

IMPORTANT ANNOUNCEMENTS

Midterm test: **Tuesday, 2 March 2021** (Week 7)

- During the scheduled lecture session
- Students must enter the Zoom waiting room by
 - 10:00 am (LA1), or
 - 14:00 (LA2)
- 60 minutes long; 25 MCQs
- Open book/notes
- NO internet
- NO backward navigation, randomized order

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IMPORTANT ANNOUNCEMENTS (cont.)

- You will need 2 devices:
 - 1 laptop (for Exemplify & soft-copy notes)
 - NO INTERNET DURING EXAM SESSION
 - Another device (e.g., phone/iPad)
 - Connected to internet for Zoom proctoring
- 2 calculators (1 financial & 1 scientific/graphing)
 - NO Excel
- NO other electronic devices
- NO second monitor

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IMPORTANT ANNOUNCEMENTS (CONT.)

Test dry-run:

- To facilitate test logistics (**Attendance is OPTIONAL**)
- **Tuesday, 23 February** (during recess week)
- Tentatively scheduled for 10 – 11 am; more info next week

Purely technical dry-run:

NO module materials will be discussed during dry-run

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Discussing test, exam, and quiz questions
before, during, and after
the test/exam/quiz with other students
constitutes **academic dishonesty**

Per the Office of Student Conduct's Circular No.3 of 2021 (21 January 2021)

- “NUS is taking a tougher stance against academic dishonesty. As such, for cases of **plagiarism and cheating** in **tests/examinations/graded assignments** that have been assessed to be ‘Moderate’ in severity, the minimum penalty would be a ‘Fail’ grade for the affected module.”
- The online version of the revised NUS Plagiarism Policy and Guidance Note can be accessed via the [Student Portal](#).

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Week 5

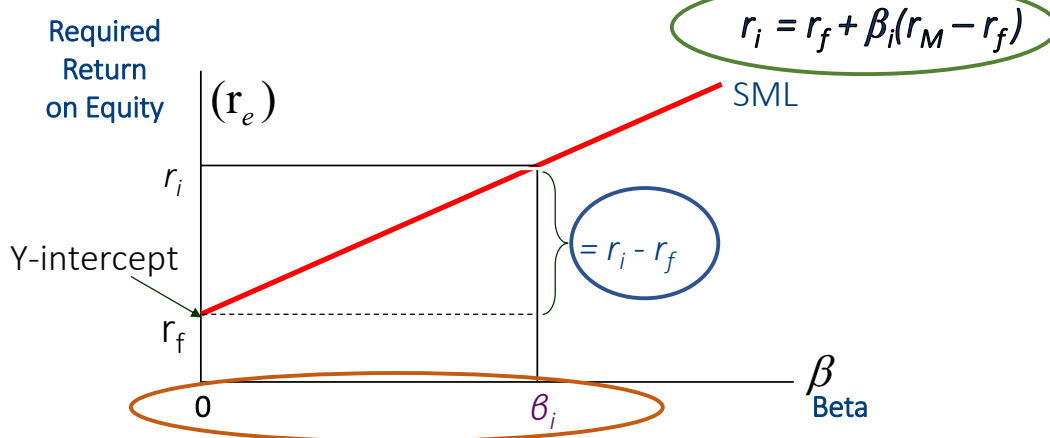
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Diversification

- Not solely focus on reducing risk
 - Diversification can substantially reduce the variability of returns **without** an equivalent reduction in expected returns (slide 9)
- Reward-to-risk ratio (slide 23)
 - In equilibrium, all assets and portfolios must have the same reward-to-risk ratio
 - The slope of the SML line

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The Security Market Line (SML)



Reward-to-risk ratio = Slope = $(r_i - r_f) / (\beta_i - 0)$

For market portfolio (M): $(r_M - r_f) / \beta_M = (r_M - r_f) / 1 = r_M - r_f$

All assets have the same reward-to-risk ratio = $(r_M - r_f) = (r_i - r_f) / \beta_i$

- $(r_i - r_f) = \beta_i * (r_M - r_f)$
- Excess return of each asset (relative to risk free rate) is proportional to the asset's beta

Beta

$$\beta_i = \frac{\text{Cov}(r_i, r_M)}{\sigma_M^2}$$



$$\beta_i = \frac{\rho_{i,M} * \sigma_i * \sigma_M}{\sigma_M^2}$$



Why not
 ~~$\beta_i = \text{Cov}(r_i, r_M) / \sigma_i \sigma_M$~~ ?

