2026

FRM®

Exam Prep

SchweserNotes™

Risk Management and Investment Management & Current Issues in Financial Markets

Part II Book 5

KAPLAN SCHWESER

Book 5: Risk Management and Investment Management & Current Issues in Financial Markets

SchweserNotes™ 2026

FRM Part II

SCHWESERNOTES™ 2026 FRM® PART II BOOK 5: RISK MANAGEMENT AND INVESTMENT MANAGEMENT & CURRENT ISSUES IN FINANCIAL MARKETS

Published in 2026 by Kaplan, Inc.

ISBN: 978-1-0788-5491-7

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STUDY SESSION 13

83. Factor Theory

Andrew Ang, *Asset Management: A Systematic Approach to Factor Investing* (New York, NY: Oxford University Press, 2014). Chapter 6.

After completing this reading, you should be able to:

a. describe factors that impact asset prices and explain the theory of factor risk premiums.
b. discuss the capital asset pricing model (CAPM) including its assumptions and explain how factor risk is addressed in the CAPM.
c. explain the implications of using the CAPM to value assets, including equilibrium and optimal holdings, exposure to factor risk, its treatment of diversification benefits, and shortcomings of the CAPM.
d. describe multifactor models and compare and contrast multifactor models to the CAPM.
e. explain how stochastic discount factors are created and apply them in the valuation of assets.
f. describe efficient market theory and explain how markets can be inefficient.

84. Factors

Andrew Ang, *Asset Management: A Systematic Approach to Factor Investing* (New York, NY: Oxford University Press, 2014). Chapter 7.

After completing this reading, you should be able to:

a. describe the process of value investing and explain why a value premium may exist.
b. explain how different macroeconomic risk factors, including economic growth, inflation, and volatility, affect asset returns and risk premiums.
c. assess methods of mitigating volatility risk in a portfolio and describe challenges that arise when managing volatility risk.
d. explain how dynamic risk factors can be used in a multifactor model of asset returns, using the Fama-French model as an example.
e. compare value and momentum investment strategies, including their return and risk profiles.

85. Alpha (and the Low-Risk Anomaly)

Andrew Ang, *Asset Management: A Systematic Approach to Factor Investing* (New York, NY: Oxford University Press, 2014). Chapter 10.

After completing this reading, you should be able to:

a. describe and evaluate the low-risk anomaly of asset returns.
b. define and calculate alpha, tracking error, the information ratio, and the Sharpe ratio.
c. explain the impact of benchmark choice on alpha and describe characteristics of an effective benchmark to measure alpha.
d. describe Grinold's fundamental law of active management, including its assumptions and limitations, and calculate the maximum attainable information ratio using this law.
e. apply a factor regression to construct a benchmark with multiple factors, measure a portfolio's sensitivity to those factors, and measure alpha against that benchmark.
f. explain how to use style analysis to handle time-varying factor exposures.
g. describe issues that arise when measuring alphas for nonlinear strategies.
h. compare the volatility anomaly and the beta anomaly and analyze evidence of each anomaly.
i. describe potential explanations for the risk anomaly.

86. Portfolio Construction

Richard Grinold and Ronald Kahn, *Active Portfolio Management: A Quantitative Approach for Producing Superior Returns and Controlling Risk, 2nd Edition* (New York, NY: McGraw-Hill, 2000). Chapter 14.

After completing this reading, you should be able to:

a. describe the inputs to the portfolio construction process and explain challenges faced when using these inputs.
b. evaluate the motivation for and the methods used for refining alphas in the implementation process.
c. describe neutralization and the different approaches used for refining alphas to be neutral.
d. explain the implications of transaction costs on portfolio construction.

e. describe practical issues in portfolio construction, including the determination of an appropriate risk aversion, aversions to specific risks, and proper alpha coverage.
f. describe portfolio revisions and rebalancing, and analyze the tradeoffs between alpha, risk, transaction costs, and time horizon.
g. determine the optimal no-trade region for rebalancing with transaction costs.
h. evaluate the strengths and weaknesses of the following portfolio construction techniques: screens, stratification, linear programming, and quadratic programming.
i. describe dispersion, explain its causes, and describe methods for controlling forms of dispersion.

87. Portfolio Risk: Analytical Methods

Philippe Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition* (New York, NY: McGraw-Hill, 2007). Chapter 7.

