

Understanding Two Remarkable Findings about Stock Yields and Growth

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Common wisdom among financial economists, such as Ritter [2002], regarding stock prices and expected inflation is based on two intuitive axioms. First, earnings and dividend yields should not vary with expected inflation and the level of interest rates.¹ For example, price-earnings ratios (the inverse of earnings yields) are not expected to deviate much from long-term averages as interest rates rise and fall. Second, anticipated *nominal* growth for earnings and dividends should vary with expected inflation, because *real* growth for firms holding real assets should not.

The evidence, however, stands in stark contrast: 1) yields generally move with interest rates, whereas 2) forecast nominal growth rates do not. Financial economists tend to either de-emphasize this contradiction, since it is not easily explained, or suggest that it is due to a Modigliani and Cohn [1979] type of inflation illusion: investors mistakenly project the same nominal growth, rather than the same real growth, over periods with high and low inflation. Projecting too low a nominal growth when inflation is high results in underpriced stocks, which translates into overstated yields because the denominator (price) is too low. The opposite error occurs when inflation is low.

Both responses are unsatisfactory. If stock prices stray substantially from where they should be, much of modern financial theory and practice can be thrown out the window. If, however, the two empirical regularities

previously noted are consistent with a rational stock market, the common wisdom is incomplete. We believe the latter. The common wisdom does not recognize that accounting rules include inflationary gains in reported earnings. Consider a retailer that buys inventory for \$100, holds it for a year, during which inventory costs rise to \$102, and sells it for \$107. Accounting profits include both the real profit of \$5 and the \$2 holding gain due to inflation. Higher inflation is associated with higher reported earnings and therefore higher earnings yields.

This insight about reported earnings, including inflationary gains, not only explains why yields vary with expected inflation (the first regularity), it also helps to explain why nominal growth need not vary with expected inflation (the second regularity). As discussed later, the relevant growth for earnings yields is the *per share* earnings growth that can be sustained in perpetuity under a *full payout policy*, where all earnings are paid out as dividends. Paying out inflationary gains as dividends reduces the real amount invested per share when inflation is high and results in lower real growth. It is nominal growth, not real growth, that remains relatively constant across low and high levels of expected inflation.

Consider again the inventory example with reported earnings of \$7, consisting of a real profit of \$5, and an inflation gain of \$2. Paying out the entire \$7 profit as dividends

leaves only \$100 available for reinvestment. If expected inflation had been zero instead of 2%, reported profit would have been \$5; paying out those profits as dividends would leave the same nominal amount of \$100 available for reinvestment. Holding nominal reinvestment constant at \$100 causes nominal growth, rather than real growth, to be relatively constant across the two scenarios.

In this article, we develop the rationale for the common wisdom, describe the two regularities that contradict it, and explain how that evidence is consistent with economic intuition when we incorporate the effect of inflation on reported earnings. A better understanding of the impact of inflation on yields and growth should leave the reader more comfortable. Price-earnings ratios higher than historical averages do not imply an overvalued market, if interest rates are low. Similarly, price movements that seem excessively volatile may be explained by changes in forecast earnings and interest rates. More importantly, the size of the gap between earnings yields and interest rates, which is currently higher than it has been for many decades, and the variation over time in that gap provide considerable information about investors' perceptions regarding long-term growth forecasts and the premium investors demand to hold equities.

THE CONVENTIONAL WISDOM

A simple illustration explains why financial economists believe yields should be the same under high and low inflation. Consider equivalent plots of land that are rented out in two worlds that are identical in all respects except that expected inflation is zero in one world and 2% in the other world. If the real required rate of return on similar investments is 5% in both worlds, the nominal required rates of return will be 5% and 7% in the zero and 2% inflation worlds, respectively. Assume that land values increase with inflation in both worlds. The annual rents charged in both worlds must then equal 5% of land value, since the rate of return required by investors equals total returns—the sum of the rent and the increase in land value. Earnings yields, which equal the ratio of annual rent to land value, would be the same 5% in both worlds. In effect, investments in real assets are associated with earnings yields that are “real” (i.e., yields vary with real required rates of return because inflationary gains are excluded from earnings). The same intuition should apply to equity investments in firms because firms hold real assets.

