume as much as before there is no inflation pressure. There is some loss of farm jobs, but if the new industry markets and prices effectively, it captures the job revenue and uses it to pay its own employees. There is an equity premium of 12% - 4% = 8%. And if the monetary agent returns its 4% gains into circulation there is no net change in the money supply.

We can formalize the relationships in this example as follows. Let D be the fraction of capital which is debt, and R_B the intrinsic return of the new business. Then we have the adjusted return on equity, using D leverage, as

$$R_E = R_B + (R_B - R_1)\, D / (1 - D) \qquad (2)$$

If the default risk is expressed as an annualized loss rate R_L, then as long as the loss upon default does not exceed equity we have the new leveraged loss rate R_L' as

$$R_L' = R_L / (1 - D) \qquad (3)$$

INFLATION CONSEQUENCES OF A NEW HIGH-RETURN BUSINESS

What is the effect on inflation of the new high-return business? The new high returns are being extracted from the economy and given to the business owners. If they spend it, then it should be inflation neutral. If they do not, it should be deflationary because of the effective money supply contraction.

We assume that in a competitive market, the new high-return business is making products of superior or new quality or quantity, or making the old products at lower prices. In the latter case, it is clearly deflationary. In the case of simply higher quantity, the laws of supply and demand assure that they cannot sell more products at the same price, so the middle case reduces to the last one and is deflationary.

In the case of superior or new products, these compete with the old products for consumer dollars. While there is no explicit basis for inflation comparison on the superior or new products, their market success implies less money available for pre-existing products. By the laws of supply and demand, then prices for pre-existing products must decline. Therefore, it seems fair to suppose that in a general sense the new high-return business, provided it is not based on a monopoly, will tend to be deflationary.

We have certainly seen this in agriculture and manufacturing as technology increases harvests or production and decreases labor.

Let us suppose for the sake of relative comparison that we have an economy in equilibrium, absent either inflation or an equity premium. The lending risk rate associated with no inflation is R_1. We represent the inflation characteristics of this economy qualitatively in Figure 3.[1]

[1] Prior to 1960 the relation between inflation and interest rates was not as clear as it was after that time. See http://www.crestmontresearch.com/docs/i-rate-relationship.pdf Crestmont Research, “INTEREST RATES & INFLATION: 1900 – 2012”

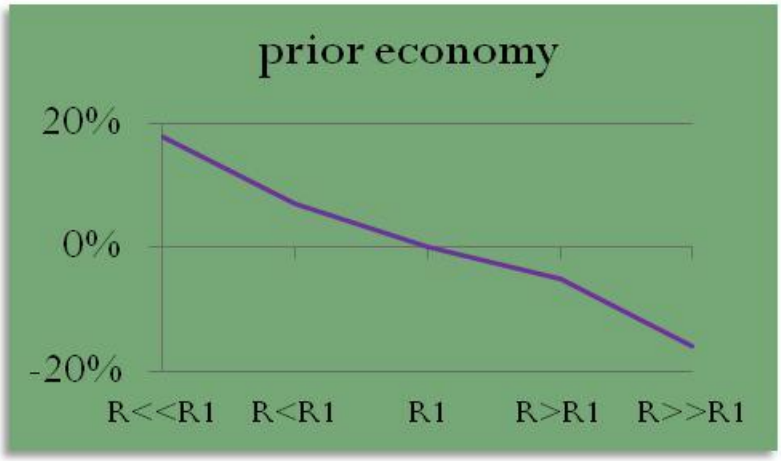

Fig. 3 – Inflation vs. interest rate in hypothetical *EP = 0* economy

Now let there be introduced a new business with intrinsic return $R_B > R_1$. Without monetary intervention, by our above assumptions and analysis, there will be deflation.

Now further assume that investors, still without monetary intervention, are able to equalize the market lending interest rate to a new value $R_2 = R_B$. Assuming inflation-deflation behaves as it has since 1960, there will be even greater deflation. The monetary agent is prompted to act.

However, to restore an inflation-neutral equilibrium, the interest rate will have to be driven to a new value $R_2' < R_1$.

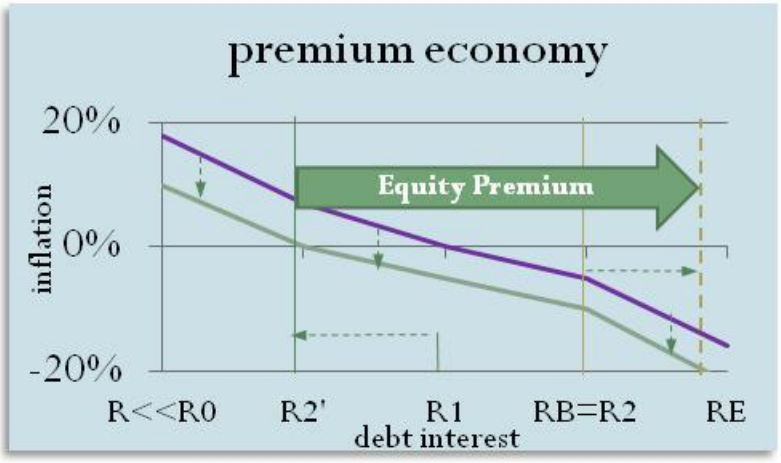

Fig. 4 – Inflation vs. interest rate in high-return business economy

In Figure 4 we see an illustration of this. The inflation curve has been pushed down (to the green line). The lending interest rate had to be lowered to prevent deflation. The expected equity returns were increased first by the intrinsic return superiority of the new business to R_B, and again by leverage using the lower cost capital at the new lending rate per equation (2) to R_E.