After completing this reading, you should be able to:

a. define, calculate, and compare the following portfolio VaR measures: diversified and undiversified portfolio VaR, individual VaR, incremental VaR, marginal VaR, and component VaR.
b. explain the impact of correlation on portfolio risk.
c. apply the concept of marginal VaR in making portfolio management decisions.
d. explain and calculate the risk-minimizing position and the position that maximizes the ratio of expected return to risk.
e. explain the difference between risk management and portfolio management and describe how to use marginal VaR in portfolio management.

88. VaR and Risk Budgeting in Investment Management

Philippe Jorion, *Value-at-Risk: The New Benchmark for Managing Financial Risk, 3rd Edition* (New York, NY: McGraw-Hill, 2007). Chapter 17.

After completing this reading, you should be able to:

a. define risk budgeting.
b. describe the impact of horizon, turnover, and leverage on the risk management process in the investment management industry.
c. describe the investment process of large investors such as pension funds.
d. describe the risk management challenges associated with investments in hedge funds.
e. describe and compare the following types of risk: absolute risk, relative risk, policy-mix risk, active management risk, funding risk, and sponsor risk.
f. explain the use of VaR to monitor risk.
g. explain how VaR can be used in the development of investment guidelines and for improving the investment process.
h. describe the risk budgeting process and calculate risk budgets across asset classes and active managers.

89. Portfolio Performance Evaluation

Zvi Bodie, Alex Kane, and Alan J. Marcus, *Investments, 12th Edition* (New York, NY: McGraw-Hill, 2020). Chapter 24.

After completing this reading, you should be able to:

a. differentiate between the time-weighted and dollar-weighted returns of a portfolio and describe their appropriate uses.
b. describe risk-adjusted performance measures, such as Sharpe's measure, Treynor's measure, Jensen's measure (Jensen's alpha), and the information ratio, and identify the circumstances under which the use of each measure is most relevant.
c. describe the uses for the Modigliani-squared and Treynor's measure in comparing two portfolios and the graphical representation of these measures.
d. determine the statistical significance of a performance measure using standard error and the t-statistic.
e. describe style analysis.
f. explain the difficulties in measuring the performance of actively managed portfolios.
g. describe performance manipulation and the problems associated with using conventional performance measures.
h. describe techniques to measure the market timing ability of fund managers with a regression and with a call option model and calculate a manager's return due to market timing.
i. describe and apply performance attribution procedures, including the asset allocation decision, sector and security selection decision, and the aggregate contribution.

STUDY SESSION 14

90. Hedge Fund Investment Strategies

David P. Stowell and Paul Stowell, *Investment Banks, Hedge Funds, and Private Equity, 4th Edition* (Elsevier, 2023). Chapter 12.

After completing this reading, you should be able to:

a. describe and compare different types of equity-based and macro hedge fund strategies and explain their return and risk profiles.
b. compare different types of arbitrage strategies and describe the mechanics of convertible arbitrage strategies.
c. describe the mechanics and risks of event-driven strategies such as merger arbitrage.
d. explain the mechanics of a distressed securities strategy, and describe challenges, risks and considerations that may arise when implementing this strategy.

91. Risk, Regulation and Organizational Structure

David P. Stowell and Paul Stowell, *Investment Banks, Hedge Funds, and Private Equity, 4th Edition* (Elsevier, 2023). Chapter 14.

After completing this reading, you should be able to:

a. describe different risks faced by investors in hedge funds.
b. explain how the activities of hedge funds and exposure to hedge funds can increase systemic risk.
c. summarize different approaches taken by regulators to mitigate risks related to hedge funds.
d. describe a typical organizational structure for a hedge fund and explain motivations for adopting this structure.

92. The Rise and Risks of Private Credit

"The Last Mile: Financial Vulnerabilities and Risks, Chapter 2: The Rise and Risks of Private Credit," IMF Global Financial Stability Report (April 2024).

After completing this reading, you should be able to:

a. describe characteristics of private credit, including its typical investors and borrowers, and compare private credit to other types of loans and fixed-income instruments.
b. explain the return profile and growth profile of the private credit asset class, and compare the historical returns of private credit to those of other asset classes.
c. describe and assess the risks and vulnerabilities related to private credit, and explain how private credit can pose risks to financial stability.
d. assess potential policy recommendations that could help mitigate the risks associated with private credit.