The intuition underlying the second belief—that real growth rates should be similar under high and low inflation—appears to be that growth rates are determined by physical quantities, such as units of product or manufacturing capacity. If growth in physical quantities is unrelated to inflation levels, real growth rates should also be unrelated to inflation levels.

Although not obvious, the two beliefs about the impact of inflation levels on yields and growth rates go hand in hand. To understand why, consider a restated version of the Gordon [1962] dividend growth model, shown in Equation (1). Forward dividend yields, or the ratio of dividends expected to be paid next year, d_1 , to current prices, p_0 , must equal the excess of nominal required rates of return, r , over nominal growth rates, g . Subtracting expected inflation, i , from both nominal rates suggests that dividend yields must also equal real required rates of return, $r - i$, minus real growth rates, $g - i$,

$$\frac{d_1}{p_0} = r - g = (r - i) - (g - i) \quad (1)$$

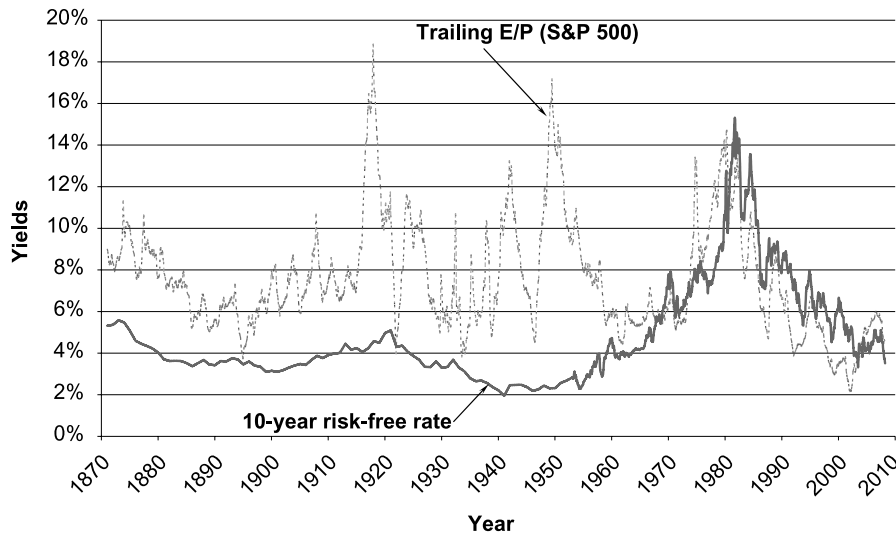
The common wisdom about constant yields is supported as long as the two terms on the right-hand side of the equation—real required rates of return and real dividend growth rates—are relatively constant and unrelated to expected inflation. Financial economics theory does not expect real required rates of return to vary with inflation, and the second term is unrelated to inflation because of the common wisdom that real growth rates are constant. In essence, the common wisdom about constant yields is implied by, and also implies, the common wisdom about constant real growth rates. Stated differently, if either relation does not hold, the other must also not hold.

EVIDENCE ON YIELDS

Exhibit 1 provides summary evidence on how expected inflation tracks earnings yields for the S&P 500. We use the 10-year U.S. government bond (constant maturity) yield for the long-term nominal risk-free rate, obtained for each month from Global Financial Data (=tcm10p before March 31, 1953, and =tcm10y after). These rates describe variation in expected inflation based on the assumption that long-term *real* risk-free rates, which equal the difference between nominal rates and expected inflation, do not vary much over time. Similar results are observed with other proxies for expected inflation based

EXHIBIT 1

Trailing Earnings Yields for the S&P 500 and 10-Year Risk-Free Rates (r_f)



Note: Earnings yields from <http://aida.econ.yale.edu/~shiller/data.htm> and risk-free rates from Global Financial Data ($=tcm10p/tcm10y$ before/after March 31, 1953).

on observed inflation. Since forward earnings are available only since the 1970s, we use trailing earnings instead, taken from <http://aida.econ.yale.edu/~shiller/data.htm>.

