Measures of Stock Market Value and Returns for the US Nonfinancial Corporate Sector, 1900-2002*

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Abstract

This paper describes a new dataset of annual time series relating to the US nonfinancial corporate sector: its market value, returns, and the major underlying stocks and flows that are valued by financial markets. The data cover the entire twentieth century, and thus fill a significant gap in the documentation of financial and real economy linkages. Previously available data cover either shorter periods, or a more restricted sample of quoted companies. A range of series are constructed on a consistent basis: returns; dividend yields (including an alternative "cashflow" measure); earnings; and "q", on a range of definitions; as well as corporate leverage measures. The main features are: the relative long-run stability of both q and the cashflow dividend yield; the systematic tendency for q to be less than unity; and the ambiguous picture presented by alternative measures of corporate leverage.

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1. Introduction

This paper describes a new dataset of annual time series relating to the US non-financial corporate sector[1] over the course of the twentieth century: its market value, and the major underlying stocks and flows that are valued by bond and stock markets. As such it is intended to fill a significant gap in the documentation of financial and real economy linkages over long historical samples. While long time series are available, and have been widely used, that relate to the performance of the stock market,[2] these sources all relate to a subset of quoted companies. As such they cannot be related directly to macroeconomic time series derived from the national accounts. As a result, fundamentals-based analysis of the stock market has been largely restricted to the analysis of dividends and (imperfect measures of) corporate earnings. The dataset described here, in contrast, can be linked to national income data, allowing analysis of a much wider range of series - both stocks and flows - with a sounder basis in economic theory.

The immediate impetus in constructing the dataset was to analyse the interaction of stock market value and returns with three key fundamentals.

The first of these, Tobin's q, relates the total value of the corporate sector to the value of its tangible assets. While time series for q have been constructed in a number of papers,[3] none have been over such a long sample. It can also be shown that a number of past estimates have significantly mis-measured both numerator and denominator of q. The dataset also allows comparison of alternative measures of q, using broad vs narrow definitions of the numerator and denominator. An advantage of the narrowest measure, "equity q", is that it can in principle be constructed from less data, and can for this reason also be constructed for the subset of quoted companies for a longer sample starting in 1871.

A puzzling feature is that all resulting series for q have an apparently stable historic mean that is significantly less than unity. If systematic mis-pricing over the course of a century is ruled out, the most likely explanation (for which some circumstantial supporting evidence is presented) would appear to be a systematic

[1] Strictly, for the non-farm, non-financial corporate sector, but since the corporate farm sector is very small, the shorter term will for convenience be used throughout except where a distinction needs to be drawn in descriptions of data sources.

[2] Eg, the Cowles(1938)/S&P index, as used by Shiller (2000) and many others, is available from 1871; data from Ibbotson & Associates are available from 1925; Siegel's (1994) series on returns dates from 1801.

[3] Eg. Blanchard et al, 1993; Brainard, Shoven & Weiss, 1980; Bernanke et al, 1988; Hall, 2001; Laitner & Stolyarov, 2003.

tendency to over-estimate the replacement value of the physical capital stock, due to underestimation of depreciation.

A second time series that can be examined using this dataset is a measure of total cash transferred to shareholders: ie, the sum of dividends and net non-dividend cashflows. This closely captures the income flow, which, in discounted terms, must equal the stock market value of the corporate sector, in contrast to the standard measure of dividends per share on reported stock indices.[4] This paper shows that the resulting "cashflow yield" provides an interesting comparison with the standard dividend yield, being distinctly more volatile in the short term, but also apparently more stable over the longer term.

The third series that can be analysed is a series for nonfinancial profits, consistent with the national accounts. This enables calculation of a P/E multiple for the nonfinancial sector as a whole, and provides interesting insights into payout policies and corporate retentions.

Although the dataset was primarily set up to address the above issues, it also includes a number of underlying data series that may be of independent interest. In particular, alternative measures of corporate leverage can be constructed. For the period from 1929 onwards, the dataset should also provide a complement to the extensive flow data for the nonfinancial corporate sector already published by the Bureau of Economic Analysis.

It should be stressed that this paper does not attempt to engage in any direct measurement of the underlying time series; but instead simply collates data from a range of previously published sources, and attempts to construct time series on as consistent a basis as possible over the course of the twentieth century. This task is a relatively easy one for the period from 1945 onwards: the Federal Reserve's Flow of Funds tables (Federal Reserve, 2003) provide virtually all the required series, either explicitly or implicitly. Before 1945 it is a considerably more complex task, with the caveats relating to data quality increasing, the earlier back in the century the data are taken. A particular problem in the period before Fed flow of funds data become available in 1945 is the lack of a published series for the market value of nonfinancial equities. This paper introduces a new approach to the construction of estimates of this series in this earlier period, which can be shown to be superior, on statistical grounds, to previous approaches.

It is hoped that the dataset will provide a basis for research on a wide range of topics: downloading of the data is actively encouraged.

[4] Miller and Modigliani's (1961) original critique of the Gordon Growth Model on these grounds has been largely ignored in the literature.

The structure of the paper is as follows. Section 2 presents a summary of the main features of the data, and provides charts of a number of key ratios that can be constructed therefrom, with a comparison, where relevant, with equivalent series for one of the most commonly used indices of quoted stocks, the Cowles/S&P Index. Section 3 provides a comparison of measures of both q and the "cashflow yield" with those in constructed in past research. Appendices provide the key data definitions[5] and a full listing of variables in the dataset.

2. A Summary of the Key Features of the Dataset

Appendix B provides a full listing of the series in the dataset. Most of the series relate to the non-financial sector, but some series are also included for the S&P/Cowles index, as a basis for comparison.[6]

In this section, after a brief summary of data sources and quality in Section 2.1, the features of a number of key series are discussed in Sections 2.2 to 2.6.

2.1. Data Sources and Data Quality

As noted in the introduction, for the period from 1945 onwards, virtually all series in the dataset either come directly, or can be constructed, from original series in the Federal Reserve's Flow of Funds tables (Federal Reserve, 2003).

For the earlier periods, there are distinct sub-periods worth noting, roughly represented by the 1st and 2nd quarters of the twentieth century.

In the second of these, National Income and Product Accounts flow data run from 1929; and Bureau of Economic Analysis fixed tangible assets data run from 1925, so that series derived from these sources clearly have the mark of quality associated with officially published series. However a number of financial series for this sub-period are derived from incomplete data, drawing on Goldsmith's (1955) balance sheets , as well as Standard & Poor's data for quoted companies (also running from 1925).

For the first quarter of the twentieth century, there are very few officially published series to draw on. The principal sources used in this earliest period are Goldsmith (*op cit*) (for balance sheet and some flow data); Kuznets (1941) (for

[5] Comprehensive definitions, and more discussion, are provided in the extended version of this paper, Wright (2004a).

[6] All underlying series can be downloaded from www.econ.bbk.ac.uk/faculty/wright

flow data); Cowles (1938) (for stock price and return data and some limited information on corporate dividends); *Historical Statistics* (new issues and aggregate price data); and the *Commercial and Financial Chronicle* (various issues), for new issues data in the first decade of the century.

In all applied work there is a clear tradeoff between the additional information provided by longer samples, and the associated fall-off in data quality in earlier periods. Clearly data for the first 45 years of the twentieth century (and more especially, the first 25) cannot be regarded as of the same quality as for the period thereafter, since their construction involves some degree of imputation from incomplete and less than consistent data sources.[7] But, on the positive side, the longer data sample does provide a number of important insights, particularly into the degree of stability of a number of financial ratios, that would be lacking if only published data from 1945 were used.

Probably the best resolution of the tradeoff is the fairly obvious one: to proceed with caution. Those wishing to make use of the dataset in econometric work would be wise to be aware of the caveats attached to the series used in earlier periods.[8]

2.2. Dividend Yields

Figure 2.1 shows the estimated dividend yield (constructed as total annual dividends/ end-year market value of equities[9]) for the non-financial corporate sector, alongside the equivalent figure for the S&P Cowles index over the full sample, 1900-2000. Reassuringly, and indeed unsurprisingly, the two series are strongly correlated.[10]

Perhaps the most striking aspect of Figure 2.1, visible in both measures of the dividend yield, is the apparent lack of a stable mean throughout the sample period. The downward drift in the dividend yield (only partially reversed in the

[7] It should be borne in mind, of course, that Fed and BEA statisticians are not themselves immune from this criticism.