93. Private Markets Investing

Cyril Demaria, Maurice Pedergnana, Remy He, Roger Rissi, and Sarah Debrand, *Asset Allocation and Private Markets: A Guide to Investing with Private Equity, Private Debt, and Private Real Assets* (Wiley, 2021). Chapter 3.

After completing this reading, you should be able to:

a. explain the motivations for investors to invest in private markets.
b. describe different investment structures that can be used to invest in private assets and compare their characteristics.
c. apply and compare different methods to measure the performance of private equity investments and describe their advantages and disadvantages.
d. explain how different risks can arise for investors in private markets and assess how these risks can be measured.
e. describe the practice of co-investing in private markets and assess its advantages and disadvantages.
f. explain benefits and challenges of investing in private markets through an intermediated investment vehicle such as a private equity or private debt fund.

94. Performing Due Diligence on Specific Managers and Funds

Kevin R. Mirabile, *Hedge Fund Investing: A Practical Approach to Understanding Investor Motivation, Manager Profits, and Fund Performance, 2nd Edition* (Hoboken, NJ: Wiley Finance, 2016). Chapter 12.

After completing this reading, you should be able to:

a. identify reasons for the failures of hedge funds in the past.
b. explain elements of the due diligence process used to assess investment managers.
c. identify themes and questions investors can consider when evaluating a hedge fund manager.
d. describe criteria that can be evaluated in assessing a hedge fund's risk management process.
e. explain how due diligence can be performed on a hedge fund's operational environment.
f. explain how a hedge fund's business model risk and its fraud risk can be assessed.

g. describe elements that can be included as part of a due diligence questionnaire.

95. Distress Symptoms and Remedies

Roberto Ippolito, *Private Capital Investing: The Handbook of Private Debt and Private Equity* (Wiley, 2020). Chapter 20.

After completing this reading, you should be able to:

a. explain different reasons why firms may experience financial distress and identify potential indicators of distress.
b. describe methods firms can use to remedy a financial distress situation at different stages of distress and explain the potential implications and challenges to using each method.
c. summarize potential legal challenges that can arise when a firm is in financial distress or is going through a restructuring.

96. Madoff: A Riot of Red Flags

Greg Gregoriou and Francois Lhabitant, *Madoff: A Riot of Red Flags* (EDHEC Publication, 2009).

After completing this reading, you should be able to:

a. explain the history of Bernie Madoff's hedge fund and describe the fund's reported strategy and its reported performance.
b. identify characteristics of Bernie Madoff's hedge fund that can serve as warning signs or potential "red flags" and explain how they can indicate potential fraud risk.

97. Market-Driven Scenarios: An Approach for Plausible Scenario Construction

Bennett W. Golub (ed.), *BlackRock's Guide to Fixed-Income Risk Management* (Wiley: 2024). Chapter 5.

After completing this reading, you should be able to:

a. describe and evaluate the market-driven scenario (MDS) approach used to develop scenarios for stress testing investment portfolios.
b. describe the scenario z-score, the volatility z-score, the correlation z-score, and the Mahalanobis distance, and explain how these are used in estimating the likelihood of occurrence and magnitude of scenarios.
c. explain steps in the process of defining and developing market-driven scenarios, and describe the application of the MDS approach in the example provided.
d. describe challenges and considerations that may arise when implementing the market-driven scenario approach.

98. Liquidity Risk Management

Bennett W. Golub (ed.), *BlackRock's Guide to Fixed-Income Risk Management* (Wiley: 2024). Chapter 7.

After completing this reading, you should be able to:

a. explain best practices for managing liquidity risk in an investment fund.
b. explain potential challenges fund managers face when managing liquidity risk in fixed-income portfolios, including challenges related to data modeling.
c. describe and apply different approaches to model asset liquidity, including an approach to modeling infrequently traded bonds and the t-cost model to calculate transaction costs for corporate bonds.
d. identify examples of extraordinary measures that regulators may allow funds to take to meet unanticipated redemption requests, and explain when each measure may be allowed.
e. explain approaches to manage and model redemption risk in an investment fund, including the redemption waterfall, approaches to model a fund's level of redemption-at-risk, and approaches to optimize liquidity to meet redemption requests.

