Equity and Fixed Income Homework

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Introduction

The primary objective of this task is to evaluate and reproduce the methodology outlined in the article titled "Market timing: Sin a little resolving the valuation timing puzzle" by Asness, C., Ilmanen, A., and Maloney, T. (2017), published in the Journal of Investment Management, volume 15(3), pages 23-40. In order to conduct this analysis, the necessary data for calculations was obtained from R. Shiller's Data Library. The risk-free rate for a duration of 10 years in U.S. Treasury Securities was acquired from FRED Economic Data. The respective links to these sources are provided at the conclusion of this project. The timeframe for the project spans from January 1, 1960, to May 1, 2023.

Task 1

- ***Running the regression described in Table 1 of the paper;***

Upon conducting the regression analysis as outlined in the above-mentioned paper, the following results were obtained. The specific details of the linear regression are as follows:

1. The cyclically adjusted price-to-earnings ratio (CAPE) was utilized as the explanatory variable.

Table 1:

	Next 10Y	Next 1Y	Next 1M
Beta	0.002	0.001	0.002
T-statistic	4.580	1.944	2.169
R Square	0.126	0.045	0.001

2. The target variables employed in the analysis were the annualized excess returns over the next 10 years, 1 year, and 1 month.

3. The dataset consisted of 641 observations, commencing from January 1, 1960.

4. The results obtained from both long (10Y) and short (1M) time periods demonstrate a statistically significant relationship between valuation ratios and subsequent returns within the analyzed sample.

5. The summary output of the regression models has been included below.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.354397153
R Square	0.125597342
Adjusted R Square	0.12422895
Standard Error	0.041477703
Observations	641

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.15790622	0.15790622	91.78460379	2.09772E-20
Residual	639	1.099335512	0.0017204		
Total	640	1.257241732			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.043610342	0.004369075	9.981596577	6.67546E-22	0.035030863	0.052189822	0.035030863	0.052189822
10Y - excess	0.001989747	0.000207689	4.580428163	2.09772E-20	-0.002397581	-0.001581912	-0.002397581	-0.001581912

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.076672955
R Square	0.04487874
Adjusted R Square	0.004322997
Standard Error	0.152441553
Observations	641

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.087811749	0.087811749	3.778730308	0.052346626
Residual	639	14.84935489	0.023238427		
Total	640	14.93716664			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.036634267	0.016057508	2.281441603	0.022850432	0.005102405	0.068166128	0.005102405	0.068166128
1Y - excess	0.001483797	0.000763311	1.943895653	0.052346626	-0.002982698	1.51042E-05	-0.002982698	1.51042E-05

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.026466305
R Square	0.000700465
Adjusted R Square	-0.000863384
Standard Error	0.475932987
Observations	641

ANOVA

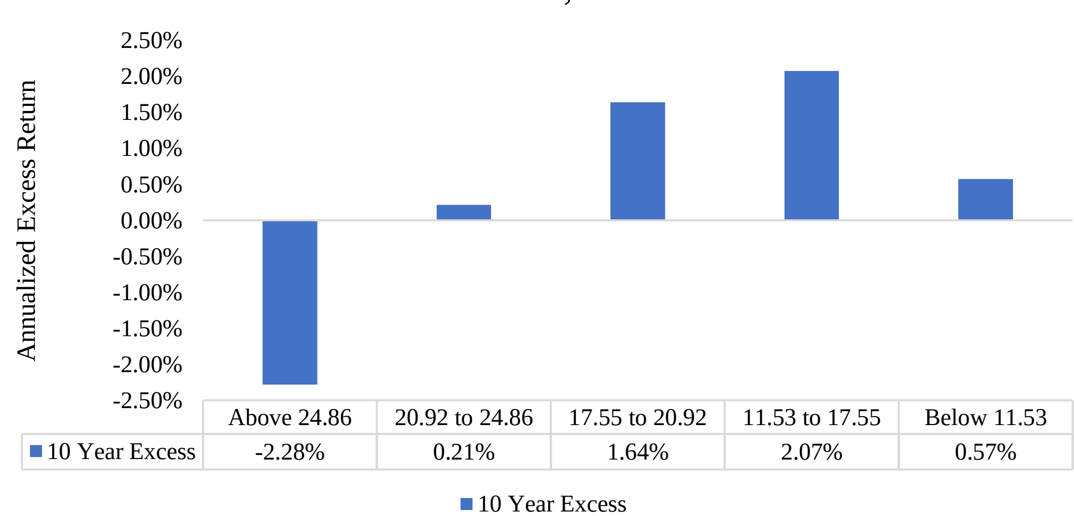
	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.101457325	0.101457325	0.447911067	0.503570358
Residual	639	144.7413007	0.226512208		
Total	640	144.842758			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.125247844	0.050132641	2.498329237	0.012728147	0.026803209	0.223692479	0.026803209	0.223692479
1M - Excess	0.001594923	0.002383109	2.169261583	0.503570358	-0.006274596	0.003084749	-0.006274596	0.003084749