We seem to be able to conclude from this that the effect of “progress” in business may be to enable the monetary agent to maintain a low interest rate and a high equity premium.

Indeed, it appears that progress might be “bad” for an economy if investors were allowed to equalize rates, causing deflation which in turn might decrease economic activity and lower business returns from both less activity and the collapse of leverage. The apparent threats to this economy are twofold: if the monetary agent is unwilling to keep rates low and thus causes deflation, or intrinsic business productivity declines causing inflation.

PRACTICAL AND IMPRACTICAL EQUALIZATION DYNAMICS

Let us consider an investor determined to profit from the equity premium to a degree that might bring about equalization. In classical theory, this investor simply sells debt (i.e. borrows) and buys equity. To guarantee equalization there must be no limit on the amounts. Notice this method is inelegant compared to rational investors simply agreeing one morning on new rates and prices. That is why there must be no limit on the amount of arbitrage. We will consider methods, the performance of those methods, obstacles, theoretical performance if the obstacles were removed, and techniques for reducing the obstacles offered by the investment industry.

The first obstacle is efficient market theory itself. The investor must either believe the market is inefficient, or that it will take a long time to reach efficient prices.

Then the investor will encounter the following legal and tax difficulties:

1. Legal borrowing for investment purposes is limited to 50% of assets in the best cases, often less, and is forbidden entirely in most retirement accounts.
2. Interest expense may only be counted against dividend income for tax purposes, not against capital gains.
3. Forced selling during market drops will cause capital losses which above $3000 a year are not deductible from other income.
4. Due to bid-ask spreads and quick or overnight movements (gaps), the investor will not be able to exactly restore positions that have been forced sales when the market rises again. Foreign securities may exhibit most of their price movement as gaps if traded through a U.S. broker on U.S. exchanges. Obtaining accounts in other countries is expensive and may involve additional tax liability.

The investor who attempts to utilize the maximum available margin could encounter forced selling (margin calls), and definitely will be unable to restore

any forced sell positions as the market rises due to being over the purchase margin limit of 50% (hold margin limits may be higher). The sensible solution is to limit use of margin so that expected market volatility will not create forced selling. In practice this means only about 30% use of borrowed funds, a far cry from “unlimited” borrowing. However, for the investor able to borrow at least half a million dollars, rates as low as 3% are available.

The investor might borrow for other purposes and re-direct the funds to equities, but risks committing fraud or encountering unsecured rates as high as 15%.

If we waive the borrowing constraints, we find that the expenses of forced selling become more frequent and severe. As much as 90% borrowing was permitted prior to the Great Depression, and was viewed as contributing to the rapid decline (though margin requirements were already increasing in 1928 so it was not the only cause).

With the advent of computers, it became possible to offer Exchange Traded Funds (ETFs) with exotic properties. A “2x” or “ultra” fund is roughly equivalent to 50% borrowing, but it is the ETF which does the borrowing, making it possible to use this kind of leverage in a retirement account. Usually such an ETF is subject to higher margin requirements by one’s broker so that the leverage cannot quite be doubled.

More recently “3x” ETFs are being offered, which is similar to being allowed use of 67% borrowed funds. Such an ETF reduces borrowing as the market declines, and increases it as the market rises, to try to keep a constant leverage. The most frequent re-balancing currently promised is “daily.”

It is not uncommon to find a 3x fund moving up or down 7% to 10% in a day. Even the S&P 500 has had 4 changes per year since 2008 above 4.6%, which means more than 13.8% in the 3x ETF UPRO. When movements are so large, tracking of the underlying securities breaks down due to compounding on the re-balanced positions. For example, if the underlying security moves down 3% one day and up 3.1% another day, it returns to the previous level.

The moves in a 3x ETF would be approximately 3x of that, or 9% and 9.3% respectively, which compound to a loss of 1.63%, possibly in as little as 2 days. Annualized, the rate is much higher. Only 4 such pairs of moves in a year would amount to a 6.5% loss, destroying any hoped for equity premium. In addition, one must add expenses for the ETF which include borrowing costs. As a result, 3x ETFs work better for low volatility indices like the S&P 500 than for fast moving commodities (e.g. NUGT) or foreign stocks (e.g. RUSL).

An examination of results shows that the best of these barely are able to return the 2x or 3x advertised since their inception, usually in the late 2000s. UPRO is an exception, luckily conceived in 2009 at a market bottom. Because they are

recent they cannot have affected the past equity premiums. We might suppose they could contribute to equalization going forward if they were not limited to 3x. Due to our arguments about equalizing through equity prices, we assume most of the pressure would be on interest rates to rise. This would require short term rates reach the 8% range, which they have attained only for one period in the last century.

