



The Evolution of Asset Pricing Theory: A Systematic Literature Review

Siti Epa Hardiyanti^{1*}

siti.epa.hardiyanti@untirta.ac.id^{1*}

Department of Banking and Finance, Faculty of Economics and Business, University Sultan Ageng Tirtayasa, Indonesia^{1*}

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ABSTRACT

Asset Pricing Theory has undergone substantial transformation since the introduction of Modern Portfolio Theory by Markowitz on 1952. Its evolution subsequently progressed through the development of Capital Asset Pricing Model (CAPM), Arbitrage Pricing Theory (APT), Intertemporal Capital Asset Pricing Model (I-CAPM), Consumption Based Capital Asset Pricing Model (C-CAPM), Sustainable Capital Asset Pricing Model (S-CAPM), and contemporary of Multifactor frameworks such as Fama-French Factor Models (FF3F, FF5F, FF6F). Although these models offer distinct theoretical perspectives, they share a common objective: to explain the relationship between risk and return more accurately. However, variations in market structures, the emergence of empirical anomalies, and the rapid growth of digital assets have challenged the explanatory power and validity of several traditional asset pricing models. Consequently, this Systematic Literature Review (SLR) aims to map the evolution of asset pricing theory, examine the theoretical foundations of major asset pricing frameworks, identify existing research gaps, and propose directions for future scholarly inquiry. The findings suggest that no single asset pricing model is capable of universally explaining variations in asset returns across all market environments. Furthermore, the rise of digital assets and advances in big data analytics highlight the needed for new generation of asset pricing theories that are more adaptive to the complexities and dynamics of contemporary financial markets.

Corresponding Author:
Siti Epa Hardiyanti

1. INTRODUCTION

Asset pricing theory is one of the most fundamental pillars of modern finance. It seeks to explain how asset prices are determined, how risk and expected return are related, and how financial markets establish equilibrium prices. Since the introduction of Modern Portfolio Theory (MPT) by Markowitz on 1952, asset pricing research has experienced significant theoretical and empirical developments.



These developments range from single-factor models such as the Capital Asset Pricing Model (CAPM) to multifactor frameworks including the Arbitrage Pricing Theory (APT) and the Fama–French Six-Factor Model. Each stage of development reflects an ongoing effort to improve the explanatory power of asset pricing models regarding observed return patterns in financial markets.

Over time, asset pricing theories have evolved not only through refinement but also through critical reassessment of preceding frameworks. The limitations of CAPM motivated the emergence of APT, while the inability of macroeconomic models to explain short-term return dynamics stimulated the development of empirically driven factor models. More recently, the proliferation of digital assets, advances in computational technologies, and the availability of large-scale financial datasets have challenged the assumptions underlying traditional asset pricing theories.

The foundation of modern asset pricing can be traced to Modern Portfolio Theory, introduced by Markowitz on 1952, which established a framework for optimizing the trade-off between risk and return. MPT emphasizes diversification and the covariance structure among assets as key determinants of portfolio risk. This theoretical foundation subsequently facilitated the development of more structured market equilibrium models.

A major milestone in this evolution was the introduction of the Capital Asset Pricing Model by Sharpe on 1964. CAPM formalized the concept of systematic risk through the beta coefficient and provided a parsimonious framework for explaining expected returns. Despite its theoretical elegance and practical simplicity, the



model relies on highly restrictive assumptions regarding market efficiency and investor behavior. As a result, empirical evidence has frequently challenged its validity, leading to the identification of numerous market anomalies.

In response to these limitations, Ross on 1976 developed the Arbitrage Pricing Theory (APT), which expanded the concept of systematic risk by allowing multiple sources of risk to influence asset returns. APT provided a more flexible framework for incorporating macroeconomic and empirical factors and laid the groundwork for the development of modern multifactor asset pricing models.

As understanding of economic dynamics advanced, intertemporal models such as the Intertemporal Capital Asset Pricing Model (I-CAPM) proposed by Merton on 1973 emerged. Unlike CAPM, I-CAPM incorporates risks associated with changes in future investment opportunities. Simultaneously, Consumption-Based Asset Pricing Models (C-CAPM), pioneered by Lucas on 1978, integrated aggregate consumption behavior into asset pricing, linking asset returns directly to macroeconomic consumption risk.

