FINANCIAL ASPECTS OF BUSINESS CYCLES:
AN ANALYSIS OF BALANCE SHEET ADJUSTMENTS OF U.S. NONFINANCIAL ENTERPRISES OVER THE TWENTIETH CENTURY

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Abstract

This paper formulates and empirically tests a model that describes the balance sheet adjustments of debt and equity financed U.S. nonfinancial enterprises over the twentieth century. In this model asset adjustments change the expected income and operating risk of firms while financing adjustments change the financial risk. To protect debt and equity investors from a conflict of interest problem, an up-front contract develops an "assignment" rule for managing the firm's balance sheet. That assignment rule has managers making asset adjustment decisions that conform to changes in the risk aversion of their equity investors as revealed to them by changes in equity share prices. These asset adjustments by themselves and then through the production function cause business cycles. Financing adjustments are then made to insulate bondholders from changes in operating risk initiated by the investment decisions of firms. In this way the contract induced assignment rule resolves the conflict of interest problem between bondholders and stockholders and in the process coalesces their welfare over the business cycle. The model makes several important predictions about the balance sheet adjustments of firms. One prediction is that firms adjust their assets in response to changes in lagged stock prices as they proxy for changes in stockholder risk aversion. A second prediction of the model is that long-term financial leverage is countercyclical; i.e., an increase in risky capital investment that causes a cyclical expansion is financed with equity, while reductions in investment that cause a recession is supported with debt. These and other predictions of the model are not rejected by the intertemporal balance sheet data for U.S. nonfinancial enterprises over the twentieth century.

JEL Classification E1, E3, G1, G3, L2

I. INTRODUCTION

The importance of a financial channel as a source and propagator of fluctuations in real economic activity has had a long and contentious history. At one end of the spectrum is the view that finance is just about little pieces of paper that have almost nothing to do with initiating or propagating something very real like the business cycle. The foundation for this view is the efficient and perfect market hypothesis in which the market prices of financial securities reflect all the publicly available information on the real returns of the firm. In effect there is a kind of financial neutrality where the financial side of the economy merely reflects what is happening on the real side of the economy. At the other end of the spectrum is the view that nothing happens on the real side of the economy without something first happening on the financial side. Just what that something on the financial side might be is the subject of great debate. Typically (although not necessarily as we will argue below) this view that "finance matters" is based on some sort of perceived imperfection in the financial system. One such approach in this direction is that agency problems and asymmetric information between inside and outside investors drive a wedge between the cost of internal and external financing of real corporate investment, something that could not happen in the world of Modigliani and Miller with perfect financial markets. This wedge is particular important for small firms. Calomiris and Hubbard (1995, p.443) summarize this view in the following way: "Lemons premia in equity markets (as in Myers and Majluf 1984) and credit rationing and loan mispricing (as in Jaffee and Russell 1976; Stiglitz and Weiss 1981; Gale and Hellwig 1985; Williamson 1986; Bernanke and Gertler 1989; and Calomiris and Hubbard 1990) imply that external finance will be more costly than internal finance." The end result is that the real investments of firms are finance constrained. When this constraint is particularly severe, a recession will soon follow. When the constraint is particularly soft, a cyclical expansion will soon follow.

The view that information asymmetries place binding financial constraints on firms is a strong indictment of the inventiveness of financial market participants. Why isn't it possible to structure financial contracts to overcome these information asymmetries? Not to do so is the equivalent of leaving "money on the table," and the financial services industry has the reputation of leaving very little money on the table. In an economy where there are substantial rewards to successful financial innovation, it would be expected that any given wedge between internal and external finance would soon be eliminated over time and could not therefore be part of a macroeconomic equilibrium. In fact Chaplinsky and Haushalter (2003) describe a set of innovative real world financial contracts called PIPE's (i.e., private investments in public equities) for severely financially constrained firms headed toward bankruptcy that attempt to do this very thing. One of the key features of these financial contracts is that they are structured to provide investors (e.g., hedge funds, venture funds, strategic corporate investors, and others) with varying degrees of asymmetric exposure to the underlying returns of the issuing company's equity. In negotiating and structuring these contracts the potential investor in PIPE's engages in extensive discussions with the management of the issuing company thereby overcoming some of these informational asymmetries. While these contract forms are relatively new they are growing rapidly, and in 2000 they represented 8 percent of seasoned equity offerings according to Chaplinsky and Haushalter. PIPE's are just one example of how investors and firms respond to an apparent imperfection in the financial system when it is seemingly profitable to do so. Finally it would seem that firms unable to take on profitable investment projects because of financing constraints, would voluntarily join themselves to or become takeover targets of firms that are not so constrained. Thus to the extent the set of outside investors includes unconstrained firms (with knowledgeable managers) in the same industry, the asymmetric information problem would seem to be less serious.

In this paper we present an alternative view on what the financial links to the real economy are, and then document the observable financial relationships implied by this view for U.S. nonfinancial (and nonfarm) enterprises. This view, which does not necessarily rely on financial market imperfections, is presented in Section II. The main contribution of this paper is presented in Section III. In this section we empirically document the financial relationships that are implied by the model described in Section II for U.S. nonfinancial enterprises over the long sample period of 1900-2002. Our main findings are: i) that changes in the capital market valuations of firms that reflect exogenous changes in risk and/or risk aversion, signal future changes in their investment strategy and the amount of operating risk and return they produce; and ii) the financing decisions of firms are matched to changes in their investment strategy so as to preserve the market valuations of their long-term liabilities. Thus the risky investments that generate operating risk and return are procyclical, while long-term financial leverage that generates financial risk is countercyclical. In a perfectly rational and efficient financial system managers of debt and equity financed firms will adjust their operating decisions and financing decisions so that these two risks will exactly offset one another over the business cycle. Finally, a short summary of the main results of this paper is presented in the concluding Section IV.

II. THEORETICAL FRAMEWORK

In this section we present the theoretical framework that underlies the empirical work in Section III. Towards this end consider a purely private economy in which a representative risk neutral entrepreneur who in the course of maximizing his/her intertemporal utility makes a real investment in a start-up company that produces the goods and services that comprise GDP. The ownership claim on this real investment in the start-up company takes the form of unlevered equity securities. Whatever GDP this representative company produces in the future will either be consumed or reinvested in the company depending on the preferences of the entrepreneur over present and future consumption. In this set-up the financial arrangements are relatively simple in that the capital structure of the company takes the form of unlevered equity.

Now suppose the founding entrepreneur retires and bequeaths the unlevered equity in the company to his/her son (s) and daughter (d). Suppose also that investors (d) and (s) are both risk averse but that (d) is relatively more risk averse than (s). When this is the case it can be shown that both investors can be made better off in terms of expected utility if the company's capital structure is changed from unlevered equity to debt and levered equity.[1] In this connection and to simplify matters we assume that (d) exchanges all her inherited unlevered equity for a debt claim on the firm, and that (s) exchanges his unlevered equity for levered equity. Now the financial arrangements in this economy are becoming more complex. They are becoming more complex because of the assumed differences in the risk aversion of both groups of investors that are now reflected in a debt and levered equity capital structure. As we will see below one implication of this difference in risk aversion is that (d) and (s) will fundamentally disagree on the firm's future business strategy. Investor (d) would vote for the firm to pursue a safe and conservative business strategy because her income is capped from above by the promised payment on the debt claim. Investor (s), on the other hand, would vote for a speculative business strategy because of the call option feature embedded in levered equity.

Insert Figure 1 here

To see this consider the geometric description of the firm inherited by investors (d) and (s) in Figure 1. This Edgeworth-Bowley box diagram presents the firm's productive capital investment, K, the expected returns, $\overline{X}$, generated on that investment, and the amount of financing provided by bondholders and stockholders, K(d) and K(s). Note that at the allocation point Z in the figure the rate of return on debt, R(d) = $\overline{X}(d)/K(d)$, is less than the rate of return on levered stock, R(s) = $\overline{X}(s)/K(s)$ indicating a positive risk premium. Now suppose R(d) and R(s) are constant in the small neighborhood around Z in the diagram. Then for small variations in K(d) we have:

1. $$\overline{X}(d) = R(d)K(d)$$

The expected returns $\overline{X}$ generated on the productive investment K of the firm is:

2. $$\overline{X} = R[K(d) + K(s)] = R[K]$$

where

R = the rate of return earned on K.

Finally the residual expected returns going to levered equity is

3. $$\overline{X}(s) = \overline{X} - \overline{X}(d)$$

Putting (2) into (3) and dividing the result into (1) results in

4. $$\frac{\overline{X}(d)}{\overline{X}(s)} = \frac{K(d)/K(s)}{R/R(d) + \{[R - R(d)]/R(d)\}K(d)/K(s)} > 0$$

a relationship between $\bar{X}(d)/\bar{X}(s)$ and K(d)/K(s) in which R(d) is a constant. Similarly for small variations in K(s) around Z in Figure 1 we have:

5. $\bar{X}(s) = R(s)K(s)$

As before

2. $\bar{X} = R[K(d) + K(s)]$

The expected returns going to bondholders from the perspective of levered stockholders is

6. $\bar{X}(d) = \bar{X} - \bar{X}(s)$

Putting (2) into (6) and dividing the result by (5) yields

7. $$\frac{\bar{X}(d)}{\bar{X}(s)} = \frac{R - R(s)}{R(s)} + \frac{R}{R(s)}\left[\frac{K(d)}{K(s)}\right] > 0$$

a linear relationship between $\bar{X}(d)/\bar{X}(s)$ and K(d)/K(s) in which R(s) is a constant.

At this point it would be useful to cast the relationships in equations (4) and (7) into observable market prices on bonds and stocks rather than the unobservable rates of return on these two securities. To do this we think of yields in two different but related senses; i) an expected yield delivered by managers to investors through their operating and financing decisions, and ii) a yield required by investors based on their time preference and aversion towards risk. For bonds the expected yield will be designated R(d, ER) and the required yield by R(d, RR). The price per bond P(d) is then given by:

8. $$P(d) = \frac{\bar{X}(d)}{R(d,\ RR)} \bullet \frac{1}{N(d)}$$

where N(d) represents the number of bonds. Multiplying the numerator of the rhs of (8) by K(d)/K(d) and defining $\bar{X}(d)/K(d)$ to be the expected yield R(d, ER) results in the following expression for the price of a bond.

9. $$P(d) = \frac{R(d,\ ER)}{R(d,\ RR)} \bullet \frac{K(d)}{N(d)}$$

Equation (9) says that the market price of one unit of debt equals the book value (or contracted redemption value) of one unit of debt scaled by the Q factor for debt, R(d, ER)/R(d, RR). The equilibrium condition for the debt market is R(d, ER)/R(d, RR) = 1.0 where market value equals book value for bonds. Linearizing the relationship in (4) we obtain the dd schedule in Figure 2. The dd schedule presents the combinations of K(d)/K(s) and $\overline{X}(d)/\overline{X}(s)$ for which R(d, ER) = R(d, RR) = R(d) in equation (4) and P(d) = K(d)/N(d) in equation (9). Points above the dd schedule are those for which R(d, ER) > R(d, RR) and P(d) > K(d)/N(d), while points below dd are those for which R(d, ER) < R(d, RR) and P(d) < K(d)/N(d). These points are represented by a (+) and (-) in Figure 2.