Perhaps the most germane finding from this section is that the levels of volatility encountered by an investor employing the strategy that might accomplish equalization are *not* the levels analyzed by Mehra and Prescott, but some large multiple of those levels. Further, it is not merely a matter of "tolerance" of this volatility and postponement of consumption. Many of the high leverage funds are set up such that if values drop below some threshold, the ETF automatically liquidates (e.g. MORL). So effectively a large loss becomes permanent.

It is possible to diversify against large losses in individual companies. Indeed, corporate expected lifetime as we saw earlier has dropped by a factor of 3 since modern portfolio theory was developed, possibly because of it. But an S&P 500 based 3x ETF is already diversified, and an investor has no option to use portfolio tricks to reduce exposure to this loss, only to reduce leverage and thereby reduce equalization pressure.

Equalization need not be accomplished directly by individual investors. Banks, of course, are prevented from using deposits to buy equities, and from 1933 to 1999 normal banks were not allowed to buy equities at all. In the last decade or so a number of "financial" companies have been formed, often favored by legislation, such as Real-Estate Investment Trusts and Business Development Companies. BDCs can issue debt and use the funds to buy equity.

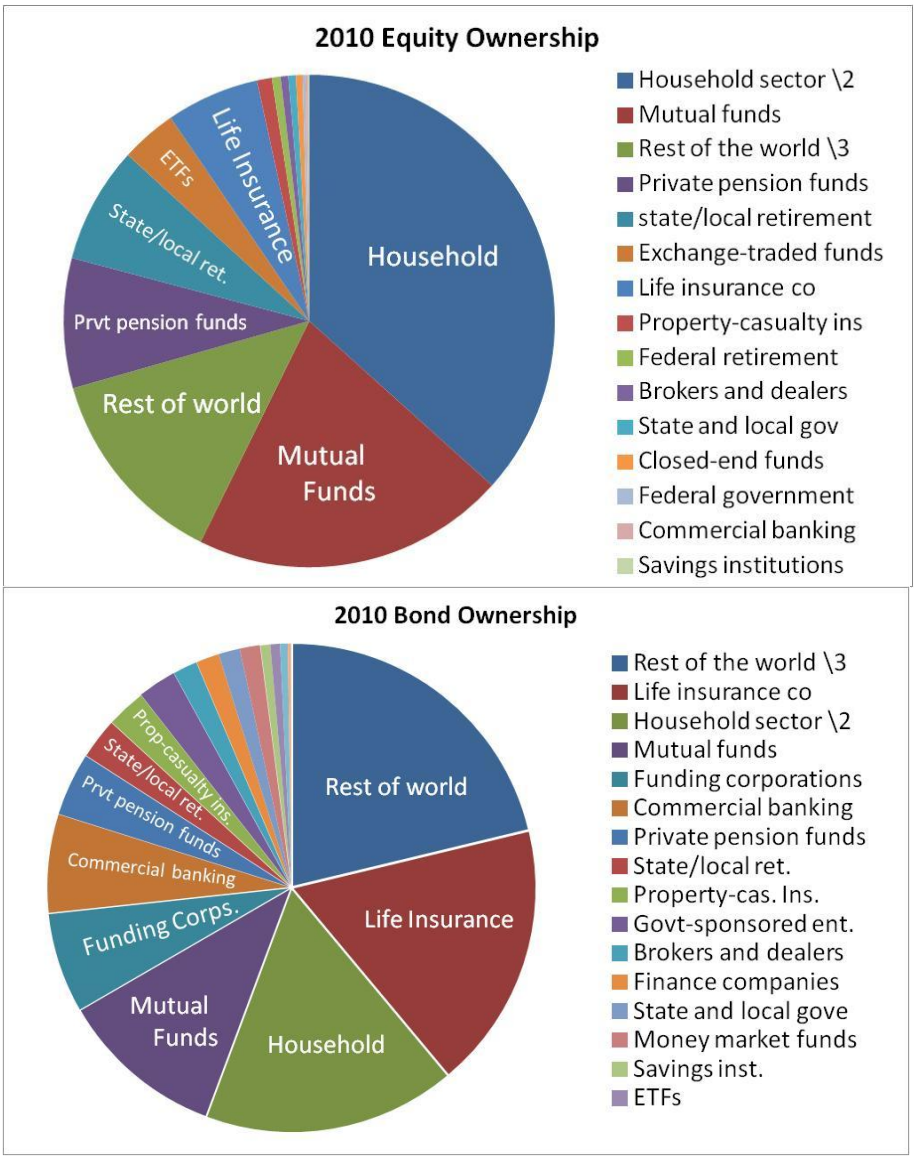

Fig. 5 – U. S. stock and bond ownership as of 2010

An examination of leading debt and equity ownership [13] (see Figure 5) shows some interesting patterns.

1. Household, mutual fund, and private pension fund are the top two and 4th largest holders of equity respectively. Each holds about half the value in bonds as it does in equity. This suggests they are using a similar theory of portfolio allocation between equity and debt.
2. Foreign holders are the 3rd largest equity holders, but they hold about twice as much debt as equity, making them the largest debt holders. Anecdotal evidence from a colleague at a major international bank suggests the primary motive of these foreign holders is safety of principal. In fact they may be heavily invested outside the U.S. so their portfolio allocations may not be as different as the U.S. numbers suggest.

