



Alternative Thinking

Capital Market Assumptions Technical Appendix: Equity Expected Return Methodology

In this year's edition of Capital Market Assumptions, we modify our equity expected return methodologies to account for the growing corporate substitution of share buybacks for dividends. For the subset of readers wanting to peruse the topic in greater depth, this Appendix is an optional supplement that discusses specific details and presents the underlying theory and practical guidance on the data required to build these estimates.

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Executive Summary

This year we revise our methodologies for estimating long-run expected equity market returns, primarily to account for the growing use of buybacks. In principle, total payouts matter and expected returns should not be affected by changes in payout policy. However, as described later, the classic Dividend Discount Model (DDM) may underestimate equity returns. In our earnings yield method, we simply use half of the (smoothed) earnings yield to approximate a long-run dividend yield that is insensitive to changes in payout policy, and then add a constant growth rate along the lines of the DDM. We apply a bigger revamp to our traditional DDM method, where both the dividend yield and growth terms are affected by structural changes in payout policy. Here, we adopt a net total payout model that incorporates an estimate of net buyback yield alongside the dividend yield in the DDM and accordingly uses aggregate growth rates.

Motivation for This Year's Revisions

In the classic DDM, the expected real return on equities is given by

$$E(r) \approx DY + g + \Delta v.$$

where

DY = dividend yield

g = expected trend growth in real dividends or earnings per share (EPS)

Δv = expected change in valuations

Assuming no mean-reversion, $\Delta v = 0$, so that

$$E(r) \approx DY + g$$

There is strong evidence that many U.S. firms have replaced dividend payouts with share buybacks, following the SEC rule 10b-18 in 1982¹ that paved the way for companies to conduct share buybacks without suspicions of price manipulation. Other reasons for the growing use of buybacks include tax advantages and corporate signaling benefits.

¹ Grullon and Michealy (2002) provide evidence of a structural change in U.S. firms' payout policy, following this rule. Also see Fama and French (2001).

Exhibit 1 plots S&P 500 dividend yield and 10-year smoothed gross buyback yield and net buyback yield (where net buybacks equal the difference between buybacks and issuance).² We see a decline in dividend yield and an increase in buyback yield since the 1980s. As dividend yield does not include buybacks, it does not capture the total payout to shareholders if companies use share repurchases in lieu of dividends to return cash to shareholders.³

Exhibit 1 | Dividend Yield, Buyback Yield and Net Buyback Yield for the S&P 500



Source: AQR, Shiller data, XPressFeed and Bloomberg. Buyback yield equals buybacks divided by market-cap while net buyback yield equals buybacks minus issuance divided by market-cap.

² In a world of asymmetric information, the market reacts negatively to dividend cuts as it believes dividend cuts portend a drop in future earnings. This makes companies more likely to smooth dividends and opt for one-off share repurchases instead of one-off increases in dividends. Such management preferences tend to make the dividend series smoother, while buybacks and issuances tend to be more cyclical. To make the series more comparable, we smooth buyback yield and net buyback yield by using cyclically adjusted 10-year averages, in line with the Shiller CAPE, but leave dividends unsmoothed. While we present a shorter history of buyback data, Ibbotson and Straehl (2016) and Boudukh, Michaely, Richardson and Roberts (2007) present a longer history and find a similar upward trend in buybacks for the S&P 500 and CRSP respectively, starting from negligible levels in the early 1980s.

³ We add a caveat that share repurchases are not always a means to return cash to shareholders. Recent evidence shows U.S. firms are increasingly issuing debt to finance share buybacks, and thus using buybacks as a means of recapitalization. When share repurchases are financed by higher leverage, the firm-level net total payout yield (NTY, to be specified below) measure that includes interest and debt repayment may differ vastly from the equity NTY. In such cases, deriving expected equity returns from the firm-level NTY measure may produce different estimates from our methodology that does not incorporate leverage. Further, Allen and Michaely (1995) show a surge in repurchases after 1983 that coincide with a surge in mergers. This is because repurchased stock is often reissued to the acquired firm in a merger, when the acquiring firm wishes to finance a merger with retained earnings or debt, but the acquired firm (for tax reasons) prefers stock. Repurchases to complete mergers simply help finance this. Additionally, total payout may still be underestimated by not including the cash distributions from cash acquisitions or mergers. Sabbatucci (2015) finds that cash M&A dividends are an important component of shareholder returns starting from the 1970s.