Insert Figure 2 here

A similar equilibrium condition for the stock market is presented as the ss schedule in the figure. In this connection let R(s, ER) be the expected rate of return on stock delivered to stockholders by the operating and financing decisions of firm managers, and let R(s, RR) be the rate of return required by stockholders which in turn depends on their time preference and risk aversion. The market price of stock P(s) can then be written as:

10. $$P(s) = \frac{\overline{X}(s)}{R(s,\ RR)} \bullet \frac{1}{N(s)}$$

where N(s) represents the number of shares of stock outstanding. Multiplying the numerator of the rhs of (10) by K(s)/K(s) we get

11. $$P(s) = \frac{\overline{X}(s)/K(s)}{R(s, RR)} \bullet \frac{K(s)}{N(s)}$$

or

$$P(s) = \frac{R(s, ER)}{R(s, RR)} \bullet \frac{K(s)}{N(s)}$$

Equation (11) says that the market price of one share of stock equals the economic book value of one share of stock multiplied by the Q factor on stock, R(s, ER)/R(s, RR). When this Q factor is unity, the market price of stock equals the book value of stock, and this is the equilibrium condition that underlies equation (7). This equilibrium condition is plotted as the ss schedule in Figure 2. Everywhere along the ss schedule in the figure we have the combinations of K(d)/K(s) and $\bar{X}(d)/\bar{X}(s)$ in which the market value of stock equals the economic book value of stock. Points above and to the left of ss in Figure 2 describe situations where R(s, ER) < R(s, RR) and the market price of stock is less than the economic book value of stock. On the other hand, points to the right of the equilibrium ss schedule are those for which R(s, ER)/R(s, RR) is greater than unity and the market price of stock is higher than the book value of stock. These points are represented by a (-) and a (+) in the figure.[2]

Figure 2 illustrates the potential conflict between bondholders and stockholders in the firm. For example if the firm is initially created at point z (i.e., where the market value of both debt and equity equals the economic book value of the firm's productive resources) but over time implements operating decisions and financing decisions that moves it into zone IV (or zone II), the stockholders will realize a capital gain (or capital loss) while the bondholders will experience a capital loss (or capital gain). How can this conflict of interest between bondholders and stockholders in zones II and IV be resolved? One way is through an up-front contract that assigns the decision-making rights over the various components of the firm's business strategy to each of the two different groups of investors. In this connection the company's business strategy can be subdivided into two parts. One part is the company's operating strategy that generates the probability distribution of the future real cash returns. This strategy is implemented by purposely varying the company's production and real investments. We make two assumptions regarding the return generating process embedded in the company's capital investments, K. The first is that expected returns, $\bar{X}$, are diminishing in the level of capital investment.

12. $\bar{X} = f(K) \qquad f' > 0 \qquad f'' \leq 0$

Hence the expected rate of return on investment falls with increasing levels of capital investment. Recent evidence uncovered by Titman, Wei, and Xie (2003) reveals a negative relationship between abnormal levels of capital investments of firms and future stock returns which is consistent with this assumption.

In addition older evidence (reviewed by Rotemberg and Woodford, 1999) on the countercyclical movement of price markups over the marginal cost of firms is also consistent with this assumption when corporate capital accumulation is procyclical. The second assumption is that operating risk, σ, is increasing in the level of capital investment.

13. $\sigma = g(K) \qquad g' > 0 \qquad g'' \geq 0$

Together these assumptions imply that the Sharpe ratio of expected returns to risk, $\bar{X}/\sigma$, diminishes with the level of capital investment as described in Figure 3. What this means is that

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Insert Figure 3 here
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an expansion (or contraction) in capital investment is associated with an increase (or decrease) in operating risk and a decrease (or increase) in the expected return to risk ratio.[3] The second part of a company's business strategy is its financing strategy. This strategy is implemented by purposely varying the company's capital structure.

To summarize we have two different investors in a firm that in turn formulate and implement two different business decisions over time, namely, an operating decision and a financing decision. One solution to the conflict of interest problem between bondholders and stockholders is to match the firm's financing decision to its operating decision. One possible matching rule is for managers to make operating decisions that conform to the risk aversion of their shareholders, and then make financing decisions (through covenants) that preserve the value of the firm's debt.[4] In terms of the firm's balance sheet this says that stockholders manage the level and structure of assets, while debtholders manage the level and structure of liabilities and equity. In this way managers acting for debt investors can always offset any changes in operating risk initiated by managers' (acting for stockholders) operating decisions, with an appropriately matched capital structure decision. Thus an increase in the real investments of firms that causes a business cycle expansion, but via equation (13) increases operating risk, would then be accompanied by an increase in equity finance (through new stock issues and reduced dividend payouts) and a reduction in financial leverage and financial risk. Similarly a reduction in the real investments of firms that causes a recession but also a reduction in operating risk, would then be accompanied by a reduction in equity finance (through stock repurchases and increased dividend payouts) and an increase in financial leverage and financial risk. The end result is that firms financially restructure themselves whenever they change their real investments and operating risk over the business cycle.

Finally, what triggers a change in the real investments of firms in this model economy? Recall from the discussion above that managers make real investment decisions that conform to the risk aversion of their equity shareholders. Moreover, our assumptions in equations (12) and (13) and Figure 3 on the return generating process embedded in real investments are that the expected rate of return to risk ratio declines (or increases) with increases (or decreases) in the level of investment. Consequently in order for any additional investments to be undertaken it is necessary for the risk aversion and required yield of shareholders to fall. The stock market signal to the firm's managers of a reduction in the risk aversion and required yield of shareholders is an increase in share valuations in the stock market. Theory and evidence consistent with the hypothesis that changes in risk aversion are an important cause of changes in stock prices can be found in Campbell and Cochrane (1999), Chan and Kogan (2002), and Froot and O'Connell (2003). Thus changes in stock prices trigger changes in the real investments of firms.

So how does a business cycle and associated financial adjustment evolve in this model? It all begins with a taste or some other kind of shock that changes the underlying risk and/or the risk aversion and required yield of shareholders. A positive shock that reduces the risk and/or risk aversion and required yield of shareholders increases the market price of equity shares. The increase in share prices is the stock market signal for managers to implement an expansionary but speculative production-investment strategy that more closely conforms to the shock-induced change in the risk aversion of equity shareholders. But this speculative expansion in production and investment will increase the operating risk of firms, given the assumption of equation (13) embedded in the return generating process for real investments. Any increase in the operating risk of firms will not be in the best interest of relatively more risk averse bondholders, and for that reason bond valuations will begin to fall. However these rational and relatively risk averse debtholders can offset this increase in the operating risk of firms that comes with a cyclical expansion in real investments with an appropriately matched financial strategy that reduces financial leverage. In other words, an optimal covenant in the debt contract would have these firms financing these increasingly risky real investments with equity thereby reducing financial leverage and restoring the market valuations of bonds to their pre-expansion valuations. In the end a cyclical expansion is characterized by a riskier stock of productive capital, a reduction in the ratio of expected returns to risk from the return generating process, a lower risk premium, and a lower debt to equity ratio. While firms have more operating risk they also have less financial risk. The up-front contract that assigned the operating decisions to shareholders and financing decisions to debtholders has succeeded in coalescing the welfare of both groups of investors during a cyclical expansion, and attaining an economy-wide product market and financial market equilibrium.

A cyclical expansion is illustrated in Figure 4. The starting position for this firm / economy is point z in the figure. The point z represents an intersection of a debt market schedule dd and a stock market schedule ss in which the market value of both debt and stock equals the economic book value of the firm / economy's productive resources. From this initial product market and financial market equilibrium position, suppose there is now a taste shock for stockholders that reduces their required yield thereby immediately shifting the stock market schedule to s″s″. For the sake of convenience we assume the required yield on debt remains unchanged. A new equilibrium now emerges at z″. However in terms of expected yields on stock, R(s, ER), the firm/ economy is still at point z. The end result is that immediately after the shock the Q factor on stock is R(s, ER)/ R″(s, RR) > 1, and hence the market value of stock is now greater than the economic book value of stock. In this model when P(s) > K(s)/N(s) the market signals the existence of an arbitrage opportunity; namely, buy productive resources in the product and factor market at book value, and then sell stock to finance the acquisition of these resources at market prices greater than book value. The resulting expansion in production-investment causes a cyclical upturn in the economy. However according to the return generating process described above in equations (12) and (13) and Figure 3, an expansion in production-investment increases the operating risk of the firm / economy and reduces the return to risk tradeoff. An increase in operating risk increases the probability of bankruptcy and possible losses for bondholders. The up-front contract, however, requires the firm to offset this increase in operating risk with a reduction in financial risk so as to keep the probability of bankruptcy constant between points z and z″. The reduction in financial risk is achieved when firms finance the cyclical expansion with equity. At the new product market and financial market equilibrium point z″ the expected yield on stock, R″(s, ER) = $\bar{X}''(s)/K''(s)$, is driven down by the expansionary production-investment decision financed with equity, to equal the new shock-induced required yield R″(s, RR) on stock so that the Q factor is once again unity and P(s) = K(s)/N(s). In the end the economy produces more operating risk but with the reduction in leverage it produces less financial risk. In effect the less risk averse stockholder investors end up financing the decreasing returns and increasing risk real investments which is the way the financial side of the economy coordinates the real side of the economy when investors differ in terms of their aversion towards risk.

A recession evolves in the opposite way. A negative shock that raises the underlying risk and/or risk aversion and required yield of shareholders, will depress the market valuation of equity shares. Falling stock prices in this model are the market signal for managers to formulate and implement safe but contractionary production-investment decisions that via equations (13) and (12) reduce the operating risk of firms and increase the expected rate of return on real investments thereby increasing the return to risk ratio. The reduction in operating risk is good for debt investors and consequently bond prices begin to rise. But now the optimal bond contract requires debt investors to finance a larger share of the increasingly safe real investments of firms. As these debt and equity financed firms in the economy downsize thereby creating a recession, the released resources from the downsizing are returned to stockholders either through dividends or share repurchases. The end result is that financial leverage increases. This increase in financial leverage arrests the increase in bond prices and, in principle, returns them to levels prevailing before the negative external shock. In the recession phase of the business cycle firms confront less operating risk but bear more financial risk. It is also the case that the return to risk ratio and risk premium are now larger.

The testable implications from this model are as follows. The first is that stock price changes precede changes in company investments. The second, third, and fourth predictions are that the return to risk ratio, the risk premium, and financial leverage are all countercyclical. In the next section we empirically test the first and fourth predictions with U.S. data for nonfinancial enterprises over the long sample period 1900-2002. The second and third predictions have been well documented in the work of Ferson and Merrick (1987), Fama and French (1989), Fama (1990), Hardouvelis and Wizman (1992), Harrison and Zhang (1999), Harvey (2001), and Brandt and Kang (2003) among others.

III. INVESTMENT DECISIONS AND FINANCING DECISIONS OF U.S. NONFINANCIAL (AND NONFARM) ENTERPRISES: SOME EMPIRICAL EVIDENCE

The theory in Section II asserts that the managers of firms: i) adjust their operating strategy and risk in response to changes in the required rates of return of their investors (as reflected in the changes of the market value of their bonds and stock); and then ii) adjust their financing strategy to offset the effects of a change in operating risk on the market value of their bonds. In this way the procyclical changes in the operating risk of firms are matched with countercyclical changes in financial risk to coalesce the welfare of bondholders and stockholders over the business cycle. To test this theory we must first find suitable proxies for the initiating capital market signal, the changes in operating strategy (and operating risk), and the changes in financial strategy (and financial risk) of firms. Towards this end we will look for these proxies in the financial statements of U.S. nonfinancial enterprises.

The financial statement data underlying the empirical work presented below was obtained from Wright (2002)[5]. Wright extends the Federal Reserve Flow of Funds Statistics on aggregate balance sheets (Table B102) and changes in net worth (Table R102) for nonfinancial and nonfarm corporations from 1945 back to 1900. His useful contribution was to link earlier published data from the Bureau of Economic Analysis (BEA), the National Income and Product Accounts, Historical Statistics, Goldsmith (1955), Kuznets (1941), and others to the Federal Reserve dataset (1945-present) to obtain a consistent time series for various financial statement variables and other economic variables for the entire twentieth century. For a description of the data see the Appendix on Data Sources.

