The Supply of Stock Returns
Adding Back Buybacks

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Abstract
The shift in corporate payout policy from dividends to buybacks creates the need for a new supply model of stock returns. Our study provides theoretical and empirical evidence for a total payout (dividends plus buybacks) model of stock returns. First, we show that long-run stock returns between 1871 and 2014 can almost entirely be attributed to the supply of total payouts. Second, we provide evidence that total payouts per-share (adjusted for the share decrease from buybacks) grow in line with economic productivity, and that aggregate total payouts grow in line with GDP. Third, we demonstrate that the dividend discount model (DDM), based on current yields and historical growth rates, significantly underestimates forward-looking equity return compared to a total payout model that includes both dividends and buybacks. Fourth, we show that the cyclically-adjusted total yield (CATY) is at least as good of a predictor of changes in expected returns as the cyclically-adjusted price-to-earnings ratio (CAPE).
Introduction

Stock returns are intrinsically linked to the cash flows they supply to investors. Ibbotson and Chen (2003) decompose historical returns based on corporate fundamentals such as dividends, earnings, and book value, and find that the majority of historical returns can be attributed to the supply of these components. In recent decades, a new source of stock market supply emerged as firms increasingly used share buybacks instead of dividends to return cash to shareholders. Skinner (2008) finds that in the U.S. stock market buybacks are now the dominant source of payout, while Boudoukh, Michaely, Richardson, and Roberts (2007) provide evidence that the payout yield, which includes both dividends and buybacks, is more predictive of changes in expected returns than the dividend yield. Von Eije and Megginson (2008) document a significant rise in buybacks of firms in the European Union, suggesting that buybacks are an increasingly important global phenomenon.

While a growing literature discusses the importance of buybacks as a form of payout, the impact of buybacks on the supply of stock returns has been relatively ignored in practice as many practitioners continue to rely on traditional supply models with dividends as the sole source of corporate payout. In these traditional supply models, payouts via buybacks lead to structural increases in per-share growth rates (e.g., earnings-per-share), as the number of shares get decreased by buybacks, even as per-share growth exceeds the underlying corporate cash flow growth. This structural change in per-share growth not only complicates the attribution of fundamental supply components to payout and fundamental growth, but it also leads to potentially biased return forecasts when current and historical market data are combined. In this article, we develop models of stock returns based on total payouts (i.e., dividends and buybacks), which not only provide a more consistent framework to examine the historical sources of returns, independent of changes in payout policy, but also provide a more robust return forecasting model, which can be related to the growth in the real economy.

This study extends the literature on the supply of equity returns in several directions.
1. We update the Ibbotson and Chen (2003) return decompositions with data through 2014, and extend their sample to 1871, adding 69 years to the sample. Our results are broadly consistent with those of Ibbotson and Chen (2003) in that we show that fundamentals account for an even larger portion of returns than in the original study, as the impact of P/E growth diminished over the longer sample.
2. We develop a supply model of stock returns based on total payouts, and find that U.S. stock returns between 1871 and 2014 can almost entirely be attributed to the supply of both dividends and buybacks.
3. We relate the growth in total payout to the real economy, and show that total payouts per-share (adjusted for the share decrease from buybacks) grow in line with economic productivity and that aggregate total payouts grow in line with aggregate GDP, suggesting that total payouts participate in the growth of the real economy.
4. We show that the dividend discount model (DDM) significantly underestimates the forward equity return, when current market information (e.g., yields) is combined with historical data (e.g., historical
growth). The Dividend and Cash Buyback Model and Dividend Less Net Issuance Model derived in this study apply universally across time periods due to their independence from payout regimes.

5. We demonstrate that the cyclically-adjusted total yield (CATY) is at least as predictive of changes in expected returns as the cyclically-adjusted price-to-earnings ratio (CAPE).

Overall, the total payout model represents a viable alternative to traditional supply models of stock return such as the dividend discount model (DDM), providing a framework to derive macro-consistent forecasts of long-run stock returns, as well as producing superior forecasts of short-term expected returns.

Data

We obtain monthly price, earnings-per-share, dividend-per-share, and inflation data for the period from January 1871 through December 2014 from Shiller.1 Consistent with Ibbotson and Chen (2003), the risk-free rate is the income return of long-term U.S. government bonds. Starting in 1926, we use income return data from the Ibbotson® SSB® Classic Yearbook, and for 1871-1925 we infer returns from 10-year U.S. Treasury bond yields from Shiller. Specifically, we assume (at the beginning of each monthly holding period) a 10-year maturity, a bond price equal to par, and a coupon equal to one-twelfth of the beginning-of-period yield.

Following Ibbotson and Chen (2003), we obtain the starting book-to-market value for 1871 from Vuolteenaho (1999). The book-to-market at the end of 2014 for the S&P 500 Index is from Morningstar, Inc. GDP and population data from 1871 to 1947 is from the Maddison Project Database2 and from the U.S. Bureau of Economic Analysis from 1948 to 2014.

For 1925 to 2014, motivated by Boudoukh, Michaely, Richardson, and Roberts (2007), we calculate net issuance for the S&P Composite based on constituent data from the Center of Research in Security Prices (CRSP) as the stock-level monthly change in shares outstanding times the share price summed across firms every month, divided by the monthly market capitalization.3 Prior to 1925, we estimate net issuance for the S&P Composite based on aggregate market value and net issuance data assembled by Wright (2004). In particular, we backcast the market values between 1900 and 1924 based on the 1925 market value for the S&P Composite from CRSP and the relation between price return, market value, and net issuance.

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2 http://www.ggdc.net/maddison/maddison-project/data.htm
3 Specifically, the net issuance value for every firm i at time t is given by:
\[ \frac{prc(t)/cfacpr(t) \times (shrout(t) \times cfacshr(t) - shrout(t-1) \times cfacshr(t-1))}{shrout} \]
where shrout is the number of shares outstanding, cfacshr is the cumulative factor to adjust shares, cfacpr is the cumulative factor to adjust price, and prc is the month-end share price. We sum across firms in the S&P Composite every month to obtain the aggregate net issuance value.
Following Wright (2004), the share price ($P_t$) is related to the market value ($MV_t$) and net issuance ($NI_t$) such that:

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

Solving for $MV_{t-1}$ and dividing by $MV_t$ we get an expression for the inverse of the change in market value, which we use to backcast market values for the period between 1900 and 1924:

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

We then calculate aggregate net issuance for 1900 to 1924 based on the geometric difference between the change in market value and the change in the price index.4

We calculate the buyback yield for the S&P Composite Index between 1971 and 2014 based on data from Compustat.5 Consistent with Fama and French (2001), we estimate buybacks based on the increase in a firm’s treasury stock, excluding repurchased shares earmarked for compensation such as employee stock option programs or payment-in-kind such as acquisitions.6 Buybacks are assumed to be zero prior to 1971, and we linearly interpolate between annual buyback data points to obtain a monthly buyback time series.

