

# Estimating Beta of Capital Asset Pricing Model : An Empirical Study using the Dow Jones Industrial Average Index Stocks

ABHISHEK PARIKH \*

---

---

## Abstract

The CAPM was introduced by Sharpe (1964) and Linter (1965) as a way to estimate the expected return of an asset, many extensions have been developed and accepted for equity pricing. Some researchers began to question the stability of beta (a measure of an asset's volatility compared to the market as a whole) in the context of equity valuation. Baesel (1974) and Porter and Ezzell (1975) were among the researchers who raised doubts about how to predict beta in the CAPM model. A recent study aimed to develop a model for predicting beta using a long-term relation for short-term (monthly) prediction. Researchers used monthly adjusted return (AR) data from January 1996 to May 2020 to develop a better predictive CAPM model. Study found that beta is not stationary in short run, suggesting need for a new methodology for predicting beta. Proposed model showed a significant reduction in error (3.45 percent) compared to existing model for the testing period. It means that investors can use model to select stocks that are likely to perform well in long run, even if there is a highly volatile trend in market.

---

---

**JEL Code :** G12, G32, O16, P3

**Keywords :** Stock Returns; CAPM; Beta Stability; Risk Premium; Sharpe; Linter; DJIA, USA

## I. Introduction

THE CAPM MODEL is the earliest model development attempt to predict asset pricing based on historical risk premiums by Sharp and Linter (1964, 1965). This extraordinary CAPM model earned William Sharp the Nobel Prize in 1990. The model's beauty is its simplicity, making it very easy to comprehend the relationship between risk and returns. Even today, when Artificial Intelligence (AI) becomes complementary to humans (Agarwal and Agarwal, 2021), CAPM is universally accepted in the investment community. This is because human trust has its financial value (Agarwal and Agarwal, 2023) that demands the stability of the model. However, the biggest drawback of the model is that it lacks empirical support for accuracy and stability in past studies. Thus, the CAPM model has been criticised by many researchers.

\* Principal and Professor, P.P. Savani University, The PPSU-SLM School of Liberal Arts and Management, NH 8, GETCO, Near Biltech, Dhamdod, Kosamba, Gujarat, 394125 INDIA

*Submitted August 2020; Accepted March 2024*

of equity returns and understanding the relationship between risks and return trade-offs for the next period. The original model talks about the risk-return relation for the current period, which may not guarantee any stability of the same relation for the next period in the short run; these results align with Francis (1979) and Liu (2020). Due to this, MCAPM gives a more accurate explanation of individual equity stock returns for the upcoming period. In addition, the new proposed model helps capture the effect of any abnormal returns created in individual equity for the next period.

Models used for beta confirm estimated beta stability in the long run as per expectation with the objective of the study. Most models have positive intercept and slope values of less than one. It confirms a decrease in beta value for the next period when it is more significant than the long-run mean beta value and vice-versa. For AAPL, the long-term beta value was 1.21, which deviates based on its previous error term. So, when the AAPL beta value is 1.21, the next period value should be 1.21. If it is higher / lower (1.62 / 0.79) than 1.21, in the next period value will be decrease/increase (1.6 / 0.80).

Thus, the model helps to create long-term equilibrium. However, one should use long-term beta by considering beta at time  $t$  and  $t+1$  equal, which can help in the long-term prediction of equity risk premium. Hence, for monthly returns, the short-term estimated beta should be used in CAPM as used by Afuenaou and Abrache (2022) and Nwani (2015); for annual returns, the investor should use the long-run beta to predict equity returns accurately.

## VI. Conclusion

This study has shown that there is a chance to reduce errors in the equity return prediction by using a modified CAPM model. However, due to the complexity of the model, there is scope to develop a more improved and simpler model with some other time-series techniques like VAR modeling as tried by (Arowolo, 2013; Koima, Mawita and Nassiuma, 2015) in existing literature. The modified CAPM model reduces error in prediction, as proved in the results of Table 1. The investor can use this modified model better to estimate the next period's returns on equity stock. And used MCAPM in line with the suggested by (Bontempi, Bottazzi and Golinelli, 2020; Makridis, Frowis, Sridhar and Bohme, 2023)