Beta captures each asset's exposure to the market risk

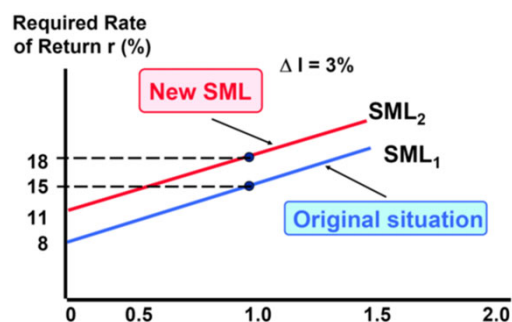
- Some assets have higher exposure, and others have lower
- Beta < 1: the asset is less exposed to the overall market movement

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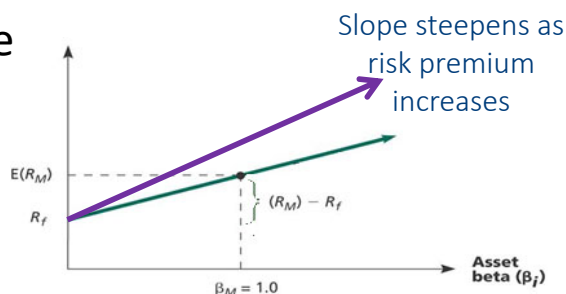
Inflation and risk aversion

$$r_i = r_f + \beta_i(r_M - r_f)$$

- How inflation change affects the SML line
 - Inflation affects r_f
 - Affects both risk-free asset and risky asset



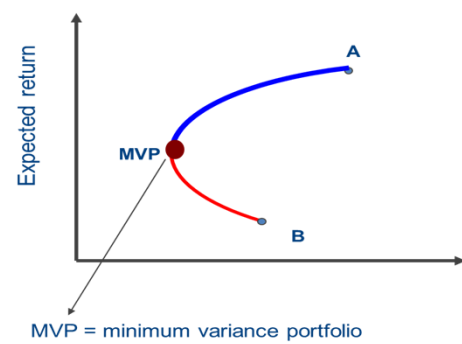
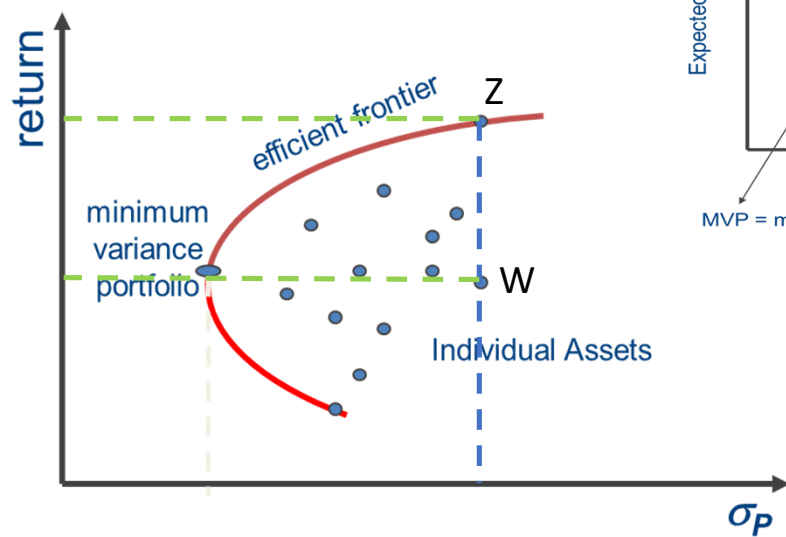
- How risk aversion change affects the SML line
 - Risk aversion affects the risk premium ($r_m - r_f$)
 - Does not affect risk-free asset