4 Our net issuance estimate is specific to the S&P Composite Index, which has a fixed number of constituents, and is different from net issuance estimated for the aggregate market. While aggregate market net issuance includes net issuance due to firm entry (e.g., IPOs) and firm exit (e.g., cash buyouts, cash mergers), net issuance specific to an index with fixed constituents captures firm-level net issuance (e.g., secondary offerings and buybacks). A potential weakness of our measure of firm-level net issuance for the period from 1900 to 1924 is that our measure is affected by the reconstitution of the index. Specifically, differences in the market capitalization of firms entering versus exiting the index impact our measure of net issuance.

5 Specifically, we estimate buybacks for each year as the change in common treasury stock (Compustat item #226) from the annual Compustat file. For the period between 1971 to 1982 before treasury stock data became available or if a firm uses the “retirement” method (assumed if current and prior year treasury stock is zero), buybacks are calculated as total expenditure on the purchase of common and preferred stocks (Compustat item #119) minus the sale of common and preferred stock (Compustat item #108). If either amount (the change in treasury stock or the difference between #115 and #108) is negative, buybacks are set to zero. The buyback yield is the sum of buybacks across firms in a given year divided by the year-end market capitalization.

6 An alternative measure of buyback activity is solely based on data from the cash flow statement (i.e., Compustat item #115). Unlike the treasury stock method, the cash flow method encompasses all cash flows generated from firms’ buybacks, including repurchased shares earmarked for compensation or payment-in-kind. We estimate an average S&P Composite buyback yield for the period from 1983 to 2014 of 2.04% and 1.64% using the cash flow method and the treasury stock method, respectively.
Ibbotson & Chen (2003) Historical Return Decompositions Updated and Extended

In this section, we update the Ibbotson and Chen (2003) return decompositions for 1871 to 2014, extending the sample from the original study (1926-2000) by 69 years, thus providing a longer-term perspective of the drivers of U.S. equity returns spanning 144 years. Our results are broadly consistent with the findings of the original study.

The six return decomposition methods of geometric average returns $R$ used by Ibbotson and Chen (2003) are restated below:

Method 1 (Building Blocks):

$$R = CPI + R_f + ERP + Interaction$$

Where,

- $CPI$ is the U.S. Consumer Price Index,
- $R_f$ is the real risk-free rate,
- $ERP$ is the equity risk premium, and
- $Interaction$ captures the reinvestment return and geometric interaction among the components.

Method 2 (Capital Gain & Income):

$$R = CPI + Cg + Inc + Interaction$$

Where,

- $Cg$ is the real capital gain, and
- $Inc$ is the dividend income return.

Method 3 (Earnings):

$$R = CPI + g_{EPS} + g_{P/E} + Inc + Interaction$$

Where,

- $g_{EPS}$ is the real EPS growth,
- $g_{P/E}$ is growth in P/E.

Method 4 (Dividends):

$$R = CPI + g_{P/E} + g_{DP} - g_{PO} + Inc + Interaction$$

Where,

- $g_{DP}$ is the real dividend-per-share growth,
- $g_{PO}$ is growth in the dividend-payout ratio.

Method 5 (Book on Equity):

$$R = CPI + g_{P/E} + g_{BV} + g_{ROE} + Inc + Interaction$$

Where,

- $g_{BV}$ is the real book equity value of equity growth,
- $g_{ROE}$ is the growth of the return on the book value of equity.

Method 6 (GDP-per-Capita):

$$R = CPI + g_{GDP/POP} + g_{FS} + Inc + Interaction$$

Where,

- $g_{GDP/POP}$ is the real growth in GDP-per-capita,
- $g_{FS}$ is the increase in equity factor share in the overall economy.

7 The historical return decompositions are the same as in Ibbotson and Chen (2003). The names of the variables are generally consistent with the original study, except that we omit the "R" in our definition of real growth rates: i.e., we use $g_{EPS}$ instead of $g_{REPS}$ for real earnings growth. The geometric average returns are expressed as the sum of each return component. The Interaction terms capture the geometric interaction between the terms and the reinvestment return to ensure that the components sum to the geometric average return.
Despite considering a significantly longer time period in this study (144 years versus 75 years), our results are broadly consistent with the findings of Ibbotson and Chen (2003). For instance, the results presented in Figure 1 confirm the observation by Ibbotson and Chen (2003) that the long-run growth in corporate productivity measured by earnings-per-share is in line with the long-run growth of overall economic productivity measured by GDP-per-capita. In fact, earnings-per-share and GDP-per-capita measures both grew at an annualized 1.83% rate between 1871 and 2014 (Method 6), highlighting the relation between real economic and corporate profit growth over our sample. Additionally, the annualized increase in P/E of 0.41% accounts for a smaller fraction of the realized return in our sample than in the original study (Methods 3-5), suggesting the majority of realized returns in our sample can be attributed to corporate fundamentals such as dividends and growth in fundamentals (i.e., earnings, dividends, and book value) which are supplied by companies. Finally, the annualized increase in equity factor share ($g_{FS}$) of 0.41% is accounted for by an equivalent increase in P/E over our sample period.

Table A1 in the Appendix shows the differences between our sample and the Ibbotson/Chen study for each of the six return methods. Equity total returns between 1871 and 2014 were an annualized 9.05%, which is 1.65% lower than the annualized 10.70% return observed in the original 1926 to 2014 period. In the “Total Payouts and the Real Economy” section below we compare GDP-per-capita growth with growth in total payouts per-share (adjusted for the share decrease from buybacks). Excluding the share decrease from buybacks from the per-share growth is important to perform a consistent comparison between macroeconomic productivity growth and growth in corporate fundamentals.
2000 sample. The majority of the decrease in total return is attributable to a 1.02% lower inflation rate, while the balance is due to lower real returns. The Building Blocks approach (Method 1) suggests that the majority of the decrease in real equity returns can be attributed to a decrease of the equity risk premium by 1.16% and a simultaneous increase of the real risk-free rate by 0.61%. Based on the capital gains and income decomposition (Method 2), the decrease in real returns can be attributed to lower capital appreciation returns by 0.77%. Finally, Methods 3-5 break the capital gains component down further, and show that the decrease in capital gains is largely attributable to a 0.84% lower P/E growth (gP/E).

A potential weakness of the Ibbotson/Chen return decompositions (except for the Building Blocks method) is the fact that the return components are sensitive to firms’ payout method (i.e., dividends versus buybacks), leading to structural breaks in the underlying supply components as buybacks have become the dominant form of payout.9 For instance, while a payout via dividend in the Earnings Method is captured in the income return component (Inc), share buybacks increase earnings-per-share growth (gEPS), as the number of shares is diminished by the buybacks. As such, the advent of share buybacks as the dominant form of payout, leads to a structural decrease in Inc, and a structural increase in per-share growth. This structural break complicates the attribution of fundamental supply components to payout and true fundamental growth. It also makes it difficult to relate growth in the stock market to growth in the real economy.

Figure 2 Dividend and Buyback Yield, 1871-2014.