The growing use of buybacks affects not just the income (dividend yield) component but also the per-share growth component of the DDM. **Exhibit 2** shows a structural decrease in dividend yield, and a structural increase in per-share earnings growth, post 1982.⁴ Thus the DDM may underestimate equity returns if current low dividend yields (that do not capture the total payout to shareholders), are used in combination with long-run realized per-share growth rates (that underestimate forward-looking per-share growth by missing the impact of lower share count due to buybacks). Academic evidence on the reduced predictive power of dividend yield in recent decades and the higher predictive power of payout yields further support our revisions this year.⁵

Exhibit 2 | Annualized Average Of Three Expected Real Return Estimates, Payout Ratio and EPS Growth Rates for the S&P 500

	Full Sample	1900-1982	1983-2016
Adjusted Shiller EP	7.7%	8.6%	5.3%
DP + constant g(EPS)	5.7%	6.4%	3.9%
0.5*Adj. Shiller EP + g(EPS)	5.3%	5.8%	4.2%
Dividend Payout Ratio	55%	60%	44%
Real Growth in EPS	1.5%	0.9%	3.1%

Source: AQR, Shiller data, XPressFeed and Bloomberg. g(EPS) refers to a constant growth rate in EPS of 1.5%. All averages are arithmetic, except for g(EPS) which is a geometric average. The dividend payout ratio is smoothed to be a ten-year average of real dividends divided by real earnings.

⁴ Buybacks are just one among many reasons for the higher EPS growth rate post 1983. Other reasons include an end to hyper-inflation, higher profitability and corporate profits accounting for a bigger share of GDP in the later period. Overall, it seems likely that only a part of the jump from about 1% trend growth in real EPS to about 3% after 1983 is sustainable going ahead, and the bulk of it is specific to an exceptionally benign environment. The period since 1983 has been characterized by a sharp decline in inflation rate and bond yields, globalization and liberalization of capital markets, and a growing share of corporate profits of the GDP (see chapter 27 in Ilmanen 2011). Finally, while regulatory changes may have made reported earnings more conservative, changing management compensation practices may have incentivized firms toward more aggressive accounting.

⁵ Boudoukh et al (2007) find that post-1984, dividend yields have become less reliable predictors of equity market returns and find that payout yields have out-of-sample predictability while dividend yields do not. They further find net total payout yields have higher predictive power than buyback yields that ignore issuance. One caveat here is that the negative sign of issuance tends to (except very recently) make the net buyback yield negative, more so when prices plummeted as in 2008 (cf. the downward spike in the net buyback yield in Exhibit 1 while the two positively-signed series spiked upwards). The inverse sign can offset the predictability of dividend yield, leading to an overall lower predictability of net total payout yield.

Aside: some commentators simply add the gross buyback yield to the dividend yield, ignoring issuance. Such a broad yield measure overstates the level of payouts that investors receive.

Next up, we describe our existing methodologies and the modifications we make to each. Clearly, we strive to improve on our past method, but we stress that there is no uniquely correct way of estimating expected equity returns; any estimates inevitably reflect embedded assumptions and data limitations.⁶

1. Earnings yield (E/P)

To recap our former methodology, the inverse of a P/E ratio measures the ex-ante real return on equities, albeit under quite strict assumptions.⁷ To smooth the excessive cyclicity in annual earnings, we use the Shiller E/P ratio which normalizes a 10-year average of earnings (scaled by the CPI to today's price levels) by today's equity prices. While this variant is smoother, it leaves us with the problem that the "Shiller earnings" are, on average, five years stale compared to current earnings. Exhibit 2 shows the long-run realized real growth rate of earnings in the U.S. has been 1.5%. Hence, we scale up the Shiller earnings yield by 1.075 to account for the fact that for a series that grows at 1.5% annually, the 10-year average will be understated by 7.5%. We apply the same growth rate to all countries as we find little predictive power in country-specific growth rates and the longer data history of the U.S. provides a more accurate reading of expected long-run growth.

