

**The Defined Future Earnings Model**  
**And the Riddle of Perpetual Claims**

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## Overview

In his timeless 1936 essay on the stock market, John Keynes observed: "...the market is subject to waves of optimistic and pessimistic sentiment which are unreasoning, and yet in a sense legitimate, where no solid basis exists for a reasonable calculation." Elsewhere in the same essay he asserts: "investment based on genuine long-term expectation is so difficult today as to be scarcely practicable."

Benjamin Graham felt likewise regarding classic valuation theory based on the discounted present value of dividends and/or internal rate of return. Thus, according to Graham "There is a well established principle which states that the investment value of a common stock equals the "present worth" of all its future dividends. To apply this principle in practice would require dividend projections for, say, between 40 and 50 years. We do not believe that estimates for so remote a future can be made with enough dependability to be really useful."

Meanwhile, William Sharpe has noted "The key idea behind the theory [CAPM] is that of market efficiency...definition is difficult, but the idea is that the price of a security will rarely diverge significantly for long from its intrinsic value defined as the certain present value of the uncertain future prospects assessed by a clever, well informed analyst.

In addition Milton Friedman is on record as saying: "The value of every asset -- whether a share of stock or what not -- is the discounted value of the future returns that asset is expected to yield."

While Alan Greenspan has cryptically noted "The value ascribed to any asset is a discounted value of future expected returns, *even if no market participant makes that calculation.*"

The aim of this paper is to shed light on the above points of view by examining the two classical models in finance for appraising common stocks; namely, the discounted present value and/or the internal rate of return. Based on the evidence presented here, we conclude that these models are woefully lacking in their ability to appraise stocks "correctly." Essentially this is because of their hyper-sensitivity to the underlying assumptions about future earnings growth rates, payout rates, discount rates, etc. required to make financial sense of the perpetual claim on a company's future earnings ability that a share of common stock represents.

An addendum to the paper examines the accuracy of consensus annual earnings forecasts and consensus estimates of future long-term (five year) earnings growth rates. The study finds that stock prices are extremely sensitive to errors in these forecasts, while accuracy for the five year forecasts of earnings growth rates is virtually non existent.

## **Introduction**

Exhibit 1 on the following page illustrates the Defined Future Earnings Model for short (5 year) intermediate (25 year) and Long-term (Infinite Horizon) approaches for the assessment of common stocks. The model determines both the Discounted Present Value (DPV) and the Internal Rate of Return (IRR) simultaneously. (Please refer to Exhibit 1 briefly and then return here.)

The model contains three distinct sections. The top-left-hand section is where the user enters the required inputs for determining future cash flows for the stock. The section on the right displays the output that is generated when recalculation for the model is initiated.

Beneath the input/output tables, each year's annual cash flows used to evaluate the stock are displayed. In the he Infinite Horizon case, which leans heavily on dividends alone, these calculations terminate after 300 years. As a practical matter, however, most cases are resolved at the 100 year mark. A "meter" is built into the model that shows the percent of the Infinite Horizon solution that is attributable only to dividends, and how much to the future price of the stock. The percent attributable to price ceases after 25 years because price is no longer considered in either the DPV or IRR calculations. In these cases, value is entirely a function of dividends.

In the equilibrium example shown in Exhibit 1, we see that dividends alone account for 99.5% of the discounted present value after 100 years, but only 93.1% after 50 years.

Selected characteristics of the equilibrium condition are as follows: The stock's price of \$100 is equal to its book value. The firm's ROE (15%) is equal to the investor's required rate of return, or the discount rate (K). The stock's yield of 6% is equal to  $K - G$ , where G is the expected growth rate for earnings. The P/E ratio of 6.67 is equal to  $1/ROE$ , and its Discounted Present Value is equal to  $D/K - G$ , where D is the first year's dividend. All of these inputs are deemed to prevail indefinitely. The resulting DPV and IRR for a stock under these conditions are the same, regardless of the time interval selected, as shown in Exhibit 1 on the following page.

## Exhibit 1

THIS EXAMPLE DENOTES AN EQUILIBRIUM CASE WHERE CORPORATE ROE AND "K" ARE IDENTICAL (P/E = 1/ROE, etc.)

## INPUTS, SUMMARY OF OUTPUT AND FIRST 30 YEARS OF ANNUAL CASH FLOW PROJECTIONS

VALUATION INPUTS									RETURNS DERIVED FROM ANNUAL CASH FLOWS				
CURRENT PRICE	EST FY1 EPS	EST FY1 DIVIDEND	Four Phase #YEARS	EST EPS GROWTH	EST PAYOUT	EST P/E YR-END	PV DISCOUNT RATE	DIVD TAX RATE	#YRS	% IRR	WEALTH INDEX IRR	\$ PRESENT VALUE	% PRICE CHANGE TO PV
100.00	15.00	6.00	FIRST 5:	9.0	40.0	6.7	15.0	0	5	15.0	2.01	100.00	-0.0
			NEXT 10:	9.0	40.0	6.7			25	15.0	32.92	100.00	-0.0
			NEXT 10:	9.0	40.0	6.7			ALL	15.0	-	100.00	-0.0
			MATURITY:	9.0	40.0	N/M							
CURR ON BUY DAT		YIELD:	6.0	PAYOUT:	40.0	P/E:	6.7						