The general picture presented in Exhibit 1 is that earnings yields move with risk-free rates and therefore with expected inflation, except for the subperiod between 1915 and 1960 during which earnings yields seem to move around substantially, while the risk-free rate stays relatively steady between 2% and 4%. Closer inspection of the nature of covariation in Exhibit 1, as well as related evidence described in Thomas and Zhang [2008], provides the following findings:

- Covariation during the 1980s and 1990s is unusually strong. Not only do trailing earnings yields move very closely with interest rates, the levels of *forward* earnings yields and interest rates are almost equal to each other during the period. This is the regularity known as the “Fed Model” because it was first mentioned in a July 1997 Federal Reserve Monetary Policy Report. The finding is remarkable because it suggests that market-level stock valuations during those two decades are described simply by the ratio of next year’s expected earnings to risk-free rates. Apparently, all other factors that are relevant, such as risk and growth, conveniently cancel each other out during this period.

- Similar strong covariation between earnings yields and long-term government bond yields is observed for a number of major markets around the world (Japan is a notable exception). Again, this is a remarkable finding that affirms the robustness of the result that earnings yields covary with expected inflation.
- Covariation between dividend yields and expected inflation is observed in the data, but it is not as evident as the covariation observed for earnings yields.

The last bullet raises the question of whether earnings or dividend yields better represent the fundamentals that underlie stock prices. Although financial economists tend to distrust earnings and view dividends as more reliable, they recognize that dividend payout policy is a choice variable that affects yields but not prices. Increasing or decreasing forward dividends in Equation (1) should have no effect on current price, because the dividend growth that can be maintained in perpetuity adjusts accordingly.

We prefer earnings yields over dividend yields for purposes of this study. Dividend payout at the market level has changed substantially over time, from levels above 80% of earnings early in the sample period described in Exhibit 1 to below 40% by the end of the sample period. As previously mentioned, changes in payout obscure the effects we

study as they impact dividend yields and relevant growth rates for reasons unrelated to changes in fundamentals. Returning to the land example, focusing on dividend yields would require us to consider the fraction of rent paid out as well as the growth in future rents caused by the fraction that is reinvested in land. Allowing for changes over time in the fraction of rents paid out would complicate the picture without adding any insights. Also, when investigating growth forecasts, it is convenient to work with earnings, since those forecasts refer to growth in earnings, not dividends.

EVIDENCE ON GROWTH RATES

Whereas evidence of co-movement between inflation rates and earnings yields has been noted for many years, evidence of co-movement between inflation rates and forecast growth is relatively recent (see Table V of Claus and Thomas [2001] and Figure 3 of Sharpe [2002]). Since observed growth is quite volatile, it generates unreliable estimates of anticipated growth. It is only since the late 1970s that forecast growth can be estimated from databases covering sell-side analysts' forecasts of earnings per share.

We estimate market-level nominal growth anticipated by the stock market by aggregating firm-level earnings forecasts made by sell-side analysts, available on I/B/E/S files. To obtain a longer-term estimate of growth, we aggregate market-level earnings forecasts for years +4 and +5 to compute the implied growth forecast for year +5. Since sell-side analysts' forecasts are known to be optimistic at four- and five-year horizons, we focus not on the level of growth forecast but on whether those optimistic growth forecasts vary with expected inflation.

The results in Exhibit 2 suggest that forecast five-year-out growth varies remarkably little, between 11% and 14%, through the 1980s and 1990s. This low level of variation contrasts sharply with the steep decline in expected inflation over the period, reflected by risk-free rates declining from 14% in 1981 to about 4% by the end of the sample period. Contrary to conventional wisdom, investors project relatively constant nominal growth rates (i.e., *real* growth in earnings is anticipated to be high (low) when expected inflation is low (high)).

To be sure, these results are consistent with a stock market that suffers from inflation illusion, that is, investors and analysts project relatively constant nominal growth rates when, in fact, they should be projecting constant real

growth rates. To investigate this possibility we check if analysts' nominal growth forecasts are systematically too low when inflation is high early in the sample period and become systematically too high as expected inflation declines over time.

Because observed earnings growth rates are generally quite variable, we elected not to compare growth forecasts with observed growth. Instead, we focus on the *level* of earnings forecast five years out and compare it with actual earnings reported five years later; for example, we compute an aggregate earnings forecast five years out for all firms in 1990 and compare that forecast against actual earnings reported in 1995 by those same firms. Because forecast errors equal actual earnings less forecast earnings and because forecasts are expected to be optimistic, forecast errors should be generally negative. And forecast errors should become more negative over time if analysts erroneously forecast constant nominal growth when they should have forecast constant real growth.