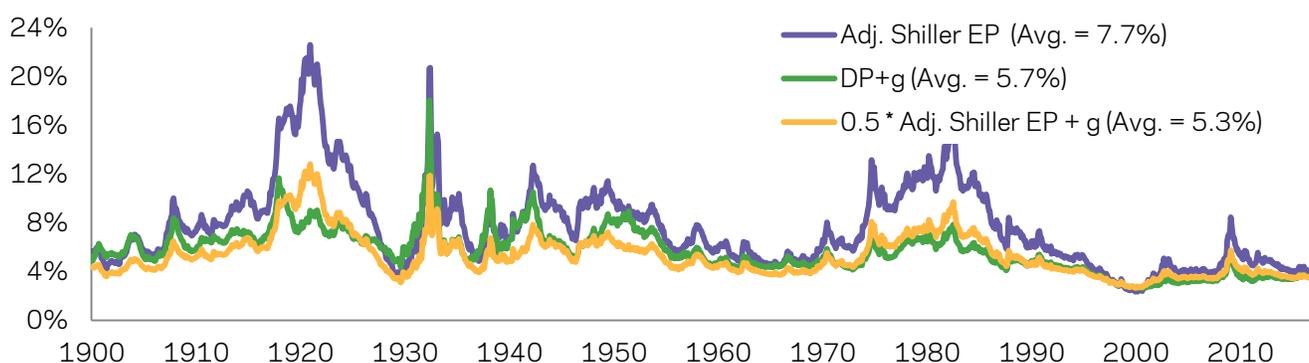
The E/P ratio embeds some implicit mix of dividend payouts and the growth rate of retained earnings (as explained in Appendix A). Our revised method makes this mix explicit by assuming a constant dividend payout ratio and a constant earnings growth rate.

As earnings yield is inherently independent of payout ratio, the former earnings yield based methodology is already insensitive to changes in payout policy. However, as shown in **Exhibit 3**, it results in equity return estimates that seem too volatile for long-run estimates that assume no mean-

⁶ Improving our methodologies is an ongoing process and we plan to keep doing research on these topics also in 2017.

⁷ See Appendix A for details



Exhibit 3 | U.S. Long-Run Expected Equity Returns 1900-2016

Source: AQR, Shiller data, XPressFeed and Bloomberg. g refers to earnings growth rate, assumed to be a constant 1.5%. All estimates use the S&P 500 index. Adjusted Shiller EP is $1.075 / \text{Shiller PE}$, embedding an annual real EPS growth of 1.5%.

reversion in valuation multiples. One simple way to remedy this is to proxy dividend yield with 50% of the Shiller E/P (as shown in Exhibit 2, the U.S. has had a long-run average dividend payout ratio of 55% with a downward trend over time), and plug this into the DDM with a real growth rate of 1.5% to form an earnings yield based DDM estimate of expected real return, that is unaffected by changes in payout policy. As noted above, expected returns should not reflect with firms' chosen payout policies; instead, lower payout ratios should be accompanied with higher EPS growth rates. The subperiod evidence in Exhibit 2 is consistent with this idea.

Exhibit 3 plots U.S. expected equity returns from this revised earnings yield approach alongside the older earnings yield approach and the classic DDM method. We see that the revised method closely mirrors the DDM but has the added advantage of being notably less volatile than the regular E/P.

To sum up, our revised earnings yield based equity expected return is:

$$E(r) \approx 0.5 * \text{Adjusted Shiller E/P} + g$$

We apply the U.S. long-run average payout ratio of 50% to any developed country. We do not use country-specific payout ratios here, as growth rates and payout/retention ratios are interlinked (theoretically, $g = (1 - \text{payout ratio}) * \text{ROE}$) and it is hence, inconsistent to use country-specific payout ratios with a U.S. earnings growth rate. The sole

exception is emerging markets, where we use a somewhat higher growth rate of 2%, which equals the forecast long-run real growth rate in GDP-per-capita (2%) as a proxy for real growth in EPS, on the lines of Ibbotson and Chen (2003).

2. DDM yield

Our former approach was the classic DDM described earlier, $E(r) \approx \text{DY} + g$, where we use country-specific estimates of DY and g . As mentioned earlier, the corporate use of share buybacks in lieu of dividends, necessitates changes to both the DY and g components of the DDM. Hence, we adopt the Net Total Payout model of stock returns as presented in Ibbotson-Straehl (2016) and used by Grinold, Kroner and Siegel (2011) to forecast equity market returns.

Net Total Payout Model Methodology

As explained in Appendix B, assuming no repricing of valuation multiples, the Net Total Payout model defines expected real equity return approximately as

$$E(r) \approx \text{NTY} + g_{\text{TPagg}}$$

where

NTY = net total payout yield

g_{TPagg} = growth in real aggregate total payouts

Net Total Payout Yield

We construct NTY on the lines of Boudoukh et al (2007) and Ibbotson-Straehl (2016), as a sum of the dividend yield and the net buyback yield. We define net buyback yield for a stock as the (negated)



monthly change in shares outstanding times the share price, divided by the monthly market capitalization, and aggregate this to the equity index level using index constituent weights.⁸ Appendix B describes alternative methods to construct net buyback yields that use other financial statement data. We (must) choose the change in shares outstanding method because the data required for the other methods are not readily available for all the countries in our international universe.