YEAR END	EPS	AFTER TAX DIVIDEND	PRE-TAX STOCK PRICE	IRR INPUTS KEYED TO PRICE & DIVIDENDS			IRR FOR DIVIDENDS ONLY	DISCOUNTED PRESENT VALUE			STOCK PRICE +DIVS		
				5 YRS	15 YRS	25 YRS		ALL YEARS	DIVIDENDS ANNUAL	DIVIDENDS CUMULATIVE		STOCK PRICE	
0			100.00	(100.00)	(100.00)	(100.00)	(100.00)						
1	15.00	6.00	109.00	6.00	6.00	6.00	6.00	5.22	5.22	94.78	100.00		
2	16.35	6.54	118.81	6.54	6.54	6.54	6.54	4.95	10.16	89.84	100.00		
3	17.82	7.13	129.50	7.13	7.13	7.13	7.13	4.69	14.85	85.15	100.00		
4	19.43	7.77	141.16	7.77	7.77	7.77	7.77	4.44	19.29	80.71	100.00		
5	21.17	8.47	153.86	162.33	8.47	8.47	8.47	4.21	23.50	76.50	100.00		
6	23.08	9.23	167.71		9.23	9.23	9.23	3.99	27.49	72.51	100.00		
7	25.16	10.06	182.80		10.06	10.06	10.06	3.78	31.28	68.72	100.00		
8	27.42	10.97	199.26		10.97	10.97	10.97	3.59	34.86	65.14	100.00		
9	29.89	11.96	217.19		11.96	11.96	11.96	3.40	38.26	61.74	100.00		
10	32.58	13.03	236.74		13.03	13.03	13.03	3.22	41.48	58.52	100.00		
11	35.51	14.20	258.04		14.20	14.20	14.20	3.05	44.54	55.46	100.00		
12	38.71	15.48	281.27		15.48	15.48	15.48	2.89	47.43	52.57	100.00		
13	42.19	16.88	306.58		16.88	16.88	16.88	2.74	50.17	49.83	100.00		
14	45.99	18.39	334.17		18.39	18.39	18.39	2.60	52.77	47.23	100.00		
15	50.13	20.05	364.25		384.30	20.05	20.05	2.46	55.24	44.76	100.00		
16	54.64	21.85	397.03			21.85	21.85	2.34	57.57	42.43	100.00		
17	59.55	23.82	432.76		DIVIDENDS	23.82	PRICE	23.82	2.21	59.79	40.21	100.00	
18	64.91	25.97	471.71		AS % OF	25.97	AS % OF	25.97	2.10	61.88	38.12	100.00	
19	70.76	28.30	514.17		FINAL PV	28.30	FINAL PV	28.30	1.99	63.87	36.13	100.00	
20	77.12	30.85	560.44			30.85		30.85	1.88	65.76	34.24	100.00	
21	84.07	33.63	610.88	5 YRS	23.5	33.63	76.5	33.63	1.79	67.54	32.46	100.00	
22	91.63	36.65	665.86	25 YRS	73.8	36.65	26.2	36.65	1.69	69.24	30.76	100.00	
23	99.88	39.95	725.79	50 YRS	93.1	39.95		39.95	1.61	70.84	29.16	100.00	
24	108.87	43.55	791.11	75 YRS	98.2	43.55		43.55	1.52	72.36	27.64	100.00	
25	118.67	47.47	862.31	100 YRS	99.5	909.77		47.47	1.44	73.81	26.19	100.00	
26	129.35	51.74						51.74	1.37	75.17			
27	140.99	56.39						56.39	1.30	76.47			
28	153.68	61.47						61.47	1.23	77.69			
29	167.51	67.00						67.00	1.16	78.86			
30	182.58	73.03						73.03	1.10	79.96			

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### **Review of the Model's Construction**

DFE is a four stage model. Thus, it can accommodate growth stocks that may not currently pay dividends, may be assumed to never pay them or to gradually begin paying them. The 5 and 25 year horizon models utilize a discounted future sale price – keyed to an estimated P/E ratio to handle these situations.

Of course, classical valuation theory assumes that someone, (or an institution) will *always* own the company's stock and that correct valuation of what is inherently a perpetual claim should be made from a "buy and hold" perspective.

For a mature company, whose earnings and dividends are expected to grow at a constant rate for the "foreseeable future," only one stage of inputs is required. This is readily accommodated by simply entering the same estimate for all four stages of the model.

By delving into the cash flow section of the model (beneath the input/output table) one can also find the IRR estimate for a 15 year time frame as well as the discounted present value for the stock in any given year based upon the P/E derived price. After the first 25 years have elapsed, price is no longer a consideration and the model switches over to a dividends only approach

I/B/E/S, First Call or Zacks will provide the first year's earnings estimate and an estimated "long-term" earnings growth rate for the next five years. (Note that First Call and Zacks estimates are virtually identical to those of IBES, since all three services rely on the same "street" sources.) The first year's dividend is easy to estimate. However if the P/E ratio is expected to rise or fall (as it no doubt will) the terrain becomes difficult. Growth stocks are very hard to cope with, period.

Needless to say, estimated earnings and dividends for a single year combined with a five year projected EPS growth are not the Rosetta stones for determining the investment attractiveness of the S&P 500, or of any stock. Thus, Wall Street analysts will provide estimates of earnings growth rates for the next five years, but not for 25 years ahead, or the indefinite future which is in the "perpetual claim domain."

Exhibit 2 on the following page shows the model's input requirements and contains a sample set of plausible inputs that could be used to evaluate the S&P 500 Index on December 31, 2006.

Common stocks are perpetuities--can't avoid making a bet on the future - Peter Bernstein

The market will be subject to waves of optimistic and pessimistic sentiment, which are unreasoning and yet in a sense legitimate where *no solid basis exists for a reasonable calculation.* - John Maynard Keynes

### Exhibit 2

<b>Defined Future Earnings Model Inputs for the S&amp;P 500 Ind</b>					
December 31, 2006					
<b>ALL STAR CONSENSUS</b>					
			<b>OLD SCHOOL</b>	<b>NEW SCHOOL</b>	
			Keynes Williams Graham Buffett	Markowitz Sharpe Modigliani Fama	
<b>Input</b>			<b>Writer's Base-Case Projections</b>		
Current Price			1,418		
ESTIMATED EPS			92.00	(Just kidding - no estimates are available from these famous Wall Street Gurus!)	
ESTIMATED Dividend 2007			25.70		
<b>ESTIMATED Earnings Growth Rate</b>					
First Five Years			7.0		
Next Ten Years			7.0		
Next Ten Years			7.0		
Maturity			7.0		
<b>ESTIMATED Dividend Payout Rate</b>					
First Five Years			28.0		
Next Ten Years			28.0		
Next Ten Years			28.0		
Maturity			28.0		
<b>ESTIMATED P/E Ratio (on 12/31)</b>					
First Five Years			15.4		
Next Ten Years			15.4		
Next Ten Years			15.4		
Required Rate of Return			9.0		
Dividend Tax Rate			0.0		

### **DFE Input / Output Tables**

Table 1 below denotes with an “X” the input variables each sub-model utilizes for its internal rate of return and present value calculations. Although the output table only displays results for three time periods, other time periods can be accessed by reviewing the detailed cash flow projections.