9 Traditional supply models such as the dividend discount model (DDM) are not inaccurate per se. For instance, Figure 1 shows that traditional supply models fully account for historical total returns. However, traditional supply models are often wrongly applied in practice, given investors’ tendency to combine current dividend yields with historical per-share growth rates when forecasting returns. Historical per-share growth rates, measured over a time frame that includes the period before buybacks were prevalent, underestimate forward-looking per-share growth by underestimating the impact of buybacks on ex-ante growth rates. In other words, by relying on historical per-share growth rates as proxy for future growth, investors underestimate the fact that in addition to benefiting from the underlying growth in firms’ cash flows, buybacks increase a buy-and-hold investor’s proportion in the company over time.
The drastic change in payout policy over the last few decades is highlighted in Figure 2, which plots dividend and buyback yields since 1871.10 The figure shows that the gradual substitution of buybacks for dividends started in the early 1980s, until ultimately buybacks exceed dividends over the more recent history. Buybacks surpassed dividends in 8 of the last 10 calendar years, supporting the claim that buybacks have become the primary way for U.S. companies to return cash to shareholders. Grullon and Michaely (2002) provide evidence that the structural change in the firms’ payout policy, among other factors, coincided with the adoption of rule 10b-18 by the Securities and Exchange Commission in 1982, which provided a safe harbor for firms to conduct share buybacks without a suspicion of share price manipulation.

Overall, the updated Ibbotson and Chen (2003) return decompositions presented in this section validate the original study’s claim that corporate fundamentals such as dividends and earnings are the main source of long-run equity returns. However, the change in corporate payout policy from dividends to buybacks creates the need for a new supply model of stock returns. Therefore, it is the aim of the remainder of this paper to develop models of the supply of stock returns that are independent of the payout method.

**Total Payout Models of Stock Returns**

We derive three supply models of stock returns based on total payouts (dividends and buybacks) that are distinguished by how they are affected by share buybacks and share issuance. The *Dividend and Cash Buyback Model* and *Dividend Less Net Issuance Model* derived in this section are independent of firms’ choice of payout method, providing a more consistent way to analyze historical returns. We relate each model to a hypothetical investor type who is differentiated by how he/she participates in share buybacks or share issuance.

The one-period total return $R_t$ of a stock over period $t-1$ to $t$ is given by:

$$R_t = \frac{D_t}{P_{t-1}} + \frac{P_t - P_{t-1}}{P_{t-1}} = \frac{D_t}{P_{t-1}} + \frac{P_t}{P_{t-1}} - 1$$

(1)

Where $D$ is the dividend-per-share and $P$ is the share price. The first right-hand term is the income return and the second term is the price return.

Total payouts refer to the payouts that investors receive from both dividends and buybacks. The advantage of measuring corporate performance based on payouts instead of accounting measures such as earnings is that payouts are not affected by changes in accounting standards or transitory factors such as special items, providing a better measure of structural drivers of the supply of stock return. We can write the price return in (1) as a function of the change in price-to-total payout ratio and the change in total payout-per-share ($TP$), where the latter is the sum of dividend-per-share and buybacks-per-share.

10 The buyback yield is assumed to be zero prior to 1971, consistent with Boudoukh, Michaely, Richardson, and Roberts (2007).
The buyback yield is defined as:

\[ 1 + \text{Buyback Yield}_t = 1 + \frac{P_t B_t}{P_t S_t} = \frac{B_t + S_t}{S_t} \]  \hspace{1cm} (4) 

where \( S \) is the number of shares outstanding, \( B \) is the number of shares repurchased, and \( P \) is the share price.

Conversely, the net issuance is defined as:

\[ 1 + \text{Net Issuance}_t = 1 + \frac{P_t (S_t - S_{t-1})}{P_t S_{t-1}} = \frac{S_t}{S_{t-1}} \]  \hspace{1cm} (5)

Notice that expression (5) is the change in share count. It implicitly consists of the shares issued less share buybacks. The two definitions (4) and (5), allow us to derive two different return models based on total payouts.
On the one hand, we can rewrite (2) as a function of (4) and get:

\[
R_t = \frac{D_t}{P_{t-1}} + \frac{B_t + S_t}{S_t} + \frac{TP_t}{TP_{t-1}} - 1
\]

\[
\text{(6.1) (6.2) (6.3) (6.4) (6.5)}
\]

We can simplify (6), and write geometric average returns as follows:

\[
\overline{R} = TY + gTPexB + gP/TP + CPI + Interaction
\]

(7)

Where the total yield \(TY\) is the dividend yield \(6.1\) plus the buyback yield \(6.2\), \(gTPexB\) is the real total payout-per-share growth adjusted for the share decrease from buybacks (geometric sum of \(6.3\) and \(6.4\) adjusted for inflation)\(^{11}\), \(gP/TP\) is the change in price-to-total payout \(6.5\), CPI is inflation, and Interaction captures the reinvestment return and geometric interaction among the components. Note that both \(TY\) and \(gTPexB\) are independent from the payout method as both dividends and buybacks are captured in the total yield term and the growth term is adjusted for the share decrease from buybacks. The buyback impact captured in this model is analogous to that of a hypothetical “Pro Rata Buyback Investor,” who tenders a proportional amount of his/her shares and gets cash in return for participating in the buyback. Whether a company performs a payout via dividends or buybacks, this investor gets cash in both cases. We refer to this model as the Dividend and Cash Buyback Model.

Conversely, we can rewrite (2) as a function of (5) and obtain:

\[
R_t = \frac{D_t}{P_{t-1}} + \frac{S_{t-1}}{S_t} + \frac{TP_t}{TP_{t-1}} - 1
\]

\[
\text{(8.1) (8.2) (8.3) (8.4) (8.5)}
\]

Expression (8) can be simplified to the following geometric average return components:

\[
\overline{R} = NTY + gTPagg + gP/TP + CPI + Interaction
\]

(9)

Where net total yield \(NTY\) is the dividend yield \(8.1\) plus the inverse of net issuance \(8.2\) (arithmetic, dividend yield less net issuance), \(gTPagg\) is the real aggregate total payout growth (geometric sum of \(8.3\) and \(8.4\) adjusted for inflation), \(gP/TP\) is the change in price-to-total payout \(8.5\), CPI is inflation, and Interaction captures the reinvestment return and geometric interaction among the components. \(NTY\) implicitly consists of dividends and buybacks less shares issued. Equation (9)

\(^{11}\) While the \(gTPexB\) term excludes the effect of buybacks on the share count, it includes the impact of buybacks on aggregate total payout growth. In particular, since the total payout-per-share growth \(6.3\) in equation 6 can be broken into aggregate total payout growth and the inverse of net issuance, by multiplying total payout-per-share growth \(6.3\) by the inverse of the buyback yield \(6.4\) to get to \(gTPexB\), we are implicitly making an adjustment for the effect of buybacks on the change in share count.
is similar to the stock return forecasting model proposed by Grinold, Kroner, and Siegel (2011). The return impact captured in this model can be related to that of a hypothetical “Cap-Weighted Index Investor,” who participates proportionally in both the buyback and issuance of shares. Similar to the previous case, independent of whether a company performs the payout via dividends or buybacks, the hypothetical investor gets cash. Additionally, this investor adds new capital to an issuing company, and therefore benefits in the aggregate growth of the company. We therefore refer to this model as the Dividend Less Net Issuance Model.

