MIT Sloan School of Management

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E52-435

Finance Theory 15.415
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Assignment 3: Valuation of Common Stocks

Due: March 4 (Thursday), 1999

1. **"The Economist" on the US Stock Market** (VW)

   Attached is the editorial from the magazine "The Economist," dated August 19, 1997. The editorial is about the dramatic increase in the US stock market in the past few years. After reading the editorial carefully, answer the following questions.

   (a) Why, according to the editorial, dividends have to grow by about 7.5% a year to justify current prices? Using formulas seen in class and the assumptions of the editorial, determine the exact rate at which dividends have to grow.

   (b) According to *The Wall Street Journal* (this article is not included), the P/E ratio of the firms listed in the S&P 500 is approximately 23. Determine the PVGO of a firm listed in the S&P 500, as a percent of price, P_0. Use the assumptions of the *Economist* editorial, and assume that earnings next year are expected to be 6% higher than this year. Ignore differences across firms.

2. **One day in the life of a stock analyst** (VW)

   It is the first day of your summer job in a brokerage house. Your boss is in a surly mood because events on the American political landscape have led to a decline in the stock market. She walks in and says: "The only good investments at a hot time like this are stocks related to cold beer and air-conditioning. Find me the value of the stocks of Duke Energy and Anheuser Busch before you go home." This is your task for the day.

   You look around sheepishly and find a sympathetic face push a ketchup-covered sheet toward you that is titled, "Company Information about Duke Energy and Anheuser Busch." (This sheet—without the ketchup—is enclosed.)

Lovely While It Lasts

The Economist, August 9th, 1997

It has undeniably been lovely, and we hate to spoil the fun just as you head for the beach. But it is high time that investors took a more sceptical look at the world's soaring stockmarkets. In America in particular, the current bull run has been astonishing. Although prices have risen pretty steadily since the crash of 1987, the really giddy growth has been crammed into the past $2\,\frac{1}{2}$ years. Wall Street's rise since late 1994 has added $5 trillion to the value of shares, creating paper riches for millions of Americans. How long can such loveliness last?

Nobody really knows. Just over a year ago investors were holding their breath as the Dow Jones Industrial Average pushed towards the 6,000 mark. It is now over 8,200 and looks set at this rate to top 10,000 in 1998. Last December Alan Greenspan worried aloud about the market's "irrational exuberance." But even the Fed's chairman has now been silenced by the Dow's further rise. Calling the top of a surging bull market is clearly a mug's game, for a newspaper no less than for a central banker.

There is, however, a far more dangerous sort of game that mugs can play. This is the game of piling into shares at prices that the economic fundamentals simply do not support. In such a case investors are merely betting that the market is going to rise before it falls, and—the entertaining and nail-biting part—that they will find someone more gullible to sell to just when the time is right.

Most recent stockmarket commentary has focused on the fear that the American economy is in danger of overheating and that this will force Mr. Greenspan to snuff out inflation by raising interest rates. But a Fed-engineered slowdown is only one of the ways in which the bull run might end. An equally likely outcome is simply that growth will not be strong enough for long enough to justify present stockmarket prices. To see why, it helps to recall some elementary facts about the setting of share prices.

A little light number-crunching To justify the present mighty run, bulls point out that America's economy is in better shape than ever: low inflation, low interest rates, booming growth after $6\,\frac{1}{2}$ years of expansion and so forth. The trouble with all this is that the value of shares today has nothing to do with the past. Their value represents the market's guess of how much profit American firms will generate in the future.

In the end two things determine the price of a share: the amount of cash investors expect to receive from the company's earnings, and the difference between that amount and the income investors could earn by choosing instead to place their money in a safer fixed-interest investment. How justified do Wall Street's current valuations look in the light of present earnings and interest rates?

Long-term interest rates are presently running at around 6.5%. In the past investors have, on average, demanded and extra five percentage points or so to compensate for the extra risk of holding shares. One cheering theory holds that today's investors, many of them baby-boomers investing over long periods for their retirement, are no longer so unhappy about the short-term volatility of stocks compared with bonds.