These top holders, plus life insurance companies, state and local retirement, and miscellaneous small holdings by federal and local governments and savings institutions and similar non-speculative parties account for approximately 90% of equity holdings. Of the remaining, 6% is ETFs. It seems reasonable to assume that the 6% in ETFs is about the maximum of the amount of capital that could be attempting to arbitrage the difference between bond and stock returns.

Even if *all* of the ETF capital were deployed for the purpose of equity premium arbitrage (which it assuredly is not) then the maximum impact would be a 6% increase in equity prices. With daily gains and losses often half this amount, average yearly changes of 7% to 8%, and yearly changes of 30% common, the impact of rational investors would seem to be in the noise. If the ETF capital were all deployed at 2x leverage (which again it is not) then 50% of it (3% of market cap) would be borrowed, accounting for some demand for debt, but small compared to Fed supply of and Treasury demand for debt.

RATIONAL BANKING

The monetary agent may in fact need to lend very little money to keep interest rates down, if other lenders believe it has unlimited power to do so. There is a natural market mechanism that may be willing to assist the monetary agent, and strong reason for it to do so, and that is banking.

In ancient times deposits were made in temples, and later with governments, for safe keeping. Amounts as much as $1/6^{th}$ were charged for security. Deposits of grain were loaned to farmers as seed. Some deposits were to facilitate trade. Modern banking origins are traced to the Renaissance, when the banks of the Medici transitioned to private banks. For trade, notes against bank deposits could be moved without the fear of robbery associated with moving gold or similar assets.

Bankers, already heavily involved in trade, discovered they could use deposits to buy and sell goods and cover the cost of storage and security, and even provide interest to depositors. While this might attract more depositors, such deposits could hardly be compared to investment capital. A merchant who personally engaged in trade would expect a much higher return. The practice of issuing “discounted” notes arose to avoid the term “interest.” Private loans from ancient times had carried rather high rates of interest, for example 12% in Athens, and religious and moral objections developed.

A rational banker would seek, presumably, to maximize his returns. But the money he uses is not his, and may come to him almost without cost, or he may be paid to keep it. If he can offer a low rate to a business which will employ workers who will open consumer accounts at the bank increasing the total deposits, and who will eventually incur consumer debt at 15% or higher, the

banker finds returns increased two ways. There are more returns from larger deposits, with returns being computed only on the banks fixed costs not the deposits. And there are returns from related transactions at higher rates, which the bank is able to capture.

Even if the bank is completely solvent, there are not enough funds to cover all deposits, and at some point a run on the bank will develop. At that time, the economy has become dependent on banking, and the government must step in and guarantee the assets that have been "banked," i.e. any capital that has been used in a bank-like manner with respect to risk management. Banks typically reserve only a tiny fraction of deposits (e.g. 3%) when compared with the equity of private companies. In the case of the U.S. Federal Reserve, solvent banks have access to very low interest loans at the Fed discount window to cover demand withdrawals, or for other purposes. Even depositors of insolvent banks receive some guarantee, but the insolvent banks are closed and their investors face losses.

Anyone who loans money to a bank with expectation of something more tangible than just to share in future bank profits is in effect a depositor. When Lehman went bankrupt in 2008, there was a small loss in money market funds that held Lehman notes, and this caused a run on money market funds that froze the market for short term commercial paper, overnight driving up interest rates from a bank-like 2% to an equity-like 8%. With 45% of corporate capital coming from debt, and 30% of the debt short term (less than one year), a change from 2% to 8% in the cost of this capital would have a dramatic effect on business returns. Almost immediately, government insurance was offered for money market deposits because they had become a banking function.

It is our argument that this is an inevitable and repeating course as technology and banking evolve. Whatever seeks to avoid risk and is deposited mainly for security will be used as low-interest capital and the economy will become dependent on it. A "bank run" will trigger government insurance, and then it officially becomes bank-like. Its uses will be regulated, and it will not be freely used as investment capital. Equity will be required to absorb bankruptcy risk. And this equity will expect a higher return.

By contrast, while a "run" on a stock is unfortunate for investors who are late to sell, the companies themselves usually continue to operate, sometimes for years after becoming "penny stocks," and occasionally even recover from this situation.

Central banks evolved from ordinary banks. One of the two or three earliest was the Bank of England, organized mainly to help finance war with France. From central banks evolved monetary agents, quasi-independent (depending on country) bankers with public responsibilities. It would be natural to assume in our allegory of Zo that the monetary agent would work through bankers to implement its policies.

The economy of Zo as we left it after industrialization appears to be in equilibrium and rational, at least until some new factor emerges or preferences change. A lender will find no agricultural demand for debt above 4%. And while industrial returns cannot equalize through price to other than their 12% return, the price to earnings ratio of their shares will rise to whatever level begins to make investors uncomfortable. The author's guess is that might be somewhere around 25, which corresponds to industrial earnings of 4%, and then *in regard to earnings equity is equalized with debt*. But because of the surprising math of discount pricing of long life returns, there is still an 8% equity premium when price appreciation is added to earnings.

And of course, if banks are utilized by Zo's monetary agent, they may offer consumers unsecured loans at credit card rates. This is not a risk premium. Credit card defaults are in the 3 to 4% range, and even at 2009 peaks rarely exceeded 6% (Bank of America the exception), indicating that around 9 to 11% was essentially risk free. Credit card rates are simply discriminatory pricing. It is difficult to enter the business of providing credit cards. It is after all a "business" with complex networks and procedures, and it has a business return. An investor wishing to capture this return buys stock in a bank, or starts a bank.