[8] In particular, there might well be good reason, on grounds of exogenous information about data quality, to test for evidence of structural breaks at points where there are major shifts in data sources: in particular, in 1925, 1929 and 1945.

[9] Strictly speaking this commonly used definition does not correspond precisely to that on quoted indices, but in practice the difference from a precisely comparable definition (in terms of dividends per share) is trivial. See Section A.1.1 for more detail.

[10] There is an independent source of data for dividends throughout the sample, but construction of a series for the market value of equities, while independently derived from 1945 onwards, is at least partially dependent on information from the S&P Cowles index before that point. Sections A.2.3, A.2.1 and A.2.3 detail the data construction methodology.

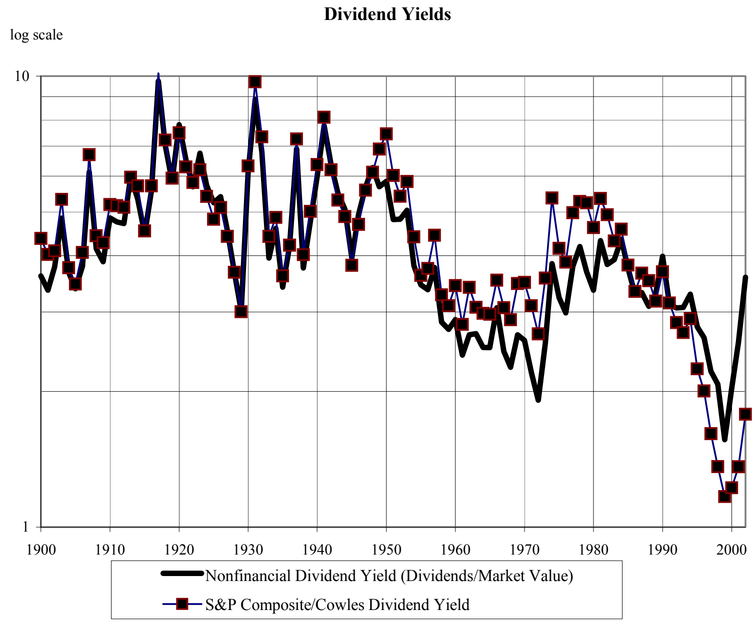

Figure 2.1:

last two years of the sample) is however considerably more marked for the S&P index in recent years.[11] Robertson & Wright (2003) show that it is impossible to reject the hypothesis of a unit root in this series (a similar result is found by Goyal & Welch, 2002, for the yield on quoted stocks) - a finding that appears to undermine much research that claims to find evidence that the dividend yield predicts future stock returns.[12] However, as discussed below, the downward drift in the dividend yield appears at least in part to be due to a distinct shift in the patterns of non-dividend cashflows

2.3. The Cashflow Yield

Miller & Modigliani's (1961) seminal paper on share valuation states clearly that the crucial series that markets should be valuing is the total flow of cash between

[11] The higher yield for the nonfinancial sector is attributed by the BEA to the tax treatment of small corporations, which encourages full payout policies.

[12] For a comprensive survey of the return predictability literature see Campbell, Lo and MacKinlay (1997). For more recent critiques, see Goyal & Welch (2002); Ang & Bekaert (2003).

corporations and shareholders, not simply dividends; but this crucial point has typically been ignored in most quantitative analysis[13] - partly, of course, because the data are only available for the corporate sector as a whole, rather than for quoted indices.

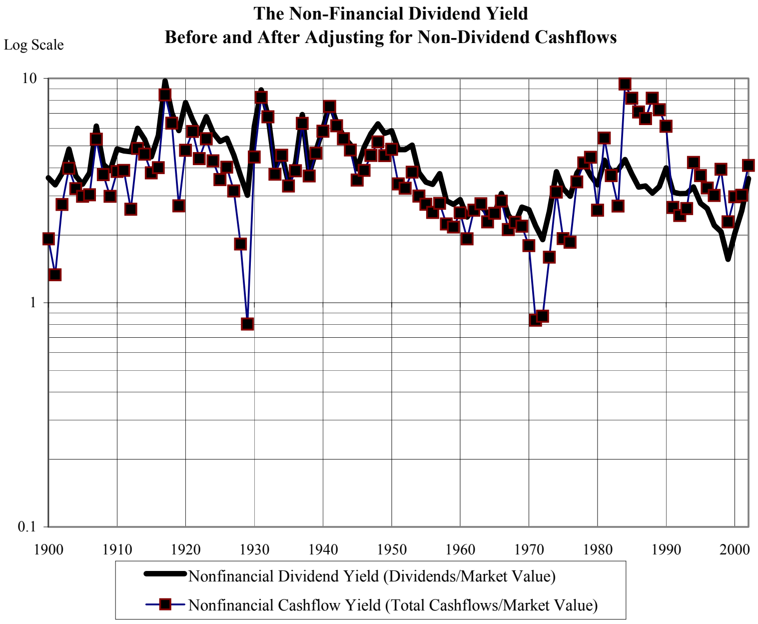

Figure 2.2:

Figure 2.2 shows, alongside the conventional measure of the dividend yield, an alternative measure, the "cashflow yield". In the numerator of this series net new equity issues (constructed by the Federal Reserve as new issues less repurchases, less cash-financed mergers and acquisitions) are deducted from dividends to derive total cashflow to shareholders. For most of the twentieth century this adjustment lowers the implied yield, but there was a striking shift in the 1980s and 1990s, when the shift to significant levels of stock buybacks and (in a number of years, more crucially) cash M&A, implied that net new issues were significantly negative.

A number of features of the resulting "Cashflow Yield" are worth noting. First, it is distinctly more volatile than the standard dividend yield: non-dividend

[13] Recent exceptions being however Ackert & 1993; Mehra, 1998; Allen & Michaely, 2002; Robertson & Wright, 2003)

cashflows have shown considerably greater variation than dividends.[14] Second, until the recent low point, previous local lows in the unadjusted dividend yield were very much accentuated in the cashflow yield (1929 being the most obvious example); but, interestingly, never by enough to result in a negative cashflow yield (though this would not be ruled out in principle). Third, the downward drift in the unadjusted yield is not present in the cashflow yield. In particular, and in marked contrast to the unadjusted yield, the cashflow yield did not look far from its historic mean at the peak of the stock market in 1999. During the sharp falls in the market thereafter it did not rise so markedly as the unadjusted yield, since total cashflow to shareholders also fell very sharply.[15]

2.4. Corporate Earnings, Payout Ratios and Retentions.

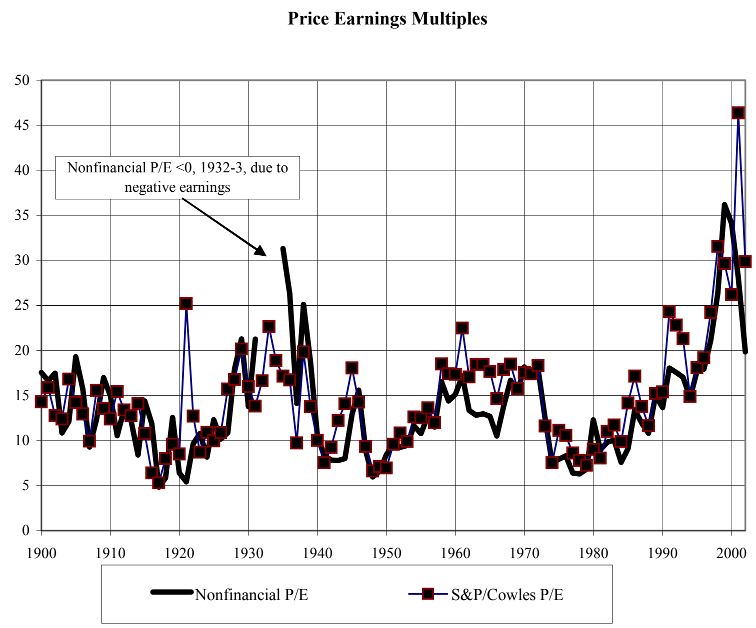

Figure 2.3:

[14] Ackert & Smith (*op cit*) show the same property holds in Canadian data.