Table 1

<b>Input</b>	<b>Discounted Present Value</b>			<b>Internal Rate of Return</b>		
	<b>5 Year Horizon</b>	<b>25 Year Horizon</b>	<b>300 Year Infinite Horizon</b>	<b>5 Year Horizon</b>	<b>25 Year Horizon</b>	<b>300 Year Infinite Horizon</b>
Current Stock Price	-	-	-	X	X	-
ESTIMATED EPS 2007	X	X	X	X	X	X
ESTIMATED Dividend 2007	X	X	X	X	X	X
<b>ESTIMATED Earnings Growth Rate</b>						
First Five Years (2007 thru 2011)	X	X	X	X	X	X
Next Ten Years (2012 thru 2021)	-	X	X	-	X	X
Next Ten Years (2022 thru 2032)	-	X	X	-	X	X
Maturity (years beyond 2032)	-	-	X	-	-	X
<b>ESTIMATED Dividend Payout Rate</b>						
First Five Years	X	X	X	X	X	X
Next Ten Years	-	X	X	-	X	X
Next Ten Years	-	X	X	-	X	X
Maturity	-	-	X	-	-	X
<b>ESTIMATED P/E Ratio (on 12/31)</b>						
First Five Years	X	X	-	X	X	-
Next Ten Years	-	-	-	-	-	-
Next Ten Years	-	X	-	-	X	-
Maturity	-	-	-	-	-	-
Required Rate of Return	X	X	X	-	-	-

### The Challenge of Looking Ahead

Before turning to a review of the tentative best-case projections set out in Exhibit 2, Table 2 below provides a snapshot of the S&P 500's performance, at five year intervals, for the past 51 years -- 1955 through 2006. In other words, if one had been able to project the market's performance for any of the 10 five-year periods spanning this long time frame, these are the actual results he would have been trying to model for an IRR or DPV appraisal. We have also broken out the 25 and 26 year results with the same purpose in mind. The annual variability of prices, earnings and P/E ratios is examined on the following page.

Table 2

<b>Historic Performance for the S&amp;P 500 Index</b>							
<b>Date</b>	<b>Price</b>	<b>Reported EPS</b>	<b>Latest 12 Months Dividends</b>	<b>P/E On Rep EPS</b>	<b>Dividend Yield</b>	<b>Payout Rate</b>	
<b>Dec-55</b>	<b>45</b>	<b>3.62</b>	<b>1.64</b>	<b>12.6</b>	<b>3.6</b>	<b>45</b>	
Dec-60	58	3.27	1.95	17.8	3.4	60	
Dec-65	92	5.19	2.72	17.8	2.9	52	
Dec-70	92	5.13	3.14	18.0	3.4	61	
Dec-75	90	7.96	3.68	11.3	4.1	46	
<b>Dec-80</b>	<b>136</b>	<b>14.82</b>	<b>6.16</b>	<b>9.2</b>	<b>4.5</b>	<b>42</b>	
Dec-85	211	14.61	7.90	14.5	3.7	54	
Dec-90	330	21.34	12.10	15.5	3.7	57	
Dec-95	616	33.96	13.79	18.1	2.2	41	
Dec-00	1,320	50.00	16.27	26.4	1.2	33	
Dec-05	1,248	69.93	22.22	17.9	1.8	32	
<b>Dec-06</b>	<b>1,418</b>	<b>81.37</b>	<b>24.08</b>	<b>17.4</b>	<b>1.7</b>	<b>30</b>	
<b>% Chg 1955-80</b>	<b>199</b>	309	276	-27	26	-8	
<b>% Chg 1980-06</b>	<b>945</b>	449	291	90	-63	-29	
<b>Compound rate</b>	<b>4.5</b>	5.8	5.4	-1.3	0.9	-0.03	
<b>Compound rate</b>	<b>9.4</b>	6.8	5.4	2.5	-3.7	-1.3	

These returns are for price appreciation only. Total returns, with dividends reinvested, were 11.9% compounded annually for the 25 years ending 1980 and 13.9% for the 26 years ending 2006. The holding period returns were 1,560% and 2,820% respectively. Notice how dramatically the dividend payout rate and yield have dropped over this time frame.

Exhibit 5 below provides a stark illustration of just how volatile and difficult to predict are future P/E ratios due to the chronic instability of prices and earnings. Still, P/E's are often treated as a valuation tool and a determinant of security prices. Their year-to-year variability, however, suggests they are often just a residual product of price movements that are driven by alternating waves of optimism and pessimism about the future.