## References

- Acharya, V. V.; T. Johnson, S. Sundaresan and S. Zheng, (2020), "The value of a cure: An asset pricing perspective", *National Bureau of Economic Research*, No. w28127
- Agarwal, J D; Y. Agarwal; M. Agarwal and A. Agarwal, (2023), "Trust as a Financial Value", *Finance India*, Vol. 37, No. 3, pp. 665-678
- Agarwal, J. D.; M. Agarwal; A. Agarwal and Y. Agarwal, (2021), "Economics of cryptocurrencies: Artificial intelligence, blockchain, and digital currency", *Information for Efficient Decision Making: Big Data, Blockchain and Relevance*, pp. 331-430
- Agarwal, J.D. and Aman Agarwal, (2004), "Literature in Finance Vol. III : Financial Systems and Markets", IIF Publications, Delhi

Agarwal, J. D.; Y. Agarwal and A. Agarwal, (2022), "Ranking World Economies based on Fintech Vertical Opportunity Index (FVOI)", *Finance India*, Vol. 36, No. 4, pp. 1173-1191

Agarwal, D. and A. Parikh, (2022), "Downside Risk Premium Based Four-Factor Asset Pricing Model: Empirical Evidence from Nifty50", *Interdisciplinary Research in Technology and Management*, IEEE, pp. 01-04

Aguentaou, S; J. Abrache and B. Kadiri, (2011), "Testing the Fama-French three-factor model in the Moroccan stock market", *International Journal of Business, Accounting, and Finance*, Vol. 5, pp. 57-67

Alles R. A. and F. Casalin, (2022), "Factor investing in Brazil: Diversifying across factor tilts and allocation strategies", *Emerging Markets Review*, Vol. 52, pp.100-906

Araujo, E., D.B. Ricardo and Z.S. Antonio, (2021), "Long-term stock returns in Brazil: Volatile equity returns for U.S.-like investors", *International Journal of Finance and Economics*, Vol. 26, pp. 6249-63

Arowolo, W. B., (2013), "Predicting stock prices returns using GARCH model", *International Journal of Engineering and Science*, Vol. 2, No. 5, pp. 32-37

Baesel, J. B., (1974), "On the Assessment of Risk: Some Further Considerations", *Journal of Finance*, Vol. 29, No. 4, pp. 1491-1494

Bontempi, M. E.; L. Bottazzi and R. Golinelli, (2020), "A multilevel index of heterogeneous short-term and long-term debt dynamics", *Journal of Corporate Finance*, Vol. 64, pp.101-666

Brenner, M. and S. Smidt, (1977), "A Simple model of non-stationarity of systematic risk", *Journal of Finance*, Vol. 32, No. 3, pp. 1081-1092

Brigham, E. F. and M.C. Ehrhardt, (2014), "Financial Management: Theory and Practices", *Fourteenth Edition*, South-Western Publisher.

Carhart, M., (1997), "On persistence in mutual fund performance", *The Journal of Finance*, Vol. 52, No. 1, pp. 57-82.

Carvalho, M., (2017), "Predicting Fama-French factors based on industry returns in Brazil", *Corporate Ownership and Control*, Vol. 15, No. 1, pp. 44-51

Drechsler, I., (2013), "Uncertainty, time-varying fear, and asset pricing", *Journal of Finance*, Vol. 68, No. 5, pp. 1843-1889

Driouchi, T.; R.H. So and L. Trigeorgis, (2020), "Investor ambiguity, systemic banking risk and economic activity: The case of too-big-to-fail", *Journal of Corporate Finance*, Vol. 62, pp.101-549

Engle, R. F., (1982), "Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of United Kingdom Inflation", *Econometrica*, Vol. 50, No. 4, pp. 987-1007

Fama, E and K. French, (1992), "The cross-section of expected stock returns", *Journal of Finance*, Vol. 47, No. 2, pp. 427-466

Fama, E. and K. French, (1993), "Common risk factors in the returns on stocks and bonds", *Journal of Financial Economics*, Vol. 33, No. 1, pp. 3-56

Fama, E and K. French, (2015), "A five factor asset pricing model", *Journal of Financial Economics*, Vol. 116, No. 1, pp. 1-22

Faria M.; H. Claudia; F.C. Laise and M.M.C. Joyce, (2021), "Performance of the Fama-French five-factor model in the pricing of anomalies in the Brazilian market", *Contemporary Accounting Magazine*, Vol. 18, No. 49, pp. 145-60

Francis, J. C., (1979), "Statistical analysis of risk surrogates for NYSE stocks", *Journal of Financial and Quantitative Analysis*, Vol. 14, No. 5, pp. 981-997

Goldberg, L. R.; A. Papanicolaou; A. Shkolnik; and S. Ulucam, (2020), "Better betas", *The Journal of Portfolio Management*, Vol. 47, No. 1, pp. 119-136