The Dividend-Per-Share Model (3), Dividend and Cash Buyback Model (7), and Dividend Less Net Issuance Model (9) together provide the basis for the analysis of the historical supply sources of returns and stock return forecasts discussed in the subsequent sections. While in the Dividend-Per-Share Model buybacks increase the growth term consistent with the traditional supply models discussed in the previous section, in the Dividend and Cash Buyback Model and Dividend Less Net Issuance Model buybacks impact the payout term and are thus independent of the payout method. The key difference between the Dividend and Cash Buyback Model and Dividend Less Net Issuance Model, is the treatment of issuance. While in the Dividend and Cash Buyback Model issuance is captured in the growth term \(g_{TPexB}\), all changes in share count (buybacks and issuance) are captured in the net total yield term \(NTY\) in the Dividend Less Net Issuance Model. In the Dividend and Cash Buyback Model, buybacks are accounted for in the payout term \(TY\).

Historical Return Decompositions

In this section we examine the return decompositions of the three supply models based on total payouts. Both Dividend and Cash Buyback Model and Dividend Less Net Issuance Model models allow for an examination of the return drivers independent of the payout method, providing a consistent framework to study the historical supply components of stock returns over time. The results for the historical return decompositions for 1871-2014 and 1901-2014 are shown in Table 1.12

The central insight from Table 1 that applies to all three models is that the supply of total payouts almost entirely explains realized returns over the 1871-2014 and 1901-2014 periods. The change in the price-to-total payout, which is the return component unrelated to the supply of total payouts common to all three models, accounts for only 0.20% for the period from 1871 to 2014, suggesting that over 97% of realized returns are related to the supply of total payouts. The total payout model thus provides a better description of long-term historical return than the earnings model in Figure 1, where the annualized growth in P/E \(g_{P/E}\) was 0.41%. Overall, this suggests the realized level of returns is almost entirely attributable to the supply of total payouts.

The results in Table 1 specific for the Dividend-Per-Share Model and Dividend and Cash Buyback Model in Table 1 show that the payout terms (i.e., dividend yield and total yield) account for the majority of historical returns. Total yields, which includes both dividends and buybacks, accounts for

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12 Our market value series starts in 1900, which makes 1901 the earliest period we can calculate a return decomposition based on the Dividend less Net Issuance Model.
over two-thirds of the real return for the period between 1871 and 2014. Despite the fact that share buybacks only became prevalent over the last three decades of the sample, explicitly accounting for buybacks as a “payout” increases the return attributed to payouts from 4.50% (dividend yield) to 4.89% (total yield). Notably, in the period from 1980 to 2014, including share buybacks along with dividends in the payout terms, dramatically raises the payout yield from 2.73% (dividend yield) to 4.26% (total yield), highlighting the important role buybacks play as way of returning cash to shareholders in recent decades. In contrast to the Dividend-Per-Share Model and Dividend and Cash Buyback Model, the net total yield payout term (NTY) in the Dividend Less Net Issuance Model is net of share issuance, thus lowering the payout term. Over the period from 1901 to 2014, the return attributable to NTY is 3.03%. NTY can be further decomposed into a dividend yield of 4.29%, buyback yield of 0.47% and, and a negative contribution from issuance of 1.70%.

Table 1 Historical Return Decompositions

<table>
<thead>
<tr>
<th>Model</th>
<th>1871-2014</th>
<th>1901-2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dividend-Per-Share Model (Buy and Hold Investor)</td>
<td></td>
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</tr>
<tr>
<td>Dividend Yield %</td>
<td>DY</td>
<td>4.50</td>
</tr>
<tr>
<td>TP Growth %</td>
<td>gTP</td>
<td>2.05</td>
</tr>
<tr>
<td>Change in Price-to-TP %</td>
<td>gP/TP</td>
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<tr>
<td>Inflation %</td>
<td>CPI</td>
<td>2.06</td>
</tr>
<tr>
<td>Interaction</td>
<td></td>
<td>0.25</td>
</tr>
</tbody>
</table>

| Dividend and Cash Buyback Model (Pro Rata Buyback Investor) | | |
| Total Yield % | TY | 4.89 | 4.78 |
| TP Growth % (Buyback Share Decrease Adjusted) | gTP | 1.67 | 1.54 |
| Change in Price-to-TP % | gP/TP | 0.20 | –0.01 |
| Inflation % | CPI | 2.06 | 3.06 |
| Interaction | | 0.24 | 0.27 |

| Dividend Less Net Issuance Model (Cap-Weighted Index Investor) | | |
| Net Total Yield % | NTY | — | 3.03 |
| Aggregate TP Growth % | gTPAgg | — | 3.27 |
| Change in Price-to-TP % | gP/TP | — | –0.01 |
| Inflation % | CPI | — | 3.06 |
| Interaction | | — | 0.29 |

| Total Return | 9.05 | 9.64 |

Note: DY is the dividend yield, TY is the dividend yield plus the buyback yield, NTY is the dividend yield plus the inverse of net issuance, gTP is the real total payout-per-share growth, gTPAgg is the real total payout-per-share growth adjusted for the share decrease from buybacks, gP/TP is the real aggregate total payout growth, CPI is inflation, and gP/TP is the change in price-to-total payout.
Figure 3 Total Yield, 1871-2014

Figure 3 shows the total yield of U.S. stocks from 1871 to 2014. The total yield series, which includes both dividends and buybacks, appears to be fairly consistent over time, generally reverting around its long-term mean. Boudoukh, Michaely, Richardson, and Roberts (2007) examine the time-series properties of dividend and total yield, and find that total yields follow a stationary time-series process, while dividend yields experienced a structural break in the early 1980s. We examine the stationarity of our monthly total yield and dividend yield series from 1871 to 2014, and confirm that total yield is more stationary than the dividend yield. Over the more recent period from 1926 to 2014, we cannot reject the hypothesis that the dividend yield is nonstationary, suggesting that the dividend yield series underwent a structural change in recent history due to the changes in firms’ payout policies. The fact that total yields follow a more stationary time-series process than dividend yields, in turn, suggests that total payouts are a more stable measure of the supply of corporate payouts.

The growth term is another key differentiator among the three models. In general, the per-share impact due to buybacks and issuance on the growth term is the opposite to that of the payout term, as the three models mechanically add up to the same total return, \( g_{TPexB} \), which excludes the impact of buybacks on the share decrease but includes issuance; this growth term \( g_{TPexB} \) amounted to 1.67% from 1871 to 2014. Aggregate growth \( g_{TPAgg} \) excludes buybacks and issuance, contributing 3.27% to return from 1901 to 2014. By contrast, total payout-per-share growth \( g_{TP} \), which

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13 Following Boudoukh, Michaely, Richardson, and Roberts (2007), we run a Dickey-Fuller (1979) test for nonstationarity for our monthly total yield series between 1871 and 2014 (assuming an AR(1) model with a constant), and get a highly significant Dickey-Fuller statistic of \(-3.80\) at the 1% significance level, indicating stationarity since the yield series is converging toward its long-term mean. Conversely, the Dickey-Fuller statistic for the monthly dividend yield series between 1871 and 2014 is lower at \(-2.90\), but still significant at a 5% level. However, if we choose the more recent start date of 1926 of our sample as in Michaely, Richardson, and Roberts (2007), we get a Dickey-Fuller statistics of \(-3.28\) and \(-2.50\) for total yield and dividend yield, respectively. While the former is significant at the 5% level, the latter is insignificant at the 10% level.
amounted to 2.05% from 1871 to 2014, is net of issuance, but includes the impact of buybacks on the decrease in share count. Since $g_{TP}$ is inclusive of buybacks, the structural shift from dividend to buybacks which started in the 1980s also led to a structural change in total payout-per-share growth. Therefore, $g_{TPexB}$ and $g_{TPAgg}$ allow for a more consistent analysis of historical growth trends over time, which is a key contribution of the Dividend and Cash Buyback Model and the Dividend Less Net Issuance Model introduced in this study.