<b>Exhibit 5</b>							
<b>Prices, Earnings and P/E Ratios for the S&amp;P 500 Index</b>							
				<b>One Year Percent Change</b>			
<b>Year</b>	<b>Current</b>	<b>Latest 12</b>	<b>Latest 12</b>		<b>Latest 12</b>	<b>Latest 12</b>	
<b>End</b>	<b>Price</b>	<b>Months</b>	<b>Months</b>	<b> </b>	<b>Current</b>	<b>Months</b>	<b>Months</b>
		<b>EPS</b>	<b>P/E</b>	<b> </b>	<b>Price</b>	<b>EPS</b>	<b>P/E</b>
2006	1,418	81.37	17.4		14	16	-2
2005	1,248	69.93	17.9		3	19	-14
2004	1,212	58.55	20.7		9	20	-9
2003	1,112	48.74	22.8		26	77	-28
2002	880	27.59	31.9		-23	12	-31
2001	1,148	24.69	46.5		-13	-51	76
2000	1,320	50.00	26.4		-10	4	-13
1999	1,469	48.17	30.5		20	28	-6
1998	1,229	37.71	32.6		27	-5	33
1997	970	39.72	24.4		31	3	28
1996	741	38.73	19.1		20	14	5
1995	616	33.96	18.1		34	11	21
1994	459	30.60	15.0		-2	40	-30
1993	466	21.89	21.3		12	37	-18
1992	417	15.97	26.1		26	-25	69
1991	330	21.34	15.5		-7	-7	0
1990	353	22.87	15.5		27	-4	32
1989	278	23.75	11.7		NA	NA	NA

Or, to put it another way, as Paul Samuelson observed years ago in a 1967 column in Newsweek:

Although present and probable future corporate profits are admittedly the most important determinant of intermediate market movements, *no way exists to determine what is the proper price-earnings ratio*. President Hadley of Yale used to say: "God Almighty does not know the cost of moving a ton of freight from New York to Chicago." I doubt that the devil himself knows what is the equilibrium price-earnings ratio on stocks. Fifteen to 1, as Secretary Douglas Dillon once rashly averred? Twenty five to 1? Or 14 to 1, as the tape enunciates now that high interest rates imply high P/E ratios on bond investments. *No one knows.*

## Permutations

In Exhibit 2 we made a best-case estimate of plausible inputs for evaluating the S&P 500's outlook at the end of 2006. We used a discount rate of 9% and expected EPS growth of 7% for the foreseeable future. The so called base-case holds the payout rate constant at 28% and assumes the P/E ratio will hold steady at 15.4. Results using these inputs are shown in the table below

VALUATION INPUTS										RETURNS DERIVED FROM ANNUAL CASH FLOWS				
CURRENT PRICE	EST FY1 EPS	EST FY1 DIVIDEND	Four Phase #YEARS	EST EPS GROWTH	EST PAYOUT	EST P/E YR-END	PV DISCOUNT RATE	DIVID TAX RATE		#YRS	% IRR	WEALTH INDEX IRR	\$ PRESENT VALUE	% PRICE CHANGE TO PV
1418.00	92.00	25.70	FIRST 5:	7.0	28.0	15.4	9.0	0		5	8.8	1.52	1,405.35	-0.9
			NEXT 10:	7.0	28.0	15.4				25	8.8	8.26	1,369.01	-3.5
			MATURITY:	7.0	28.0	N/M				ALL	8.8	-	1,282.97	-9.5
CURR ON BUY DATE		YIELD:	1.8	PAYOUT:	27.9	P/E:	15.4							

If we were to become more aggressive, however, and raise the discount rate to 12% (comparable to the past 50 years total return for the S&P) the present value of the Index would fall to \$803 (a drop of 41%) for the 25 year model and to \$515 (a drop of 60%) for the infinite horizon model. *Note, moreover, that the IRR of 8.8%, is unaffected by the 12.0% discount rate and still implies an 8.8% return over all three time frames under review.*

Going back to the base-case, a change in the estimated P/E for the index from 15.4 to 20.0 (given an improvement in investor "sentiment") produces the following result:

VALUATION INPUTS										RETURNS DERIVED FROM ANNUAL CASH FLOWS				
CURRENT PRICE	EST FY1 EPS	EST FY1 DIVIDEND	Four Phase #YEARS	EST EPS GROWTH	EST PAYOUT	EST P/E YR-END	PV DISCOUNT RATE	DIVID TAX RATE		#YRS	% IRR	WEALTH INDEX IRR	\$ PRESENT VALUE	% PRICE CHANGE TO PV
1418.00	92.00	25.70	FIRST 5:	7.0	28.0	20.0	9.0	0		5	14.4	1.96	1,791.13	26.3
			NEXT 10:	7.0	28.0	20.0				25	9.7	10.22	1,635.38	15.3
			MATURITY:	7.0	28.0	N/M				ALL	8.8	-	1,282.97	-9.5
CURR ON BUY DATE		YIELD:	1.8	PAYOUT:	27.9	P/E:	15.4							

Next, if earnings per share growth were estimated to be 5%, instead of 7% as in the base-case, then this is the result:

VALUATION INPUTS										RETURNS DERIVED FROM ANNUAL CASH FLOWS				
CURRENT PRICE	EST FY1 EPS	EST FY1 DIVIDEND	Four Phase #YEARS	EST EPS GROWTH	EST PAYOUT	EST P/E YR-END	PV DISCOUNT RATE	DIVID TAX RATE		#YRS	% IRR	WEALTH INDEX IRR	\$ PRESENT VALUE	% PRICE CHANGE TO PV
1418.00	92.00	25.70	FIRST 5:	5.0	28.0	15.4	9.0	0		5	6.8	1.39	1,284.98	-9.4
			NEXT 10:	5.0	28.0	15.4				25	6.8	5.20	947.43	-33.2
			MATURITY:	5.0	28.0	N/M				ALL	6.8	-	643.94	-54.6
CURR ON BUY DATE		YIELD:	1.8	PAYOUT:	27.9	P/E:	15.4							

Thus far, we have focused our attention on the S&P 500 which is largely comprised of mature companies. Still, we have seen how sensitive those assessments are to slight variations in the inputs. We have also seen how one's perspective can be dramatically affected by the time frame under review as well as the choice of an internal rate of return or discounted present value evaluation. However, these permutations pale in comparison to the challenges one confronts when doing a long-term assessment for the stock of a pure growth company with low, or non-existent, dividends.