The first set of empirical tests is directed towards the business cycle adjustments that are pictured in Figure 4. According to the theory that is described in the figure, cyclical expansions occurring in zone I are characterized by a reduction in bondholders' share in corporate income (the result of an expansionary and speculative investment strategy), and a reduction in financial leverage (the result of an offsetting safe and conservative financial strategy). The opposite occurs in a recession. In this case corporate income is redistributed towards bondholders and financial leverage is increased. Both are the result of a deliberate change in the business strategy of firms. This can be seen in zone III of the figure as firms implement the safe and conservative investment strategy of downsizing and at the same time increasing financial leverage by returning some of the released resources to stockholders through stock repurchases and increased dividend payouts. Evidence supporting these predictions is presented in Table 1.

Table 1 presents the means and standard deviations of relevant economic variables for recession years, all years, and expansion years for the U.S. nonfinancial corporate sector over the sample time period. Recession years and expansion years are defined in the following way. The first step is to calculate the mean and standard deviation for GDP growth, $G\dot{D}P$, in the nonfinancial corporate sector over the entire sample period 1900-2002. As can be seen in column (3) of the table, the mean and standard deviation for $G\dot{D}P$ are 4 percent and 6.2 percent respectively. Recession years are then defined to be those years in which $G\dot{D}P$ is less than or equal to the mean $G\dot{D}P$ minus one-half the standard deviation of $G\dot{D}P$. Thus recession years are those years in which $G\dot{D}P$ is less than or equal to .9 percent (4-(.5)6.2), while expansion years are those years in which $G\dot{D}P$ is greater than or equal to 7.1 percent (4+(.5)6.2). Once the recession years and expansion years are determined, the means and standard deviations for each of the economic variables in column 1 are calculated and presented in columns 2 and 4 of the table.

We begin by considering the two economic variables on the axis' of Figure 4; namely, bondholders' share in corporate income and long-term financial leverage. The cyclical adjustment of these two variables are given as $\Delta\left[\bar{X}(b)/\bar{X}\right]$, and Δ(LT Liab/Net Worth).[6] The theoretical framework in Section II predicts that both variables are countercyclical, rising in recessions and falling in expansions. The evidence for these predictions over the sample period 1900-2002 is given in columns 2 and 4 of the table. There it can be seen that these predictions are not rejected by the data for the nonfinancial corporate sector. Moreover, the differences in the means of these variables between the recession years and the expansion years are significantly different from zero at the 5 percent and 1 percent levels respectively on a one-tail t-test. The results indicate that on average corporate income is being redistributed towards bondholders (or stockholders) during recessions (or expansions), while financial leverage is rising (or falling) during recessions (or expansions). Note that the adjustment in the distribution of corporate income between bondholders and stockholders is roughly of the same magnitude in both recession years and expansion years, and for all years it is zero. On the other hand, the reduction in the measure of leverage in the table during expansion years is much greater than the increase in leverage during recession years. The next two variables in column 1 of the table are measures of tangible investment. The first is the change in the real value of inventories, Δ(Inv), while the second is the sum of the changes in inventories, plant, and equipment, Δ(Inv + P&E). As expected these investments are procyclical. Moreover, the differences in these two measures of investment between recession years and expansion years are significantly different from zero at the 1 percent and 5 percent levels on a one-tail test. It is also the case that the recession adjustment (relative to all years) of these two tangible investment variables is of a greater magnitude than the expansion adjustment. Finally the last variable in column 1 is the one year lagged change in the real market value of equity in the nonfinancial corporate sector, ΔSP_{-1}. According to the theory this lagged stock market variable should be falling for the recession years and rising for the expansion years. The results in columns 1 and 3 indicate that this is indeed the case. Moreover, the difference between the averaged ΔSP_{-1} variable for the recession years and expansion years is statistically significant at the 1-percent level. This result is consistent with the view that changes in equity valuations on average signal year ahead changes in real output and investment in the nonfinancial corporate sector.

The results in Table 1 compare the values of certain economic and financial variables (about which the theoretical framework in Section II makes a prediction) in recession years and expansion years. The results indicate that in the 28 years of recession financial leverage and bondholders' share in corporate income are on average rising, while in the 30 years of cyclical expansion both of these variables on average are falling. This is what the theory predicts. The next set of empirical tests measures the response of risky corporate investments to six different capital market signals for three different time samples over all the years in the period 1900-2002. Corporate investment decisions are the instruments that in turn influence the expected operating income and operating risk of firms, and the distribution of that expected income among bondholders and stockholders. Two measures of reproducible tangible investments are used in the regression tests in Table 2. The first is the change in the real replacement value of inventories, Δ(Inv), held by nonfinancial enterprises. The second is the change in inventories plus the change in the real replacement value of the stock of plant and equipment held by these companies, Δ(Inv + P&E). Six capital market variables are used in the regressions to represent the advance signal of a change in investor's preferences for risk and return. The first and last two are used together and are an integral part of the model described in Figures 2 and 4. One is an equity Q-ratio which in principle is equal to R(s, ER)/R(s, RR) as described in equation (11). In practice it is measured as the ratio of the market value of net worth to the economic book value of net worth. The latter is measured as the real replacement cost of total assets minus the book value of debt. The variable used in the regressions in parts I and II of Table 2 is the change in this Q factor, namely, Δ(NWQ). The other capital market variable is a debt Q-ratio. The variable used in the regressions in parts I and II is the change in this debt Q-ratio, Δ(LT Liab Q). In equation (9) this debt Q-ratio equals R(d, ER)/R(d, RR). In practice this debt Q factor is measured as the ratio of the market value of bonds and mortgages to the book value of bonds and mortgages. The next measure of a capital market signal in parts I and II of Table 2 is the change in the real market value of the total equity in the nonfinancial corporate sector, Δ(SP). The fourth capital market variable used in this study is the change in a combined debt and equity Q-ratio for the nonfinancial corporate sector and is indicated by ΔQ^{bea}. This Q-ratio uses net debt (gross debt outstanding minus financial assets) along with equity in the numerator and consequently only tangible assets in the denominator.[7] The final two capital market variables are the average equity Q-ratio, NWQ, and the average debt Q-ratio, LT Liab Q. These two average Q-ratios are used in the investment regressions in parts III and IV of Table 2.

The sample period for the regression tests in Table 2 runs from 1900-2002. Much in the way of outside disturbances has occurred over this sample time period. There have been two world wars, a world wide depression of unprecedented severity, radical changes in tax regimes, three medium to small wars, price controls, and an oil boycott of the U.S. To accommodate these outside disturbances we will include dummy variables in the regressions at the beginning of each disturbance with one exception. The one exception is World War I. Including a dummy variable for 1917 had a minimal effect on the investment regressions so one was not used. The dummy variables used in the regression tests of Table 2 are the following: DV41 for World War II, DV50 for the Korean War, and DV73, DV74 for the oil shock and price controls in the early and mid-1970's. All dummy variables take on the value of unity in the year of the external disturbance and zero elsewhere. Slope dummy variables were not empirically successful and hence were not included in the regressions.

Insert Table 2 about here

Table 2 presents the results (i.e., the estimated coefficients on the lagged capital market variables, the t-statistics, the P-values, and the coefficient of determination) for the two corporate investment regressions run over the three sample time periods; 1900-2002, 1900-1951, and 1952-2002. In part I the measure of corporate investment is the change in inventories, Δ(Inv). The regressors are the changes in various lagged capital market variables, and the various dummy variables included where appropriate over the three sample time periods. For the entire sample period of 1900-2002 the regression results are presented in (2I1)-(2I3). The regressions in (2I1)-(2I3) indicate that the estimated coefficients on all lagged capital market variables are positive and statistically significant. In part II of the table the measure of corporate investment is the change in tangible reproducible assets, Δ(Inv + P&E), and the regressors are the same lagged capital market variables and dummy variables used in Part I. For the long sample period 1900-2002 the results are given in (2II1)-(2II3). As can be seen all of the estimated coefficients on the lagged capital market variables are positive and statistically significant at the 5 percent level. One interesting feature emerges from the table for the long sample period in regressions (2I1) and (2II1), and that is the estimated coefficient on the equity Q variable is much larger than the coefficient on the debt Q variable. This might suggest that the equity signal is relatively more important than the debt signal at least insofar as tangible investments are concerned.

The remainder of parts I and II of Table 2 report the regression results for Δ(Inv) and Δ(Inv + P&E) over the two subsample time periods of 1900-1951 and 1952-2002. For inventory investment in Part I it can be seen that seven of the eight estimated coefficients on the four lagged capital market variables over both subsample time periods are positive and statistically significant at the 5 percent level while the eighth is significant at the 7 percent level. The estimated coefficients on ΔNWQ_{-1} and $\Delta LT\ Liab\ Q_{-1}$ are both somewhat higher in the second half of the sample period, and considerably higher in the case of ΔQ^{bea}_{-1}. On the other hand, the estimated coefficient on ΔSP_{-1} is somewhat lower in the second half of the sample. For the broader measure of investment, Δ(Inv + P&E), in Part II of the table there are some similarities but also some notable differences compared to the results in Part I. The estimated coefficients on the lagged capital market variables for this broader measure of corporate investment are positive as predicted by the theory, and for the second half of the sample period they are all statistically significant. However, in the first half of the sample period the coefficients on $\Delta LT\ Liab\ Q_{-1}$ and ΔQ^{bea}_{-1} are only significant at approximately the 11 and 8 percent levels. For this broader measure of investment the match between the data and theory is much better in the second half of the sample period than in the first half. The parameter values on the capital market variables are also somewhat different for the narrower and broader measures of investment. In the case of ΔNWQ_{-1} there was a decline in the estimated parameter value in the second half of the sample period compared to the first half, while for $\Delta LT\ Liab\ Q_{-1}$ there was hardly any change between the two periods. The estimated coefficient on ΔSP_{-1} increased moderately in the second half of the sample, while the coefficient on ΔQ^{bea}_{-1} increased sharply. Finally, for both categories of investment and both time periods the estimated coefficient on ΔNWQ_{-1} is considerably larger than the estimated coefficient on ΔLT Liab Q_{-1} indicating the relative importance of the equity signal in triggering corporate investment decisions.

Parts III and IV of Table 2 report the results for the two corporate investment regressions over the three sample time periods, but this time using the average equity Q (i.e., NWQ_{-1}) and the average debt Q (i.e., LT Liab Q_{-1}) rather than their marginal counterparts used in parts I and II. The results for the average Q-ratios in parts III and IV are more or less the same as those for the marginal Q-ratios in parts I and II. Again, it is the case that the most support for the market signaling hypothesis occurs over the full sample time period and the second half of the twentieth century. For these time periods the estimated coefficients on NWQ_{-1} and LT Liab Q_{-1} are positive and statistically significant for both measures of investment Δ(Inv) and Δ(Inv + P&E) in regression 2III 1, 2III 3, 2IV 1, and 2IV 3. There were some differences for the first half of the sample time period in that the marginal debt and equity Q-ratios in parts I and II provided more support for the market signaling hypothesis than the average Q-ratios reported in parts III and IV. For this earlier time period none of the estimated coefficients on NWQ_{-1} and LT Liab Q_{-1} in both the Δ(Inv) and Δ(Inv + P&E) regressions were statistically significant, and the point estimate on LT Liab Q_{-1} in the inventory investment regression (2III 2) was actually negative.[8]

In summary there is a great deal of evidence in Table 2 and endnote 8 that changes in lagged capital market variables signal changes in the operating strategy of firms as reflected in their tangible investment decisions. There is also evidence that the signal from the stock market is much louder than the signal from the bond market. For U.S. nonfinancial enterprises it has been hard for manager to "just say no to the stock market" when formulating their investment decisions.[9] Moreover in endnote 8 it was observed that cash flow variables (possibly reflecting financial frictions) that were found to be important determinants of corporate investments in many previous studies, were not particularly important in this study of investment. Capital market signaling of investor preferences for operating strategies to expand or contract the risky tangible investments of their firms is one function of an efficient financial system. The other function emphasized in Section II of this paper is the role of rational financial contracts in matching the financing decisions of firms to their investment decisions, and in the process coalescing the welfare of their bondholders and stockholders over the business cycle. We now present some evidence on the financing decisions of nonfinancial corporations over the twentieth century, and how those decisions are matched to various operating decisions.