[15] See Section 3.3 for a comparison with other investigations of non-dividend cashflows, and some evidence of the breakdown of non-dividend cashflows into its constituent elements.

Figure 2.3 plots price-earnings multiples (end year market value/annual earnings) for the nonfinancial sector against the same series for the S&P Cowles index. The profits (ie, earnings) figures used for the nonfinancial series, derived from the National Income and Product Accounts (NIPA), are described in Appendix A, Sections A.1.2 and A.2.4. The chart omits observations of the nonfinancial series in two years, 1931 and 1932 when NIPA measures of profits were negative. In contrast, S&P earnings remained positive throughout this period.[16]

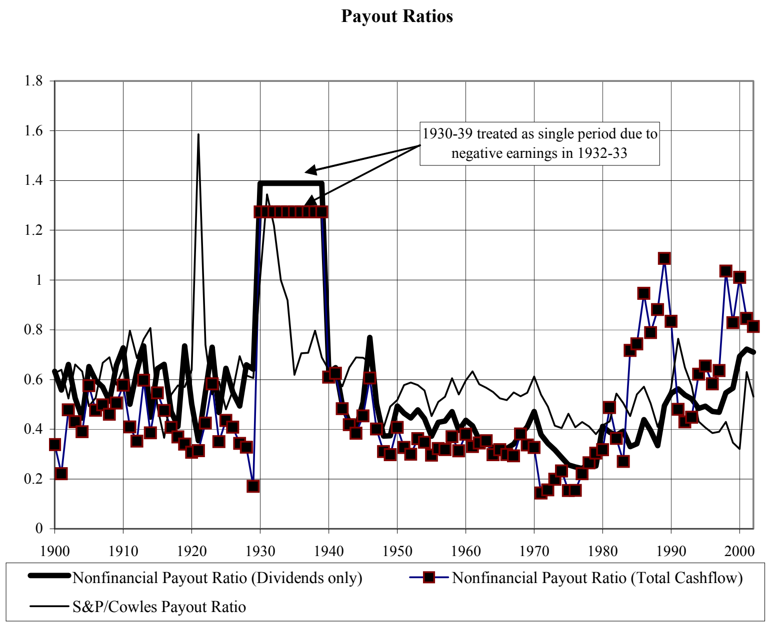

Figure 2.4:

Figure 2.4 compares implied corporate payout polices, both on the basis of dividends alone (where a direct comparison between the total and quoted companies is possible) and total cashflow to shareholders (for which no direct comparison can be made). The chart reveals some interesting contrasts between the three series.

In most of the first half of the century, the two dividend-only payout ratios were at very similar levels; the most conspicuous exception being the early 1930s,

[16] In an extended version of this paper (Wright, 2004b) I discuss possible explanations for this divergence, and for a general tendency for nonfinancial profits to be more volatile than quoted company profits. I also examine the impact of inflation-adjustments to earnings.

when, as noted above, total nonfinancial earnings were negative in 1932-33. Even if the entire decade 1930-1939 is treated as a single observation, as in the chart, payout ratios were well above 100% on a sustained basis; whereas S&P companies only had reported payout ratios above 100% in four years (1930-34).

The comparison with the ratio based on total cashflow offers interesting contrasts, and some puzzles. For most of the twentieth century this measure was systematically lower than the dividend-only measure, since firms were typically making new issues, but was distinctly higher in the last two decades of the century, as firms made significant non-dividend transfers. In part this mirrors the pattern already seen in the two alternative yield measures; but a distinct contrast is that, whereas the pattern of non-dividend cashflows appears on average to result in a more stable yield in total cashflow terms, it appears to result in a *less* stable pattern in payout ratios. This is particularly marked at the end of the sample. Dividend-only payout ratios were roughly at historic average levels for the subsample of the S&P companies, and not especially high (given cyclical conditions) for the nonfinancial sector as a whole; but the total payout ratio was at extremely high levels compared to its mean, with two observations above 100%.[17]

This feature can only readily be explained in one of two ways: either firms were pursuing exceptionally generous (and possibly unsustainable) dividend policies, given their degree of profitability, or national accounts measures of profits were underestimating true earnings during this period. This latter explanation would in principle be consistent with some research (Hall, 2001; Laitner & Stolyarov, 2003) that has claimed that there is significant under-recording of corporate assets, and hence, by implication, of corporate saving.[18]

2.5. Alternative Measures of "q"

Use of nonfinancial flow data derived from the national accounts allows consideration of a range of associated balance sheet data that are not available (or at least not on a reliable, and mutually consistent basis) for quoted indices. The analysis

[17] There were also total payout ratios near or above 100% in the late 1980s, but these are more readily explicable, since they occurred during a period of very strong M&A activity. Much of this was financed by debt, such that the total payout ratio to equity-holders and bondholders combined was not particularly exceptional. No such explanation can be found in the data for the end of the 1990s and the start of the new millennium.

[18] For further discussion of this issue, in relation to alleged evidence of significant intangible assets, see Section 3.1; and in relation to the implied picture of corporate indebtedness, see Section 2.6.

here will focus especially on measures of "q"

The standard definition, following Tobin, and hence usually termed "Tobin's q" or "Tobin's average q" is:

$$q_T = \frac{\text{market value of equities +liabilities}}{\text{total assets}}$$

An alternative definition, which can be termed "equity q"is defined by:

$$q_E = \frac{\text{market value of equities}}{\text{net worth}}$$

where net worth = total assets - liabilities. For both Tobin's q and equity q the numerator needs to be measured at market value, and both numerator and denominator should be measured in a way that consistently reflects the ownership of the underlying assets..

Both measures of q have positive and negative features as indicators of aggregate stock market value. Under Miller-Modigliani conditions, the total market value of the firm should be invariant to the method of funding a given level of capital; and evidently Tobin's q has the desirable feature that it is similarly unaffected. In contrast, equity q is not invariant to methods of funding; however, for values of equity q (and hence Tobin's q) close to unity the impact will be relatively small.[19]

On the other hand, equity q has the advantage that it is immune to changes in the definition of capital. Tobin's q is usually defined in terms of narrow physical capital (of which two competing measures are discussed below, in Section A.1.3). But in principle Tobin's q can also be defined in terms of total corporate assets and liabilities (since the very existence of corporate financial assets casts doubt on the standard implicit assumption that they can simply be netted off liabilities as if assets and liabilities were perfect substitutes). In contrast changes in the definition of capital have no impact on net worth, and hence on equity q since, for consistency with the flow accounts, they must also imply corresponding adjustments to liabilities. As shown below this also implies the advantage that measures of equity q can be constructed without recourse to capital stock data.

Figure 2.5 compares three alternative measures of q. The first measure of Tobin's q uses only tangible assets in the denominator, and thus includes only

[19]Define $q_E = \frac{V}{K-L}$, where V =value of equities, K = capital; L debt. Hence $\frac{dq_E}{dL}|_{dK=0} = \frac{1}{K-L}\left(q_E - 1\right)$, since $dq_E = \frac{1}{K-L}dV + \frac{V}{(K-L)^2}dL$, and $dK = 0 \rightarrow dV = -dL$.

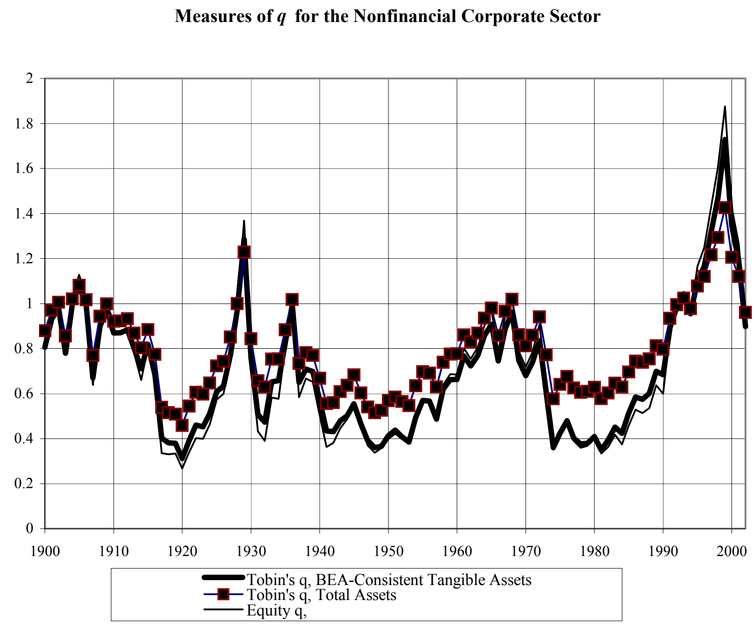

Figure 2.5:

net liabilities in the numerator;[20] the second uses total assets in the denominator, and hence gross liabilities in the numerator. All three use the same estimate of the market value of equities. The chart makes clear that all three measures have very similar characteristics, and are very strongly correlated; however, as might be expected, equity q is the most volatile, and Tobin's q based on total assets the least. A number of features of all three series are worthy of note.