During the 1990s, empirical evidence increasingly suggested that market risk alone could not fully explain cross-sectional variations in asset returns. Fama and French (1992, 1993) demonstrated that firm size and book-to-market characteristics significantly contribute to return differences, leading to the development of the Three-Factor Model. Subsequently, Carhart (1997) introduced momentum as an additional explanatory factor, while Fama and French (2015) expanded their framework into the Five-Factor Model by incorporating profitability and investment



factors. These multifactor models have become among the most influential frameworks in both academic research and financial practice.

Nevertheless, these models remain subject to criticism. Numerous studies have shown that factors found to be significant in one market or period may fail to explain returns in different institutional or economic contexts. Such findings suggest that asset pricing relationships are not universal but instead depend on market structure, investor behavior, and prevailing economic conditions.

Furthermore, technological advancements and the emergence of big data analytics have transformed how researchers evaluate risk and predict returns. Traditional asset pricing models, which primarily rely on macroeconomic variables or linear statistical relationships, increasingly face challenges in explaining nonlinear price dynamics, high-frequency volatility, and the behavior of emerging asset classes such as cryptocurrencies.

Existing literature reveals several unresolved issues. No asset pricing model has consistently explained the full variation in asset returns, particularly for non-traditional assets characterized by unique risk-return profiles. In addition, the integration of macroeconomic theories with empirical factor-based approaches remains incomplete, indicating the need for a more comprehensive and unified framework.

Accordingly, this study conducts a Systematic Literature Review (SLR) to examine the evolution of asset pricing theory from its early foundations to contemporary developments. Through a systematic synthesis of the literature, this review identifies major theoretical milestones, evaluates persistent limitations, and

outlines promising directions for future research. The study aims to provide a comprehensive reference for scholars seeking to understand the foundations, evolution, and future trajectory of modern asset pricing theory.

2. RESEARCH QUESTION

This study seeks to address the following research questions:

RQ1 : How has asset pricing theory evolved in over time?

RQ2 : What the research gap emerge from the evolution of asset pricing theory?

RQ3 : What the future research agenda can be proposed to advance the evolution of asset pricing theory?

3. LITERATURE REVIEW

Table 1. Synthesis of Asset Pricing Theory

Author(s)	Year	Theory/Model	Main Contribution	Implications for Asset Pricing
Markowitz (Markowitz, 1952)	1952	Modern Portfolio Theory (MPT)	Introduced mean–variance optimization and diversification principles	Established the risk–return foundation of asset pricing

Treynor (Treynor, 1961)	1961	Market Value and Risk	Identified systematic risk as the relevant source of risk	Provided the conceptual basis for CAPM
Sharpe (Sharpe, 1964)	1964	CAPM	Introduced beta as a measure of systematic risk	Formalized the risk–return relationship
Lintner (Lintner, 1965)	1965	CAPM Extension	Derived equilibrium expected returns under systematic risk	Strengthened the theoretical foundation of CAPM
Mossin (Mossin, 1966)	1966	CAPM Formalization	Provided additional equilibrium conditions for CAPM	Enhanced theoretical consistency
Jensen (Jensen, 1968)	1968	Jensen’s Alpha	Developed a measure of abnormal portfolio performance	Improved performance evaluation in asset pricing studies

Tobin (Tobin, 1969)	1969	q-Theory of Investment	Linked firm valuation to investment decisions	Extended asset pricing toward investment theory
Fama (Fama, 1970)	1970	Efficient Market Hypothesis (EMH)	Proposed informational efficiency in financial markets	Became a cornerstone of modern finance
Merton (Merton, 1973)	1973	Intertemporal CAPM (I- CAPM)	Incorporated changing investment opportunities over time	Expanded risk factors beyond market beta
Ross (Ross, 1976)	1976	Arbitrage Pricing Theory (APT)	Introduced a multifactor approach to asset pricing	Challenged the single-factor CAPM framework
Lucas (Lucas, 1978)	1978	Consumption- Based CAPM (C-CAPM)	Linked asset returns to aggregate consumption risk	Integrated macroeconomics into asset pricing

Fama & French (Fama & French, 1992)	1992	Size and Value Anomalies	Demonstrated limitations of CAPM	Motivated multifactor asset pricing models
Fama & French (Fama & French, 1993)	1993	Three-Factor Model	Added size and value factors to market risk	Improved cross-sectional return explanations
Carhart	1997	Four-Factor Model	Added momentum factor	Enhanced empirical performance of multifactor models
Shefrin & Statman	2000	Behavioral CAPM	Incorporated investor biases and heterogeneous beliefs	Challenged rational investor assumptions
Kelly et al.	2013	Tail Risk Asset Pricing	Demonstrated that extreme downside risks are priced	Expanded understanding of systematic risk