Just as with the Shiller CAPE, we smooth cyclical variations in buybacks and issuance, by normalizing 10-year averages of net buybacks (scaled by the CPI to current price levels) by current prices. For each country we add the cyclically adjusted net buyback yield to the current dividend yield to arrive at the NTY.⁹

Growth in Aggregate Total Payouts (g_{TPagg})

We estimate growth in aggregate total payouts for each developed country using the average of two approaches. (As usual, we like averaging when there is no uniquely correct approach!) The first is a top-down, forward-looking approach: we use consensus forecast¹⁰ long-term growth in real aggregate GDP as a proxy for the long-term growth in real total payouts.¹¹ The second is a bottom-up, historical-based approach that starts with the realized long-term growth in real EPS of the equity indices since 1970. Assuming a constant payout ratio, per-share growth in EPS equals per-share growth in payouts. To convert this per-share growth in payouts to

aggregate growth in payouts, we add an estimate of *dilution*, proxied by U.S. long-term realized equity dilution (1.6%).¹² We shrink both the aggregate GDP growth and the EPS growth estimates towards cross-country averages.¹³

We stress in Appendix B the importance of using the changing share count consistently in the yield and growth estimates. In the classic DDM, dividend yield and per-share growth rate were combined. In the revised NTY method, we subtract the net issuance yield (difference between issuance and buybacks) from dividend yield and add net issuance to the growth term (to arrive at aggregate payout growth). The subtraction and addition do not exactly wash out in our empirical applications because we use relatively current net issuance (smoothed over 10 years) to compute our net total payout yield, whereas for the average growth estimate we use a much longer period of historical data (as we use the long-run mean as our estimate of future growth rate).

Putting It All Together

Exhibit 4 summarizes our expected equity returns using both methods described above, as well as their average as our final estimate (final column). For emerging markets, we continue to use the classic DDM in place of the NTY model, due to data limitations described in Appendix B. Our final estimate of long-run expected real return for U.S. equities is 4.2% using our new method (0.2% higher than it would have been under the old method).¹⁴ As

⁸ This net issuance estimate is specific to an index with 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). One limitation of this measure of firm-level net issuance is that it is affected by the reconstitution of the index, specifically, differences in the market capitalization of firms entering versus exiting the index.

⁹ One caveat is that data quality outside the U.S. is weaker; thus, the net buyback yields on Australia and Canada may be too low.

¹⁰ Economists' forecasts are based on linear extrapolation of beginning of 12 month forecast at the start of each calendar year.

¹¹ Ibbotson and Straehl (2016) find that the long-run growth in total payouts empirically matches the growth in aggregate GDP, and that the long-run growth in EPS similarly mirrors growth in GDP-per-capita. Grinold et al (2011) forecast real equity returns summing together dividend yield, net buyback yield, and aggregate GDP growth.

¹² We do not have access to long histories of dilution estimates or aggregate earnings growth rates outside the U.S., so we take this indirect approach. We estimate the U.S. long-term dilution as growth in real aggregate total payouts (3.27% over the period 1901 to 2014, as per Ibbotson and Straehl (2016)) minus realized per-share growth in real EPS (1.7%), which comes to 1.6%. We note this is somewhat lower than the 2% dilution estimate of Bernstein and Arnott (2003), probably due to an upward trend in buybacks since then, as well as Bernstein and Arnott's use of a different methodology (using returns and capitalization increase, not change in shares) and a different stock universe (CRSP instead of the S&P 500) to measure dilution. Ibbotson & Straehl find a 1.7% net issuance over the period 1901 to 2014.

¹³ We shrink growth rates halfway towards the cross-sectional market-cap-weighted mean. This is justified by our finding that the growth rates have low explanatory power for the cross-sectional variation in future equity returns. Thus we trust more the global level as an anchor. The shrunk realized EPS growth rates are in the range of 1.1% to 1.7%.