### **A Closer Look**

Exhibit 6 on the following page takes a more detailed look at our base-case projections for the S&P 500's future performance. Cash flows are shown for the first 30 years although the actual model terminates the Infinite Horizon after projecting the data for 300 years so that the last penny gets counted whatever the situation.

For the two shorter time horizons of 5 and 25 years respectively, the cumulative value of discounted dividends is added to the discounted value of the stock's price on the end date. Thus, for the 25 year time frame the cumulative discounted value of dividends is \$477.27. The projected stock price is \$7,689.59 with a present value of \$891.74. The sum of these two produces the total discounted present value of \$1,369.01.

Upon further examination of all the cash flows we can determine that at the end of 100 years, the cumulative present value of discounted dividends is only 84.6% of the terminal 300 year value of \$1,282.97. Parenthetically, the value of the 100<sup>th</sup> year dividend is \$20,890 up from \$27.50 in 2007, while EPS have climbed to \$74,607. The discounted present value (at a 9% rate) of the 100<sup>th</sup> year dividend, however, is only \$3.78.

Please refer to Exhibit 6

## Exhibit 6

## S&amp;P 500 12-31-06: Writer's Base-Case Projections

## INPUTS, SUMMARY OF OUTPUT AND FIRST 30 YEARS OF ANNUAL CASH FLOW PROJECTIONS

										RETURNS DERIVED FROM ANNUAL CASH FLOWS				
CURRENT PRICE	EST FY1 EPS	EST FY1 DIVIDEND	Four Phase #YEARS	EST EPS GROWTH	EST PAYOUT	EST P/E YR-END	PV DISCOUNT RATE	DIVD TAX RATE		#YRS	% IRR	WEALTH INDEX IRR	\$ PRESENT VALUE	% PRICE CHANGE TO PV
1418.00	92.00	25.70	FIRST 5: NEXT 10: NEXT 10: MATURITY:	7.0 7.0 7.0 7.0	28.0 28.0 28.0 28.0	15.4 15.4 15.4 N/M	9.0	0		5	8.8	1.52	1,405.35	-0.9
										25	8.8	8.26	1,369.01	-3.5
										ALL	8.8	-	1,282.97	-9.5
CURR ON BUY DAT		YIELD:		1.8	PAYOUT:	27.9	P/E:	15.4						
										DISCOUNTED PRESENT VALUE				
YEAR END	EPS	AFTER TAX DIVIDEND	PRE-TAX STOCK PRICE	IRR INPUTS KEYED TO PRICE & DIVIDENDS			IRR FOR DIVIDENDS ONLY		DISCOUNTED PRESENT VALUE		STOCK PRICE +DIVDS			
				5 YRS	15 YRS	25 YRS	ALL YEARS	DIVIDENDS ANNUAL	CUMULATIVE	STOCK PRICE				
0			1,418.00	(1,418.00)	(1,418.00)	(1,418.00)		(1,418.00)						
1	92.00	25.70	1515.98	25.70	25.70	25.70		25.70	23.58	23.58	1,390.80	1,414.38		
2	98.44	27.56	1622.09	27.56	27.56	27.56		27.56	23.20	46.78	1,365.28	1,412.06		
3	105.33	29.49	1735.64	29.49	29.49	29.49		29.49	22.77	69.55	1,340.23	1,409.78		
4	112.70	31.56	1857.14	31.56	31.56	31.56		31.56	22.36	91.91	1,315.64	1,407.55		
5	120.59	33.77	1987.14	2,020.90	33.77	33.77		33.77	21.95	113.85	1,291.50	1,405.35		
6	129.03	36.13	2126.23		36.13	36.13		36.13	21.54	135.40	1,267.80	1,403.20		
7	138.07	38.66	2275.07		38.66	38.66		38.66	21.15	156.54	1,244.54	1,401.09		
8	147.73	41.36	2434.33		41.36	41.36		41.36	20.76	177.30	1,221.71	1,399.01		
9	158.07	44.26	2604.73		44.26	44.26		44.26	20.38	197.68	1,199.29	1,396.97		
10	169.14	47.36	2787.06		47.36	47.36		47.36	20.00	217.69	1,177.28	1,394.97		
11	180.98	50.67	2982.15		50.67	50.67		50.67	19.64	237.32	1,155.68	1,393.01		
12	193.65	54.22	3190.91		54.22	54.22		54.22	19.28	256.60	1,134.48	1,391.08		
13	207.20	58.02	3414.27		58.02	58.02		58.02	18.92	275.53	1,113.66	1,389.19		
14	221.71	62.08	3653.27		62.08	62.08		62.08	18.58	294.10	1,093.23	1,387.33		
15	237.23	66.42	3909.00		3,975.42	66.42		66.42	18.24	312.34	1,073.17	1,385.51		
16	253.83	71.07	4182.63			71.07		71.07	17.90	330.24	1,053.48	1,383.72		
17	271.60	76.05	4475.41			76.05		76.05	17.57	347.81	1,034.15	1,381.96		
18	290.61	81.37	4788.69			81.37		81.37	17.25	365.06	1,015.17	1,380.23		
19	310.95	87.07	5123.90			87.07		87.07	16.93	382.00	996.54	1,378.54		
20	332.72	93.16	5482.57	Period	FINAL PV	93.16	FINAL PV	93.16	16.62	398.62	978.26	1,376.88		
21	356.01	99.68	5866.35	5 YRS	8.9	99.68	91.1	99.68	16.32	414.94	960.31	1,375.25		
22	380.93	106.66	6276.99	25 YRS	37.2	106.66	62.8	106.66	16.02	430.95	942.69	1,373.64		
23	407.60	114.13	6716.38	50 YRS	60.6	114.13		114.13	15.72	446.68	925.39	1,372.07		
24	436.13	122.12	7186.53	75 YRS	75.4	122.12		122.12	15.44	462.12	908.41	1,370.53		
25	466.66	130.66	7689.59	100 YRS	84.6	7,820.25		130.66	15.15	477.27	891.74	1,369.01		
26	499.32	139.81						139.81	14.87	492.14				
27	534.28	149.60						149.60	14.60	506.74				
28	571.68	160.07						160.07	14.33	521.08				
29	611.69	171.27						171.27	14.07	535.15				
30	654.51	183.26						183.26	13.81	548.96				