But even if this were true, and the risk premium had fallen by half to $2\,\frac{1}{2}$%, shareholders would have to earn a return of 9% a year to justify current valuations. At present the firms listed in the S&P 500, America's biggest publicly traded companies, are paying dividends of around $115 billion a year. Of course, this paltry dividend yield of only around 1.6% does not include the capital gains that investors expect in future. Ultimately, though, such increases must be backed up by rising dividends. To justify current prices those dividends will have to grow fast (by about $7\,\frac{1}{2}$% a year, it turns out) to generate a reasonable return. And since inflation is currently running at around 3% a year, firms' profits must rise by 4–5% in real terms indefinitely.

To many bulls this seems easy. The profits of America's non-financial companies have been growing by 19% a year during the current expansion. But this is hardly a guide to future performance. Since profits tend to be low during recessions, they rebounded sharply as America's recovery took hold. Now, though, the recovery is no longer new. With the expansion beginning to moderate, and labour markets tightening, firms' output cannot grow faster than productivity without reigniting inflation.

There is of course a delightful notion that productivity in America is in the throes of a secular rise, thanks to the spread of information technology, deregulation and globalisation—and to the virtuous interaction of these things. Although official numbers do not yet support this case, the difficulty of measuring productivity accurately in a service-driven modern economy is widely acknowledged. Even so, for investors to base their expectations on such anecdotal evidence is perilous in the extreme. Historically, real productivity growth has risen at 2–2 $\frac{1}{2}$%. It would have to rise by twice as much to deliver the needed 4–5% growth in real profits.

There is a third way—beyond growth in output or growth in productivity—for firms to increase their flow of profits, and therefore buoy up share prices. They can also, if workers oblige, divert a bigger share of their revenues from wages into profits. Economists are having a lively debate as to whether this diversion is taking place, and to what degree. But even if it is taking place, it must be close to its limits in an economy at pretty full employment. After years of holding steady, unit labour costs have been on the rise, which means that wage increases are at last beginning to outstrip productivity gains.

As befits a bit of light number-crunching to take to the beach, much of the foregoing could be written on the back of an envelope. And as proponents of rational expectations love to point out, the market knows all. In this case, it certainly seems to know something *The Economist* has missed. Still, our best wishes for the holiday season.

Company Information About
Duke Energy and Anheuser Busch

Duke Energy:
Supplies electricity to 1.8 million customers in North and South Carolina and supplies approximately 12% of the natural gas consumed in the US. Has 20,000 employees and 130,683 common stockholders. Source: *Value Line.*

Anheuser Busch:
The world's largest brewer, one of the largest theme park operators in the US, the second-largest US manufacturer of aluminum beverage containers. Significant brands: Budweiser, Michelob, and Busch. Has 24,125 employees and 64,120 shareholders. Source: *Value Line.*

Dividend Information

Company Name	This Year's Dividend	Next Year's Dividend	2-yr Avg Forecasted Dividend growth
Duke Energy	2.20	2.29	4.0%
Anheuser Busch	1.04	1.13	8.4%

Historical average growth rates

	1-Year Growth Rates			
Company Name	1994	1995	1996	5-yr Avg
Duke Energy	4.35	4.17	4.00	4.36
Anheuser Busch	11.43	10.26	9.30	11.52

Source: *Dow-Jones News Retrieval*

Historical ROE $\times$ (1 $-$ payout ratio)

Company Name	5-year avg ROE	5-year avg payout	Estimated Div Growth
Duke Energy	13.0%	69%	4%
Anheuser Busch	23.6%	39%	14%

Source: *Value Line*

Information on interest rates and risk premia

Long-term Interest Rates	6.0%
Market Risk Premium	5.0%

Adjustments to Market Premium

Duke Energy	-1.50%
Anheuser Busch	-0.75%