According to the model in Section II a procyclical movement in operating risk triggered by a capital market signal must be offset with a countercyclical movement in financial risk in order to balance the interests of bondholders and stockholders in the representative firm over the business cycle. Operating risk as well as operating returns are generated by the production, pricing, and investment decisions of firms. Financial risk in this model is the result of the firm's choice of a capital structure. In Tables 3 and 4 we test these predictions from the theory using various measures of production, prices, and corporate investments to proxy for changes in operating risk, and changes in capital structure to proxy for changes in financial risk.

Table 3 begins the empirical testing of this financing prediction from the theory in Section II by regressing the measure of financial leverage, Δ(LT Liab/Net Worth), on two business cycle variables and two dummy variables over the three sample time periods of 1900-2002, 1900-1951, and 1952-2002. The two business cycle variables are the percentage growth rate of real GDP generated by the nonfinancial (and nonfarm) corporate sector, $\dot{GDP}$, and the percentage rate of change in the GDP deflator for nonfinancial corporate product, GDP-I. The two dummy variables take on the value of unity for 1936 and 1974, and zero elsewhere.[10]

Insert Table 3 here

The prediction from the theoretical framework is that the estimated coefficients on the two business cycle variables (as proxies for operating risk) should be negative. An increase (or decrease) in the production and pricing of output that results in business cycle expansions (or recessions), also increases (or decreases) the operating risk of firms. This increase (or decrease) in the operating risk that accompanies cyclical expansions (or recessions), must then be matched with a reduction (or increase) in financial leverage and financial risk. Table 3 presents the estimated coefficients, t-scores, P-values, and the coefficient of determination that will help assess the predictions from the theory. As can be seen the predictions from the theory are not rejected by the data in Table 3 in that all of the estimated coefficients on $\dot{GDP}$ and GDP-I are negative. Moreover, all of the estimated coefficients are statistically significant with the one exception of the coefficient on GDP-I in regression 3I3 for the period 1952-2002, and that coefficient is statistically significant at the 5.9 percent level. In all cases the estimated coefficient on the inflation rate variable is larger than the coefficient on the output variable although this is only marginally the case in regression (3I3) for the second half of the sample period.

To sum up, the evidence in Table 3 like that in Table 1 indicates that marginal adjustments in long-term financial leverage are countercyclical. Production and pricing decisions that change the operating risk of firms and the state of the economy are appropriately matched with financing decisions that shift financial risk in the opposite direction. This is what the theoretical framework in Section II predicts, and the results in Tables 1 and 3 do not reject these predictions.

The next set of regressions uses the two measures of corporate investment that proxied for changes in operating risk in Table 2, Δ(Inv) and Δ(Inv + P&E). According to the theory a capital market signal induces managers to change their operating strategy. One instrument of this operating strategy is the decision to change the tangible investments of the firm. Then with a planning, ordering, and building lag the investment expenditures are incurred and financing arrangements put in place. If the new operating strategy increases the operating risk of the representative firm, then according to the theory the resulting new tangible investment expenditures will be financed predominately with equity thereby reducing financial leverage. If the new strategy reduces operating risk by downsizing the representative firm, then the released financial resources will be returned to stockholders and financial leverage will rise. The prediction from the theory is that adjustments in financial leverage will be negatively related to risky tangible investments. This prediction is tested in part II of Table 3 over the three sample time periods, 1900-2002, 1900-1951, and 1952-2002. In the table the change in financial leverage, Δ(LT Liab/Net Worth), is regressed on the two measures of tangible investment—Δ(Inv) and Δ(Inv + P&E)—and the dummy variables for the years 1936 and 1974. The estimated coefficients, the t-scores, the P-values, and the adjusted coefficient of determination are reported in the body of the table. As can be seen in regressions 3II1-3II6, all of the estimated coefficients on the two corporate investment variables are negative and all are statistically significant. An expansion (or reduction) in risky tangible investments is accompanied by a reduction (or expansion) in financial leverage that in turn reflects financial risk. Firms match their financing strategy to the risks of their operating strategy. [11]

Up to this point attention has been focused on the fundamental non-tax reasons for the capital structure choices of U.S. nonfinancial firms over time. Tax considerations as a motivation for issuing debt have been ignored. However in the U.S. and many other countries interest payments on debt reduce the taxable income and tax payments of firms. From the corporate tax perspective debt is a more tax efficient financing instrument than equity, and this efficiency increases with the corporate tax rate. Individual tax rates on investment income can increase or decrease the corporate tax efficiency of debt financing. For example, high personal tax rates on debt income (i.e., rates higher than the corporate income tax rates) combined with low personal tax rates on equity income reduce the corporate tax advantage of debt financing. Conversely low personal income tax rates on debt income (lower than the corporate income tax rate) increase the corporate tax advantage of debt financing. In this connection the Tax Reform Act of 1986 is noteworthy. The Tax Reform Act of 1986 reduced personal income tax rates so that they were significantly below the corporate income tax rates, and at the same time made the personal capital gains tax rate approximately equal to the rate on dividend income. The end result is that the Tax Reform Act of 1986 provided firms with a tax inducement to finance their operating strategies with debt. To include tax considerations in the financing decisions of firms, a corporate income tax rate variable (i.e., the ratio of tax liabilities to taxable income of nonfinancial corporations indicated by t) is incorporated into the regressions presented in Table 3. The sign of the estimated coefficient on the tax rate variable t is predicted to be positive in that the higher (or lower) the corporate income tax rate the greater (or smaller) the tax incentive to issue debt, holding the non-tax factors constant. In addition the dummy variables DV86 and DV87 (that take on the value of one in 1986 and 1987 and zero elsewhere) are included in the financial leverage regressions presented in Table 3 to account for the tax regime changes that accompanied the Tax Reform Act of 1986. A dummy variable for 1987 is included since some of the provisions of the Act became effective in 1987. The results for these tax adjustments are presented in Table 4 for the second half of the sample time period, 1952-2002.

Insert Table 4 here

In the table Δ(LT Liab/Net Worth) is regressed on the non-tax factors of $\dot{GDP}$, GDP-I, Δ(Inv), Δ(Inv + P&E), and DV74 just as they were in regressions 3I3, 3II3, and 3II6 in Table 3. To these non-tax operating risk factors we now add the tax factors of t, DV86, and DV87. As can be seen in these regressions the estimated coefficient on t is positive in 4I1 and 4I2, but negative in 4I3. However, none of the estimated coefficients on t are statistically significant. Moreover, the estimated coefficients on DV86 and DV87 (not shown in the table) are both positive and statistically significant at the .01 percent level. The Tax Reform Act of 1986 had an effect on the financial policies of nonfinancial corporations over and above the operating risk variables emphasized in this study. Nevertheless, it is the case that the estimated coefficients of $\dot{GDP}$, GDP-I, Δ(Inv), and Δ(Inv + P&E) in the table are approximately the same as those in 3I3, 3II3, and 3II6 in Table 3.[12]

The evidence from Table 4 indicates that including time varying tax factors in the financial adjustment regressions for the second half of the sample time period had very little effect on the estimated coefficients of the operating risk variables. The estimated coefficients on $\dot{GDP}$, GDP-I, Δ(Inv), and Δ(Inv + P&E) are pretty much the same in Table 4 as they were in Table 3. While the estimated coefficient on the tax rate variable t was typically positive (except in the case of 4I3), it was never statistically significant. On the other hand, the Tax Reform Act of 1986 was an important factor in the financial decisions of U.S. nonfinancial enterprises in 1986 and 1987. The end result of this legislation was to make corporate tax rates significantly higher than personal tax rates thereby providing a tax motivation for corporations to increase their financial leverage. Our results indicate that U.S. firms responded to this tax factor in the way predicted by finance theory. In any event the evidence from Table 4 indicates that variations in tax rates due to fluctuations in economic activity are of secondary importance, compared to the more fundamental non-tax factor, of changing operating risk in explaining the intertemporal variations in the financing adjustment of U.S. nonfinancial corporations.[13]

The evidence from Tables 3, 4, and endnote 13 is generally supportive of the hypothesis advanced in Section II; namely, U.S. nonfinancial corporations over the twentieth century used financial leverage and dividend adjustments to offset changes in operational risk resulting from changes in their production, pricing, and tangible investment decisions. When firms increase (or decrease) their operating risk by increasing (or decreasing) their production, prices, and tangible investments thereby producing business cycle expansions (or recessions), they offset the increase (or decrease) in operating risk with a reduction (or expansion) in financial leverage and financial risk. Firms sell risk and return in the market place. In risky cyclical expansions firm returns are redistributed towards stockholders. However, a rational bond contract requires these stockholders to reinvest these transitory excess returns in the firm thereby reducing financial leverage. In recessions (the result of downsizing the firm) returns are redistributed towards bondholders. In this case a rational bond contract allows the stockholders to withdraw their investment in the firm (i.e., requiring the firm to repurchase equity in the market or pay large dividends to shareholders) thereby increasing financial leverage. When risks and return are distributed in this way debt and equity securities are rational contract forms for gathering capital resources for the firm.

IV. SUMMARY AND CONCLUSIONS

This paper presents and tests a theory of balance sheet adjustments for nonfinancial enterprises with multiple investors, namely, bondholders and stockholders. These balance sheet adjustments are implemented with the production-investment decisions and financing decisions of firm managers in a way that coalesces the interests of bondholders and stockholders over the business cycle. In this model the suppliers of productive resources to firms are heterogeneous in terms of their risk aversion. The more risk averse investors concentrate their holdings in bonds while the less risk averse investors concentrate their holdings in levered equity. The heterogeneity in the risk aversion of the two groups of investors creates a classic conflict of interest problem concerning the management of the firm. This conflict of interest problem is resolved in this model with a contract that requires managers to manage the firm in the joint interest of their bondholders and stockholders.[14] Asset adjustments are made to conform to the risk aversion of the firm's shareholders. Contract induced financing adjustments are then made to insulate the firm's debt securities from any change in operating risk caused by the asset adjustment decisions. Under this regime of shared decisions-making managers acting for bondholders can always offset any change in operating risk initiated by the asset adjustment decisions of managers acting for shareholders, with an appropriately matched financing decision. Cyclical supply adjustments in this economy are then linked to the asset side of firm balance sheets by a return generating function that is diminishing in expected returns and increasing in risk. This implies that business cycle expansions are characterized by relatively low expected rates of return and relatively high risk, while recessions are characterized by high expected rates of return and relatively low risk. Empirical evidence on the cyclical movement of the Sharpe index and risk premium is consistent with the return generating process assumed in this model.

How do business cycles occur in this model? Outside shocks initiate asset adjustments of firms by changing the perceived risk of the environment and/or the taste for risk and return of shareholders along with their required yield on stock. This change in risk and the taste for risk and return of equity investors is communicated to firm managers by changes in share prices in the stock market. Managers respond to the stock market signal by changing the level and composition of the firm's assets (after a planning and production lag) so that they conform to the post shock risk aversion of their shareholders. Thus an outside shock that reduces risk perceptions and the risk aversion of shareholders raising share prices in the stock market, is followed by a speculative and expansionary adjustment in the level and structure of company assets that by equation 13 increases the operating risk borne by investors. To protect their bondholders managers issue new equity and retain the speculative and transitory profits earned during the cyclical expansion. These new equity issues and earnings retentions reduce financial leverage and financial risk thereby restoring the investment quality (and market valuation) of the firm's bonds. A negative external shock that increases the perception of risk and/or the risk aversion and required yield of equity investors produces a recession in the following way. The resulting decline in share valuations is the market signal for firms to implement a relatively safe operating strategy. This relatively safe operating strategy takes the form of reducing the growth of firm assets and shifting the composition of assets into a more liquid and safe form such as cash and other short-term assets. The operating strategy of downsizing firms both causes a recession and a reduction in operating risk (via the return generating process in 13) which increases the investment quality of bonds. Coalescing managers in this model then take away the resulting capital gains on bonds due to the reduction in operating risk, by returning the released resources from the downsizing decision to equity investors in the form of relatively high dividends and the repurchase of shares. This financial strategy increases financial leverage and financial risk. In principle this increase in financial risk can exactly offset the reduction in operating risk so that the market valuation of bonds is unaffected by the negative outside shock.