While not a derivation of any particular equity premium, the example of Zo demonstrates that *an* equity premium exceeding the expected risk premium *can* exist in equilibrium without irrationality, and without exhausting the means or will of the monetary agent.

The monetary agent has latitude to choose its intervention rate. The value chosen in the above example was arbitrarily selected to make the economies before and after the change easy to compare, having the same total average return. But a rational monetary agent seeking to maximize employment and willing to tolerate some inflation might choose a lower rate, creating a larger equity premium and faster growth.

When the author discusses these concepts with economists versed in the equity premium, sometimes there is the question, "But what about markets? There is a borrower and a lender. How do they agree on price or rate?" There are two key things to keep in mind. First, efficient market theory only holds that market participants will not be able to profit from widely available information. It does not hold that all market participants agree, either on price or risk. The question asked with the article "a" implies homogeneous participants, which is not the case. Money has not disappeared from banks as interest rates have dropped toward zero and fees are even required in some cases. But money did disappear from overnight lending after a 3% default due to Lehman.

While this does not challenge efficient market theory, perhaps the reader will argue it challenges rational investor theory. This thorny and legitimate question

is fortunately avoided because low interest market capital is not necessary if the monetary agent is willing to lend, as for example in the massive Quantitative Easing program of the Federal Reserve, and prevents the money it has lent from being invested in equities, and if bankers are rational, passing on the monetary agent's rate for reasons described above.

Next we should look at a bit of history to see if our theory is empirical as well as rational.

THE ERA OF FREE BANKING

In the 2003 article cited earlier, Mehra and Prescott observe that the equity premium was zero from 1802 to 1862. During this period the charter of the Bank of the United States was allowed to expire in 1811. The United States experienced great difficulty financing the War of 1812 due to severe inflation, with the result that the credit and borrowing status of the U.S. was at its lowest level since the country's founding. A charter for a Second Bank of the U.S. was granted in 1816, and the bank opened in 1817, but became entangled in partisan politics and was closed by Andrew Jackson. All banking business was done by state chartered banks until 1863, when the confusion of banknote values and instability of banks was judged to be an intolerable problem and Congress passed the National Bank Acts of 1863 and 1864, again during wartime.

This period of "Free Banking" as it was called (was it "free market banking" we wonder?) is notably coincident with the period of a zero equity premium. A passerby not otherwise burdened by politics (of that time or ours) might think it at least pardonable to look in the direction of banking and monetary policy for an explanation of the lack of equity premium. When banking was relatively unregulated, it seems the returns equalized as economists would expect. However, this alone does not explain *why* they do not equalize otherwise. It merely indicates a direction in which to look.

Just the fact that banks were risky does not by itself argue for an effect on the lending interest rates. While most investigators have focused on the risk premium, one of the purposes of this paper to focus on the effect of interest rates (a quantity essentially controlled by monetary policy) on business returns. And we will further argue that business returns, not prices, must determine the long term equity return, because investors with limited time preferences who are also confounded by the friction between individual and aggregate (index) returns will not be able to equalize 100 year aggregated market returns.

Banking was not the only focus of the federal government during the 1860s. The nation was at war yet again, and became the first nation to spend more than a billion dollars in a year. Two thirds of the North's costs were financed with bond sales. 12% was financed with the printing of "greenbacks" which could *not* be converted to gold. The remainder was raised through tariffs and taxes. The

South was not in a good position to sell bonds to its population, or to raise tariffs, and induced severe inflation by relying on printing currency. General Lee became unable to purchase supplies [14].

THE INDUSTRIALISTS

The basis of modern corporations was laid with the tracks of the transcontinental railroad, initiated by legislation in 1862 and 1864. Disputes over the route were more easily settled without the South's presence in Congress. Construction was financed by the sale of bonds at 6%. The bonds were guaranteed by the sale of land grants in addition to operating revenues. Further, the government guaranteed a market for the railroads by land grants to homesteaders, prompting a significant population increase. We will come back to the role of population growth in business returns in a moment.

Railroads encountered thousands of separate jurisdictions across the country, leading to regulatory problems. This resulted in Supreme Court cases in 1886 and 1888 that established corporations had equal protection of law under the 14th amendment (the 14th was also a result of the Civil War period), and may consist of "a succession of members without dissolution" [15]. These and other developments established an *unlimited lifetime* for corporations, making financing by equity issues significantly more attractive, enhancing the ability of the corporations to generate returns, and reducing risk [16].

These legal developments had the opposite effect on risk vs. returns from the economic forces of investor choices and demands. The government was pushing interest rates down to finance wars and railroads, and pushing the possible business returns up in order to create a national infrastructure. While few corporations from that era realized the potential of unlimited life, and few do today, several such as Union Pacific and General Electric are still with us.

Indeed, the early shareholders of GE and Standard Oil would have been justified in paying nearly any price for their shares, provided only that their time preferences for consumption included a preference for the success of their descendents. When Jay Rockefeller retires in 2014, the United States will be without a Rockefeller in high office for the first time in four decades and only the second time since the 1950s.