Figure 4 shows the impact of adjusting the per-share growth rate by the share decrease from buybacks. Previous studies measure historical growth rates based on per-share statistics (e.g., earnings-per-share) without adjusting for the impact of buybacks on share count (e.g., see Figure 1). Figure 4 plots the real total payout-per-share growth ($g_{TP}$) and the real total payout-per-share growth adjusted for the share decrease from buybacks ($g_{TPexB}$). While annualized growth of the former was 4.70%, the buyback-share-decrease-adjusted growth rate was only 3.16%. The difference is attributable to the buyback yield over the period, suggesting that a significant portion (32% between 1980 and 2014) of growth measured by per-share statistics is due to buybacks, not growth of the underlying cash flows of the businesses. This example suggests that the buyback share decrease adjustment of per-share growth rates has important implications for the measurement of fundamental corporate cash flow growth.

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Figure 4: Growth of $1—Impact of Buyback Share Decrease Adjustment on Per-Share Growth, 1980-2014

- $g_{TP}$: Growth of TP Per-Share = 4.70%
- $g_{TPexB}$: Growth of TP Per-Share (Buyback Share Decrease Adjusted) = 3.16%

Note: $g_{TPexB}$ is the real total payout per-share (adjusted for the share decrease from buybacks) growth, and $g_{TP}$ is the real total payout-per-share growth.

Return decompositions in Table 1 highlight the long-term drivers of stock return, but long-run averages mask the variations in the return components over shorter periods. To examine how the various return components vary over shorter-term market cycles, Figure 5 shows the return...
decomposition based on the Dividend and Cash Buyback Model for rolling 10-year real returns. Total yield ($TY$) is the most stable component of real returns, generally fluctuating between approximately 4% to 6%. In turn, the growth term ($g_{TPexB}$) is significantly more volatile than total yields, with the 10-year growth rate ranging from 8.96% to –6.56% over the sample period. The volatility in growth rates can be attributed to the fact that corporate payouts are sensitive to the business cycle, with firms paying out more of their earnings during good economic times when profits are high and cutting back payouts during recessions. Note that although $g_{TPexB}$ excludes the effects of buybacks on the share count, buybacks are still a component of aggregate total payout growth. For instance, Skinner (2008) finds that buybacks are more sensitive than dividends to variations in a firm’s earnings, as buybacks offer greater flexibility to make short-term adjustments than dividends, suggesting that buybacks are a key driver of the short-term volatility in the growth term in recent history. Finally, growth in price-to-total payout ratio ($g_{P/TP}$) varies most significantly in the short-run. Although the contribution of $g_{P/TP}$ to long-run returns in Table 1 is only 0.20%, $g_{P/TP}$ varies materially in the short-term. Classical financial theory assumes a constant equity premium, but a growing body of research suggests that expected returns vary over time in ways that are predictable (e.g., see Cochrane, 2011). Time-varying expected returns are a potential explanation for the observed variation in changes in valuations in the short-term.

A variance decomposition of 10-year real log return in Table 2 confirms that the change in valuation $g_{P/TP}$ is the most variable return component in the short-run. In particular, changes in valuation explain more than half of the variance in real return, while changes in real growth rates explain almost a third of the variability. Conversely, only 3.8% of the variance is explained by changes in total yield. Therefore, while total yield and the growth of total payouts explain the majority of the return level in Table 1, the analysis of 10-year returns suggests that changes in valuation account for a significant portion of the variance of returns in the short-run.

Overall, the historical return decompositions based on the total payout models examined in this section show that long-term historical stock returns can almost fully be attributed to the supply of total payouts, and that total payouts have been more stable than dividends over time.
Figure 5 Rolling 10-Year Real Return Decomposition, 1871-2014

Note: Total yield is the dividend yield plus the buyback yield, \( g_{TPexB} \) is the real total payout-per-share growth adjusted for the share decrease from buybacks, and \( g_{P/TP} \) is the change in price-to-total payout. The geometric sum of the three components equals the real total return over the period.

Table 2 Variance Decomposition Rolling 10-Year Real Log Returns, 1871-2014

<table>
<thead>
<tr>
<th>Dividend and Cash Buyback Model</th>
<th>Contribution to Variance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Yield ( TY )</td>
<td>3.80</td>
</tr>
<tr>
<td>TP Growth (Buyback Share Decrease Adjusted) ( g_{TPexB} )</td>
<td>32.55</td>
</tr>
<tr>
<td>Change in Price-to-TP ( g_{P/TP} )</td>
<td>56.09</td>
</tr>
<tr>
<td>Interaction</td>
<td>7.56</td>
</tr>
</tbody>
</table>

Note: \( TY \) is the dividend yield plus the buyback yield, \( g_{TPexB} \) is the real total payout-per-share growth adjusted for the share decrease from buybacks, and \( g_{P/TP} \) is the change in price-to-total payout.

Total Payouts and the Real Economy
Following prior research on the supply of stock returns, we now examine the relation of growth in total payouts and the growth in the real economy. Unlike previous studies, however, the growth rates in our model are adjusted for changes in payout policy, allowing for an apples-to-apples comparison of growth trends over time. Diermeier, Ibbotson and Siegel (1984) relate the return of aggregate financial assets to the performance of the real economy and stress the importance for capital market forecasts to be “macroconsistent”: long-run growth expectations for financial assets need to be anchored in reasonable growth expectations for the economy overall. After all, financial assets cannot outperform the economy indefinitely since the asset would ultimately become the economy itself! Applying the supply model to stocks, Ibbotson and Chen (2003) show that growth in earnings-per-share for U.S. stocks is in line with U.S. GDP-per-capita growth.
To think about growth in the real economy and stock market payouts in a consistent manner, we start with a simple model for the aggregate economy and then derive growth rates that are consistent with our definition of growth in our equity forecasting model. In other words, we derive macroeconomic equivalents of the growth terms in our equity forecasting model.

We assume that aggregate output (Y) of the economy follows a standard Cobb-Douglas production function:

\[ Y = AK^{1-\beta}L^\beta \]  

(10)

A is the total factor productivity—the amount not explained by labor and capital and often attributed to improvements in technology, K is the capital stock, and L is the labor hours worked. \( \beta \) is the output elasticity, which is assumed to be \(<1\) and constant over time. Taking logs (denoted in small letters) and the first difference (i.e., difference between \( t+1 \) and \( t \)) in (10), we get an expression for the drivers of aggregate output growth (i.e., GDP):

\[ \Delta y = \Delta a + (\beta - 1)\Delta k + \beta \Delta l \]  

(11)

Equation (11) suggests that GDP growth (\( \Delta y \)) is a function of the change in total factor productivity (\( \Delta a \)), the change in capital stock (\( \Delta k \)) and the change in labor hours worked (\( \Delta l \)) with \( \beta \) determining the sensitivity of aggregate growth to changes in the factor inputs (i.e., changes in labor and capital input).