- Example on slides 35-36: 8% is the market risk premium, which is $(r_m - r_f)$

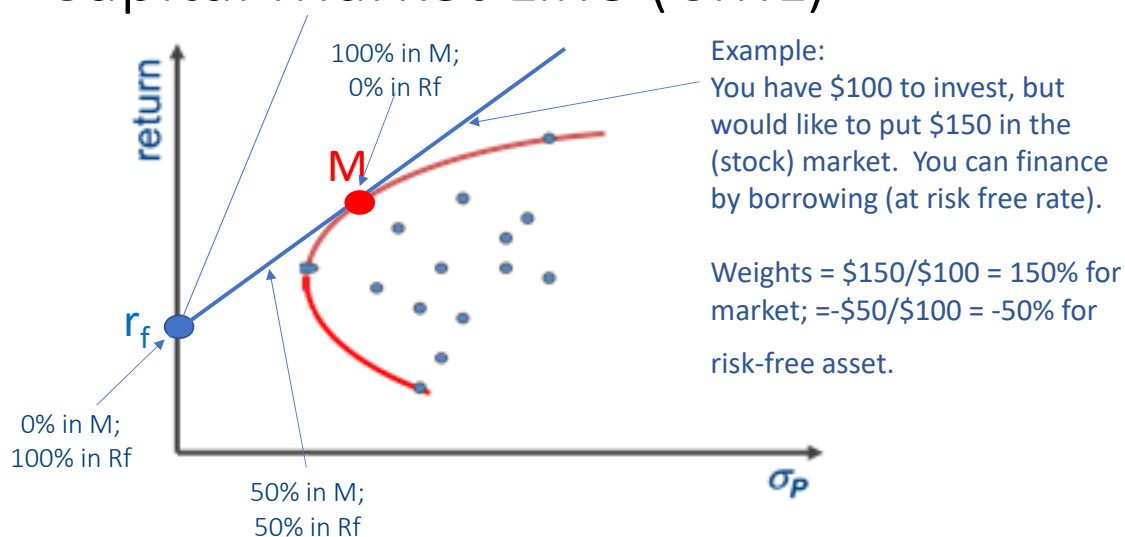
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Efficient frontier



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Capital Market Line (CML)



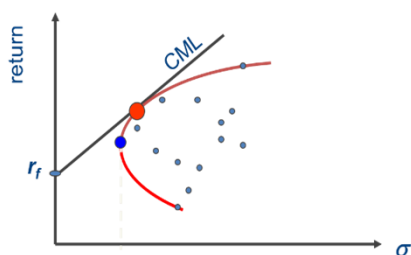
The CML denotes the allocation between risk-free asset and the M (market) portfolio

- Allows for lending and borrowing at risk-free rate

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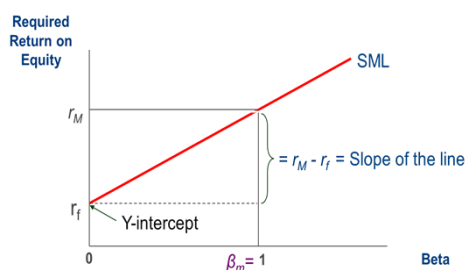
CML

- Risky assets are the dots, inside the curve, and below the efficient frontier and CML
- The CML denotes the allocation between risk-free asset and the M portfolio
- Useful to identify optimal portfolio
- Note: the x-axis is Standard Deviation



SML

- Risky assets are SUPPOSED to line up on the red line.
- The SML denotes the expected/required rate of return of various assets, depending on its Beta
- Useful to identify potentially mispriced assets (i.e., those that lie off the SML line)
- Note: the x-axis is Beta



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Other notes

- One of CAPM assumptions: All investors are fully diversified across a range of investments (Slide 31)
 - Many investors do not diversify
- How useful are these?
 - Efficient frontier analysis is used for asset allocation
 - CAPM is used for various investment & capital budgeting purposes

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Week 5

List of topics

Note:

You are responsible for all materials covered in the pre-recorded videos posted on LumiNUS, unless they are marked “not examinable”. This list only serves to help you in your revisions.

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Week 5 topics

- Portfolio returns
- Portfolio risk
 - Portfolio standard deviation
- Diversification
 - Diversifiable risk
 - Non-diversifiable risk
 - Total risk

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Week 5 topics (cont.)

Capital Asset Pricing Model (CAPM)

No reward for veering risk unnecessarily

- Beta
 - $\text{Beta} = 1$; $\text{beta} < 1$; $\text{beta} > 1$
- Security Market Line (SML)
- Market risk premium
- Reward-to-risk ratio
- Portfolio beta
- Expected returns and required returns
- Impact of:
 - Inflation
 - Change in risk aversion

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Week 5 topics (Cont.)

Markowitz Portfolio Theory

- Efficient portfolio
- Efficient frontier
- Minimum variance portfolio (MVP)
- Capital Market Line (CML)

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