99. Illiquid Assets

Andrew Ang, *Asset Management: A Systematic Approach to Factor Investing* (New York, NY: Oxford University Press, 2014). Chapter 13.

After completing this reading, you should be able to:

a. evaluate the characteristics of illiquid markets.
b. discuss the relationship between market imperfections and illiquidity.
c. assess the impact of biases on reported returns for illiquid assets.
d. explain the process of unsmoothing returns and the effects of unsmoothing.
e. compare illiquidity risk premiums across and within asset categories.

f. evaluate the impact of allocating illiquid assets to a portfolio, including the impact on rebalancing and trading and on optimizing the proportion of illiquid assets.

STUDY SESSION 15

100. Advances in Artificial Intelligence: Implications for Capital Markets Activities

"Advances in Artificial Intelligence: Implications for Capital Markets Activities," International Monetary Fund (October 2024).

After completing this reading, you should be able to:

a. describe current uses of artificial intelligence (AI) and machine learning (ML) in capital markets, and potential future uses of sophisticated AI models including GenAI.
b. explain the implications of further adoption of AI on market dynamics.
c. explain the implications of further adoption of AI on financial stability.
d. describe best practices for regulators pertaining to AI, including the use of AI by supervisors and recommendations for policy on the use of AI by regulated entities.

101. The Financial Stability Implications of Artificial Intelligence

"The Financial Stability Implications of Artificial Intelligence," Financial Stability Board (November 2024).

After completing this reading, you should be able to:

a. explain key developments in AI since 2017, differentiating between supply-side drivers and demand-side drivers.
b. identify and analyze existing and emerging AI use cases in financial services, including industry use cases as well as regulatory and supervisory use cases.
c. assess the potential implications of AI for financial stability, with a focus on the following vulnerabilities:
   - third-party dependencies and service provider concentration
   - market correlations
   - cyber risks
   - model risk, data, and governance
   - other vulnerabilities, such as fraud, disinformation, and misalignment

102. The Global Drivers of Private Credit

"The Global Drivers of Private Credit," Bank for International Settlements (February 2025).

After completing this reading, you should be able to:

a. describe the structure and characteristics of private credit funds, as well as the patterns in the global growth of the asset class.
b. discuss the potential drivers of private credit growth and interpret regression results about their impact.
c. compare private credit loans with bank loans and assess how changes in cost of equity, cost of debt, and leverage have influenced the competitive dynamics between them.

103. Global Financial Stability Report

***Global Financial Stability Report*. Chapter 2, "Geopolitical Risks: Implications for Asset Prices and Financial Stability." International Monetary Fund (April 2025).**

After completing this reading, you should be able to:

a. identify and explain the key channels through which geopolitical risk influences asset prices and financial stability and discuss policy measures to address potential consequences.
b. analyze how global geopolitical risk events affect countries, sectors, and asset classes differently, including their varying impacts on commodity importers and exporters.
c. assess the stock market responses to different domestic and global geopolitical risk events, including Russia's invasion of Ukraine and the U.S.–China trade tensions, and explain the cross-border effects of these events.
d. evaluate the effects of geopolitical shocks on sovereign risk premiums.
e. explain how investors price geopolitical risk in equity and option markets, including changes in downside risk and tail-risk premiums.
f. describe the implications of geopolitical risk exposure for the resilience of banks and nonbank financial institutions, including effects on equity valuations, lending, and investment fund flows.

104. Monetary and Fiscal Policy: Safeguarding Stability and Trust

Annual Economic Report 2023, Section 2: Monetary and fiscal policy: safeguarding stability and trust, Bank for International Settlements (June 2023).

After completing this reading, you should be able to:

a. compare and contrast the channels through which fiscal policy and monetary policy influence a country's economic activity and financial markets, and define the "region of stability" in terms of their joint policy stances.
b. describe the consequences of breaching the boundaries of the region of stability, and how these consequences have evolved over time in advanced economies and in emerging market economies.
c. describe the risks that global economies face as a result of high public debt levels, including the potential for these high debt levels, in combination with other factors, to drive tension between fiscal policy and monetary policy.

105. Regulating the Crypto Ecosystem: The Case of Unbacked Crypto Assets

"Regulating the Crypto Ecosystem: The Case of Unbacked Crypto Assets," International Monetary Fund Fintech Notes (September 2022).