The first is that, both on the basis of visual inspection and more formal statistical testing (see Robertson and Wright, 2004), there appears to be a reasonably

[20] This measure also requires an adjustment for the ownership of the physical capital stock, since this is owned by the "domestic nonfinancial corporate sector" - namely, US and overseas corporations operating in the domestic market. The market value of equities and debt, however, are those of US corporations alone, and include the market's valuation of US companies' overseas assets. The numerator can however be put on a comparable basis to the denominator by subtraction of the value of net overseas direct investment. In practice it turns out that this correction makes little difference to the resulting ratio. In the case of the measure using total assetsownership issues do not arise, because both numerator and denominator relate to the value of US corporations only, from all operations.

strong tendency to mean reversion. Robertson and Wright show that this property is indeed to be expected, since there are strong *a priori* grounds for expecting the mean value of q to be invariant to shifts in most structural parameters in the economy. In this respect, they show that q has an advantage over the dividend yield, which may, in principle be subject to permanent shifts in mean. Robertson and Wright conclude that, as a result, the predictability literature is both more empirically robust, and more readily interpretable, if re-interpreted in terms of q.

The second and more puzzling feature is that, for all three series, the apparently stable mean value to which q appears to revert is significantly below unity.[21] Standard macro theory would hold that, in the absence of systematic mis-pricing, the mean value of q should either be unity, or if anything slightly above (Robertson & Wright, *op cit*). One possible explanation for lower mean values is some systematic form of measurement error. Since the numerator of q is derived largely from quoted market statistics, the most likely source of any measurement error must be the denominator, implying some systematic historic over-estimation of capital. Since BEA capital data are constructed by the perpetual inventory method from (presumably reliable) gross investment figures, minus estimated depreciation, this must in turn imply that these latter figures are underestimated. Hence, by implication, any presumed overestimation of capital also implies overestimation of profits, net of depreciation.[22]There are two pieces of supporting evidence for this explanation.

The first is that alternative methods of constructing fixed capital series to those used by the BEA can result in signficantly lower resulting estimates. As discussed at greater length below in Section A.2.5, estimates of corporate capital for the first half of the century from Goldsmith (1955), derived originally from balance sheet, rather than perpetual inventory estimates, while strongly correlated with BEA measures over a common sample, are significantly lower in level terms (and would be roughly consistent with q having a mean value close to unity). Gordon (1990) also suggests that BEA capital data are significantly overstated.

The second element of supporting evidence for this explanation is more indirect, and comes from data for quoted companies. Given some assumed initial

[21] There is an additional apparently puzzling contrast here with a time series for q for the total business sector, in a recent paper by Laitner & Stolyarov (2003), which has a mean well *above* unity. However the puzzle turns out to be more apparent than real: Laitner & Stolyarov simply get their data wrong, mainly by omitting important elements of tangible assets from the denominator of their q estimate. See Section 3.1 for a brief discussion.

[22] The necessary link between the two measurement errors is most evident in equity q, since in this case the denominator is simply an accumulation of retained profits.

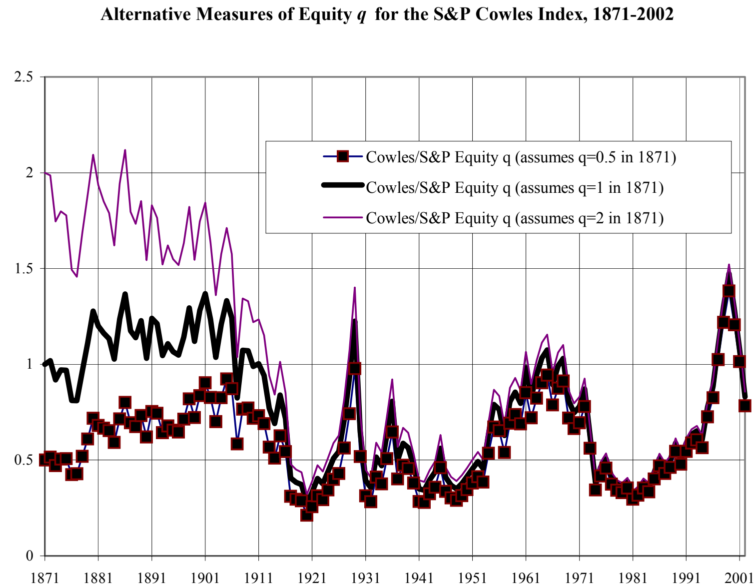

Figure 2.6:

estimate of real net worth per share, a measure of equity q for the Cowles/S&P Index can be derived by cumulating real retained profits per share.[23] Figure 2.6 shows that, while differences in the assumed starting level of net worth per share in 1871 imply, unsurprisingly, very significant differences in the implied estimates of equity q in the earlier years of the sample, trend growth in real net worth per share means that the impact of the initial assumption becomes increasingly less significant. As a result, for most of the twentieth century the three alternative estimates of equity q for the Cowles/S&P index are fairly similar (and, of course, increasingly so as the century progresses).

Furthermore, as the table below shows, the various alternative measures of equity q all share the property of average values well below unity, even allowing for the very different starting values.[24]

[23] I am grateful to Derry Pickford for suggesting this approach.

[24] A very similar (and even more marked) feature is evident in data for the United Kingdom (Smithers, 2003).

Mean Values of Alternative Estimates of "Equity q"

	1900-2002	1945-2002	1871-2002
Nonfinancial Equity q	0.63	0.64	n/a
Cowles/S&P Equity q (if=0.5 in 1871)	0.52	0.56	0.55
Cowles/S&P Equity q (if=1 in 1871)	0.63	0.63	0.71
Cowles/S&P Equity q (if=2 in 1871)	0.71	0.67	0.86

Given reasonably reliable dividends data, the above figures thus suggest that profits figures for quoted companies are systematically overstated (or, strictly speaking, are valued by markets as if they were). The degree of correspondence between the estimates for quoted companies, and the mean values of all three measures of q for nonfinancial companies, derived from balance sheets, would appear to be strong circumstantial evidence that the source of this overstatement lies in under-depreciation of capital.

2.6. Corporate Leverage Ratios

As a by-product of producing measures of q, the database also allows construction of a range of measures of corporate leverage, over a longer continuous sample period than previously available (*cf* Holland & Myers, 1984; Miller, 1963). In contrast to the fairly consistent pattern shown by by different q measures, Figure 2.7 shows that, depending on which leverage measure is used, and on whether allowance is made for possible under- or over-statement of corporate debt, strikingly different pictures of leverage can be constructed.[25] The list of measures shown is by no means exhaustive, but is intended simply to demonstrate how wide a range of estimates of leverage can be derived from available data. The variation between different measures is particularly marked at the end of the sample, when it would have been possible to claim that, depending on which measure was used, leverage was either near its record high, or near its record low.

All leverage measures shown are calculated as the ratio of some measure of nonfinancial corporate debt to total market value, itself measured as the sum of the market value of corporate equities and the relevant debt measure.[26]

[25] Measures of q are relatively unaffected because different leverage definitions imply offsetting movements to both numerator and denominator of q.

[26] All debt measures are at market prices. Where some elements of debt are not available from Fed or other sources on this basis an adjustment is made, described in Wright (2004a) Section 6.