Relating the macroeconomic output in equation (11) to the stock payouts, a stock represents a claim on the residual product of the economic process that is available to owners of capital after all other claims have been satisfied. In theory, the owner of capital chooses factor inputs (e.g., labor and capital) to maximize his/her share in the economic process (i.e., expected profits), which are ultimately returned to the owner of capital via dividends and buybacks. Therefore, since the choice of the factor inputs (i.e., \( L \) and \( K \)) is driven by a firm’s expected payouts and the firm also benefits from improvements in productivity (\( \Delta a \)), it is reasonable to expect that aggregate total payouts (\( gTPAgg \)) grow in line with the overall economic process (\( \Delta y \)), barring changes in factor share.

A portion of the overall economic output (\( \Delta y \)) is financed with new capital, represented by the change in the capital stock (\( \Delta k \)) in equation (10). For example, the owner of the firm may issue more stock to buy a new machine. In this way, the growth available to owners of capital is the growth per unit of capital invested. To obtain income per unit of capital, we need to divide equation (9) above by \( K \):

\[ \frac{Y}{K} = \frac{AK^{1-\beta}L^\beta}{K} = A\left(\frac{L}{K}\right)^\beta \]  

(12)

\[ \Delta y - \Delta k = \Delta a + \beta (\Delta l - \Delta k) \]  

(11)
As in equation (11), taking logs and first differences we obtain growth rates:

$$\Delta y - \Delta k = \Delta a + \beta(\Delta l - \Delta k)$$  (13)

Equation (13) shows that the growth in income per unit of invested capital is the growth in overall output ($\Delta y$) minus new capital investment ($\Delta k$), which equals the growth in productivity ($\Delta a$) plus the relative growth of labor versus capital. If the labor-to-capital ratio is constant (i.e. $\Delta k=\Delta l$), the last term in (13) goes to zero, and GDP-per-unit of capital reduces to the growth in total factor productivity ($\Delta a$).

From the perspective of a stock market index such as the S&P Composite examined here, new capital investments take the form of new share issuance. Since the number of constituents in the S&P Composite is fixed (i.e., for every stock added to the index, another stock leaves the index), firm-level issuance such as secondary offerings by existing companies are the key drivers of new issuance in our dataset. For stock market indexes that cover the overall universe of stocks such as the Wilshire 5000, IPOs are an additional source of new issuance. New issuance increases the number of shares outstanding, which for a given level of earnings leads to lower earnings-per-share. Thus per-share growth such as the growth of earnings-per-share (adjusted for the share decrease from buybacks) is the natural stock market equivalent of the growth in income per invested capital in equation (12). Buybacks, on the other hand, constitute a “payout” similar to a dividend with the money that investors receive from tendering the shares to the repurchasing company flowing back into the economy and thus need to be excluded from our stock-market measure of “invested” capital. Previous studies on the supply of equity returns did not make an adjustment for the share decrease from buybacks in their growth terms.

Having identified the macroeconomic equivalents of the growth rates in our total payout models from a theoretical perspective, we now examine the relation between economic growth and total payout growth of stocks empirically. Specifically, we compare aggregate real total payout growth ($g_{TP_{agg}}$) to GDP growth, and real total payout-per-share (adjusted for the share decrease from buybacks) growth ($g_{P_{perShare}}$) to GDP-per-capita growth. We choose GDP-per-capita as a proxy for productivity growth because it has history since 1872.

Figure 6 shows that for 1901 to 2014, as predicted, aggregate total payouts and GDP grew at roughly similar annualized rates of 3.27% and 3.36%, respectively. Similarly, Figure 7 demonstrates that the total payout-per-share (adjusted for the share decrease from buybacks) annualized growth of 1.67% was approximately in line with GDP-per-capita growth of 1.83% for 1872 to 2014. We also test statistically whether the annual growth rates of total payouts are significantly different from

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14 Despite its name, the Wilshire 5000 is not limited to 5000 constituents and attempts to represent the entire U.S. stock market.
15 The comparison is based on annual data because the GDP and GDP-per-capita series have annual frequency.
16 Our market capitalization data starts in 1900, which means 1901 is the earliest we can compare aggregate total payout growth to GDP growth.
their macroeconomic equivalent. Both statistical tests are insignificant with a t-statistic for GDP vs. aggregate total payout growth of 0.75, and GDP-per-capita versus total payout-per-share (adjusted for the share decrease from buybacks) growth of 0.61, suggesting that the hypothesis that the two growth rates are the same cannot be rejected. Arnott and Bernstein (2002) assume that the growth of dividends is structurally slower than GDP-per-capita growth. We do not find significant evidence that total payout (adjusted for the share decrease from buybacks) growth is structurally lower than productivity growth. Overall, Figures 6 and 7 provide empirical evidence that the long-run growth in total payouts can be approximated by the growth in the real economy.¹⁷

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Figure 6  Growth of $1—Aggregate Total Payout vs. GDP Growth, 1901-2014

<table>
<thead>
<tr>
<th>Year</th>
<th>Real GDP</th>
<th>gTPAgg</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1910</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1920</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1940</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1950</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: gTPAgg is the real aggregate total payout growth.

¹⁷ The difference between aggregate growth (gTPAgg) and per-share growth (gTPexB) is commonly referred to as “dilution,” as existing shareholders’ share in a firm is reduced by the issuance of new shares (e.g., see Bernstein and Arnott, 2003). The macroeconomic equivalents examined in this section provide some intuition as to what creates the wedge between the aggregate and per-share measures of growth. While aggregate growth measures the growth independent of factor inputs, productivity growth is growth per unit of input. Viewed from this perspective, the term “dilution” is a misnomer because, while existing shareholders’ share in a firm is reduced, they benefit from the payoffs that the issued capital generates. In other words, the fact that firms raise new capital should not make existing shareholders worse off, even though the shareholder’s portion in the firm declines: i.e. shareholders get an asset in return for new issued capital. This is not to say that firms’ capital allocation decisions are always optimal, but new capital is not “dilutive” per se.
While the long-run trend growth rates examined in Figures 6 and 7 are closely related, there are significant differences in the short run. On one hand, these differences can be attributed to compositional differences between the stock market and real economic measures, with the stock market tracking only listed companies and real economic measures tracking the entire economy. On the other hand, there are obvious differences because total payouts measure only the residual part of the economics process that accrues to owners of capital after all other claims have been paid, while the GDP measures the economic value added of the economy overall. We refer to this driver as changes in factor share. Greenwald, Lettau and Ludvigson (2014) identified changes in factor share of workers versus shareholders as one of the three key stylized factors explaining stock price movements over time. Total factor productivity and changes in risk aversion are the other two.