After completing this reading, you should be able to:

a. define and describe crypto assets, including the categories broadly used by global financial regulators to classify them.
b. evaluate the key components within the crypto ecosystem, the potential risks generated by these components, and potential regulatory responses to address those risks.
c. identify and describe some of the global approaches to the regulation of unbacked crypto assets, including the BCBS' proposed treatment of banks' exposures to crypto assets.
d. examine the considerations and steps introduced by the Bali Fintech Agenda (BFA) for developing a regulatory framework for crypto assets.

106. Tokenization and Financial Market Inefficiencies

"Tokenization and Financial Market Inefficiencies," International Monetary Fund Fintech Notes (January 2025).

After completing this reading, you should be able to:

a. explain the process of tokenization and describe the fundamental features of tokenized assets and digital ledgers.
b. describe frictions and inefficiencies that can arise during different phases of an asset's lifecycle and explain how the different features of tokenization can both increase and mitigate risks related to these frictions.
c. explain how the use of tokenization and digital ledgers can impact financial market externalities, including those related to the transmission of shocks across the financial system, investments in market infrastructure, and network and knowledge effects.
d. explain how the proliferation of distributed ledger technologies can impact retail investors and brokerage firms.
e. compare different models and methods that are currently available to achieve sharedness, programmability, and trust on a ledger, and describe the conditions under which trust can fail in such models.

107. Digital Resilience and Financial Stability: The Quest for Policy Tools in the Financial Sector

Jose Ramon Martinez, "Digital Resilience and Financial Stability, The Quest for Policy Tools in The Financial Sector," Banco de Espana (April 2023).

After completing this reading, you should be able to:

a. describe characteristics of cyber risks and information/communication technology (ICT) risks faced by financial institutions.
b. assess the interactions between cyber and ICT risks and financial risks and explain how cyber and ICT risk events at financial institutions can lead to systemic financial risk.
c. describe potential macroprudential tools and policy measures that can be used to address cyber risks and ICT risks and explain challenges to the adoption of each one.

The following is a review of the Risk Management and Investment Management principles designed to address the learning objectives set forth by GARP®. Cross-reference to GARP assigned reading—Ang, Chapter 6.

READING 83

FACTOR THEORY

Study Session 13

EXAM FOCUS

In this reading, we introduce factor theory and factor risk. A key point is that it is not the exposure to an asset that is rewarded, but the exposure to the underlying factors. The risk of these factors is being rewarded with risk premiums. Several factor theories are introduced, including the capital asset pricing model (CAPM) and multifactor models. For the exam, understand the key assumptions of the CAPM while recognizing the model's limitations in a real-world setting, and be able to contrast the CAPM with the assumptions of multifactor models. Through multifactor models, we introduce the concept of a stochastic discount factor, which is a random variable used in pricing an asset. Finally, be familiar with the efficient market hypothesis, since it identifies areas of market inefficiencies that can be exploited through active management.

MODULE 83.1: FACTORS THAT IMPACT ASSET PRICES AND THE CAPM

LO 83.a: Describe factors that impact asset prices and explain the theory of factor risk premiums.

In the context of factor investing, it is easiest to think of assets as bundles of **factor risks**, where exposure to the different factor risks earns risk premiums. The underlying **factors** may include the market (which is a tradeable investment factor), interest rates, or investing styles (including value/growth, low volatility, or momentum). Factors may also be classified as fundamental macroeconomic factors, such as inflation and economic growth.

Factor theory is based on an analysis of factor risks. Factor risks represent exposures to *bad times*, where exposures to adverse economic and investment conditions are rewarded with risk premiums. Factor theory is based on three primary principles:

1. *Factors are important, not assets*. It is not exposure to the specific asset that matters, but rather the exposure to the underlying risk factors. As a result, investors must look through assets and understand the underlying factor risks.
2. *Assets represent bundles of factors*. Assets typically represent bundles of risk factors, although some assets, like equities and government bonds, can be thought of as factors themselves. Other assets, including corporate bonds, private equity, and hedge funds,

contain many factors, such as equity risk, interest rate risk, volatility risk, and default risk. Assets' risk premiums reflect these risk factors.