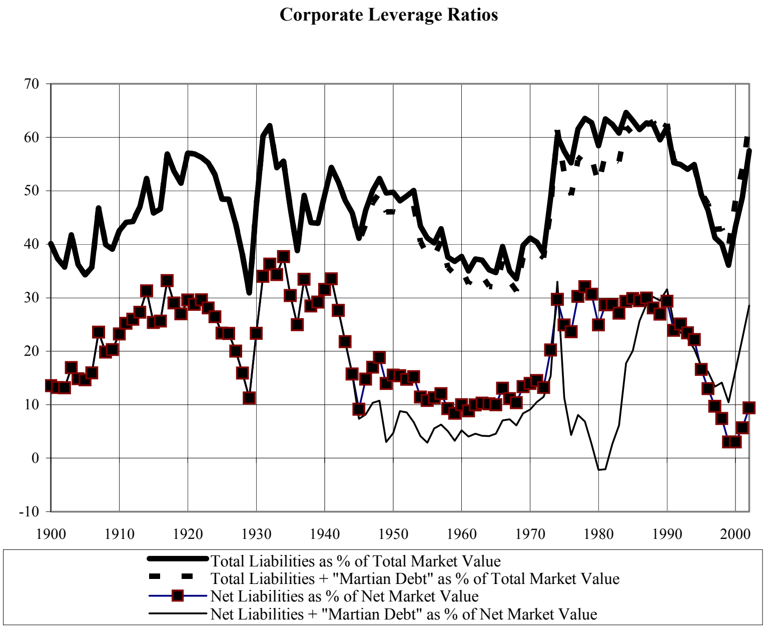

Figure 2.7:

A key distinction is between gross and net measures of corporate liabilities. The latter measure is more commonly used, partly because net liabilities are frequently inferred indirectly by "grossing-up" net interest payments (as, for example, in Holland & Myers (*op cit*), Bernanke et al, 1988)[27]; here however, debt figures are taken directly from balance sheet data (see Sections A.1.4 and A.2.3) so the comparison can be carried out on both definitions.

Clearly, as might be expected, net and gross leverage have very different average values; though equally clearly they have been hit by similar shocks (not least the swings in the other element of total market value, the value of the stock market). A striking feature of both series is that, despite significant fluctuations, both appear, if not necessarily stationary, at least to move within certain bounds. Gross leverage appears to have been mainly within a range of ten percentage points either side of 50% of total market value; net leverage has typically moved in a range around 20%.

[27] An approach that can lead to quite serious mis–measurement of net liabilities - see discussion in Section 3.2.

Towards the end of the sample, the two series, as calculated on the basis of recorded assets and liabilities, presented distinctly different pictures of corporate indebtedness, in relation to historic norms. Both fell very sharply during the 1990s, largely due to the sharp rise in the value of the stock market during this period. The net measure was quite widely used to argue that the corporate debt burden was an historically low level in relation to total corporate value. Both measures then rose quite sharply after the stock market peaked; but whereas the recorded gross measure recovered to levels that were fairly high in relation to historical norms, the net measure remained quite low in historical terms.

However, there are some reasons for scepticism about the net measure. Wright (*op cit*) shows that if net worth had grown in line with flow measures of retained profits, consistent with the national accounts, its growth would have been significantly more muted (indeed, would have been close to zero in some recent years). By implication, for any given measure of the capital stock, the implied figures for net liabilities would have grown even more rapidly. To reconcile the two figures, the Fed include what is in effect a balancing item in miscelleaneous assets and liabilities, that include significant unidentified elements.

Nor is the nonfinancial corporate sector the only sector where discrepancies have been significant. It is possible to construct a time series for total unidentified debt: the gap between total identified assets and total liabilities[28] of all sectors, including the overseas sector Figure 2.7 shows the impact on the two recorded measures of leverage on the (admittedly extreme) assumption,that all of what might be termed "Martian debt" is in reality unrecorded debt of the nonfinancial corporate sector. The chart shows that the effect on gross leverage is relatively limited, though it does suggest that recent values are much closer to previous peak levels. There is however a much more dramatic impact on the recent pattern of net leverage. Instead of being at a near-record low, the adjusted series is not far off previous historic peaks in the1930s, and very close to its postwar peak.

It should be stressed that none of these series can be regarded as providing the definitive picture of nonfinancial corporate leverage: what they do clearly convey is that apparently reasonable and sensible calculations can yield distinctly contradictory pictures - especially in recent data. Empirical investigations into the predictive power of the alternative measures might possibly help in deciding which is the most practically useful indicator.[29]

[28] Measured in the broadest possible definition: see Wright (2004b) for details of data construction.

[29] Wright (*op cit*), Section 3.4 details the construction of an adjustment to net liabilities to

3. A Comparison of the Dataset with Some Past Research

3.1. Laitner and Stolyarov's (2003) q estimates

In a recent paper, Laitner & Stolyarov (2003) construct an estimate of Tobin's q for the total business sector over the period 1953-2000. They motivate their theoretical and empirical analysis by noting that, in their dataset, Tobin's q has usually been well above 1 - a feature that, like Hall (2001), they attribute to intangible assets, since the denominator of q only measures tangible assets. This key feature of their dataset is not, however, visible in the dataset described in this paper. Indeed, as Section 2.5 notes, quite the contrary is the case. Since the nonfinancial corporate sector is such a large part of the total business sector (in 2000 it was 56% of the total by market value) this discrepancy appears on the face of it to be a serious puzzle.

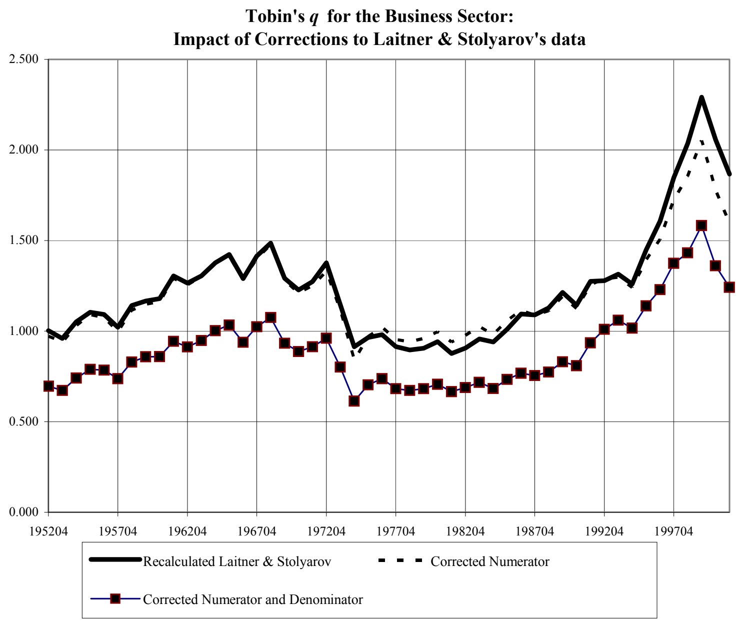

Figure 3.1:

offset the impact of a distinct change in the Fed's treatment of tangible assets from the late 1980s onwards. This adjustment also suggests distinctly higher corporate leverage at the end of the sample.

In fact, on closer examination, there is not much to puzzle over: Laitner & Stolyarov simply get their data wrong. A detailed comparison in Wright (2004b) shows that they both overestimate the numerator and underestimate the denominator of their q estimate. The latter error is most significant: the primary factor being the omission of significant elements of tangible (rather than intangible) assets, from the denominator (the most important of which omissions were residential capital and land). When the calculation is carried out correcting for these errors the resulting q series for the business sector as a whole turns out also to have a mean well below unity, consistent with the equivalent series for the non-financial corporate sector described in this paper. Figure 3.1 (reproduced from Wright, 2004b) shows the impact of these corrections.

3.2. Bernanke, Bohn and Reiss's (1988) q estimates

A much cited time series for q, constructed for an econometric study of investment, is found in Bernanke, Bohn and Reiss (1988). This series is conceptually rather different from the series constructed here, since it is an attempt to derive a series for *marginal* q from data on Tobin's (average) q, corrected for changes in tax rates, and tax breaks on investment, etc. Nonetheless it is of interest to compare the techniques applied in constructing the average q figures that feed into that estimate with the methodology used here.