## The Effect of Dividend Taxation

Finally we want to consider how taxation of dividends affects the S&P 500's investment attractiveness. Thus, the input/output tables below shows results for a tax exempt investor such as a pension fund, 401k or IRA account versus an investor with dividend tax rates of 15 and 35 percent. By holding the discount rate steady at 9%, we can see the impact on both the internal rate of return and discounted present value of the market for taxpayers in different brackets. As expected, the impact is quite substantial.

### Tax exempt investor

VALUATION INPUTS										RETURNS DERIVED FROM ANNUAL CASH FLOWS				
CURRENT PRICE	EST FY1 EPS	EST FY1 DIVIDEND	Four Phase #YEARS	EST EPS GROWTH	EST PAYOUT	EST P/E YR-END	PV DISCOUNT RATE	DIVID TAX RATE		#YRS	% IRR	WEALTH INDEX IRR	\$ PRESENT VALUE	% PRICE CHANGE TO PV
1418.00	92.00	25.70	FIRST 5:	7.0	28.0	15.4	9.0	0		5	8.8	1.52	1,405.35	-0.9
			NEXT 10:	7.0	28.0	14.4				25	8.8	8.26	1,369.01	-3.5
			MATURITY:	7.0	28.0	N/M				ALL	8.8	-	1,282.97	-9.5
CURR ON BUY DATE		YIELD:	1.8	PAYOUT:	27.9	P/E:	15.4							

### Impact of a 15% tax rate on dividends:

VALUATION INPUTS										RETURNS DERIVED FROM ANNUAL CASH FLOWS				
CURRENT PRICE	EST FY1 EPS	EST FY1 DIVIDEND	Four Phase #YEARS	EST EPS GROWTH	EST PAYOUT	EST P/E YR-END	PV DISCOUNT RATE	DIVID TAX RATE		#YRS	% IRR	WEALTH INDEX IRR	\$ PRESENT VALUE	% PRICE CHANGE TO PV
1418.00	92.00	25.70	FIRST 5:	7.0	28.0	15.4	9.0	15		5	8.5	1.51	1,388.28	-2.1
			NEXT 10:	7.0	28.0	14.4				25	8.5	7.76	1,297.42	-8.5
			MATURITY:	7.0	28.0	N/M				ALL	8.5	-	1,090.52	-23.1
CURR ON BUY DATE		YIELD:	1.8	PAYOUT:	27.9	P/E:	15.4							

### Impact of a 35% Tax rate on dividends

VALUATION INPUTS										RETURNS DERIVED FROM ANNUAL CASH FLOWS				
CURRENT PRICE	EST FY1 EPS	EST FY1 DIVIDEND	Four Phase #YEARS	EST EPS GROWTH	EST PAYOUT	EST P/E YR-END	PV DISCOUNT RATE	DIVID TAX RATE		#YRS	% IRR	WEALTH INDEX IRR	\$ PRESENT VALUE	% PRICE CHANGE TO PV
1418.00	92.00	25.70	FIRST 5:	7.0	28.0	15.4	9.0	35		5	8.2	1.48	1,365.51	-3.7
			NEXT 10:	7.0	28.0	14.4				25	8.2	7.14	1,201.97	-15.2
			MATURITY:	7.0	28.0	N/M				ALL	8.1	-	833.93	-41.2
CURR ON BUY DATE		YIELD:	1.8	PAYOUT:	27.9	P/E:	15.4							

This concludes our review of the Discounted Dividend and Internal Rate of Return valuation models. We think this review has amply illustrated numerous difficulties that can arise when trying to implement one of the most theoretically correct methods of appraising a given stock or the market as a whole. Thus the specific model and time frame selected can make all the difference – not to mention the choice of a discount rate, estimated EPS growth rates and dividend payout rates. In the addendum that follows we focus on just one of these problems – the woeful inaccuracy of earnings forecasts.

## ADDENDUM

### Stock Price Performance in Relation To Errors in Consensus Earnings Forecasts

This appendix summarizes a study by the author of errors in consensus forecasts of annual EPS and long-term earnings growth rates for the five year period ending December 1986. A number of studies have found annual earnings forecasts to be woefully inaccurate and to have a significant impact on stock prices. This study confirms those results as well as providing new information about the inaccuracy of long-term growth rate forecasts and the magnitude of price changes associated with those errors.

The database for the study was obtained from the Equity Analysis System maintained by Zacks Investment Research. Only companies meeting the following criteria were included: December fiscal-year end; estimated, and actual, FY EPS not less than \$0.25; at least two estimates for long-term earnings growth rate. In addition, about 100 Utility stocks were excluded from the study resulting in 350 companies that qualified. The average number of annual EPS forecasts per company was 13 and for long-term earnings growth the average was 6.

Errors for the one year forecasts were expressed as the percent by which actual EPS were above, or below, estimate. Long-term growth rate errors were expressed as the percentage point difference between the estimated growth rate and the next five years actual least squares growth rate.

The relationship between annual forecast errors and price change was measured over a 15 month period following the date of the estimate. For forecasts of long-term growth, estimate errors and price change were compared over a 63 month period. In both cases, price performance is measured to the end of the quarter in which actual earnings used to evaluate errors were reported.

### RESEARCH FINDINGS

The mean absolute forecast error for annual EPS was 22.6% over this five year period. The consensus estimate was higher than actual earnings 72% of the time. The five year average R-square between estimated EPS and reported earnings was 0.79. This was only slightly better than an average R-square of 0.76 when earnings in the prior year were used as the estimate for the current year.