- ***Replicating results in Charts 1 & 2.***

Chart 1 illustrates the sorted U.S. Equity 10-year returns based on the initial cyclically adjusted price-to-earnings (CAPE) valuation. The dataset utilized for constructing this chart encompasses the period from 1960 to 2023. In contrast, Chart 2 displays U.S. equity returns organized according to the corresponding starting valuation data over an identical time frame. These visual representations effectively portray the connection between initial valuations and subsequent equity returns, thereby offering valuable insights for the analysis carried out in the research paper.

Chart 1. U.S. Equity 10 Year returns sorted by starting CAPE Valuation, 1960 - 2023



The statistical evidence supporting the notion that higher valuations predict lower subsequent returns, and vice versa, appears to be robust, as indicated by Chart 1. However, it is crucial to acknowledge that real-life market timing strategies may not yield the same pronounced results as depicted in Chart 1. It should be noted that stocks with high Price-to-Earnings (P/E) Ratios above 24.86 experienced a significant decline in excess returns over a 10-year period, suggesting underperformance. These observations indicate that the range of P/E ratios can offer insights into potential excess returns across different time horizons. This implies that investors may contemplate adjusting their investment strategies based on the prevailing P/E ratio range to potentially enhance returns.

Additionally, it is worth mentioning that when examining shorter time periods, such as 1-year and 3-month returns, the observed relationship between valuations and subsequent returns tends to diminish. In other words, as the time horizon is shortened, the association between valuation ratios and returns becomes less apparent. This is evidenced by a decrease in the R-squared value, which signifies the strength of the relationship between the analyzed variables. Therefore, the findings suggest that the predictive power of valuation ratios diminishes when evaluating returns over shorter timeframes, and the expected trend may not consistently manifest within these annualized periods.

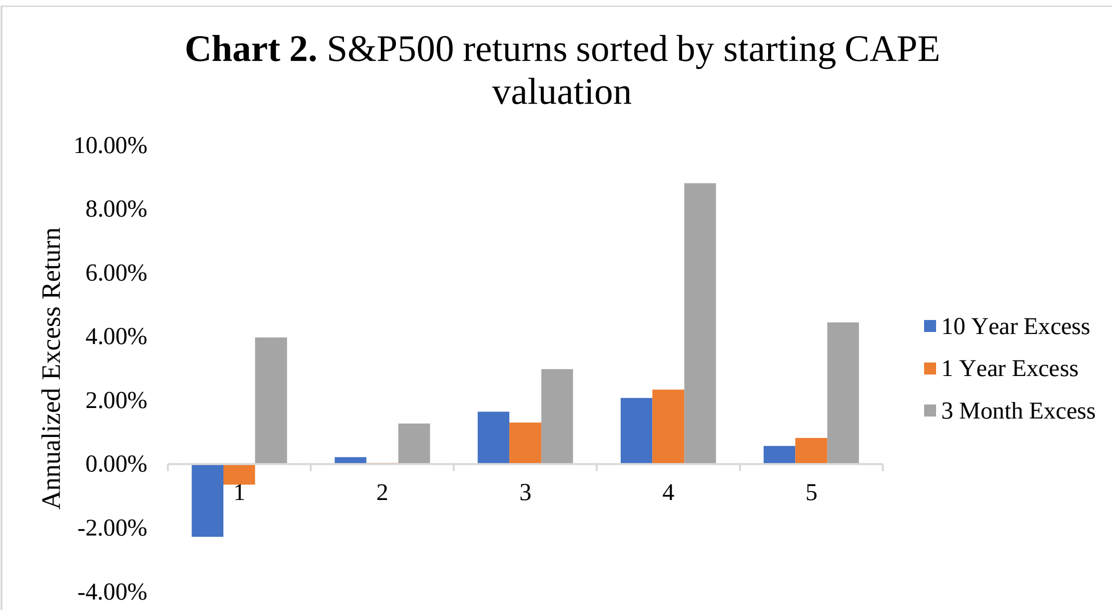


Chart 2 reveals a correlation between Price-to-Earnings (P/E) ratios and excess returns. Lower P/E ratios are generally associated with positive excess returns, whereas higher P/E ratios exhibit mixed or negative excess returns. The designation "1" represents P/E ratios that are above 24.86, while "5" corresponds to P/E ratios that are below 11.53.