¹⁴ The equivalent estimates using our former approach would have been



Exhibit 4 | Building Expected Real Returns for Equity Markets

	Earnings-Yield Based			Dividend Discount Model Based					Combined Avg (E/P Based, DDM Based)
	E/P	g (EPS)	0.5 * E/P + g(EPS)	DY	NBY	GP	GG	DDM = DY+NBY +avg(GP, GG)	
	Adj. Shiller Earnings Yield	g(EPS)	EP Based E[r]	Div. Yield	10y Cycl. Adj. Net Buyback Yield	Long- Term Historic al Real Payout Growth	Long- Term Forecas t GDP Growth	DDM Based E[r]	Expected Real Equity Return
U.S.	4.3%	1.5%	3.7%	2.1%	0.1%	3.3%	2.0%	4.8%	4.2%
Euro-5	5.8%	1.5%	4.4%	3.2%	-0.4%	3.2%	1.7%	5.2%	4.8%
Japan	4.3%	1.5%	3.7%	2.0%	0.0%	3.1%	1.3%	4.2%	3.9%
U.K.	6.2%	1.5%	4.6%	4.0%	-0.3%	2.7%	1.9%	6.0%	5.3%
Australia	5.9%	1.5%	4.5%	4.1%	-1.1%	3.1%	2.3%	5.8%	5.1%
Canada	5.0%	1.5%	4.0%	2.7%	-1.6%	3.0%	1.9%	3.6%	3.8%
Global Devlpd.	4.7%	1.5%	3.8%	2.4%	-0.1%	3.2%	1.9%	4.9%	4.4%
Global Dev. ex US	5.4%	1.5%	4.2%	3.0%	-0.5%	3.0%	1.7%	5.0%	4.6%
Emerging Mkts	8.7%	2.0%	6.4%	2.5%			2%*	4.5%*	5.4%

* For emerging markets, our DDM estimate is dividend yield plus forecast GDP growth per capita. The growth estimate 2% is thus not comparable to other markets.

Source: AQR, Consensus Economics and Bloomberg. Return assumptions and methodology are subject to change and based on data as of December 31, 2016. The local real equity expected return is an average of two approaches: 1. The Shiller earnings yield (using 10-year earnings) scaled by 1.075 (embedding an annual real EPS growth of 1.5%), multiplied by 0.5 and added to a real growth rate in EPS of 1.5% for developed countries and 2% for emerging markets. 2. The sum of dividend yield plus estimates of net buyback yield (NBY) and long-term real growth of aggregate payouts gTPagg. G is the average of two measures: (i) long-term historical real earnings growth (since 1970) adjusted for dilution (GP), and (ii) long-term forecast real GDP growth based on Consensus Economics data (GG). GP and GG are both shrunk halfway towards a cross-country average. For earnings yield, U.S. is based on the S&P 500; U.K. on the FTSE 100 Index; "Euro-5" is a cap-weighted average of large-cap indices in Germany, France, Italy, the Netherlands and Spain; Japan on the Topix Index; and "Emerging Markets" is based on the MSCI Emerging Markets Index. For DDM estimates, all countries are based on corresponding MSCI indices. "Global Developed" is a cap-weighted average of the developed market estimates. Hypothetical performance results have certain inherent limitations, some of which are disclosed in the back.

before, prospective real return estimates are clearly higher for European, Australian, and Emerging equity markets than for North America and Japan.

4.0%, 5.3%, 3.9%, 5.6%, 5.8%, 4.5%, 4.4%, 5.0% and 6.6% for the U.S, Euro-5, Japan, U.K., Australia, Canada, Global Developed, Global Developed ex US and Emerging Markets respectively.



Appendix A: The Relation Between Earnings Yield and Equity Expected Returns

We present here the theoretical justification behind using earnings yield to proxy for equity expected returns.

Start with the Gordon growth model:

$$E(r) = DY + g \quad (1)$$

where

DY = Dividend Yield

g = growth rate in perpetuity

Given k = payout ratio, then the retention ratio (or plowback ratio) equals $1 - k$ and the following relations hold:

$$DY = k * EP \quad (2)$$

$$g = (1-k) * ROE \quad (3)$$

where

EP = Earnings Yield

ROE = Return on Equity

Plugging equations (2) and (3) into equation (1),

$$E(r) = k * EP + (1-k) * ROE \quad (4)$$

In a steady state of the market, a firms' return on internal investment opportunities ROE converges to its cost of equity $E(r)$.¹⁵

$$ROE = E(r) \quad (5)$$

Plugging equation (5) into equation (4),

$$E(r) = k * EP + (1-k) * E(r) \quad (6)$$

$$E(r) = EP \quad (7)$$

Stated simply, if reinvested earnings grow at the cost of capital, then $E(r) = EP$. Intuitively, in this world the value of the firm is insensitive to the payout ratio k because whether the firm reinvests earnings and generates profits equal to its ROE, or distributes them to investors with a market-wide cost of capital $E(r)$, both the firm and the shareholders earn the same rate of return. Philips and Ural (2016) provide a similar theoretical framework, starting with the dividend discount model and using the clean surplus relationship.