Gonedes, N. J., (1973), "Evidence on the Information Content of Accounting Numbers: Accounting-based and Market-based Estimates of Systematic Risk", *Journal of Financial and Quantitative Analysis*, Vol. 8, No. 2, pp. 407-443

Gorodnichenko, Y.; T. Pham and O. Talavera, (2023), "The voice of monetary policy", *American Economic Review*, Vol. 113, No. 2, pp. 548-584

Koima, J. K.; P.N. Mwita and D.K. Nassiuma, (2015), "Volatility Estimation of stock pricing using GARCH method", *European Journal of Business Management*, Vol. 7, No. 19, pp. 108-113

Lintner, J., (1965), "Security Price, Risk and Maximal Gains from Diversification", *Journal of Finance*, Vol. 20, No. 4, pp. 79-96

Liu, Q., (2020), "Stability and Bayesian consistency in two-sided markets", *American Economic Review*, Vol. 110, No. 8, pp. 2625-2666

Makridis, C. A.; M. Fröwis; K. Sridhar; and R. Böhme, (2023), "The rise of decentralized cryptocurrency exchanges: Evaluating the role of airdrops and governance tokens", *Journal of Corporate Finance*, Vol. 79, pp.102-358

Malik, N., (2014), "Testing the Validity of CAPM in Emerging Markets", *Finance India*, Vol. 28, No. 4, pp. 22-32

Nwani, C., (2015), "An empirical investigation of Fama-French-Carhart multifactor model: UK Evidence", *IOSR Journal of Economics and Finance*, Vol. 6, No. 1, pp. 95-103

Parikh, A.; D. Kumari; M. Johann and D. Mladenovic, (2023), "The impact of environmental, social and governance score on shareholder wealth: A new dimension in investment philosophy", *Cleaner and Responsible Consumption*, Vol. 8, pp.100-101

Porter, R. Burr and John, R., Ezzell, "A Note on the Predictive Ability of Beta Coefficients", *Journal of Business Research*, Vol. 3, No. 2, pp. 367-372

Ricker, W. E., (1984), "Computation and uses of central trend lines", *Canadian Journal of Zoology*, Vol. 62, No. 10, pp. 1897-1905

Ross, S. (1976), "The arbitrage theory of capital asset pricing", *Journal of Economic Theory*, Vol. 13, No. 3, pp. 341-360

Schneider, P.; C. Wagner and J. Zechner, (2020), "Low-Risk anomalies?" *The Journal of Finance*, Vol. 75, No. 5, pp. 2673-2718

Seth, R. and A. Mehra, (2019), "Explaining Small Size Firm Returns through Growth Premium in Indian Capital Markets: An Empirical Investigation", *Finance India*, Vol. 33, No. 2, pp. 347-358

Shah, T. and A. Parikh, (2019), "Does the number of holdings in a risk parity portfolio matter?", *Journal of Asset Management*, Vol. 20, No. 2, pp. 124-133

Sharp William, (1964), "Capital asset prices: A theory of market equilibrium under risk", *Journal of Finance*, Vol. 19, No. 3, pp. 425-442

Silva M. and S. Antonio, (2018), "Portfolio selection: A comparative analysis of the five factors of Fama and French and artificial neural networks", *Focus: Accounting Reflection*, Vol. 37, No. 1, pp. 141-57

Sinha, P. and P. Sawaliya, (2020), "Behaviour of Asset Pricing Models in Pre and Post Crisis Period: An Evidence from India", *Finance India*, Vol. 34, No. 3, pp. 347-358

Tazi, O.; S. Aguenou and J. Abrache, (2022), "A Comparative Study of the Fama-French Three Factor and the Carhart Four Factor Models: Empirical Evidence from Morocco", *International Journal of Economics and Financial Issues*, Vol. 12, No. 1, pp. 58-66

Varga, G. and R.D. Brito, (2016), "The cross-section of expected stock returns in Brazil", *Brazilian Review of Finance*, Vol. 14, No. 2, pp. 151-87

Wong, W. K., (2021), "Editorial statement and research ideas for behavioral financial economics in the emerging market", *International Journal of Emerging Markets*, Vol. 16, No. 5, pp. 946-951

Zhou, X.; Y. Lin and J. Zhong, (2022), "A six-factor asset pricing model of China's stock market from the perspective of institutional investors' dominance", *International Journal of Emerging Markets*, Vol. 19, No. 3, pp. 172-183