Fama & French (Fama & French, 2015)	2015	Five-Factor Model	Added profitability and investment factors	Became one of the leading empirical asset pricing models
Fama & French (Fama & French, 2018)	2018	Six-Factor Model	Combined the five-factor framework with momentum factor	Improved explanatory power for cross-sectional stock returns and integrated momentum into the Fama–French framework
Gu, Kelly & Xiu (Gu et al., 2020)	2020	Machine Learning Asset Pricing	Applied machine learning techniques to return prediction	Introduced nonlinear predictive frameworks
Zerbib	2022	Sustainable CAPM (S-CAPM)	Incorporated ESG considerations into risk premiums	Extended asset pricing toward sustainability



(Zerbib, 2022)				
Martin & Nagel (Martin & Nagel, 2022)	2022	Big Data Asset Pricing	Examined investor learning in high-dimensional information environments	Highlighted the role of big data in asset pricing

The development of asset pricing theory started with the work of Markowitz (1952), who introduced Modern Portfolio Theory (MPT). He showed that investors should consider both expected return and risk when building a portfolio. His theory also highlighted the importance of diversification in reducing risk.

Building on this idea, Treynor (1961) suggested that only market-related risk, known as systematic risk, should affect expected returns. This idea later became the foundation of the Capital Asset Pricing Model (CAPM), developed by Sharpe (1964), Lintner (1965), and Mossin (1966). CAPM explains that an asset's expected return depends on its sensitivity to market movements, measured by beta.

CAPM became one of the most influential models in finance because it provided a simple way to explain the relationship between risk and return. Jensen (1968) later introduced Jensen's Alpha, a measure used to evaluate whether an



investment performs better or worse than expected. Around the same time, Tobin (1969) developed q-theory, which linked firm value to investment decisions.

The Efficient Market Hypothesis (EMH), proposed by Fama (1970), further supported these theories by arguing that asset prices reflect all available information. Together, MPT, CAPM, and EMH became the foundation of modern finance and emphasized the role of rational investors, market efficiency, and systematic risk.

However, CAPM was later criticized because it could not fully explain many patterns observed in financial markets. This encouraged researchers to explore broader sources of risk.

One important development was the Intertemporal Capital Asset Pricing Model (I-CAPM) introduced by Merton (1973). Unlike CAPM, which focuses on a single investment period, I-CAPM considers that investors make decisions over time and face changing economic conditions. As a result, expected returns depend not only on market risk but also on factors that affect future investment opportunities.

Lucas (1978) further expanded asset pricing theory through the Consumption-Based Capital Asset Pricing Model (C-CAPM). This model links asset returns to changes in consumption and argues that investors require higher returns for assets that perform poorly during difficult economic periods.

Although these macroeconomic models improved the understanding of asset pricing, many studies found that they could not fully explain actual return patterns in financial markets.

The next major step in asset pricing theory was the move from single-factor models to multifactor models. Ross (1976) introduced Arbitrage Pricing Theory (APT), which suggested that several risk factors, rather than a single market factor, influence asset returns.

APT provided a more flexible framework than CAPM because it allowed different economic and statistical factors to affect asset prices. Although it did not specify which factors should be used, it opened the door for future multifactor research.

Later studies identified several market anomalies that CAPM could not explain. Fama and French (1992) found that firm size and book-to-market value affect stock returns. These findings led to the development of the Fama–French Three-Factor Model (1993), which added size and value factors to market risk.

Carhart (1997) extended this model by adding momentum as a fourth factor. Later, Fama and French (2015) introduced the Five-Factor Model by including profitability and investment factors. More recently, the Six-Factor Model combined these factors with momentum to improve the explanation of stock returns.

These multifactor models showed that asset returns are influenced by many sources of risk and firm characteristics. As a result, they became widely used in both academic research and investment practice.

Despite their success, multifactor models still assume that investors behave rationally. This limitation led to the development of behavioral asset pricing theories.

Shefrin and Statman (2000) introduced Behavioral CAPM (B-CAPM), which argues that investor emotions, biases, and different beliefs can influence asset prices. This approach challenged the traditional assumption that investors always make rational decisions.

Researchers also began paying more attention to extreme market events. Kelly et al. (2013) showed that tail risk, or the risk of rare but severe losses, affects asset prices because investors require compensation for bearing such risks.

Together, behavioral finance and tail-risk research expanded the understanding of risk beyond traditional market factors and highlighted the importance of investor behavior and extreme events.

The most recent developments in asset pricing theory have been driven by advances in technology, data availability, and sustainability concerns.