¹⁵ If a firm's return on assets is higher than its cost of capital, then the high return on assets attracts competitors into the marketplace, and the competition reduces profitability so as to make the return on assets converge to the market-wide cost of capital. In a steady state, return on assets equals the cost of capital and the economic value of the total book assets will be maintained, whereas if the firm's return on assets is higher/lower than its cost of capital, the firm would be constantly increasing/decreasing the economic book value of its assets.



Appendix B: The Net Total Payout Model

We present the net total payout model for equity returns as described in Ibbotson-Straehl (2016), and show how it translates to the dividend discount model (DDM) under specific circumstances. We then describe how to implement this model, with practical considerations and data limitations likely to be encountered.

Derivation

The expected one-period total return r of a stock over period $t-1$ to t is the sum of income return (dividend yield) and capital gains (price appreciation):

$$E(r_t) = \frac{D_t}{P_{t-1}} + \frac{P_t}{P_{t-1}} - 1 \quad (1)$$

where

D is the dividend-per-share

P is the share price

The price return in equation(1) can be rewritten as a function of the change in total payout-per-share TP_t (sum of dividend-per-share and buybacks-per-share) and the change in price-to-total payout ratio $\frac{P_t}{TP_t}$, giving:

$$E(r_t) = \frac{D_t}{P_{t-1}} + \frac{TP_t}{TP_{t-1}} \frac{\frac{P_t}{TP_t}}{\frac{P_{t-1}}{TP_{t-1}}} - 1 \quad (2)$$

Now, Net Issuance is defined as the change in share count, multiplied by share price, giving:

$$1 + \% \text{ Net Issuance}_t = 1 + \frac{P_t (S_t - S_{t-1})}{P_t S_{t-1}} = \frac{S_t}{S_{t-1}} \quad (3)$$

where

S_t = Shares outstanding at time t

Rewriting (2) as a function of (3) we obtain:

$$E(r_t) = \frac{D_t}{P_{t-1}} + \frac{S_{t-1}}{S_t} \frac{TP_t}{TP_{t-1}} \frac{S_t}{S_{t-1}} \frac{\frac{P_t}{TP_t}}{\frac{P_{t-1}}{TP_{t-1}}} - 1 \quad (4)$$

Aggregate total payouts TP_{Agg} equals total payout-per-share TP_t multiplied by share count S_t

$$\frac{TP_{Agg,t}}{TP_{Agg,t-1}} = \frac{TP_t}{TP_{t-1}} \frac{S_t}{S_{t-1}}$$

$$E(r_t) = \frac{D_t}{P_{t-1}} + \frac{S_{t-1}}{S_t} \frac{TP_{Agg,t}}{TP_{Agg,t-1}} \frac{\frac{P_t}{TP_t}}{\frac{P_{t-1}}{TP_{t-1}}} - 1 \quad (5)$$

Equation (5) can be simplified to the following geometric average return components:

$$E(r_t) = NTY + g_{TPAgg} + g_{P/TP} + i + Interaction \quad (6)$$

where

NTY , Net Total Yield = dividend yield plus net buyback yield (that is, dividend yield less net issuance)

g_{TPAgg} = real aggregate total payout growth

$g_{P/TP}$ = change in price-to-total payout ratio

i = inflation

$Interaction$ captures the reinvestment return and geometric interaction among the components



Equation (6) is similar to the stock return forecasting model proposed by Grinold, Kroner, and Siegel (2011). Assuming no repricing of valuation multiples, $g_{P/TP} = 0$. Taking an approximation and ignoring the interaction component¹⁶, we get:

$$\text{Real expected return } E(r_t) \approx \text{NTY} + g_{TP\text{Agg}} \quad (7)$$