Figure 3.2 shows three series: first, the series for tax-adjusted q as given in Bernanke *et al*[30]; second, Tobin's q as calculated in this paper; third an equivalent series on the same basis that replicates the figure for Tobin's (average) q that fed into Bernanke *et al*'s marginal q calculations.

In the common sample all three series have fairly similar properties in terms of percentage changes (the chart is on a log scale).[31] The *level* of the Bernanke *et al* series is however well above unity, in contrast to both the raw figures for average q. The similarities between the latter measures over this period imply however that (in contrast to the comparison with Laitner & Stolyarov, *op cit*) the difference in level of the tax-adjusted measure is almost entirely explained by the various adjustments for tax treatment.

[30] Or strictly, fourth quarter values of the series given in Table 8 (p323), plus one, for comparability with measures in thies paper.

[31] Note however that in the (relatively short) sample used by Bernanke *et al* the mean-reverting property of q was much less clearly visible - the series being essentially composed of a single upswing and a single downswing.

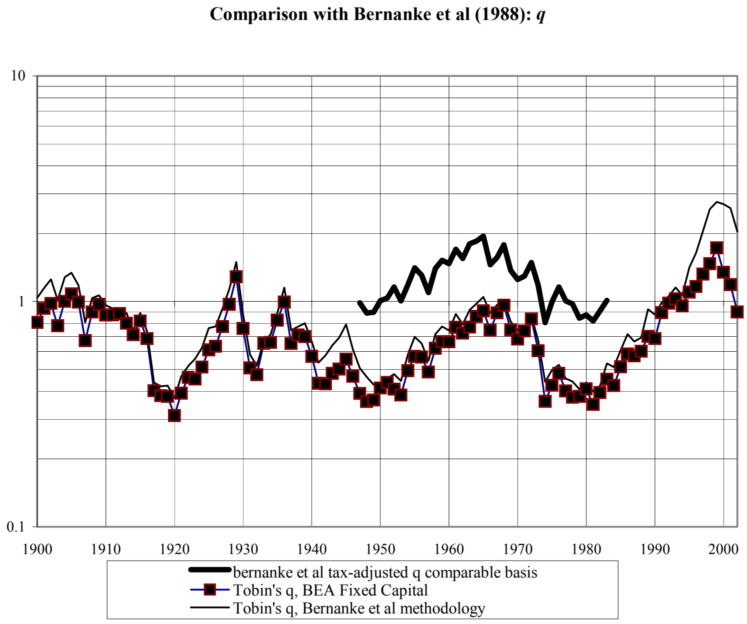

Figure 3.2:

It is worth noting, however, that, as Figure 3.2 shows, if the Bernanke *et al* methodology is extended forwards beyond their original sample, the two average q series diverge quite substantially. The primary explanation is that Bernanke *et al* did not make any use of published Fed balance sheet data on the value of equities and debt, but instead used a rather crude "grossing-up" approach to both. Wright (2004a) shows that when the implied market value of equities and debt series are compared with the equivalent Fed series, they diverge, at times by very large amounts (up to two fold in the case of equities, and up to fivefold in the case of debt) - most notably in the last ten years of the sample. The lesson to be learned from this comparison is that those who wish to follow the Bernanke *et al* approach in deriving an estimate of tax-adjusted marginal q should be careful to ensure that the the average (Tobin's) q measures that feed in are consistent with Fed data.

3.3. Alternative Estimates of Non-Dividend Cashflows

Most recent discussions of adjustments to dividends to allow for the impact of non-dividend cashflows (eg, Fama & French (2001); Grullon & Michaely (2002); Liang & Sharpe (1999)) have focussed on the role of repurchases. While these have grown very rapidly over the past decades, their impact has frequently been swamped in the recent past by the impact of cash-financed acquisitions, that are, in effect, negative new issues, since they withdraw stock from non-corporate ownership, in exchange for a cash payment. Flow of funds data on net new issues take full account of these transactions (as well as taking account of more conventional new issues, that have been very small in the recent past, but were quantitatively much more important in earlier periods).

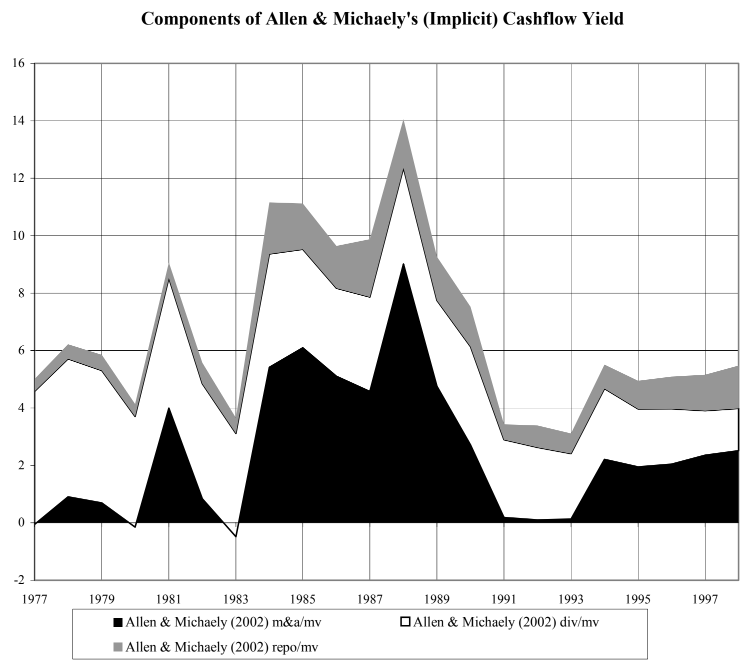

Figure 3.3:

The importance of cash-financed acquisitions in aggregate payout policy has received relatively little attention (exceptions are Shoven (1986); Bagwell & Shoven (1989); Ackert and Smith (1993); and Allen & Michaely (2002)) The latter authors note that, although, at times these flows have at times dwarfed all other forms of cash distribution, there have thus far been barely any attempts to engage in empirical investigations that measure aggregate cash distribution taking these flows into account (the only exceptions appear to be Ackert and Smith, *op cit;* Mehra, *op cit*; Robertson and Wright, 2003).

Given the differences in definition, the cashflow yield series described in Sections 2.2 cannot be directly compared with estimates, such as those of Liang & Sharpe (*op cit*) that only correct for repurchases. It is however possible to make a comparison with figures in Allen & Michaely (*op cit*). Wright (*op cit)* shows that the general pattern of the two series is quite similar; and that any differences appear to be readily explicable.

The Fed do not provide any breakdown of net new issues into its constituent components. However, to the extent that Allen & Michaely's data can be treated as mutually consistent, they can be used to derive such a breakdown, as shown in Figure 3.3. This shows that while repurchases have grown significantly since 1977, to a level almost equal to dividends at the end of their sample, movements in both repurchases and dividends have at times been dwarfed by those in cash-financed acquisitions. In particular, these were the dominant element in the sharp upswing in the cashflow yield during the 1980s.

APPENDIX

A. Key Data Definitions

The extended version of this paper (Wright, 2004b) provides full details on the construction of all 67 series in the dataset. In this section I focus on the key issues and definitions. The discussion falls naturally into two sub-samples: 1945 onwards; and 1900-1944.

A.1. Key Data Definitions, 1945-2002

From 1945 onwards data for the non-farm, non-financial corporate sector are derived almost entirely from a single source: Federal Reserve (2001) The only series not so derived are price deflators[32] and two series derived from the National Income and Product Accounts.

A.1.1. Price Indices, Dividends, and Total Returns

Standard Definitions The nonfinancial stock price, P_t, is defined by:

$$\frac{P_t}{P_{t-1}} = \frac{MV_t - NI_t}{MV_{t-1}} \tag{A.1}$$

where MV_t = market value of equities outstanding (Table B102, line 34); NI_t = net nonfinancial corporate equity issues (Table R102, line 11). It is set equal to unity in 1945 (the start-point for Fed data) as a convenient normalisation. The implied index of the number of shares outstanding is defined simply by: $E_t = MV_t/P_t$

Total dividend payments, DIV_t for the non-farm, non-financial corporate sector come from Table F102, line 3. Following the timing convention of Miller-Modigliani (1961) they can be divided by E_{t-1} to derive dividends per share, DPS_t (since dividends are deemed to be paid out at the end of the period to those who held shares at the start of the period). Hence the dividend yield can be defined consistently with published indices by:

$$DY_t = \frac{DPS_t}{P_t} = \frac{DIV_t/E_{t-1}}{MV_t/E_t} = \frac{DIV_t}{MV_t}\frac{E_t}{E_{t-1}} \tag{A.2}$$

[32] Details on which are provided in Wright (2004a) Section 5.