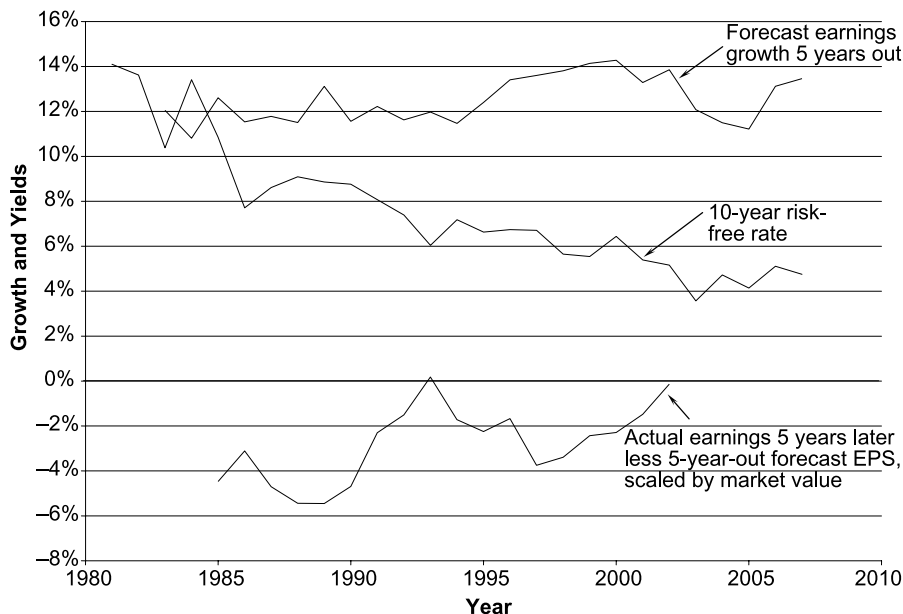
The line at the bottom of Exhibit 2 describes variation over time in five-year-out forecast errors. Forecast errors are indeed optimistic, indicated by negative values, but the level of optimism appears to *decrease* over time, indicated by less-negative values later in the sample period. Not observing increasing optimism as inflation declines is clearly inconsistent with the proposition that real growth rates should remain constant as expected inflation varies. In fact, real growth rates increased as inflation declined. These results are more consistent with the view that increases in expected inflation have a negative impact on real cash flows and valuations (e.g., Fama [1981] and Lucas [1996]). Overall, the evidence suggests that analysts do not suffer from inflation illusion, and it is reasonable to forecast constant nominal growth rates.

RATIONALIZING THE SEEMINGLY CONTRADICTIONARY EVIDENCE

Equation (2) considers the case of *full payout* to convert the dividend yield relation in Equation (1) to a relation that describes earnings yields. Since dividends equal earnings when all earnings are paid out as dividends, forward dividend yields, d_1/p_0 , in Equation (1) can be replaced by forward earnings yields, e_1/p_0 . However, the dividend growth term, g , must be replaced by full payout growth, g_{fp} , the growth in per share dividends that can be sustained forever if all earnings are paid out as dividends,²

EXHIBIT 2

Forecast 5-Year Growth in Earnings, 5-Year-Out Forecast Errors, and 10-Year Risk-Free Rates, 1981–2007



Note: Forecast growth and actual data are from I/B/E/S for all U.S. firms with forecasts, and risk-free rates are from Global Financial Data (=tcm10y).

$$\frac{e_1}{p_0} = r - g_{fp} = (r_f + r_p) - g_{fp} \quad (2)$$

Equation (2) states that earnings yields must equal the excess of nominal required rates of return, r , over nominal full payout growth. Note that required rates of return represent the sum of risk-free rates, r_f , and the equity premium, r_p , which is the extra return required to compensate investors for the risk associated with equity investments. Because finance theory suggests that the equity premium does not vary with expected inflation, evidence indicating that earnings yields covary with risk-free rates must imply that full payout growth does not vary with expected inflation.