In the case of no buybacks or issuance,

$$S_t = S_{t-1}, \text{ implying}$$

$$\text{NTY} = \text{DY} \quad (8)$$

$$\text{and } g_{TP\text{Agg}} = \frac{TP_{\text{Agg},t}}{TP_{\text{Agg},t-1}} = \frac{TP_t}{TP_{t-1}} \frac{S_t}{S_{t-1}} = \frac{TP_t}{TP_{t-1}} = g_{TP} \quad (9)$$

Plugging (8) and (9) into (7) leads to the classic DDM

$$E(r_t) \approx \text{DY} + g_{TP} \quad (10)$$

Building Buyback Yield and Net Issuance Yield

While our international universe constrains us to use the change in shares method to construct net buybacks, there are other methods available that are applicable to the U.S.:

1. Change in Shares Outstanding

When a company buys back stock, it reduces the number of shares outstanding, and vice versa when it issues stock. As per Ibbotson-Straehl (2016) and Boudukh et al (2007), the net issuance for a firm equals the share-split-adjusted product of the change in shares outstanding and the share price. Net buyback yield equals the negated twelve months net issuance divided by market cap.

The advantage of this method is its wider international coverage and longer history. However, the drawback is that it captures issuances not generating cash flows, for example, stock acquisitions and employee stock grants.

2. Statement of Cash Flows

For U.S. companies, the statement of cash flows reports the amount of purchases and sales of common and preferred stock. So, as per Boudukh et al (2017), common stock buybacks can be estimated from the statement of cash flows by the sum of total expenditure on the purchase of common and preferred stocks, and the reduction in the value of the net number of preferred stocks outstanding. Similarly, common stock issuance can be estimated as the sale of common and preferred stock minus any increase in the value of the net number of preferred stock outstanding.

This method allows separating stock buybacks from issuance. But it encompasses all cash flows generated from firms' buybacks, including when firms repurchase shares in anticipation of the exercise of employee stock options and can thus overstate buybacks.¹⁷

¹⁶ A more precise derivation could further decompose the interaction term and account for its components. However, for the sake of simplicity, we present this approximation that expresses the expected return using fewer building blocks.

¹⁷ Ibbotson-Straehl (2016) find an average S&P 500 buyback yield of 2.04% using the cash-flow statement versus 1.64% when using the change in treasury stock method.



3. Change in Treasury Stock

Treasury stock captures the cumulative effects of stock repurchase and reissue, and is not affected by seasoned equity offerings. Thus, the change in treasury stock reflects share repurchases unless the firm retires or cancels the repurchased shares, in which case one of the preceding two methods would have to be used to estimate share repurchases. Fama and French (2001) estimate buybacks as the increase in common treasury stock. Boudukh et al fine-tune this measure to exclude repurchase shares earmarked for compensation or payment-in-kind, by adjusting for the potential asynchronicity between repurchase and option exercise.¹⁸ However, one limitation of this method is that it can be used only to measure share repurchases, not issuances as treasury stock does not reflect secondary equity offerings.

Building Growth Estimates

As mentioned in the main text, we estimate aggregate growth in total payouts using a combination of realized EPS growth plus dilution, and consensus forecast aggregate GDP growth. Both series have their problems (the former is backward-looking, the latter focuses on output growth rather than corporate earnings), but together they give us some plausible estimates for future long-run payout growth in different markets. Another possible input would be analysts' forecast of long-run earnings growth, but we avoided these forecasts as they are notoriously plagued by overoptimism (perhaps especially in countries where analysts have greater incentives for an optimistic bias). Hence, to incorporate a more direct measure of corporate earnings, we calculate realized real EPS growth from the MSCI country equity indices. While the MSCI indices have the advantage of a long history going back to 1970, their drawback is that they are heavily concentrated, with typically 40% to 50% of the index weight in the top 10 stocks, and hence can be driven by stock-specific risk. Our other growth proxy relies on economists' GDP- growth forecasts, adjusted for trend population growth. There are many reasons why output growth may differ from earnings growth over the next decade, but the empirical estimates seem reasonable (higher for emerging markets and lower for Europe and Japan).

We do not extend the revised growth estimation approach to emerging markets. Due to poorer data quality in emerging markets, we do not have good estimates of the net buyback yield and cannot adjust the dividend yield estimate for dilution, which would then make it inconsistent to use the forecast aggregate GDP growth estimates. Further, for emerging markets, realized earnings growth may be less indicative of future growth due to shorter histories and higher inflation that results in negative real EPS growth even when nominal EPS growth is positive. Thus, for emerging markets we continue to use the DDM approach from past years that uses forecast GDP-per-capita growth, added to dividend yield. (If we used the same method as for developed countries, the positive term from expected population growth and the negative term from dilution would partly offset each other.)