In this section, we’ve provided both theoretical and empirical evidence of the relation between corporate total payout growth and the growth in the real economy. In particular, we identified macroeconomic growth measures that correspond to the two total payout growth measures. We further showed that long-run total payout growth rates are statistically indistinguishable from the macroeconomic growth rate.

**Forecasting Equity Returns**

Our total payout model can be used to generate forecasts of equity returns, and in this section we will evaluate its ability to do so. Given that expected returns are time-varying, we can distinguish between long-term (i.e., unconditional) and short-term (i.e., conditional) expected returns. We first
discuss the long-term expected return, before turning to the model’s ability to predict changes in expected returns (i.e., predicting short-term expected returns).

The long-run expected return of any of the supply models discussed in this paper can be expressed in terms of two basic components: payout yield and growth. Previous studies such as Ibbotson and Chen (2003) used dividends as the only measure of payout. Our study along with Grinold, Kroner, and Siegel (2011) expand the definition of payouts to stock buybacks. Consistent with Ibbotson and Chen (2003) and Arnott and Bernstein (2002), we exclude the change-in-valuation term from long-term expected returns. Long-run expected real returns are given by:

Expected Real Return = Payout Yield + Real Growth + Interaction

To isolate the impact of using total yield as opposed to dividends as the basis of our long-term forecast, we apply the formula to both dividends and total payouts. In the dividend case, payout is the average dividend income return (\(Inc\)) for 1871 to 2014, and the growth term is the growth in real dividends per-share (\(g_{Div}\)). Conversely, for the total payout case, the payout is the historical total yield over the sample period, while the growth term is total payout-per-share (adjusted for the share decrease from buybacks) growth (\(g_{TPexB}\)). Following Ibbotson and Chen (2003), we also include the Interaction term.

Table 3 Long-Run Expected Returns

<table>
<thead>
<tr>
<th>Historical (1871-2014)</th>
<th>Current Yield &amp; Historical Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dividend</td>
</tr>
<tr>
<td>Payout Yield %</td>
<td>4.50</td>
</tr>
<tr>
<td>Growth %</td>
<td>1.46</td>
</tr>
<tr>
<td>Interaction %</td>
<td>0.26</td>
</tr>
<tr>
<td>Expected Real Return</td>
<td>6.21</td>
</tr>
<tr>
<td>Diff. Dividend vs Total Payout Model</td>
<td>-0.58</td>
</tr>
</tbody>
</table>

Note: The current total yield is based on the 10-year average real total payout per-share divided by the current market price as of December 2014.

Table 3 compares the real return forecasts of the dividend and total payout model based on historical values. The expected real return based on the historical dividend and total payout model is 6.21% and 6.79%, respectively. The difference can be attributed to the fact that the dividend model does not account for buybacks in the payout yield term, and the dividend-per-share growth was lower than total payout-per-share (adjusted for the share decrease from buybacks) growth, as buybacks were substituted for dividends in recent decades. Therefore, based on historical payout yields and growth rate, the dividend model leads to an expected real return that is 0.58% lower than that of the total payout model.
Next, we estimate an expected return based on current yields and the historical growth rate. Since current yields are sensitive to current market valuations, we technically need to include an additional term to account for the potential future change in valuations (e.g., \( \frac{gP}{TP} \) in equation 6 above). For the purpose of this analysis though, we assume no change in valuation to focus on the impact of the different definitions of payout on the forward-looking equity return.

As of December 2014, the dividend yield is 1.92% and cyclically-adjusted total yield is 3.21% (Note that this is the same measure as CATY discussed below). Total payouts tend to be more cyclical than dividends due to the greater volatility of buybacks, so we estimate the total yield based on the average of the prior 10-year real total payouts. The current (i.e., not cyclically-adjusted) total yield is 4.41% as of year-end 2014. We use the same growth and interaction terms as in the historical scenario.

The combination of current yields with the historical growth rates, leads to significantly different estimates of forward equity returns between the two models. The expected real return based on the dividend model is 3.63%, while the expected real return based on total payout model is 5.11%. Not surprisingly, the bulk of the 1.48% difference can be attributed to the fact that the dividend yield is 1.29% lower than the total yield. The difference in historical growth rates of 0.21% is small by comparison.

Overall, the dividend model leads to a lower estimate of expected equity returns for both the historical scenario as well as when current yields are combined with historical growth rates. Not only does the dividend model exclude buybacks from the payout yield, it also underestimates historical growth due to the substitution of buybacks for dividends. The total payout model, in contrast, provides a more complete forecast of equity returns because each supply component is independent from changes in the payout method, providing a more precise forecast even if current yields are combined with historical growth rates.

Having discussed long-term expected returns, we now examine the total payout model’s ability to forecast shorter-term changes in expected return. In particular, we compare the short-term predictability of total payout yields to other valuation measures such as the dividend yield or the price-to-earnings ratio. The variance decomposition of 10-year log returns in Table 2 highlights that the majority of the variability in shorter-term returns is attributable to changes in valuation. Total payout yields (i.e., \( TY \) and \( NTY \)) capture the variability in the payout term and the change in valuation term since the latter is just the inverse of the total payout yield \( \frac{P}{TP} = \frac{1}{TY} \). To evaluate the extent our variables predict changes in future returns, we run predictive regressions of current market measures, such as yields, on non-overlapping one-year-ahead real equity total returns as measured by the S&P Composite Index. The results of the predictive regression are shown in Table 4.
Table 4  Predictive Regressions of One-Year Forward Returns

<table>
<thead>
<tr>
<th></th>
<th>Simple Variables</th>
<th>Cyclically-Adjusted Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P/E</td>
<td>Div. Yield (DY)</td>
</tr>
<tr>
<td>Since 1871</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>11.34</td>
<td>1.34</td>
</tr>
<tr>
<td>Tstat</td>
<td>2.98</td>
<td>0.32</td>
</tr>
<tr>
<td>Coeff.</td>
<td>–0.19</td>
<td>1.60</td>
</tr>
<tr>
<td>Tstat</td>
<td>–0.83</td>
<td>1.80</td>
</tr>
<tr>
<td>R² %</td>
<td>0.49</td>
<td>2.24</td>
</tr>
<tr>
<td>Since 1881</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>10.80</td>
<td>0.64</td>
</tr>
<tr>
<td>Tstat</td>
<td>2.69</td>
<td>0.14</td>
</tr>
<tr>
<td>Coeff.</td>
<td>–0.17</td>
<td>1.75</td>
</tr>
<tr>
<td>Tstat</td>
<td>–0.71</td>
<td>1.82</td>
</tr>
<tr>
<td>R² %</td>
<td>0.38</td>
<td>2.46</td>
</tr>
<tr>
<td>Since 1901</td>
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<td></td>
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<tr>
<td>Intercept</td>
<td>10.68</td>
<td>0.85</td>
</tr>
<tr>
<td>Tstat</td>
<td>2.48</td>
<td>0.18</td>
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<tr>
<td>Coeff.</td>
<td>–0.16</td>
<td>1.72</td>
</tr>
<tr>
<td>Tstat</td>
<td>–0.64</td>
<td>1.66</td>
</tr>
<tr>
<td>R² %</td>
<td>0.37</td>
<td>2.43</td>
</tr>
</tbody>
</table>

Note: Our data sample starts in 1871. 1881 is the first year we can calculate the cyclically-adjusted (10-year average) valuation measures, CAPE and CATY. 1901 is the earliest we have data to estimate NTY.