The mean absolute forecast error for the estimated long-term growth rates was 13.9%, while 73% of the estimates were too high. There was no correlation between estimates and actuals -- the R-square was 0.00. This was also the case when the previous five years least square growth rate was used to estimate the next five years growth rate.

To examine the relationship between forecast errors and price performance, all stocks were ranked on the direction of errors where "+" denotes a positive earnings surprise (actual above estimate) and "-" denotes a negative earnings surprise (actual below estimate). Ten deciles, comprised of 35 stocks each, were then formed to examine the relationship between price performance and the size and direction of forecast errors. Table 1 below shows results for the annual forecasts.

Table 1

One Year EPS Forecast Errors and Price Change

DECILE	% Annual Estimate Error						15 Month % Price Change					
	'82	'83	'84	'85	'86	5 YEAR	'82	'83	'84	'85	'86	5 YEAR
						AVG						AVG
1	21	35	36	25	38	31	70	31	23	83	60	53
2	1	10	12	5	8	7	54	27	24	78	60	49
3	-5	3	4	-1	2	1	54	21	22	68	49	43
4	-11	-1	-1	-6	0	-4	35	18	19	61	52	37
5	-18	-5	-4	-11	-4	-8	32	15	17	51	45	32
6	-26	-9	-8	-16	-8	-14	25	10	9	49	35	26
7	-34	-14	-14	-25	-16	-20	19	12	4	34	31	20
8	-42	-22	-21	-35	-24	-29	16	3	-6	38	28	16
9	-53	-35	-34	-50	-37	-42	22	10	-10	23	15	12
10	-72	-55	-59	-64	-63	-63	12	6	-9	11	11	6
AVERAGE	-24	-9	-9	-15	-11	-14	34	15	9	51	38	30

As seen in Table 1, the relationship between estimate errors and price performance is quite strong. Over the 5 year period the stocks in decile 1 (positive earnings surprises) had an average price gain of 53%, while the decile 10 stocks (largest negative surprises) rose 6%. Table 2 on the following page shows similar results for errors in estimated long-term growth rates, with the stocks in decile 1 rising 318% versus a gain of 33% for the stocks in decile 10.

**Table 2**  
**LONG-TERM GROWTH RATE FORECAST ERRORS**  
 350 Stock Universe: 12/81 - 12/86

	DECILE	GROWTH RATE ERROR	5 YEAR PRICE CHANGE	EST GROWTH RATE	ACTUAL LS GROWTH RATE
ACT ABOVE EST	1	22.3	318.2	15.1	37.4
	2	4.8	297.0	13.0	17.8
	3	0.8	243.1	13.9	14.7
ACT BELOW EST	4	-2.3	226.7	13.9	11.6
	5	-5.1	172.3	14.7	9.6
	6	-8.1	156.1	14.4	6.3
	7	-12.4	97.2	15.7	3.3
	8	-17.9	100.3	15.7	-2.1
	9	-24.5	77.8	16.6	-7.9
	10	-41.0	33.1	17.4	-23.6
AVERAGE		-8.2	172.6	15.0	6.8

The data in Tables 1 and 2 is also shown in Charts 1 through 4, beginning on the following page. Chart 5 below, shows the lack of correlation between estimated and actual growth rates was evenly distributed across the entire universe of companies and not attributable to outliers.