There are a number of financial predictions that follow from the balance sheet adjustment model presented in Section II. The first of these is that changes in the capital market valuations of firms precede changes in the level and structure of firm assets. More particularly an increase in the capital market valuation of the firm causes an increase of investment in tangible assets such as inventories and plant and equipment. The result is a business cycle expansion. Conversely a decline in the capital market value of firms causes a reduction of investment in tangible assets. This investment strategy eventually leads to a recession. Table 2 and endnote 8 provide a great deal of evidence indicating that changing capital market variables signal (with a lag) changes in the tangible investments of U.S. nonfinancial enterprises over the twentieth century. The table also indicates that the signal from the stock market is much louder (in terms of the estimated coefficient) than the signal from the bond market. Finally endnote 8 indicates that including cash flow variables in the tangible investment regressions, along side the Q-ratios for debt and equity securities, do not change these empirical results. These adjustments to the assets of firms must be financed. How they are financed in the model of Section II depends on the amount of operating risk they generate. An expansion in tangible assets causes a cyclical expansion in economic activity but at the cost of an increase in operating risk according to the return generating function in equation 13. To protect bondholders cyclical expansions in tangible assets must be financed with equity. A reduction in tangible assets results in a recession and a reduction in operating risk. Cyclical reductions in tangible assets that reduce operating risk are then accompanied with a shift in the financing of the firm towards bondholders. This implies that marginal adjustments in financial leverage are countercyclical and negatively correlated to risky tangible investments. Tables 3 and 4, provide a great deal of evidence supporting this prediction. Taking tax considerations into account does not change the empirical support for this financing prediction. The countercyclical movement of financial leverage is as much a stylized fact of U.S. business cycles in the twentieth century as the procyclical movement of risky tangible investments. If this were not so it would be difficult to rationalize the existence of debt and equity financed firms.

END NOTES

1. For a numerical example of how an all equity company gets transformed into a debt and levered equity company when investors are heterogeneous in their risk aversion see Krainer (2003, pp. 15-19). At this point all we are doing is assigning ownership claims to the real productive assets of this representative firm valued at their replacement cost in the factor market. In particular we do not claim that the financial market value of a debt and equity financed firm is different than the market value of an all equity firm which would violate the Modigliani-Miller irrelevance proposition on capital structure. In what follows below we will be concerned about the rational intertemporal movement of the capital structure of this representative firm over different stages of the business cycle, or, in the terminology of MM over different risk classes. We definitely are not comparing two firms with identical assets (and hence in the same risk class) in the same stage of the business cycle.

2. It is shown in Krainer (2003, pp. 42-43) that the ss schedule intersects the dd schedule from below as long as $R(d) < R(s)$.

3. There are a number of theoretical and empirical arguments that can be invoked in support of this non-traditional assumption. One argument is that to the extent business investments at the margin are associated with more distant future cash flows and that more distant cash flows are subject to more operating risk than those in the near future, then taking those marginally less attractive investments in cyclical expansions necessarily increases the operating risk of firms. A second argument is that expansionary business investments today create increased supply and competition tomorrow with an associated increase in operating risk. More particularly when those expansionary investments are heterogeneous in magnitude across firms, the differential affect on supply will result in an increase in the variability of future relative prices which in turn will also increase the operating risk of firms. On the other hand, contractions in real business investments that downsize firms and create recessions will relieve competitive pressures thereby

reducing the operating risk of the surviving firms. In this connection if prices are downwardly rigid for whatever reason, relative price variability will tend to fall in recessions and reduce the operating risk of firms. Recent theoretical and empirical evidence supporting this view can be found in Anderson (1994) (2000), Balke and Wynne (2000), Ball and Mankiw (1995), and Parsley (1996) among many others. Much of this evidence takes the form of empirically observing the positive association between inflation rates and the cross-section variability of relative prices of goods and services. This approach has recently been extended by Parsley and Popper (2003) to stock prices. They find that high positive changes in aggregate stock prices are associated with high variability in the cross-section of relative stock prices, and that this positive relationship is statistically significant. Thus, if relative stock price volatility reflects volatility in the marginal product of capital of different firms, then periods of inflationary expansions will be associated with an increase in the operating risk of firms. Finally, Brandt and Kang (2003) use a latent VAR approach to study the contemporaneous and intertemporal relationship between the conditional mean and variability of excess stock returns. They find that in and around the troughs of recessions mean returns are rising while the volatility of returns is falling, whereas in and around the peaks of cyclical expansions mean returns are falling while the volatility of returns is rising over their sample period 1946-1998. In other words, there is a negative correlation between mean returns and volatility of returns over the business cycle which in turn makes the Sharpe ratio strongly countercyclical. If returns in the stock market track the real returns of the firm, then this evidence is consistent with the return generating process assumed in equations (12) and (13) and Figure 3.

4. Typically covenants in long-term bond contracts place tighter constraints on the financing decisions of firms than on their operating or investment decisions, at least in the U.S. For an analysis of the market pricing and role of long-term bond covenants in the U.S. financial System see Smith and Warner (1979), Krainer (1992, Chapter 5), and Bradley and Roberts (2003).

5. The paper and data can be downloaded from his Website at www.econ.bbk.ac.uk/facutly/Wright

6. We were unable to use the variable $\bar{X}(b)/\bar{X}(s)$ because $\bar{X}(s)$ was significantly negative in 1932-33.

7. Tobin (1969) suggested that the Q-ratio relevant for corporate investment decisions is marginal Q; i.e., the ratio of the capital market value of new additional capital goods to their current replacement cost. Many empirical studies of corporate investment using the Q approach proxy marginal Q with average Q. Hayashi (1982) has shown that marginal Q and average Q are equivalent when the firm is a price taker in factor and product markets, and the production and installation (of capital) functions are both linear homogeneous. In what follows in the tables below is that we proxy marginal Q with the change in average Q; namely, Δ(NWQ), Δ(LT Liab Q), and ΔQ^{bea}. In parts III and IV of Table 2 we also present some corporate investment regressions using the average equity and debt Q-ratios, NWQ and LT Liab Q. Most measures of the Q-ratio used in empirical investment studies are found to be below unity, the equilibrium value for Q. This is certainly true for Q^{bea} where the mean and median are .73 and .69 respectively over the period 1900-2001. The conventional reason given for this result is that the replacement cost of capital in the denominator is overstated because the depreciation of capital is understated. Curiously our two empirical measures of Q, NWQ and LT Liab Q are approximately 1.0 on average over the 1900-2002 period. In this connection the mean and median for NWQ is .99876 and .99985, while for LT Liab Q they are .9925 and .9952.

8. Many empirical studies that use Q-ratios as a market signal that summarizes the future profitability of new corporate investment often include cash flow as an additional explanatory variable. Typical results from these studies find that Q has a relatively small effect on corporate investment (particularly for small low dividend paying firms) while cash flow has a much larger

effect. Some (e.g., Hubbard, 1998) interpret these results as evidence of the importance of financing constraints arising from asymmetric information between inside and outside investors, while others (e.g., Abel and Eberely, 2004) interpret these results as consistent with the existence of growth options associated with exogenous changes in the technology frontier of firms. The Q-ratio used in these studies is one for the entire firm, much like the variable Q^{bea} used in some of the regressions presented in Table 2. The Q-ratios that are relevant for the theory developed in Section II above and used in other regressions in Table 2 are an equity Q and a debt Q as separate explanatory variables for corporate investment. It would therefore seem useful to include real cash flows, CF (defined as nominal earnings retention plus depreciation charges deflated by the consumer price index), along side the equity Q and debt Q used in the tangible investment regressions presented in Table 2. These results are presented in i-vi.

1903-2002

i. $$\Delta(Inv + P\&E)_t = \underset{(3.34)}{60.472} + \underset{(4.02)}{1569.335}\, \Delta(NWQ)_{-1} + \underset{(3.96)}{692.421}\, \Delta(LT\ Liab\ Q)_{-1}$$

$$+ \underset{(1.75)}{.567}\Delta(CF)_{-1} + \underset{(6.24)}{165.146}(DV)^{50} + \underset{(11.05)}{145.733}(DV)^{73} + \underset{(20.73)}{382.264}(DV)^{74}$$

$\bar{R}^2$ =.57 AR(1) =.63

1902-2002

ii. $$\Delta(Inv + P\&E)_t = \underset{(-4.07)}{-3852.982} + \underset{(4.21)}{2850.425}(NWQ)_{-1} + \underset{(3.44)}{1032.075}(LT\ LiabQ)_{-1}$$

$$+ \underset{(1.41)}{.204}(CF)_{-1} + \underset{(10.85)}{154.365}(DV)^{50} + \underset{(2.88)}{122.581}(DV)^{73} + \underset{(5.84)}{341.447}(DV)^{74}$$

$\bar{R}^2$ =.60 AR(1) =.73

1903-1951

iii. $\Delta(Inv + P\&E)_t = \underset{(2.25)}{24.705} + \underset{(2.50)}{1992.983}\,\Delta(NWQ)_{-1} + \underset{(1.91)}{739.411}\,\Delta(LT\ LiabQ)_{-1}$

$+ \underset{(.58)}{.293}\,\Delta(CF)_{-1} + \underset{(7.56)}{161.000}(DV)^{50}$

$\bar{R}^2 = .26 \qquad AR(1) = .35$

1902-1951

iv. $\Delta(Inv + P\&E)_t = \underset{(-1.92)}{-2224.850} + \underset{(2.09)}{1660.776}\,(NW)_{-1} + \underset{(1.59)}{590.306}\,(LT\ LiabQ)_{-1}$

$\underset{(-.49)}{-.091}\,CF_{-1} + \underset{(19.85)}{152.007}\,(DV)^{50}$

$\bar{R}^2 = .26 \qquad AR(1) = .34$

1952-2002

v. $\Delta(Inv + P\&E)_t = \underset{(3.61)}{95.815} + \underset{(3.26)}{1362.686}\,\Delta(NWQ)_{-1} + \underset{(3.17)}{811.453}\,\Delta(LT\ LiabQ)_{-1}$

$+ \underset{(2.05)}{.890}\,\Delta(CF)_{-1} + \underset{(8.39)}{135.381}\,(DV)^{73} + \underset{(17.94)}{369.785}\,(DV)^{74}$

$\bar{R}^2 = .55 \qquad AR(1) = .57$

1952-2002

vi. $\Delta(Inv + P\&E)_t = \underset{(-3.70)}{-4019.786} + \underset{(3.51)}{2899.867}\,(NWQ)_{-1} + \underset{(3.63)}{1292.279}\,(LT\ LiabQ)_{-1}$

$\underset{(-.29)}{-.081}\,CF_{-1} + \underset{(2.18)}{99.027}\,(DV)^{73} + \underset{(5.41)}{316.728}\,(DV)^{74}$

$\bar{R}^2 = .59 \qquad AR(1) = .80$

From (i)–(iv) and (vi) it can be seen that the estimated coefficients on the cash flow variable are both positive and negative, but never statistically significant. On the other hand, the estimated coefficient on $\Delta(CF)_{-1}$ in (v) is positive and statistically significant at the 5 percent level. Essentially the same results are obtained when cash flow measures are combined with ΔSP and ΔQ^{bea} capital market variables. On the other hand, the estimated coefficients on equity and debt Q measures are more or less the same as those reported in Table 2. Our particular regression tests for the entire nonfinancial corporate sector in this endnote provides little support for the hypothesis that cash flow variables (reflecting financial frictions) are a major determinant of aggregate corporate investment expenditures.