This timing convention is however frequently ignored, at very little cost in terms of accuracy of the data, by using the simpler approximated definition (as shown in Figure 2.1) DIV_t/MV_t, since the ratio E_t/E_{t-1} is typically very close to unity.

The total return to shareholders is given by:

$$1 + R_t = \frac{P_t + DPS_t}{P_{t-1}} = \frac{P_t}{P_{t-1}} (1 + DY_t) \tag{A.3}$$

Alternative definitions using total cashflow to shareholders. Following Miller & Modigliani(1961), define total cashflow to shareholders, as in Mehra (1998), Robertson & Wright (2003) as:

$$\widetilde{DIV}_t = DIV_t - NI_t \tag{A.4}$$

The corresponding "cashflow yield" is given by

$$\widetilde{DY}_t = \frac{\widetilde{DIV}_t}{MV_t}$$

and the corresponding return is

$$1 + \widetilde{R}_t = \frac{MV_t + \widetilde{DIV}_t}{MV_{t-1}} \tag{A.5}$$

Following Miller & Modigliani, this must (using (A.1) and the definitions of E_t and DPS_t) be identical to the return as defined in (A.3):

A.1.2. Corporate Earnings

Corporate profits (earnings) are constructed from national income data as follows:[33]

[33] All references are to tables in the National Income and Product Accounts.

$$
\begin{aligned}
EARN_t &= \text{Nonfinancial profits before tax from domestic operations (1.16 line 28)} \\
&\quad + \text{Overseas profits} \\
&\quad - \text{Profits tax liability(1.16 line 29)} \\
&\quad + \text{Inventory Valuation Adjustment (1.16, line 33)} \\
&\quad + \text{Capital Consumption Adjustment (1.16, line 34)} \\
&\quad \text{ where} \\
\text{overseas profits} &= \text{Income from foreign corporations to US corporations (8.25 line 15)} \\
&\quad - \text{Corporate Profits after Tax, Payments to rest of world (6.19B/C line 76)}
\end{aligned}
$$

The adjustment for overseas profits puts the resulting series on a comparable ownership basis to equity market value data, which relate only to US corporations

A.1.3. Tangible Assets

Two alternative measures of tangible assets, $KFED_t$ and $KBEA_t$ are constructed. Both include estimates of the value of land. The two measures only differ from 1990 onwards, due a distinct discontinuity in the Fed's data construction methods from that date onwards: the latter estimate treats land more consistently.[34]

A.1.4. Financial Assets and Liabilities

Underlying figures come straightforwardly from the flow of funds tables. In Wright (2004a) I give details of an adjustment (broadly following the methodology in Brainard, Shoven and Weiss, 1980) that converts some elements of liabilities to a market valuation. The adjustment (which also applies in earlier periods) has sometimes implied fairly significant (up to 20%) changes in net liability figures, but has relatively little impact on q estimates.

A.2. Data Definitions, 1900-1945

Before 1945 there is no single, mutually consistent source of data. However, those data sources that do exist are mainly available for at least some of the period after 1945 as well, so it is possible to assess the degree of correspondence with flow of funds data, which is generally good.

[34] See Wright (2004a) for more details.

A.2.1. Dividends

A fairly reliable series for total nonfinancial dividend payments, DIV_t, can be constructed from the start of the century, taking data from NIPA Table 1.16 from (1929-44); Kuznets, 1941 (1919-28); Goldsmith, 1955(1900-1918); and Cowles, 1938 (1900-02)

A.2.2. New Issues

A range of sources is used to construct a series for net new issues, NI_t before Fed data become available. The quality of the data is almost certainly distinctly lower than in the post-1945 period, although the series itself is, in most years, relatively small (averaging at most around 1%-2% of market value). There is also a reasonable overlap with Fed data from 1946 onwards.The sources used are Miller, 1963; *Historical Statistics* and the *Commercial and Financial Chronicle* (various issues). Wright (2004a) shows that where they overlap the correspondence between the various underlying, but non-continuous data sources is generally good.

A.2.3. Market Value of Equities, Stock Prices and Returns

There is no independent source of equity market value data before 1945. Two alternative and largely independent procedures are used to construct the data. For most of the sample the correspondence between the two resulting series is very good. A final series for market value is constructed as an unweighted geometric average of the two alternative estimates. Both methods depend on one of two series associated with an index of quoted stock prices (hence a restricted sample of corporations compared to the nonfinancial sector as a whole): the S&P Composite Index, extrapolated backwards before 1925 using data from Cowles (1938).

Method 1: Equating the Dividend Yield to the S&P/Cowles series This approach is very commonly used (see, for example, Blanchard *et al* 1993; Holland and Myers 1984; Miller, 1963, Bernanke *et al*, 1988) Define market value by:

$$MV_{1t} = \frac{DIV_t}{DY_t^s} \tag{A.6}$$

where DY_t^s is the dividend yield on the S&P Composite/ Cowles index (dividends per share are annual average figures, consistent with standard practice, given the use of end-year stock price figures). Relatively small discrepancies between the true, but (in this sub-sample) unobservable nonfincancial dividend yield and the assumed yield can thus in principle imply significant differences in market value. As shown in Section 3.2, if applied in the post-1945 period, this approach generates major differences from the Fed data in some periods. There is also strong evidence (discussed in Wright, 2004b) that the method becomes increasingly unreliable, the further back in time it is used.

Method 2: Equating Returns to the S&P/Cowles Index An alternative procedure is to generate market value by assuming that the return for all nonfinancial companies was equal to the return on the S&P/Cowles index before 1945. In the common sample, from 1945 onwards, the correspondence between the two return series is, as might be expected, fairly good.[35]

Given this assumption, (A.3), which defines the total return can be inverted to derive the implied change in price. Given figures for new issues, this in turn implies a series for market value, MV_{2t} by inverting (A.1). Since (A.1) determines the change in market value, rather than its level, it is clear that prediction errors from this method will again cumulate up, the further back in time it is applied.

A comparison of the two methods Figure A.1 compares the results by examining implied dividend yields in the period 1900-1944. The yield for Method 1 is by construction identical to the yield on the S&P/Cowles index; that on Method 1 is given by DIV_t/MV_{1t}. While both give a fairly similar picture in terms of the yield, implied differences in market value figures are not trivial - particularly in the earliest years of the sample.

Wright (*op cit) (*Appendix A) provides a formal comparison of the statistical properties of the two alternative estimates. This suggests strongly that, given the sample length used, implied standard errors for Method 2 are well below those for Method 1. Although the purely statistical properties would point to a distinctly higher weight on Method 2, the final estimate of market value is derived, on grounds of simplicity, as a simple unweighted geometric average of the

[35] See Figure 2.5 in Wright (2004a). Mean log returns for all nonfinancials and for the S&P were, respectively, 0.1220 and 0.1163, with a correlation coefficient of 0.94449, and a root mean squared prediction error of 0.0497 in logs . The slightly higher mean of the former presumably reflects the inclusion of smaller firms, which are well-known to have outperformed larger stocks in the postwar era. The difference between means is however not statistically significant (with a p-value of 0.4), so it was not taken into account in backward extrapolation.