Silver had been demonetized in 1873 as new deposits had undermined its value. Bimetallism or “free silver” would have allowed farmers to pay their debts more easily. The Panic of 1893 intensified debates. In a famous speech at the Democratic Convention of 1896, William Jennings Bryan said, "You shall not crucify mankind upon a cross of gold." But Bryan lost the main election and in 1900 McKinley reinforced the single metal standard, which restricted the money supply available to fuel growth while facilitating trade with other gold standard nations such as England.

Debate continued as farmers were joined by successful businessmen who also opposed banking and trade views on money. A 1921 New York Times article [17] describes the efforts of Henry Ford and Thomas Edison to promote commodity based money instead of debt based money. Both men were famous for setting up mass production assembly lines, and could not visualize other than catastrophe if a limited quantity of gold money were divided by all they could produce. Edison is quoted as saying, “Gold is a relic of Julius Cesar, and interest is an invention of Satan.”

So the strongest form of the gold standard had only lasted 33 years when a worldwide depression and severe deflation reversed political fortunes and the winds of global trade.

GROWTH AND FREE TRADE

Without doubt structural differences in the means of generating returns between bonds and equities were introduced by legislation and court rulings. There arose a new class of businesses engaged in innovation and mass production, whose interests were more aligned with miners and farmers than with lenders and landholders. They did not get “commodity money” in 1921, but they got rid of gold completely by 1971 and with free floating currencies the nation which produces the most sees its currency rise in value. Isn’t that commodity based money? For all practical purposes, Edison and Ford won in the end.

The rhetoric of the debates has changed little. It appears the tide may have turned merely because with a higher growth rate, the industrialists and their successors came to control most of the capital and jobs. This is suggestive of rationality by adaptive selection [18].

The charter of The Federal Reserve pre-dates this adaptation, and does not mandate “growth.” However, the relation between growth and employment is well known, and a monetary agent is a political entity which cannot remain immune to the dominant thinking of its context. If for no other reason, the dominant thinking mode controls how markets will react to the monetary agent. Interest rates are not set in stone. What markets think the central bank can or will do on average over time is more important than today’s rate, because the equalization pressure of the discount pricing model from very-long returns makes future growth very important in today’s prices.

So we argue that a *rational monetary agent* will adopt a goal of maximizing growth, in addition to anything that may be written in its charter. The success of the experimental new policies of central banks today will determine which policies are adaptively carried forward and become the goals of future monetary agents. The Bank of Japan, for example, has gone beyond interest rates and buys equity (using Exchanged Traded Funds). In our model this does not appear

to increase growth, but Japan is desperate to experiment after decades of stagnation.

The European Union at this writing appears to be coming under older influences. Even their monetary charter is different, not addressing employment. In our simplified analysis we supposed central bank lending to be used for production, but many European governments have used credit for less-than-productive spending.

China has possibly the most aggressively managed economy in history, having evolved a kind of capitalism from its communist central planning roots. This is culturally supported in China more than some other countries because of a very long history of coordinated action and preservation of social good. Favorable capital rates are made available to business not only through monetary and banking means, but also government direct ownership of businesses. (Possibly inspiring the Japanese model?) Time will ultimately decide if this system is well adapted. If it is, then countries with low production growth rates will become poorer in the de-facto era of commodity based money. In some countries, Edison even got his wish for zero interest.

NEAR-EQUILIBRIUM TRENDS

When contemplating an actual calculation of what the equity premium should be, it is hard to find data at any interval without evidence of some long term trend. We already mentioned the decline in tenure on broad indices, for example. It seems more profitable to identify relevant long term trends than to try and avoid them.

Interest Rates

On the one hand, there is an obvious trend downward in interest rates since ancient times. On the other hand, there does not seem to be any reason to suppose that the relation between interest rates and loan failure due to war or insolvency or business failure has changed. Interest rates were as low as 4% in the core of the Roman Empire in 25 A.D., only to rise again to exceed ancient levels during the depths of the Dark Ages. According to Armstrong [19], every government has succumbed to the temptation to borrow more than it can repay, and war is most often the cause of excess borrowing. Also according to Armstrong, speculation and inflation are the typical endpoint of cycles, and governments have often tried to regulate interest rates.

It has been our assumption that inflation would indeed end the effectiveness of monetary intervention at lowering interest rates, so we take no issue with these claims. Some clarification of terminology is advisable. Inflation in the historical scenarios was often due to an excess accumulation of gold or other fixed basis money. Inflation in the price of goods corresponds to an equal and opposite

deflation in the value of money. In the case of a money supply loosely based on GDP relative to trading partners, the goods themselves are “trade money” and a deflation in the monetary value of the trade goods is somewhat analogous to the historical case of inflation of prices via deflation in the value of the monetary commodity.

In other words, in our model deflation has emerged as a persistent problem in an economy in which productivity constantly increases, but the terminology is masking similarity to historical economies.

We are wary of an “end of the line” somewhere in a government strategy to regulate interest, and in the remainder of this section will attempt to identify other substantive trends that account for the equity premium – trends that allow monetary intervention to be successful for the time being.