We did experiment with several alternative specifications for i-vi in some unreported regressions. Following Bond, Kleman, Newton-Smith, Syed, and Vliegke (2004). We also included measures of the stock of short-term financial assets and sales growth (proxied by GDP growth in the nonfinancial corporate sector) as additional explanatory variables in the above regressions. Bond et. al. argue that these two additional variables might provide some information on longer-run expected profitability. In their statistical analysis of U.K. firms these two explanatory variables were positively related to corporate investment, and the relationship was statistically significant. For the most part we did not obtain the same results when adding the stock of short-term financial assets and GDP growth in the nonfinancial corporate sector to the regressions in i-vi above. In (i) the estimated coefficient on the change in short-term financial assets was positive and statistically significant at the 1 percent level. However, the estimated coefficient on GDP growth was negative and statistically insignificant in this and all other five regressions. Moreover when adding the change in short-term financial assets and GDP growth to regression (v), the positive estimated coefficient on the change in real cash flows no longer is statistically significant. Finally including these two additional explanatory variables in these six regressions had very little effect on the estimated coefficients for the debt and equity Q-ratios.

9. For an attempt to measure how hard it is for managers to "just say no" when formulating their capital budgeting plans in the presence of stock market bubbles see Gilchrist, Himmelberg, and Huberman (2004).

10. It is somewhat surprising that the largest one year decline in long-term debt for the entire 102 year sample period occurred in the year 1936. The year 1936 experienced a sharp expansion in terms of $\dot{GDP}$, Δ(Inv), and Δ(Inv + P&E). Accordingly the model in Section II predicted a decline in financial leverage. However, the actual decline was 10.7 times the predicted decline for Δ(LT Liab/Net Worth). Major economic events that occurred in and around that year include the enactment of social security in 1935 and the tax on undistributed profits of corporations enacted in 1936. What is somewhat surprising is that a tax on undistributed corporate profits (ostensibly designed to capture personal tax revenues on dividend income thus giving rise to the double taxation of corporate income) should have the exact opposite effect on long-term debt financing by forcing companies to rely less on retained earnings and more on external financing to fund their new investments. On the other hand, Treasury Decision No. 4674 (approved on August 6, 1936) allowed companies to issue taxable stock dividends which in turn would enable firms to avoid the undistributed corporate profit tax and yet keep the cash in the business to acquire assets and/or retire liabilities. This way of meeting the new tax legislation would minimize the corporate tax liability while at the same time maximizing the amount of internal funds retained in the business. For a general discussion of the effects of the undistributed corporate profits tax on the financing decisions of U.S. firms at that time see Calomaris (1993) and Calomiris and Hubbard (1995).

11. Section II of this paper presented a model of the balance sheet adjustments of a representative firm. These adjustments represent a recursive system in that the asset adjustments—i.e., Δ(Inv) and Δ(Inv + P&E)—depend on lagged capital market signals, and the financing adjustments—i.e., Δ(LT Liab/Net Worth)—then depends on the asset adjustments. Under these recursive conditions the OLS estimates of b_1 in Table 3 are both consistent and efficient. An alternative estimation technique for the financing adjustment would be 2SLS. While 2SLS estimates of b_1 will be consistent, they will not necessarily be efficient. In an earlier and longer version of this paper that is available on the SSRN (see Krainer, 2004, ID number 602921), we also estimated the b_1 for the six regressions in part II of Table 3 using the Fair (1970) procedure for two stage least squares. In the interest of conserving space we will only summarize those results here, and the interested reader is referred to the earlier working paper on the SSRN. In this connection the 2SLS estimates of b_1 on the two investment variables Δ(Inv) and Δ(Inv + P&E) were all negative, and with one exception were statistically significant. The one exception was the estimate for b_1 on Δ(Inv + P&E) for the period 1900-1951 where the negative parameter estimate was not significantly different from zero. It was also the case that the 2SLS point estimate of b_1 on both Δ(Inv) and Δ(Inv + P&E) for the 1900-1951 period were somewhat smaller than the OLS estimates of b_1 in part II of Table 3. For the other two sample periods, 1900-2002 and 1952-2002, the 2SLS estimates of b_1 were more or less the same as the OLS estimates in Table 3.

12. We also experimented with Δt (instead of t) in measuring the corporate tax rate effect on financial leverage in the regressions presented in Table 5. The regression experiments with Δt were also unsuccessful in that the estimated coefficient on Δt was always negative but never statistically significant.

The results obtained here are essentially the same as those in Krainer (2003, pp. 122 and 258-259) for the G-7 countries. While significant changes in the tax code—such as the Tax Reform Act of

1986—can have a measurable effect on the level of financial leverage, the year to year variations in effective corporate tax rates due to fluctuations in the economy do not seem to have much of an effect on capital structure decisions of U.S. firms.

13. Another financing decision variable that in principle can offset changes in operating risk is the dividend payout rate, div, defined as the ratio of cash dividends to company profits after taxes. Reinvestment of profits is one way firms can reduce financial leverage and financial risk in their attempt to offset an increase in operating risk. Moreover, the dividend policy decision was also affected by the 1986 Tax Reform Act which narrowed the difference between the personal tax on dividend and capital gain income. To test the financing adjustment hypothesis of Section II we regress the change in the dividend payout rate on the four measures of operating risk used in Table 3 and 4, and the two dummy variables capturing the effects of the 1986 Tax Reform Act. The financial adjustment hypothesis predicts that the change in the dividend payout ratio is negatively related to the four measures of operating risk. The regressions will only be carried out over the second half of the sample time period 1952-2002 because profits in the nonfinancial corporate sector were negative in 1932 and 1933. The results are as follows.

1952-2002

13i) $$\Delta(\text{div})_t = \underset{(2.72)}{.0978} - \underset{(4.00)}{1.4077}(\dot{\text{GDP}})_t \underset{(-1.35)}{-.6202}(\text{GDP-I})_t \underset{(7.18)}{+.2343}(\text{DV})^{86} \underset{(-5.83)}{-.3441}(\text{DV})^{87}$$

$\bar{R}^2 = .523$ AR(1) $= .282$

13ii) $$\Delta(\text{div})_t = \underset{(2.41)}{.0422} \underset{(-3.55)}{-.0013}\Delta(\text{Inv})_t \underset{(9.61)}{+.2288}(\text{DV})^{86} \underset{(-6.96)}{-.3283}(\text{DV})^{87}$$

$\bar{R}^2 = .549$ AR(1) $= .237$

13iii) $\Delta(\text{div})_t = .0625 \quad -.0003\Delta(\text{Inv} + \text{P\&E})_t \quad +.2612(\text{DV})^{86} \quad -.3681(\text{DV})^{87}$
(2.45) (−2.51) (8.92) (−6.17)

$\bar{R}^2 = .448 \qquad AR(1) = .255$

As can be seen the results are in line with those obtained in the financial leverage regressions for the same time period in Tables 3, and 4. The estimated coefficients on all four operating risk measures are negative and statistically significant for $\dot{GDP}$, Δ(Inv), and Δ(Inv + P&E). The lone exception is the negative estimated coefficient on the pricing variable GDP-I in (13i) which is not statistically significant. This result was also obtained in the financial leverage regressions of 3I3 in Table 3 and 4I1 in Table 4. Finally, the dummy variables $(\text{DV})^{86}$ and $(\text{DV})^{87}$ reflecting the change in taxation on dividend and capital gains income are also statistically significant.

14. So why isn't this conflict of interest problem resolved by the simple expedient of investors holding both the debt and levered equity securities of the same company and in the same proportions as they would in the market portfolio of the capital asset pricing model with simple separation? The answer must be that the costs of advanced contracting that resolves the conflict in this model are less than the costs (including regulatory costs) of diversification that face investors who want to hold the debt and levered equity securities of the same company. Regulatory costs for some institutional investors are particularly high. For example, life insurance companies are the single most important investor in corporate debt securities. State regulation of life insurance companies allows these debt securities to be valued on the asset side of the balance sheet at face value or acquisition cost. On the other hand, these states (in particular, New York) require life insurance companies to value the equities in their portfolios at current market prices. In stock market downturns declining equity share valuations will reduce the surplus (the difference between assets and liabilities) of life insurance companies which in turn can impair their ability to sell life insurance products in certain states. For this reason it is practically impossible for insurance companies to resolve the conflict of interest problem with diversification, but instead they are forced to rely on the advanced contracting described in

Section II. Finally Lehn and Paulsen (1991) provide some empirical evidence on this question in the context of leveraged buyouts, a form of takeover that is often associated with bondholder losses. In this connection they examine the portfolio holdings of 24 mutual funds over the period 1979/80-1987/88 when this form of takeover was very popular. The hypothesis they test is whether these mutual funds increased their matched holdings of bonds and stocks in the same companies over this period of increased leverage buyouts. They found in the beginning of their sample period that only 7.3 percent of these funds bondholdings were invested in bonds of the same companies in which they also owned stock. That percentage had only risen to 13.4 by the end of their sample period, a change they found to be statistically insignificant. On the basis of this test they concluded that matched ownership of bonds and stocks in the same companies did not resolve the bondholder-stockholder conflict of interest problem over the 1979/80-1987/88 time period.

APPENDIX ON DATA SOURCES

We begin with a description of the capital market variables used in this study which according to the theory provide the market signal for a change in the operating strategy of nonfinancial enterprises.

NWQ = The ratio of the market value of net worth in the nonfinancial corporate sector to the economic book value of net worth. The economic book value of net worth is defined as the replacement cost of total assets minus the book value of total liabilities. From equation (11) N(s)P(s)/K(s) = NWQ = 1.0 when the expected rate of return on equity, R(s, ER), equals the required rate of return on equity, R(s, RR). This was defined to be the equilibrium condition in the stock market. From Wright (2002).

LT Liab Q = The ratio of the market value of long-term liabilities (i.e., bonds and mortgages) to the book value of long-term liabilities. Recall from equation (9) that N(d)P(d)/K(d) = LT Liab Q = 1.0 when the expected rate of return on debt, R(d, ER), equals the required rate of return on debt, R(d, RR). This was defined to be the equilibrium condition in the bond market. From Wright (2002).

Q^{bea} = The ratio of the market value of nonfinancial corporate equity and net liabilities (total liabilities minus financial assets) to the replacement cost of BEA tangible assets. BEA and Federal Reserve measures of tangible assets differ in terms of their respective valuation of corporate real estate after 1989. After 1989 the Federal Reserve assumed that the real stock of land remained constant and the value of land was only adjusted by changes in real estate prices. The BEA measures land as a fixed proportion of total tangible assets. For a detailed description of these differences see Wright (2002, pp. 28-30). We use the BEA valuation in all measures of tangible assets since it is compatible with earlier measures of assets. From Wright (2002).

SP = The real market value of equity in the nonfinancial corporate sector. Nominal market valuations were deflated by the consumer price index. From Wright (2002).

The next set of variables represent the measures for a change in the operating strategy (which in turn is induced by the previously described capital market valuations) of nonfinancial enterprises. We proxy changes in operating strategy with changes in real inventories, and the sum of the change in real inventories and the change in real plant and equipment. Inventories are the most volatile component of total assets of nonfinancial corporations as measured by the coefficient of variation. We also use a measure of investment that includes plant and equipment since this category of assets is the vehicle by which new but risky technologies are introduced into the firm. The specific measures of corporate investments are as follows:

Inv = The replacement cost of inventories in the nonfinancial corporate sector, deflated by the U.S. consumer price index. For a description of the estimation procedure used for this variable see the *Survey of Current Business*, October 2002, p. 27. From Wright (2002).