3. *Investors have different optimal risk exposures*. Investors each have different optimal exposures to risk factors. One of the important factors is volatility. Higher volatility results in greater asset risks during bad times. One important recent example of bad times was the 2007–2009 financial crisis. In return for bearing factor risks, investors require compensation through a risk premium (e.g., a volatility premium for volatility risk) during normal times. Economic growth represents another factor to which investors want different exposures.

Bad times could represent economic bad times, including high inflation and low economic growth. They could also represent bad times for investing, including poorly performing investments or markets. Factors are all unique, and each represents exposure to a different set of bad times.

LO 83.b: Discuss the capital asset pricing model (CAPM) including its assumptions and explain how factor risk is addressed in the CAPM.

The **capital asset pricing model (CAPM)** describes how an asset behaves not in isolation, but in relation to other assets and to the market. The CAPM views not the asset's own volatility as the relevant measure, but its covariance with the market portfolio, as measured by the asset's *beta*.

The CAPM assumes that the only relevant factor is the market portfolio, and risk premiums are determined solely by beta. As mentioned, risk premiums are important because they compensate investors for losses during bad times. Risk here is determined by the assets' movements relative to each other, and not by the assets in isolation.

LO 83.c: Explain the implications of using the CAPM to value assets, including equilibrium and optimal holdings, exposure to factor risk, its treatment of diversification benefits, and shortcomings of the CAPM.

Implications of Using the CAPM

The CAPM holds six important lessons.

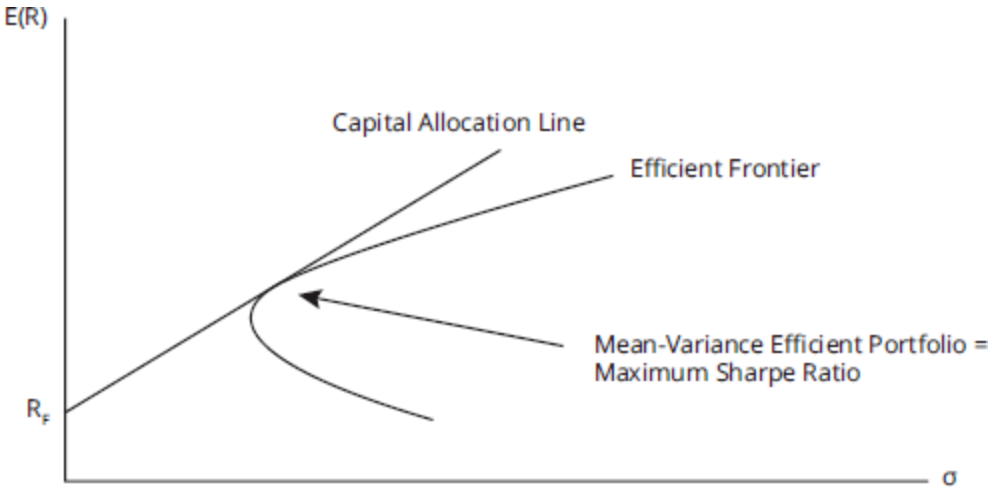
Lesson 1: Hold the factor, not the individual asset.

In a CAPM world, stocks are held in proportion to their market capitalization, where the sole factor is the market portfolio. The market portfolio can be constructed by holding many assets, which helps diversify away *idiosyncratic (firm-specific) risk*, leaving only *systematic (market) risk*. Individual stocks have risk premiums, which compensate investors for being exposed to the market factor. Market risk affects all investors exposed to the market portfolio.

According to the CAPM, investors do not wish to hold assets in isolation, because diversification improves the risk-return profile of a portfolio. The concept is simple: diversification helps ensure that bad returns from one asset will be offset by the returns of other assets that perform well. This also improves Sharpe ratios (i.e., risk premium divided by total risk). Investors continue to diversify until they are left with the market portfolio, which represents the optimal diversified portfolio.

Mean-variance efficient portfolio. Portfolio diversification and Sharpe ratios can be graphically represented by the mean-variance **efficient frontier**. When investors hold portfolios that combine the risky asset and the risk-free asset, the various risk-return combinations are represented by the **capital allocation line (CAL)**. The risky asset in this case is the *mean-variance efficient (MVE) market portfolio*, which is efficient because it represents the maximum Sharpe ratio given investors' preferences. The specific combination of the risk-free asset and the MVE portfolio depends on investor risk aversion.