Task 2

In this section, the "Buy and Hold" and "Market Timing" strategies will be employed to attain our results and conduct a comparative analysis. The figures indicate that the Buy-and-Hold strategy demonstrates a higher average return.

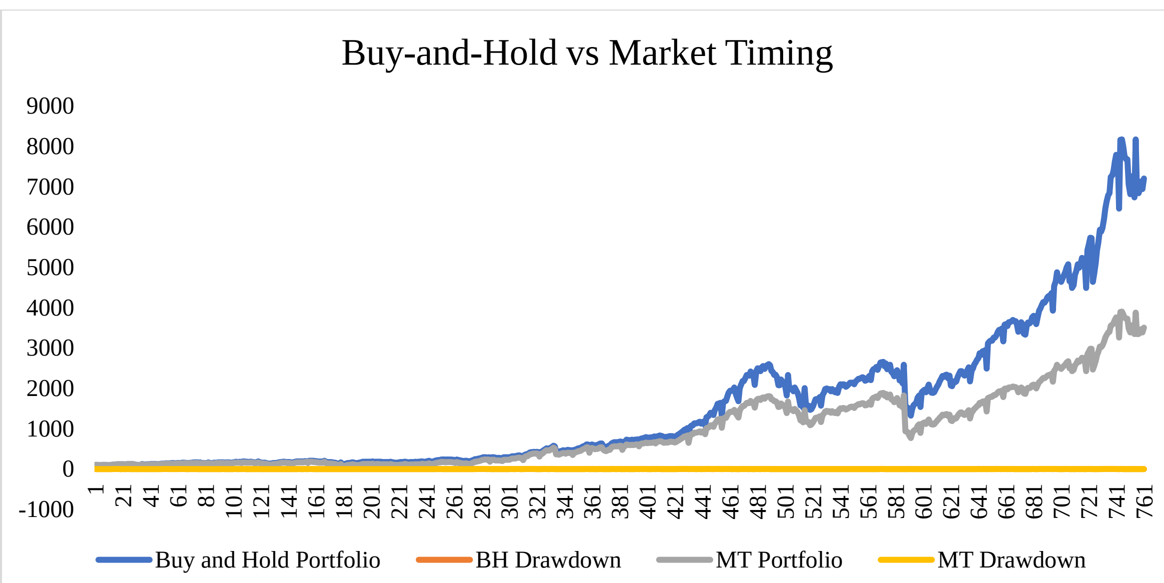
The Market Timing strategy experiences a greater maximum drawdown (62%) compared to the Buy and Hold strategy (50%), signifying a more significant loss during periods of severe market decline. The higher maximum drawdown associated with the Market Timing strategy implies that engaging in market timing and frequent adjustments to investment positions may expose investors to elevated levels of risk and potential downside. Conversely, the Buy and Hold strategy, with its lower maximum drawdown, exhibits greater resilience during market downturns. By adhering to a long-term investment approach and maintaining market exposure, investors utilizing the Buy and Hold strategy are more likely to navigate market fluctuations and mitigate substantial losses.

Table 2:

	1960/01-2023/05	
	Buy-and-Hold	Value timing
Excess Return	0%	-4%
Volatility	7%	8%
Sharpe ratio	0.05	0.04
Max drawdown	-50%	-62%
Average Position	107%	100%

Result

In summary, according to the data illustrated in the chart provided, our Market Timing strategy exhibited superior performance compared to the Buy-and-Hold strategy, albeit with a marginal distinction. Consequently, our implementation of the Market Timing strategy enabled us to outperform the market.



References

1) Robert Shiller's Data Library - http://www.econ.yale.edu/~shiller/data.htm (07-jun-2023)
2) FRED Economic Data - https://fred.stlouisfed.org/series/GS10 (07-jun-2023)
3) Source for working file - https://github.com/afatirium/EFI_HW (13-jun-2023)