(Inv+P&E) = The replacement cost of inventories and plant and equipment in the nonfinancial corporate sector deflated by the U.S. consumer price index. For a description of the estimation procedures used for this variable see "Fixed Reproducible Tangible Wealth in the United States, 1925-94," Bureau of Economic Analysis, U.S. Department of Commerce, August 1999. This article is available on the BEA website, www.bea.gov under Methodologies. From Wright (2002).

For the proxy measure of the matching financial strategy we will use the following definition of long-term financial leverage.

$\left(\frac{\text{LT Liab}}{\text{Net Worth}}\right)$ = The ratio of long-term liabilities to the economic book value of net worth. From Wright (2002).

Other variables used in the empirical work presented below are:

$\dot{\text{GDP}}$ = The percentage rate of growth in real GDP generated by nonfinancial corporations. From Wright (2002).

GDP – I = The percentage rate of change in the GDP deflator for the nonfinancial corporate sector. From Wright (2002).

$\bar{X}(b)$ = Interest payments on long-term debt. The variable $\bar{X}(b)$ was obtained by multiplying the book value of long-term liabilities (the sum of bonds and mortgages of nonfinancial corporations) from Wright (2002), by Moody's average annual Aaa rate on corporate bonds. The Aaa bond yield from 1919-2001 was obtained from *Mergent Industrial Manual,* 2002. For the period 1900-1918 this bond yield was the rate on corporate bonds with five years to maturity. This maturity was chosen because it more closely approximated the Aaa rate for the year 1919. This data was obtained from the *Historical Statistics of the United States from Colonial Times to 1970*, Part 2, U.S. Department of Commerce, Washington, D.C., 1975, Series X 487-491, p. 1004.

$\bar{X}$ = The sum of interest payments on total debt and total profits after taxes. These two variables were obtained from Wright (2002).

t = The corporate profits tax rate for nonfinancial corporations. This tax rate is computed as the ratio of profit tax liability of nonfinancial corporations (line 29), to profits before taxes (line 28) of nonfinancial corporations. This data comes from Table 1.16 of the National Income and Product Account Tables and was obtained from the BEA website, www.bea.gov .

div = The dividend payout rate defined as the ratio of cash dividends paid to shareholders, to the profits after taxes of nonfinancial corporations. Cash dividends paid to shareholders comes from line 31 and profits after taxes comes from line 30 of Table 1.16 of the

National Income and Product Account Tables and was obtained from the BEA website, www.bea.gov .

CF = Real cash flow defined as the sum of undistributed profits and depreciation charges for nonfinancial corporations deflated by the U.S. consumer price index. The depreciation charges and undistributed profits comes from lines, 20 and 32 of Table 1.16 of the National Income and Product Accounts and was obtained from the BEA website, www.bea.gov .

Table 1

The Cyclical Distribution of Income, Financing, and Investment of U.S. Nonfinancial Corporations 1900-2002

(1)	(2) Means (Std. Dev)	(3) Means (Std. Dev)	(4) Means (Std. Dev)
Variables	**Recession Years[1]**	**All Years**	**Expansion Years[1]**
$\dot{GDP}^{c}$	-.035 (.036)	.040 (.062)	.107 (.034)
$\Delta(\bar{X}(b)/X)^{a}$	.25 (.84)	.00	-.23 (1.15)
$\Delta\left(\frac{\text{LT Liab}}{\text{Net Worth}}\right) \bullet 100^{c}$	.74 (3.59)	-.01 (2.71)	-1.50 (2.80)
$\Delta(\text{Inv})^{c}$	-9.60 (40.37)	10.53 (31.71)	20.95 (20.18)
$\Delta(\text{Inv} + \text{P\&E})^{a}$	27.50 (117.30)	73.04 (101.16)	76.00 (75.50)
ΔSP_{-1}^{c}	-291.00 (638.7)	108.48 (615.84)	133.76 (184.20)

1. Recession years and expansion years were obtained in the following way. First we calculated the average growth rate for GDP (and the standard deviation of the growth rate) for the entire sample time period 1900-2002. We then defined recession years to be those years in which the growth rate in GDP was less than or equal to the average growth rate (.04) minus one-half the standard deviation of the growth rate, or, $\dot{GDP}$ (Recession) $\leq .04 - (.5)(.062) \leq .009$. Expansion years were those years in which $\dot{GDP}$ was equal or larger than average $\dot{GDP}$ plus one-half the standard deviation of $\dot{GDP}$, or, $\dot{GDP}$ (Expansion) $\geq .04 + (.5)(.062) \geq .071$. Using this criteria we obtained 28 recession years and 30 expansion years. The recession years were: 1904, 1908, 1914-15, 1917, 1919-21, 1924, 1927-28, 1930-33, 1938, 1945-46, 1949, 1954, 1958, 1970, 1974-75, 1980, 1982, 1991, and 2001. The expansion years were: 1905-06, 1909, 1916, 1918, 1922-23, 1925, 1934-37, 1939-43, 1947-48, 1950, 1953, 1955, 1959, 1962, 1964-65, 1972, 1976-77, and 1984.

a, b, and c. Indicates that the difference in means between recession years and expansion years is significantly different than zero at the 5 percent, 2.5 percent and 1 percent level on a one-tail t-test respectively.

Table 2

Nonfinancial Corporate Investments and Capital Market Signals

The table reports the estimated coefficients on various lagged capital market variables for two categories of corporate investment and over three sample time periods. The White corrected t-scores and P-values are reported beneath the estimated coefficients.

I. $\Delta(\text{Inv}) = a_0 + a_i(\text{Capital Market Variables}) + a_j(\text{DummyVairable}) + U$

SAMPLE PERIOD:	1900-2002		
Regressions:	2I1	2I2	2I3
Regressors			
ΔNWQ_{-1}	875.6628 (5.34/.000)		
$\Delta LT\ LiabQ_{-1}$	439.7674 (5.74/.000)		
ΔSP_{-1}		.0203 (3.75/.000)	
ΔQ^{bea}_{-1}			71.2660 (2.87/.003)
DV	DV41, DV50, DV73, DV74	DV41, DV50 DV73, DV74	DV41, DV50 DV73, DV74
$\overline{R}^2$	.493	.421	.355
SAMPLE PERIOD:	1900-1951		
Regressions:	2I4	2I5	2I6
Regressors			
ΔNWQ_{-1}	613.0079 (1.86/.070)		
$\Delta LT\ LiabQ_{-1}$	311.3625 (2.01/.050)		
ΔSP_{-1}		.0253 (2.55/.014)	
ΔQ^{bea}_{-1}			26.6468 (2.07/.044)
DV	DV41, DV50	DV41, DV50	DV41, DV50
$\overline{R}^2$	.400	.433	.411
SAMPLE PERIOD:	1952-2001		
Regressions:	2I7	2I8	2I9
Regressors			
ΔNWQ_{-1}	855.9067 (4.35/.000)		
$\Delta LT\ LiabQ_{-1}$	466.3443 (4.31/.000)		
ΔSP_{-1}		.0199 (3.31/.002)	
ΔQ^{bea}_{-1}			156.3213 (3.49/.001)
DV	DV73, DV74	DV73, DV74	DV73, DV74
$\overline{R}^2$	.493	.393	.413

Table 2 (continued)

II. **Δ(Inv + P&E) = a_0 + a_i(Capital Market Variables) + a_j(Dummy Variables) + U**

SAMPLE PERIOD:	**1900-2002**		
Regressions:	2II1	2II2	2II3
Regressors			
ΔNWQ_{-1}	1423.195 (3.65/.000)		
$\Delta LT\ LiabQ_{-1}$	629.1491 (3.75/.000)		
ΔSP_{-1}		.0537 (7.76/.000)	
ΔQ^{bea}_{-1}			158.3841 (2.69/.008)
DV	DV41, DV50, DV73, DV74	DV41, DV50 DV73, DV74	DV41, DV50 DV73, DV74
$\bar{R}^2$	.564	.642	.565
SAMPLE PERIOD:	**1900-1951**		
Regressions:	2II4	2II5	2II6
Regressors			
ΔNWQ_{-1}	1797.987 (2.24/.030)		
$\Delta LT\ LiabQ_{-1}$	675.5854 (1.62/.113)		
ΔSP_{-1}		.0455 (2.05/.047)	
ΔQ^{bea}_{-1}			46.0110 (1.77/.083)
DV	DV41, DV50	DV41, DV50	DV41, DV50
$\bar{R}^2$	.347	.343	.332
SAMPLE PERIOD:	**1952-2002**		
Regressions:	2II7	2II8	2II9
Regressors			
ΔNWQ_{-1}	1231.098 (2.62/.012)		
$\Delta LT\ LiabQ_{-1}$	689.1479 (2.93/.005)		
ΔSP_{-1}		.0541 (6.98/.000)	
ΔQ^{bea}_{-1}			369.7753 (4.23/.000)
DV	DV73, DV74	DV73, DV74	DV73, DV74
$\bar{R}^2$	.516	.631	.611

III. (Inv) = a_0 + a_i(Capital Market Variables) + a_j(Dummy Variables) + U

SAMPLE PERIOD:	**1900-2002**	**1900-1951**	**1952-2002**
Regressions:	2III1	2III2	2III3
Regressors			
NWQ_{-1}	1542.922 (5.85/.000)	136.7202 (.47/.64)	1536.831 (3.37/.002)
LT $LiabQ_{-1}$	5.93.9108 (5.29/.000)	–2.2263 (–.02/.98)	433.9389 (3.82/.000)
DV	DV41, DV50, DV73, DV74	DV41, DV50	DV73, DV74
$\overline{R}^2$	.41	.37	.47

IV. (Inv + P&E) = a_0 + a_i(Capital Market Variables) + a_j(Dummy Variables) + U

SAMPLE PERIOD:	**1900-2002**	**1900-1951**	**1952-2002**
Regressions:	2IV1	2IV2	2IV3
Regressors			
NWQ_{-1}	2940.874 (4.6/.000)	1614.800 (1.93/.061)	2929.863 (3.64/.001)
LT $LiabQ_{-1}$	1156.961 (3.94/.000)	512.2414 (1.30/.201)	1297.027 (3.71/.001)
DV	DV41, DV50, DV73, DV74	DV41, DV50	DV73, DV74
$\overline{R}^2$	.61	.35	.60

Table 3

Nonfinancial Corporate Leverage and the Business Cycle

The table reports the estimated coefficients on two business cycle variables and two measures of corporate investments in long-term financial leverage regressions over three sample time periods. The White corrected t-scores and P-values are reported beneath the estimated coefficients.

I. $\Delta\left(\frac{\text{LT Liab}}{\text{Net Worth}}\right) = b_0 + b_i \text{ (Business Cycle Variables)} + b_j \text{ (Dummy Variables)} + V$

Sample Period:	**1900-2002**	**1900-1951**	**1952-2002**
Regressions:	**3I1**	**3I2**	**3I3**
Regressors			
$\dot{\text{GDP}}$	−.0930 (−3.57/.001)	−.0802 (−2.48/.017)	−.1304 (−2.97/.005)
GDP-I	−.1960 (−5.36/.000)	−.2086 (−4.86/.000)	−.1531 (−1.93/.059)
DV	DV36,DV74	DV36	DV74
$\bar{R}^2$	.692	.711	.510

II. $\Delta\left(\frac{\text{LT Liab}}{\text{Net Worth}}\right) = b_0 + b_1 \text{ (Corporate Investment)} + b_2 \text{ (DV)} + V$

Sample Period:	**1900-2002**	**1900-1951**	**1952-2002**
Regressions:	**3II1**	**3II2**	**3II3**
Regressors			
Δ(Inv) X 100	−.0246 (−5.08/.000)	−.0590 (−2.74/.009)	−.0160 (−2.63/.001)
DV	DV36	DV36	DV74
$\bar{R}^2$	.574	.611	.584
Regressions:	**3II4**	**3II5**	**3II6**
Regressors			
Δ(Inv + P&E) X 100	−.0091 (−4.25/.000)	−.0188 (−2.24/.030)	−.0066 (−3.43/.001)
DV	DV36	DV36	
$\bar{R}^2$	.549	.561	.564

Table 4

Nonfinancial Corporate Leverage, Taxes, and the Business Cycle

The table reports the estimated regression coefficients on two business cycle variables, two corporate investment variables, a tax rate variable, and various dummy variables for the long-term financial leverage regression over the sample period 1952-2002. The White corrected t-scores and P-values are reported beneath the estimated coefficients.