Population Growth

Population growth over the last century in the USA is about 1.3% annually, slowing to 1.24% since 1947, or 1.01% since 1974, and about 0.7% in recent years [20]. Population increases absorb production output and also contribute to production output. If business ownership is fixed, i.e. does not grow with population, then excess returns might be expected with population growth. Below we will examine a means by which this might generate some equity premium, but it is not per se a characteristic of population growth, rather the disposition of dividends and capital hoarding.

Productivity Growth

Our analysis depends on introduction of a higher productivity business into an economy – at least once. In fact productivity has been growing at around or just under 2% during the entire history of the U.S. [21]. There is a slight decline in recent decades, but the trend once again seems up since the 2009 financial crisis as many automation technologies mature, and business owners implement automation to compete with low cost labor in world markets. In the first quarter of 2013, for example, manufacturing productivity increased 3.5% while labor costs decreased 10% [22]. This is four years into a “recovery” and the deflationary pressure is evident. While future productivity is extremely uncertain, our analysis is valid as long as productivity does not decline. In the very long term, the decline in importance of labor if productivity increases without limit is something the world economy has not yet addressed.

GDP Growth

GDP in the U.S. has been growing at around 3% since 1929, or around 2.2% since 1947 [23]. We will take 1947 to 2012 as a basis interval for discussion in this section for a variety of reasons, such as data availability and avoidance of

major wars and major market lows or highs (that we know of, in regard to the end date). It begins just before the modern structure of the Fed in 1951 and should allow full evaluation of any impact of the modern Fed, without difficulties in comparing data to different monetary regimes.

This section was inspired by a comment in [7] claiming that equity returns had no particular relation to GDP growth, and could exceed GDP growth indefinitely. The comment was strong to arouse contrarian suspicions. Indeed, if one looks at the ordinary way of computing GDP via production, there is little way of identifying how it would relate to equity returns. But there is an *income GDP* which in principle gives the same total result, a kind of book-balancing of GDP, and when we turn to this we find the five components of Table 2.

Income GDP component	annualized growth 1947-2012
Corporate earnings	2.5%
Salaries	2.2%
Investment income	2.8%
Farm income	-1.1%
Unincorporated non-farm income	2.1%
	====
Total GDP	2.2%

Table 2 - Income GDP since 1947
(Data from the Bureau of Economic Analysis)

Here we see two factors that relate directly to equity returns. Investment income includes both dividends and interest, and has been growing .6% faster than GDP, increasing their share by 48% (about half) over the 66 year period at the expense of other GDP components. Corporate earnings have exceeded by .3% resulting in a 22% increase in share. Most of the cannibalization has been of farm income, but small unincorporated businesses have also seen their share decline slightly, by 7%.

The BEA data does not distinguish business size, only incorporation status. Large businesses enjoy lower cost of capital due to perceived stability, and should receive relatively more stimulus from a low rate monetary policy. Have they? Shiller provides data on the S&P Composite (1500) which show a growth rate of 2.65% over this period [24]. These 1500 businesses represent 80% of the available equity, and their excess growth rate of earnings over GDP is .45%, increasing their share of GDP by 34.5%.

Equity returns are price returns plus dividends. Price returns are directly computable as change in earnings (the earnings growth we have just been discussing) and change in P/E ratio. The P/E since 1947 has increased at an annualized rate of 0.9%, also determined from the Shiller data.

Many popular equity premium analyses are based on indices similar to the S&P Composite, or even smaller. If we simply add the excess (over average GDP) growth rates of corporate earnings, P/E, and investment income, we have .6%+.45%+.9% = 1.95% excess return over GDP, a "premium" for holding large corporate entities. Of this, 1.05% is cannibalization at the expense of other GDP components and non-inflationary. The remainder is P/E ratio, a volatile estimate of the stability of future growth, possibly very distant growth, as we have seen. P/E returns are zero-sum, that is, for every dollar realized in a sale, some buyer put up a dollar, so P/E increases to not lead to inflation by themselves. The entire 1.95% is non-inflationary.

Ownership concentration

One component of the equity premium is somewhat theoretical, and that is the full re-investment of dividends. This has become more practical for small investors with increasing availability of mutual funds and ETFs, both of which come at some non-negligible cost in expenses. This part of the premium necessarily results in a (again theoretical) concentration of ownership, as through re-investment, the investor who realizes this return increases her share of ownership of the total market. Obviously if *all* investors followed this policy, per-investor share of the market would remain unchanged, so it is somewhat of a paradoxical component of the EP.

Dividends, like interest payments in the economy of Zo, will have an inflationary effect only if spent for consumption. If re-invested, they have only the effect of ownership concentration. If an investor is "realizing" the full EP, then she must be following a strategy of re-investment, and therefore the dividend payments are non-inflationary. So we can add the average annual dividend of 3.46% since 1947 (again from Shiller) to the above 1.95% to find a justifiable non-inflationary EP of 5.41% over that period. If we accept that 4% of the EP has been equalized through competition and shorter company lifetimes, then a former EP of roughly 9.5% is easily explained.