¹⁸ Specifically, Boudukh et al (2007) subtract from the year t measure of repurchase, any negative change that occurs in the year $t+1$, assuming the latter represents reissuance of treasury stock in response to the exercise of employee stock options.



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The MSCI Emerging Markets Index is a free float-adjusted market capitalization index that is designed to measure equity market performance of emerging markets.

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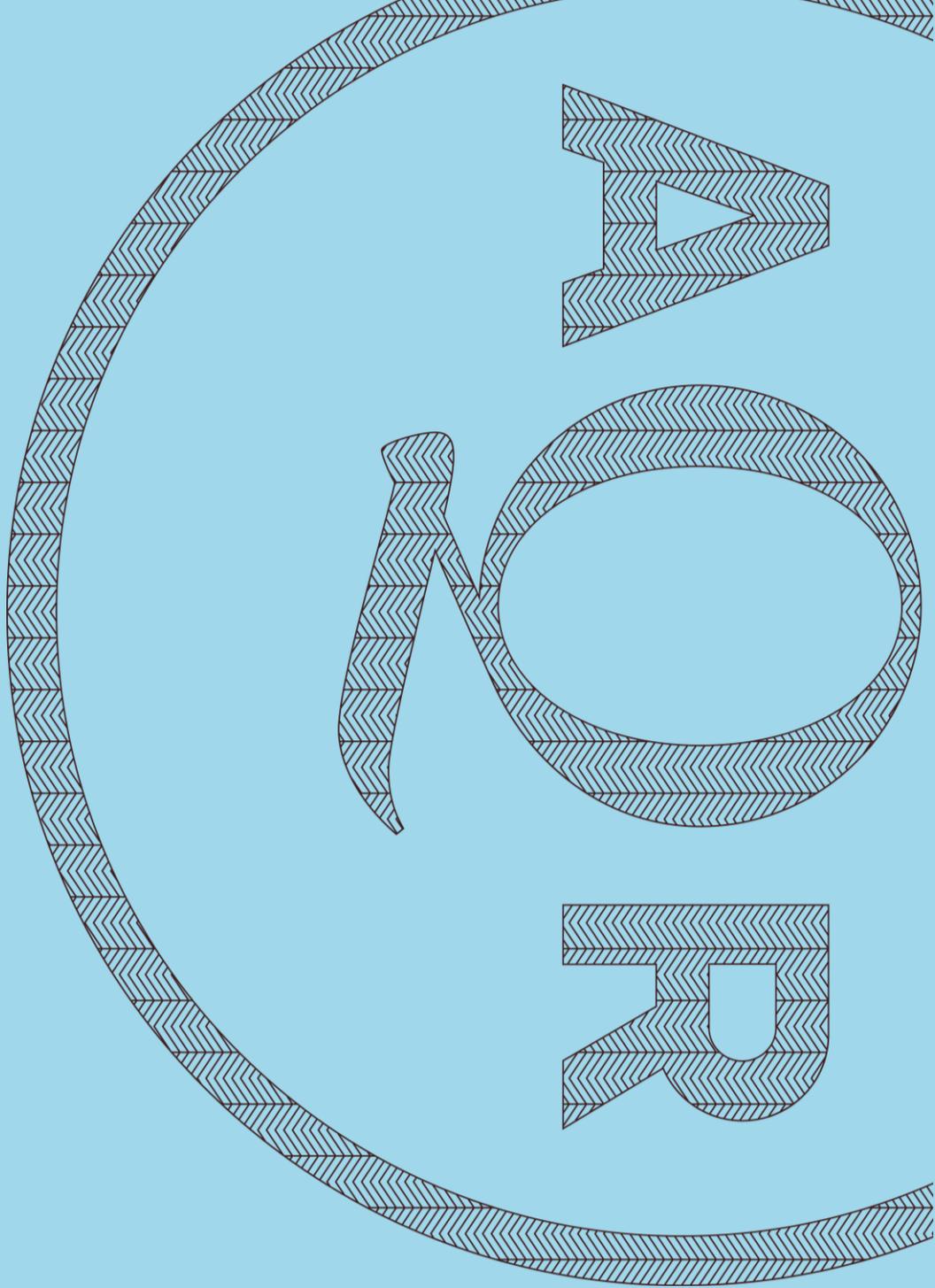


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