A few words about full payout growth—although g_{fp} is lower than g , because it excludes growth due to earnings that are retained, a full payout policy does not require that firm-level growth decline accordingly; firms can issue new shares in the future to replace increased dividend payout. The only growth that is relevant for earnings yields, however, is the lower earnings growth that can be achieved on *existing* shares under a full payout policy. Also, note that growth measures more familiar to economists, such as GDP growth, are not relevant here. Not only should growth

estimates relevant for earnings yields exclude growth from new firms and new issues of shares for existing firms, they should focus on dollar earnings, unadjusted for quality improvements. For example, workers assembling computers may be viewed for GDP purposes as becoming more productive over time once adjustments are made for quality improvements in the output produced, but accounting earnings will show declining profitability if nominal selling prices decline. Put differently, evidence suggesting that nominal GDP growth increases with expected inflation does not imply that nominal growth in full payout accounting earnings, g_{fp} , should also increase with expected inflation.

To understand how inflation should impact earnings yields and g_{fp} , we compare accounting numbers for two otherwise identical firms in stock markets with and without inflation. The discussion that follows is a summary of the spreadsheet simulations conducted in Thomas [2007], in which differences between the two firms' reported incomes are computed for four generic asset classes: debt instruments, inventory, depreciating assets, and nondepreciable land. These four assets span the different attributes that are relevant to a discussion of earnings yields. Debt instruments have fixed nominal cash flows (e.g., a fixed-rate bond) whereas the remaining three assets have cash flows that are

fixed in real terms (nominal cash flows should offset expected inflation). Inventory is purchased, valued at historical costs, and sold at current prices. Depreciable assets are purchased, the original cost is depreciated over time, and that depreciation is deducted each year from the cash flows generated by those assets. Land is held at its historical cost, even though it increases in value due to inflation, and generates cash flows each year from rents.

The main finding is that earnings yields in the inflation scenario are higher than those in the no-inflation scenario as long as holding gains due to inflation are recognized as accounting income. This result is not surprising for debt instruments, since earnings are simply the nominal interest charged, which is clearly higher in the inflation scenario. For inventory, since profits are computed as the excess of inflated selling prices over historical costs, earnings are higher in the inflation scenario by the amount of inflationary holding gains. Earnings are again higher in the presence of inflation for depreciable assets, since profits are computed based on the excess of the inflated nominal flows generated from those assets over the depreciation computed on historical costs.

Nondepreciable land is the only asset for which holding gains are not recognized in accounting income (assuming that land is not eventually sold and continues to be carried at historical cost). As described in the earlier land-for-rent example, nominal expected returns from investing in land, as well as the unrecognized holding gains, both increase with inflation. As a result, the difference between the two, which represents the rental income recognized as earnings, remains relatively unaffected by inflation. Although earnings yields do not co-move with the expected inflation for land, we believe that effect is likely to be small for U.S. equity markets because land is a small fraction of the total assets held by publicly traded firms.³

These same accounting rules also explain why σ_{fp} does not generally increase with inflation. For all assets, except land, including holding gains in reported earnings causes higher nominal dividend payouts in the inflation case when firms follow a full payout policy. As a result, the nominal funds available for reinvestment are similar in the inflation and no-inflation scenarios and this causes the nominal earnings growth rate possible to also be similar for the two cases. As described in the retailer example given earlier, the nominal amounts reinvested are \$100 in both the no-inflation and 2% inflation scenarios. Reinvesting similar nominal amounts results in similar nominal earnings growth rates to be projected in the two cases

and thus implies that real growth rates must be lower in the inflation scenario.

To review, the two empirical regularities on how expected inflation is related to earnings yields and nominal growth do not contradict economic intuition, once the accounting rules used to compute reported earnings are incorporated. Including inflationary holding gains in reported earnings causes earnings and earnings yields to be higher when expected inflation is high. And recognizing that the growth parameter relevant for earnings yields is full payout growth indicates why that growth is not likely to increase when expected inflation is high. This is so because paying out the inflationary gains included in earnings under higher levels of inflation results in less real investment.

IMPLICATIONS

If the evidence on earnings yields and nominal growth is consistent with rational stock markets, investors do not suffer from inflation illusion. This is a matter of great relief to us! It also has important implications. Much of modern finance is based on stock prices being reasonably efficient most of the time. Investor rationality allows many useful insights and analyses, such as explaining behavior and pricing new securities. If the conventional wisdom was right and stock prices are systematically and substantially lower (higher) than they should be for extended periods when expected inflation is high (low), systematic study of financial topics would be severely hampered.