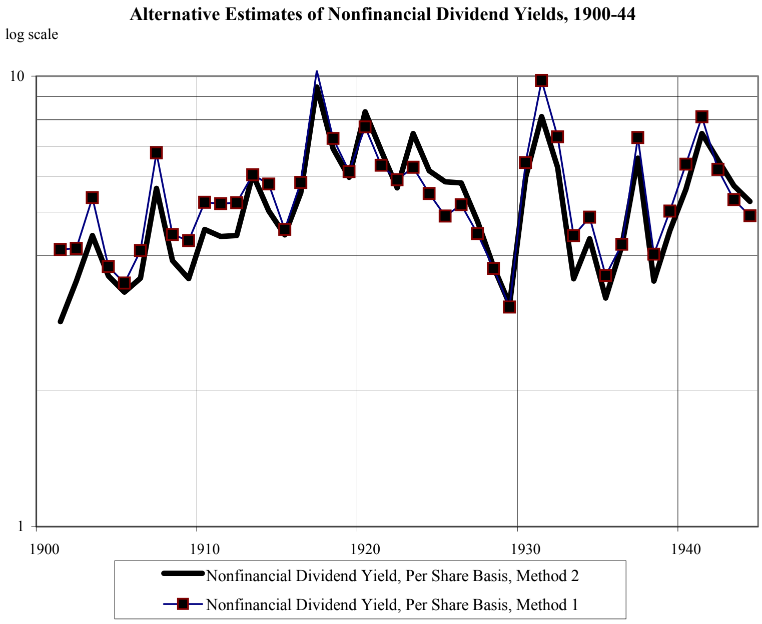

Figure A.1:

two estimates. Alternative estimates and related series from both methods are however provided in the dataset.

A.2.4. Corporate Earnings

For the period 1929-1944, the series used is the same as that used in the post-1945 period (see Section A.1.2).

Before 1929, the series is extrapolated backwards using data from Goldsmith (1955) and Kuznets (1941).

A.2.5. Tangible Assets

Tangible assets figures for the period 1900-1945 are derived by building up the components of total tangible assets from its constituent components. For the sample 1925-1944, figures for non-residential structures + equipment for the non-farm non-financial sector are available from the Bureau of Economic Analysis website. From 1900 to 1924, tangible assets estimates are constructed using data from Goldsmith (1955).

The largest single element, fixed capital, is derived from the Goldsmith figures can be constructed up until 1945, and a comparable figure can be directly compared with the BEA series over the overlapping sample (1925-45). In one respect the comparison is reassuring: the correlation between percentage changes is 0.97, and the ratio between the series also remains relatively stable. However, of more concern is a very marked difference in levels terms: the equivalent Goldsmith series averages only around 0.6 times the BEA series. While it is well-known that perpetual inventory techniques, as employed by the BEA, can produce quite significant differences from the census-style techniques employed by Goldsmith, the discrepancy is nonetheless striking, especially given the observation, noted above, in Section 2.5, that the mean value of q would appear to suggest either systematic overestimation of the capital stock, or systematic mis-pricing. It is perhaps worth noting that, assuming Goldsmith's techniques were to imply a similar ratio if applied over the entire century, the resulting average value for Tobin's q would be very close to unity.

A.2.6. Financial Asset and Liabilities

Financial assets and liabilities (mainly at book value) are also derived from Goldsmith (*op cit*) Table W-31. Although this only provides two overlapping observations with Flow of Funds data, both the totals and constituent elements in the total correspond very closely (unsurprisingly, since both are derived primarily from a common primary source, *Statistics of Income).* The same technique to adjust data to market value is carried out as in the later sample.

References

[1] Ackert, L and Smith, B (1993) "Stock price volatility, ordinary dividends, and other cash flows to shareholders", *Journal of Finance* 48 (4) 1147-1160

[2] Ang, A and Bekaert, G (2003), "Stock Return Predictability: Is it There?" Columbia University, *Mimeo*

[3] Allen, F and Michaely, R (2002), "Payout Policy", in Constantinides, G, Harris, M, and Stulz, R (eds) North-Holland *Handbook of Economics*

[4] Bagwell, L and Shoven, J (1989) "Cash Distributions to Shareholders", *Journal of Economic Perspectives*, 3 (3) pp 129-140

[5] Bureau of Economic Analysis (1977) *Historical Statistics of the United States, Colonial Times to 1970*

[6] Bernanke, B, Bohn, H and Reiss, P (1988) "Alternative Non-Nested Specification Tests of Time-Series Investment Models" *Journal of Econometrics* 37, 293-326

[7] Blanchard, O J, Rhee C and Summers L (1993), "The Stock Market, Profit and Investment" *Quarterly Journal of Economics*, February 1993

[8] W Brainard, J Shoven and L Weiss (1980), "The Financial Valuation of the Return to Capital", *Broookings Papers on Economic Activity* 2: 1980, pp 453-502

[9] Campbell, J, Lo, A and MacKinlay, A (1997) *The Econometrics of Financial Markets*, Princeton University Press, Princeton NJ

[10] Cowles, A C (1938) *Common-Stock Indices* Principia Press, Bloomington Indiana

[11] Fama, E and French, K (2001) "Disappearing Dividends: Changing firm characteristics or lower propensity to pay?", *Journal of Financial Economics*, 60, pp 3-43

[12] Federal Reserve(1943), *Banking and Monetary Statistics*, Board of Governors of the Federal Reserve System, Washington DC

[13] Federal Reserve (2003) *Flow of Funds for the United States* March 2003

[14] Goldsmith, R W (1955) *A Study of Saving in the United States*, Vol I, Princetion University Press, Princeton, New Jersey

[15] Gordon, R J (1990) "The measurement of durable goods prices" National Bureau of Economic Research Monograph series Chicago and London: University of Chicago Press.

[16] Goyal, A and Welch I (2002) "Predicting the Equity Premium with Dividend Ratios", NBER Working Paper 8788

[17] Grullon, Gustavo, and Michaely, Roni (2002), "Dividends, Share Repurchases and the Substitution Hypothesis", *Journal of Finance*, Vol 57, No 4, pp 1649-1684

[18] Hall, R (2001) "The Stock Market and Capital Accumulation," *American Economic Review* 91:1185-1202

[19] Holland, DM and Myers, SC (1984), "Trends in Corporate Profitability and Capital Costs in the United State", in Holland, D M (ed) *Measuring Profitability and Capital Costs*, Gower Publishing Co

[20] Kuznets, S (1941) *National Income and Its Composition, 1919-1938* Vol I, National Bureau of Economic Research, New York

[21] Laitner, J and Stolyarov, D (2003), "Technological Change and the Stock Market", *American Economic Review,* vol. 93, no. 4 1240-67

[22] Liang, J N and Sharpe, S A (1999) "Share Repurchases and Employee Stock Options and their Implications for S&P 500 Share Retirements and Expected Returns", Board of Governors of the Federal Reserve System Discussion Paper.

[23] Mehra, R (1998) "On the volatility of stock prices: an exercise in quantitative theory" *International Journal of Systems Science*, Vol 29, 11, pp 1203-1211

[24] Miller, M H (1963) "The Corporation Income Tax and Corporate Financial Policies" in Commision and Money and Credit *Stabilization Policies*, Prentice-Hall, Englewood Cliffs, NJ

[25] Miller, M H and Modigliani, F, (1961), "Dividend policy, growth, and the valuation of shares", *Journal of Business*, 34, pp 411-433.

[26] F A. Pearson and G F. Warren (1935), *Gold and Prices* (New York: John Wiley and Sons, 1935).

[27] Robertson, D and Wright, S (2003), "Dividends, Total Cash-flows to Shareholders and Predictive Return Regressions", www.econ.bbk.ac.uk/faculty/wright

[28] Robertson, D and Wright, S (2004), "Tobin's q and the Stock Market", www.econ.bbk.ac.uk/faculty/wright

[29] Romer, C (1999) "Changes in Business Cycles: Evidence and Explanations" *Journal of Economic Perspectives* v13, n2 (Spring 1999): pp 23-44

[30] Shoven, J (1986) "The Tax Consequences of Share Repurchases and Other Non-Dividend Cash Payments to Equity Owners", in Summers, L (ed) *Tax Policy and the Economy* Vol I Cambridge MA; NBER and MIT Press, pp 29-54

[31] Siegel, J (1994) *Stocks for the Long Run*, Burr Ridge, Illinois, Irwin Professional.

[32] Smithers, A (2004) "Valuing the UK Stock Market", Smithers & Co Report no. 205, January 2004

[33] Shiller, R (2000) *Irrational Exuberance*

[34] Wright, S (2004a) "Measures of Stock Market Value and Returns for the US Nonfinancial Corporate Sector, 1900-2002: Extended Version" www.econ.bbk.ac.uk/faculty/wright

[35] Wright, S (2004b) "Technological Change and the Stock Market: A Comment", www.econ.bbk.ac.uk/faculty/wright