I. $\Delta\left(\frac{\text{LT Liab}}{\text{Net Worth}}\right) = b_o + b_i\begin{pmatrix}\text{Business}\\ \text{CycleVariables}\end{pmatrix} + b_l\begin{pmatrix}\text{Corporate}\\ \text{Tax Rates}\end{pmatrix} + b_j\begin{pmatrix}\text{Dummy}\\ \text{Variables}\end{pmatrix} + V$

Sample Period:	**1952-2002**		
Regressions:	**4I1**	**4I2**	**4I3**
Regressors			
$\dot{\text{GDP}}$	−.1219 (−2.79/.008)		
GDP-I	−.1258 (−1.92/.062)		
Δ(Inv) X 100		−.0159 (−3.34/.002)	
Δ(Inv + P&E) X 100			−.0064 (−3.15/.003)
t	.0147 (.42/.677)	.0116 (.356/.723)	−.0147 (−.382/.704)
DV	DV74,DV86,DV87	DV74,DV86,DV87	DV74,DV86,DV87
$\bar{R}^2$	.517	.588	.565

Figure 1

Input and Expected Output Sharing in an Debt and Equity Economy

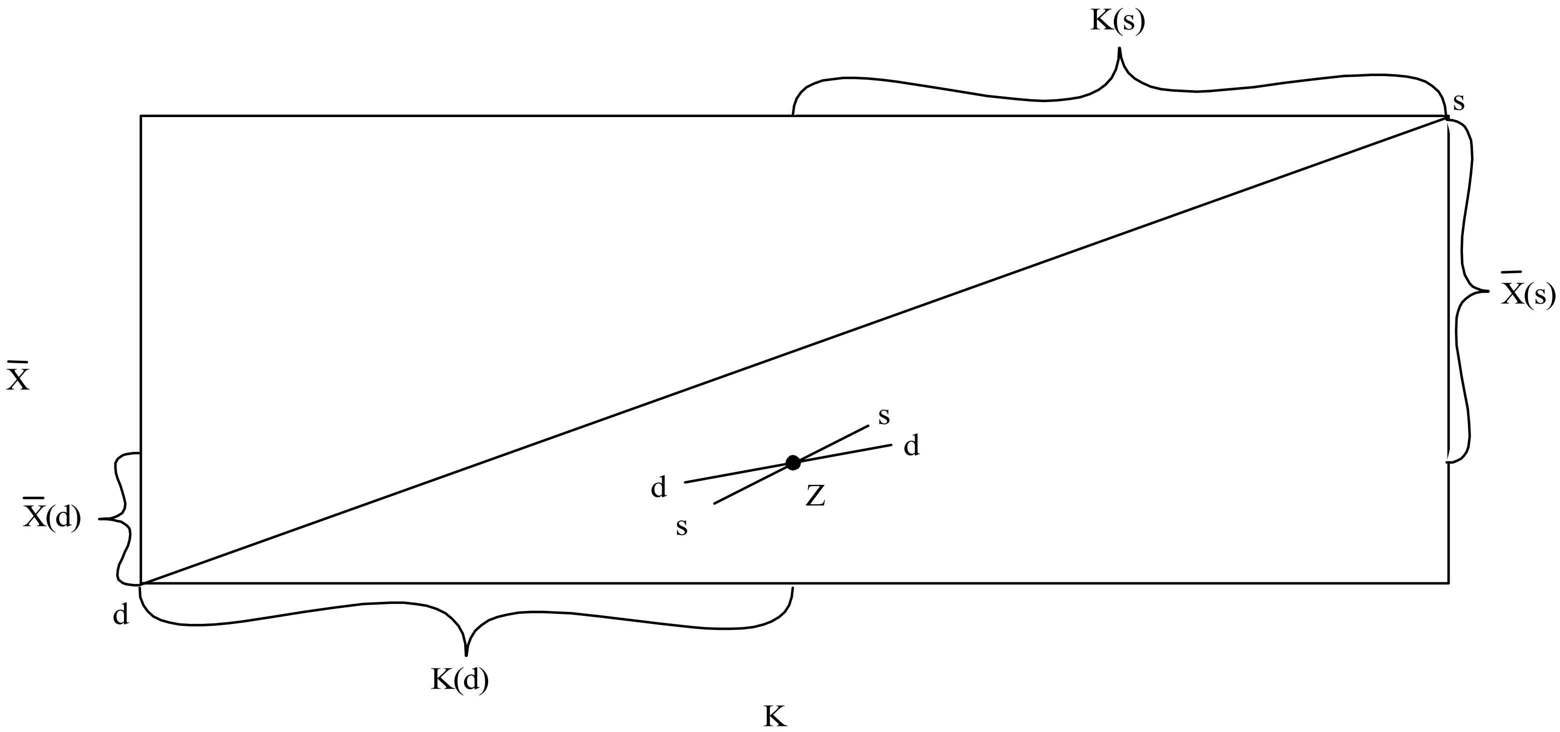


Figure 2

Financial Markets Equilibrium

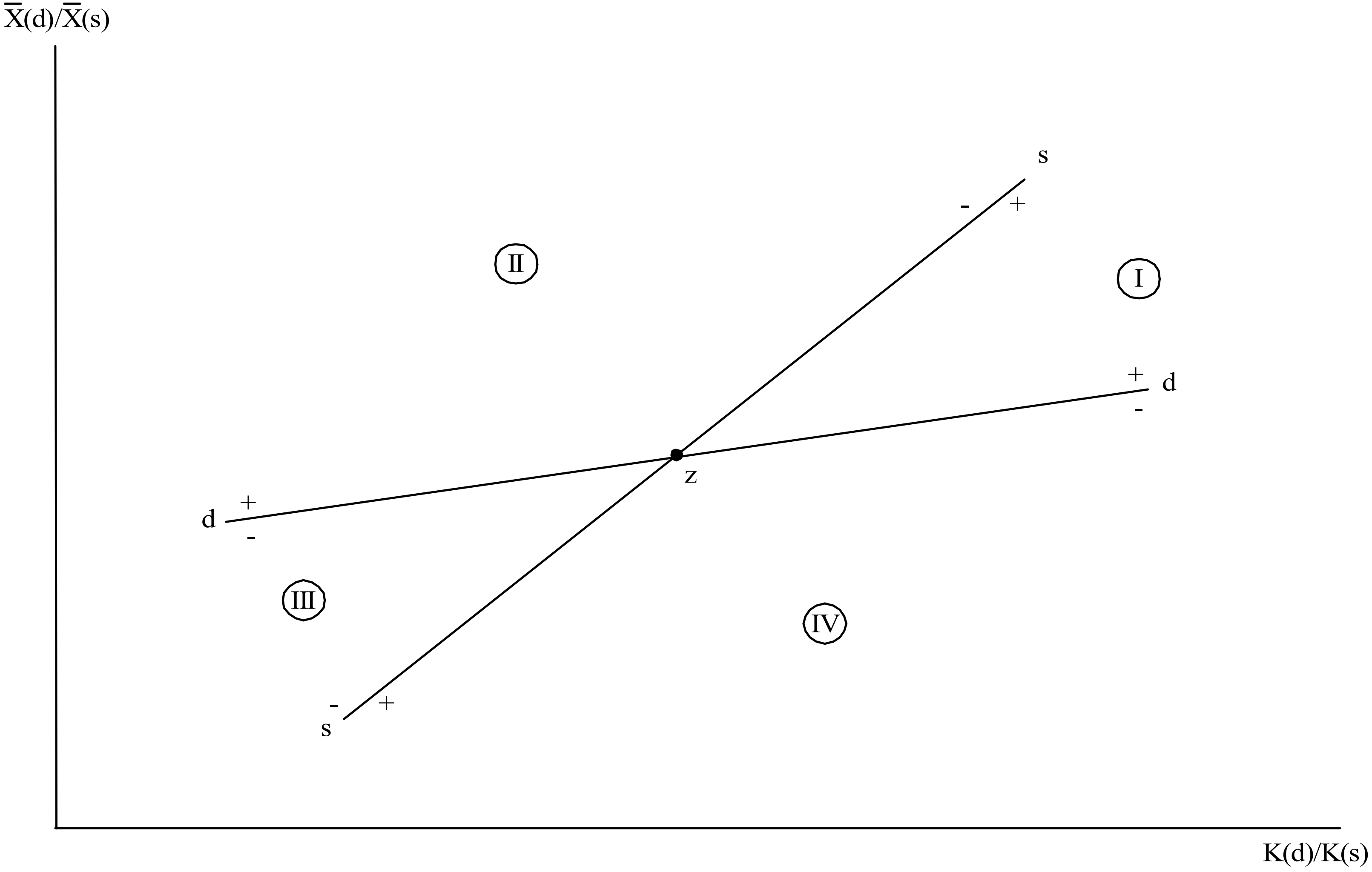
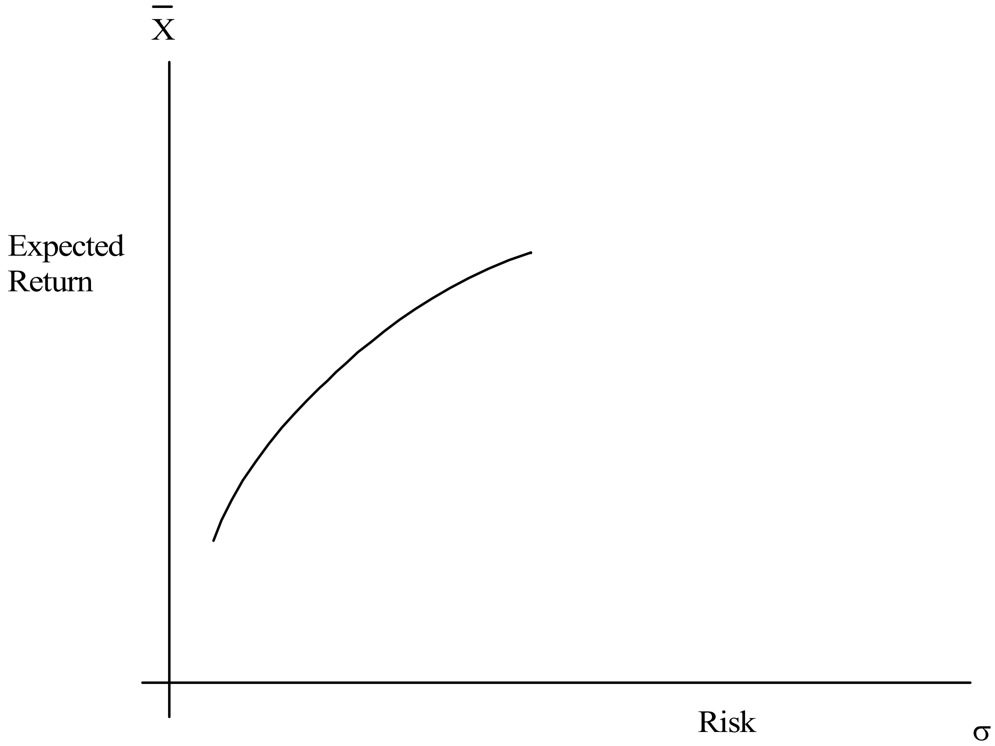


Figure 3

Risk and Return Trade-off for Capital Investment



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