The approximate equivalence between forward earnings yields and risk-free rates during the 1980s and 1990s suggests that stock prices can generally be explained by forecast earnings and risk-free rates. In contrast, attempts to relate market valuations with dividends, both contemporaneous and paid in the future, have typically met with little success. Prior research has concluded that this weak relation between stock prices and fundamentals (level of dividends and expected returns) suggests that stock prices are too volatile, in the sense that they often deviate from fundamentals (see, for example, Figure 1 from Grossman and Shiller [1981]); moving from observed future dividends to current forecasts of future earnings dramatically changes the inferences regarding excess volatility.

According to Equation (2), observing an approximate equivalence between earnings yields and risk-free rates implies that the equity premium must approximately cancel out full payout growth during the 1980s and 1990s.

Observing consistent equivalence suggests that full payout growth and the equity premium are both relatively constant, since it is unlikely that they both move in exactly the same way. Concluding that the equity premium varied little over the 1980s and 1990s is important for a number of research questions studied in financial economics.

This evidence has implications not only for variability in the equity premium, but also for the level of the equity premium. Based on our earlier discussion of full payout growth, we believe that full payout growth for the U.S. market should, in general, vary within a narrow range, say between zero and 5%.⁴ If so, the equity premium must also lie in the same range during these two decades. While this level of risk premium is inconsistent with equity premia around 8% derived from historic stock returns (e.g., Ibbotson [2007]), it is consistent with the lower risk premium estimates that have been proposed recently in the literature (e.g., Claus and Thomas [2001] and Fama and French [2002]).

Moving to other years in which earnings yields generally exceed risk-free rates, our discussion suggests that the equity premium was higher and/or full payout growth was lower than that during the 1980s and 1990s (see Asness [2003] for a similar conclusion based on volatility of stock returns). But the fact that co-movement between earnings yields and risk-free rates is generally observed suggests that levels of the equity premium and full payout growth remain relatively constant, as it is unlikely that they both moved similarly.

While there is general co-movement between earnings yields and risk-free rates, there are periods when the gap between the two series shifts to a new level. For example, the current economic crisis is associated with rising earnings yields, because prices have fallen faster than forecast earnings, and falling risk-free rates. This higher gap suggests an increase in the equity premium caused by investors becoming more risk averse and an increase in the perceived risk of equities. The higher gap is also consistent with lower long-term growth expectations.

Finally, efforts to link dividend yields to subsequently observed returns have generally met with little success. Recently, however, Cochrane [2008] showed that dividend yields since 1950 co-move strongly with returns earned over the following seven-year period. A simple explanation for this result is provided by the co-movement between yields and long-term risk-free rates shown in Exhibit 1. If levels of long-term risk-free rates are associated with levels of required rates of return expected over the longer term,

assuming that the equity premium remains relatively constant, it is not surprising that observed long-term returns reflect those required rates of return.

In conclusion, we focus attention on two remarkable empirical regularities that describe how yields and nominal growth vary with expected inflation. Rather than ignore them or reject them as being signs of an irrational stock market, we believe they are consistent with economic intuition. More important, they hold the potential to offer insights about important parameters that affect stock prices.

ENDNOTES

¹Since stock prices are forward looking, our focus is on inflation expected over the long-term future, not observed inflation. Long-term, risk-free yields serve as a proxy for expected inflation as long as real risk-free rates are relatively constant over time.

²We eschew the more conventional approach of linking earnings yields to dividend yields by inserting a payout ratio, because it assumes that payout ratios and dividend growth, g , are unrelated. It is easy to show that g depends on the payout ratio, but that relation is complex and not easily captured by the dividend growth model.

³Note that a substantial portion of land that appears on corporate balance sheets is not purchased land, but land associated with property acquired under capital leases. The absence of co-movement between earnings yields and inflation predicted for purchased land does not carry over to leased land.

⁴A large portion of growth in aggregate earnings is due to the issuance of new shares (primarily by new firms) and due to the reinvestment of earnings not paid out as dividends. Neither source contributes to full payout growth. The only growth that is relevant here is that due to positive net present value opportunities that will be harvested in the future, net of any decline in earnings from projects currently in operation. While such opportunities may be abundant for certain sectors or during certain periods, it is hard to conceive of substantial net growth opportunities for the aggregate market that can be sustained in perpetuity.

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