Figure 83.1: Capital Allocation Line



Equilibrium. In equilibrium, demand for an asset equals supply, and since under the CAPM all investors hold the risky MVE market portfolio, the market is the factor. For equilibrium to happen, someone must hold the MVE portfolio as the risky asset. If no investor held the risky asset, the risky asset must be overpriced, and its expected return must be too low. This situation cannot represent an equilibrium state. Since under CAPM the expected payoff of an asset remains constant, the asset's expected return must increase as its price falls. In equilibrium, the risk factor is the market, and it has a risk premium. The market factor is a function of investor risk aversion and utilities, and risk premiums will not disappear since investors cannot use arbitrage to remove systematic risk.

Lesson 2: Investors have their own optimal factor risk exposures.

Every investor holds the same risky MVE market portfolio, but the proportion in which they hold it differs. Investors hold different combinations of the risk-free asset and the risky portfolio, representing various positions along the CAL.

Lesson 3: The average investor is fully invested in the market.

An investor with an average risk aversion would hold 100% of the risky MVE market portfolio, which represents the tangency point of the MVE frontier and the CAL. The average investor's risk aversion is, therefore, the risk aversion of the market.

Lesson 4: Exposure to factor risk must be rewarded.

When all investors invest in the same risky MVE portfolio, the CAL for an investor is called the **capital market line (CML)** in equilibrium. The risk premium of the CML depends on an investor's risk aversion and the volatility of the market portfolio:

$$E(R_M) - R_F = \bar{\gamma} \times \sigma_M^2$$

where $E(R_M) - R_F$ is the market risk premium, γ is the average investor's risk aversion, and σ_M^2 is the market portfolio's variance. During volatile market times (e.g., the 2007–2009 financial crisis), equity prices typically fall and expected returns increase. In the CAPM world, the risk premium is proportional to the market variance. Because market variance removes all idiosyncratic risk, the remaining systematic risk should be rewarded through the risk premium. When the average investor's risk aversion increases, the market risk premium should also increase.

Lesson 5: Risk is measured in terms of beta exposure.

An individual asset's risk is measured as factor exposure to the asset, and higher factor exposures to the asset indicate higher expected returns (assuming the risk premium is positive). The risk premium of an individual asset is derived under the CAPM formula using beta pricing to construct the **security market line** (**SML)**. The formula states that:

$$E(R_i) - R_F = \frac{cov(R_i, R_M)}{var(R_M)} \times [E(R_M) - R_F] = \beta_i \times [E(R_M) - R_F]$$

where R_i is the individual stock's return, R_F is the risk-free rate, and **beta** is a function of the market variance and the asset's co-movement with the market: [$\beta_i = cov(R_i, R_M) / var(R_M)$]. Higher co-movements denote higher betas, which correspond to higher risk premiums. Whereas previously we looked at systematic risk and diversification, beta looks at idiosyncratic risk and the lack of diversification.

Higher betas imply lower diversification benefits. Investors tend to find high betas (high sensitivities to market returns) unattractive, and therefore want to be compensated with higher expected returns. On the other hand, low beta assets are valuable because they do comparatively well when markets perform poorly, offering significant diversification benefits. During the 2007–2009 financial crisis, certain assets (safe havens like gold and government bonds) became so attractive that they had negative expected returns. This meant investors actually paid to hold these assets!

Lesson 6: Valuable assets have low risk premiums.

The CAPM risk premium represents the reward investors receive for holding the asset in bad times. Since the market portfolio is the risk factor, bad times indicate low market returns. Assets that have losses during periods of low market returns have high betas, which indicates they are risky and, therefore, should have high risk premiums. Low-beta assets have positive payoffs when the market performs poorly, making them valuable to investors. As a result, investors do not require high risk premiums to hold these assets.

Shortcomings of the CAPM

The CAPM makes several simplifying assumptions that are necessary to make the model work; however, many of these assumptions are considered overly simplistic or not reflective of the real world. The assumptions of the CAPM break down especially in illiquid, inefficient markets where information may be costly and not available to all investors. We look at seven of these assumptions:

1. *Investors only have financial wealth*. Investors have unique income streams and liabilities. Liabilities are often denominated in real terms, and income streams are risky because incomes decline during periods of low economic growth. As a result, both inflation and