The first column set in Table 4 shows the regression results for simple valuation ratios such as price-to-earnings ratio (P/E), dividend yield, total yield and net total yield. The last two terms are identical to the total yield and net payout terms in equations (6) and (8) above, respectively. The regression results show that the total yield and the net total yield are more predictive than the simple P/E and dividend yield over every sample period tested. For instance, over the period since 1871, the total yield has an R-squared of 3.27% compared to an R-squared of only 2.24% and 0.49% for the dividend yield and P/E, respectively. Additionally, the regression coefficient of the total yield variable is statistically significant with a t-statistic of 2.18, while the coefficient on the dividend yield is only marginally significant. For the sample period from 1901 to 2014, when net payout data is first available, the net total yield has the highest R-squared and a highly significant coefficient with a t-stat of 2.44, while both the P/E and dividend yield have insignificant coefficients at the 5% level. Our results showing the superior predictive power of total yield and net total yield are broadly consistent with those of Boudoukh, Michaely, Richardson, and Roberts (2007), who perform similar predictive tests of payout yields.

In the second column set in Table 4 we examine the return predictability of cyclically-adjusted valuation measures. Following Campbell and Shiller (1998), we take a 10-year average of the real total payout-per-share to construct cyclically-adjusted yield measures. We refer to the cyclically-
adjusted total yield as CATY. CAPE is the Shiller P/E from the Shiller dataset. It makes sense to cyclically-adjust the total payouts because buybacks, which are part of total payouts, tend to be more volatile than dividends.

The predictive regressions based on the cyclically-adjusted measures in Table 4 show that CATY is marginally more predictive than the CAPE. Over both the sample periods starting 1881 and 1901, CATY has a higher R-squared and a more significant coefficient than CAPE. As such, our analysis suggests that CATY is a highly predictive alternative to traditional valuation measures such as CAPE. In contrast to CAPE, CATY does not rely on accounting profits as its proxy of firms’ fundamental value, but uses distributable cash flows (i.e., dividends and buybacks) instead.18

Overall, this section provides evidence that the total payout models not only provide a more complete forecast of long-run returns when current yields are combined with historical growth rates, but they are also superior predictors of changes in expected returns.

Conclusions
The advent of buybacks as the dominant source of corporate payout creates the need for a new supply model of stock returns. The study makes several important contributions to the literature on the supply of equity returns.

1. We apply the Ibbotson and Chen (2003) return decompositions to the 1871-2014 sample of equity returns, and we find results that are in line with those of the original study. In particular, we show that supply components account for an even larger portion of realized returns due to the smaller contribution of P/E growth over the longer sample period.

2. We develop a Dividend and Cash Buyback Model and Dividend Less Net Issuance Model of the supply of stock returns which are independent of the change in payout policy, and find that historical equity returns can almost entirely (97%) be attributed to the supply of total payouts.

3. We compare the growth of aggregate total payouts and total payout per-share (adjusted for the share decrease from buybacks) to their macroeconomic equivalents, GDP and productivity growth, and find that total payouts grow in line with the real economy. Thus the total payout models provide a framework to derive long-run expected returns that are anchored in macroconsistent growth expectations.

4. We show that the dividend discount model (DDM), based on current dividend yields and historical per-share growth rates, significantly underestimates expected returns relative to the total payout model.

18 We ran the same predictive regressions for the inverse of the CAPE (i.e., the cyclically-adjusted earnings yield; E/P ratio) and got qualitatively similar results as for the CAPE. The R-squared and the t-stat are marginally lower (i.e., less significant) than for the CAPE.
5. We provide evidence that total payout yields are better predictors of changes in expected returns than dividend yields. Additionally, we demonstrate that the cyclically-adjusted total yield (CATY) is at least as predictive as the cyclically-adjusted price-to-earnings ratio (CAPE).

This study has important practical implications for return forecasting. Corporate substitution of buybacks for dividends caused a secular decrease in dividend yields, and an analogous increase in per-share growth, leading to a structural break in the return components of traditional supply models such as the dividend discount model. The Dividend and Cash Buyback Model and Dividend Less Net Issuance Model developed in this paper are independent of these changes in corporate payout policy. Therefore, these supply models not only provide a more consistent framework to attribute historical returns to the supply of payout and fundamental growth, but they also provide superior forecasts of long- and short-term expected returns.

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References


Appendix

Table A1  % Difference in Return Decompositions: This study versus Ibbotson/Chen (2003)

<table>
<thead>
<tr>
<th>Building Blocks</th>
<th>Capital Gain and Income</th>
<th>Earnings</th>
<th>Dividends</th>
<th>Book on Equity</th>
<th>GDP per Capita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction</td>
<td>–0.08</td>
<td>–0.08</td>
<td>–0.09</td>
<td>–0.09</td>
<td>–0.06</td>
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<tr>
<td>ERP</td>
<td>–1.16</td>
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<td>RF</td>
<td>0.61</td>
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<tr>
<td>INC</td>
<td></td>
<td>0.22</td>
<td>0.22</td>
<td>0.22</td>
<td>0.22</td>
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<tr>
<td>CG</td>
<td></td>
<td></td>
<td>–0.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g(P/E)</td>
<td></td>
<td>–0.84</td>
<td>–0.84</td>
<td>–0.84</td>
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<tr>
<td>g(EPS)</td>
<td></td>
<td>0.08</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>−g(PO)</td>
<td></td>
<td></td>
<td>−0.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g(DIV)</td>
<td></td>
<td></td>
<td></td>
<td>0.23</td>
<td></td>
</tr>
<tr>
<td>g(BV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.03</td>
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<tr>
<td>g(ROE)</td>
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<td>0.02</td>
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<tr>
<td>g(FS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>−0.55</td>
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<tr>
<td>g(GDP/POP)</td>
<td></td>
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<td>−0.21</td>
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<tr>
<td>CPI</td>
<td>–1.02</td>
<td>–1.02</td>
<td>–1.02</td>
<td>–1.02</td>
<td>–1.02</td>
</tr>
<tr>
<td>Nominal Total Return</td>
<td>−1.65</td>
<td>−1.65</td>
<td>−1.65</td>
<td>−1.65</td>
<td>−1.65</td>
</tr>
</tbody>
</table>

Note: This table shows the difference in the historical return decompositions in this study versus Ibbotson and Chen (2003).

The six historical return decompositions were first introduced by Ibbotson and Chen (2003), and were updated in this study using a longer sample period from 1871 to 2014. The original study was based on a sample from 1926 to 2000. Both studies rely on the same methodology to derive the return decompositions. Equity total returns between 1871 and 2014 were an annualized 9.05%, which is 1.65% lower than the 10.70% annualized return observed in the original 1926 to 2000 sample. The majority of the decrease in total return is attributable to a 1.02% lower inflation rate, while the balance is due to lower real returns. The lower real return our in sample is largely due to a smaller contribution from the growth in the price-to-earnings ratio. The results of the return decompositions presented in this study are depicted in Figure 1.