**Chart 5**  
**EST LT GRTH RATE vs. NEXT 5 YR LEAST SQ GRTH RATE**  
 Stocks Ranked Low- to-High on Est LT Growth Rate

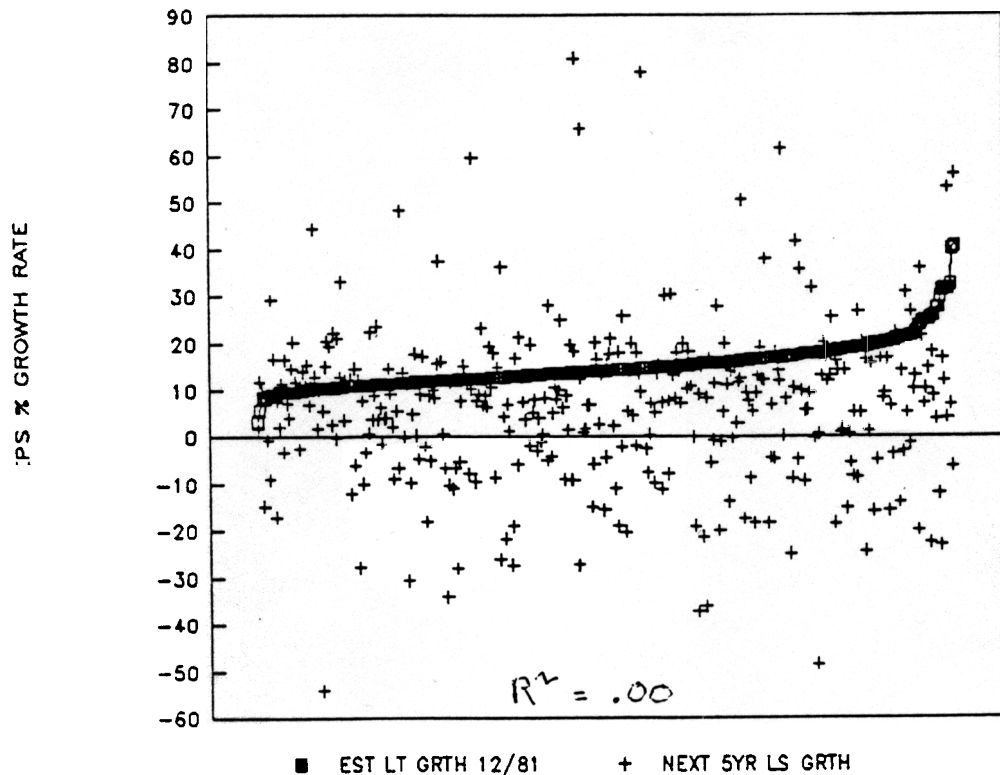
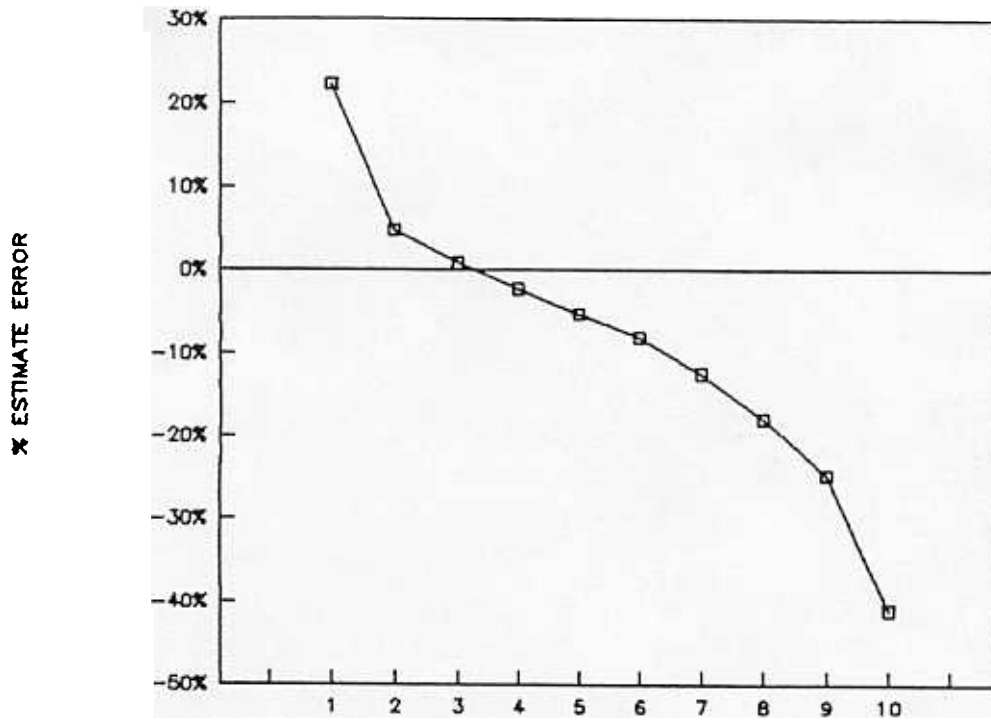


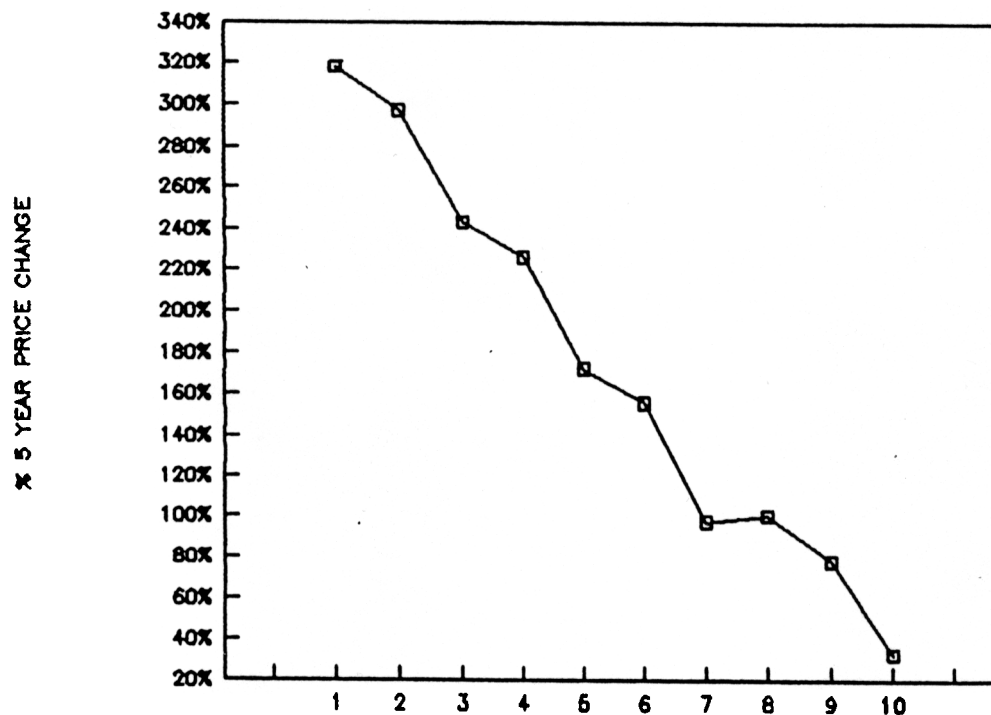


CHART 3  
LT GROWTH RATE ESTIMATE ERRORS



DECILE 1 - LARGEST POSITIVE EARNINGS SURPRISES

CHART 4  
5 YEAR PRICE CHANGE KEYED TO EST ERRORS



EACH DECILE IN BOTH CHARTS CONTAINS THE SAME STOCKS

As a further check on these results, we compared the consensus estimated five year EPS growth rate to the actual five year EPS percent change from 12/81 to 12/86. The R-square was 0.02.

### **CONCLUSION**

The results presented here strongly suggest that consensus estimates of long-term earnings growth rates (which influence both the valuation and pricing of individual stocks to an important degree) are no better than a naive forecast that each stocks' growth rate will equal the average rate for all stocks. This has important implications for value related investment models that select stocks not on the basis of explicit earnings forecasts, but rather on the (implied) prospect that forecast errors are likely to hurt glamour stocks more than they are helped, and to help unpopular/depressed stocks more than they are harmed.

\* \* \*