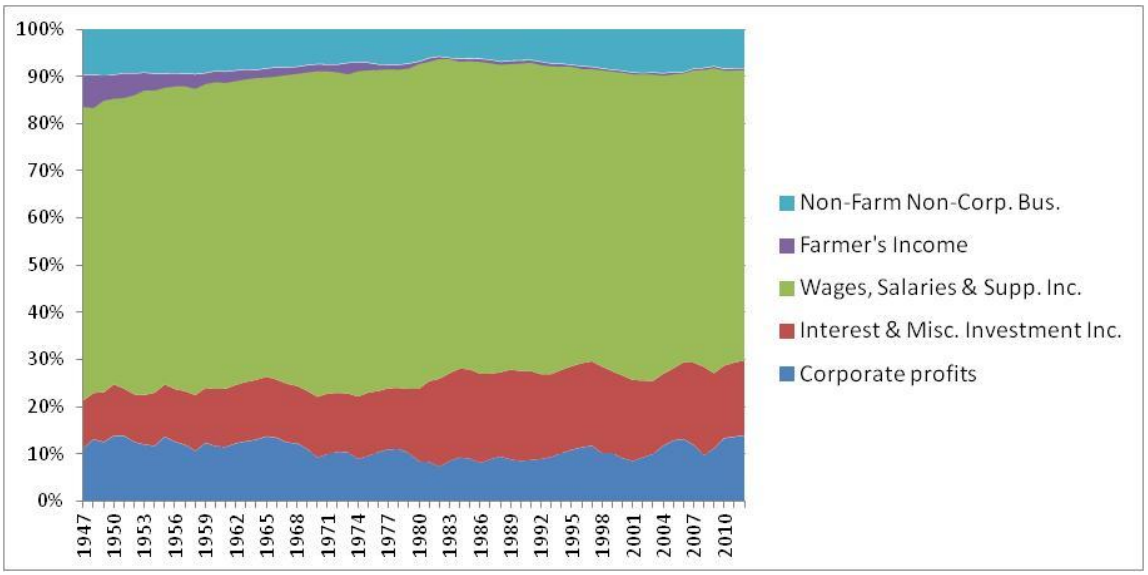

Fig. 6 – Relative share of income GDP components

Figure 6 shows the share of income GDP by its 5 categories. It is evident that while corporate share is increasing, there is a long way to go before investment income dominates salaries, and even unincorporated business are in no apparent danger of disappearing, so cannibalization can continue for a long time (though not indefinitely, of course).

SUMMARY AND CONCLUSION

Equity returns cannot equalize through the mechanism of discounted pricing because, especially when rotating portfolios are employed, this would result in very high P/E ratios which are unrealistically volatile. And the portfolio-driven valuations would be out of sync with individual equity fair values and subject to attack by arbitrage.

The selection of any particular time preference for investors affects only the P/E ratio. The underlying intrinsic business growth rate re-emerges through re-equalization as new earnings are discovered, formerly outside the time preference window. Therefore, the most likely method of equalization is through rising interest rates, i.e. falling prices of bonds and other debt.

Monetary policy, government borrowing, and the regulation of banking and private borrowing, together with the discriminatory powers and related-transaction interests of rational bankers are able to maintain an equity premium by lowering, on average, interest rates below equity return rates. As long as business productivity is high and increasing, inflation will permit low interest rates. Indeed, if rates are not held below where investors would equalize them, the economy would be threatened by deflation. As productivity increases, the deflation threshold becomes lower.

The dual action nature of the mechanisms we have described, that is the lowering of benchmark lending interest rates in conjunction with raising the return on equities, suggest that unlike many temporal preference schemes, our mechanism simultaneously contributes to the resolution of both the equity premium puzzle and the risk-free rate puzzle.

Zheng has pointed out that various preference-based adjustments to the consumption CAPM which seem to work in theory in fact fail when confronted with data regressions. But even worse, they cannot theoretically explain why the EP would be large for long periods, and then sometimes negative for long periods [2]. Since our model can move the equity premium and lending interest rates in opposite directions, we don't stand in contradiction to historical data.

We conclude that an equity premium in excess of a traditional "risk premium" is likely to be best understood as the introduction of new high-return business activity into an economy, with a side effect in that the GDP structurally changes, growing toward industries exhibiting the new productivity, and toward large businesses with the lowest cost of capital. However, due to the necessity of maintaining a perpetual portfolio to realize the equity premium there will be a premium on new businesses, and if the EP is fully realized by investors, a concentration of equity ownership through re-investment.

As a consequence, it may be that rather than an expectation of monetary policy which is entirely cyclic, it is likely that over time if productivity continues to increase, monetary policy needs to permanently adapt. Rather than a question of the sustainability of a new monetary policy regime, we find a question of whether it is wise to discontinue an adaptation to productivity increases and associated deflation.

Several questions remain for further research. In the past, it has not always been necessary for monetary agents to supply large amounts of capital at non-market rates. Is this a sustainable situation, or will adaptive forces gradually reduce the low interest capital available? For example, the transfer of wealth from working classes to investor classes might be a long term adaptive pressure which reduces low interest capital. Alternatively, we might ask if the working classes embed some instinctive knowledge of the possibility of occasional catastrophic failures which the investor classes are not taking into account. Or will an age of automation and robotics disempower the working class, disconnecting us from historical patterns? Looking to the far future, one might even ask if non-human entities will eventually be allowed to enter the investor class, much as during the 19th century corporations enjoyed an expansion of rights culminating in full corporate personhood.

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