Gu, Kelly, and Xiu (2020) showed that machine learning methods can improve return prediction by identifying complex relationships that traditional models may miss. Their work introduced a new data-driven approach to asset pricing research.

At the same time, sustainability has become an important topic in finance. Zerbib (2022) proposed the Sustainable Capital Asset Pricing Model (S-CAPM), which includes Environmental, Social, and Governance (ESG) factors in asset pricing. This reflects the growing interest of investors in sustainable and responsible investing.

Martin and Nagel (2022) also highlighted the role of big data in financial markets. They argued that investors learn from large amounts of information, which can influence return predictability and asset prices.

Overall, recent developments show that asset pricing theory is moving toward more flexible, data-driven, and adaptive models that can better capture the complexity of modern financial markets.

The evolution of asset pricing theory reveals a gradual transition from highly parsimonious equilibrium models toward increasingly multidimensional frameworks. Early theories emphasized diversification, systematic risk, and market efficiency. Subsequent developments incorporated macroeconomic dynamics, multiple risk factors, investor behavior, extreme-event risk, sustainability considerations, and machine-learning techniques.

Despite these advances, no single framework has achieved universal explanatory power across markets, asset classes, and economic environments. The literature therefore suggests that asset pricing remains an evolving field characterized by a continuous search for models capable of integrating economic fundamentals, behavioral mechanisms, technological innovation, and high-dimensional data.

Table 2. The Evolution of Asset Pricing Theory

Period	Key Theories	Main Focus	Representative Studies
1952– 1970	MPT, CAPM, EMH	Risk–return trade-off, diversification, market equilibrium	Markowitz (1952), Sharpe (1964), Fama (1970)
1968– 1978	I-CAPM, C-CAPM, q-Theory	Macroeconomic and intertemporal risks	Merton (1973), Lucas (1978), Tobin (1969)
1976– 2015	APT, Three-Factor, Four-Factor, Five-Factor Models	Multifactor explanations of expected returns	Ross (1976), Fama & French (1993, 2015), Carhart (1997)
2000– 2022	Behavioral, Tail Risk, ESG, Machine Learning, Big Data	Behavioral factors, sustainability, nonlinear prediction, data-driven finance	Shefrin & Statman (2000), Gu et al. (2020), Zerbib (2022), Martin & Nagel (2022)

4. RESEARCH GAP

Although asset pricing theory has evolved significantly, several important research gaps remain.

Table 3. Research Gaps in Asset Pricing Literature

Gap Category	Description
Theoretical Gap	No single framework combines traditional, behavioral, ESG, and machine-learning perspectives
Empirical Gap	Asset pricing factors often produce inconsistent results across countries and market conditions
Methodological Gap	Machine learning improves prediction but often lacks economic interpretation
Contextual Gap	Existing models may not fully capture the effects of ESG, real-time information, technological innovation, and changing market structures

5. FUTURE RESEARCH AGENDA

Future research should focus on developing a more comprehensive asset pricing framework that integrates traditional risk factors with behavioral, sustainability, and technological dimensions.

Several promising directions can be identified:

1. Develop integrated asset pricing models that combine economic, behavioral, ESG, and machine learning factors.
2. Examine whether asset pricing models can be generalized across different countries and asset classes.
3. Improve the interpretability of machine learning models used in asset pricing research.
4. Investigate the pricing of digital assets, cryptocurrencies, and decentralized finance (DeFi) instruments.
5. Explore the interaction between ESG factors and traditional risk factors.
6. Analyze how real-time information and alternative data affect asset prices.
7. Study the impact of extreme events and tail risks on asset valuation.

Future asset pricing research should aim to build models that are not only accurate in prediction but also theoretically meaningful and applicable across different market conditions.

6. CONCLUSION

This systematic literature review examined the evolution of asset pricing theory from its early foundations to contemporary developments. The review shows that asset pricing theory has progressed from simple risk-return frameworks to more complex models incorporating macroeconomic variables, multiple risk factors, investor behavior, sustainability concerns, and advanced data analytics.

Despite these developments, no single model can fully explain asset returns across all markets and periods. Existing theories continue to face theoretical, empirical,



methodological, and contextual limitations. The emergence of machine learning, ESG investing, cryptocurrencies, and big data further highlights the need for new approaches to asset pricing.

Future research should focus on developing integrated and adaptive asset pricing frameworks that combine economic theory, behavioral insights, sustainability factors, and modern analytical techniques. Such efforts may contribute to a more comprehensive understanding of asset pricing in increasingly complex financial markets.



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