1. Individual investors

a) There are four types of under-diversification.

① **Home bias**: Individuals tend to invest much more in domestic stocks, ignoring the benefits of international diversification. One theory for rational approach is information advantage. Investors can understand domestic stocks better than foreign stocks due to the asymmetric information. Another one for behavioral approach is the preference for the familiar/mere exposure effect. Even though the investors don't really know whether the stocks are good or not and they are just exposed to those firms every day, they will prefer to those familiar stocks.

② **Local bias**: Within their domestic equity holdings, individuals prefer to locally-headquartered stocks. The theory for behavioral approach is also the preference for the familiar/mere exposure effect. They are exposed to those local brands every day and more familiar with them. Therefore, they think those stocks are better and make irrational decisions.

③ **Concentrated stock holdings:** Some households hold concentrated positions in relatively few stocks. The theory for behavioral approach is that the investors are overconfident about the validity of their analysis. Another one is prospect theory. People may want to have large positions in "lottery-type" stocks to give themselves a chance of becoming wealthy.

④ **Large holdings of own-company stock:** People invest a surprisingly large fraction of their retirement savings in the stock of their own company. One theory for rational approach is information advantage. People think they can get more information than those outside the company. For behavioral approaches, it maybe because individuals are more familiar with their working company or want to show their loyalty to the company, or because they are overconfident with their decisions on their own company, or just because they are too lazy to study the stock market and simply invest their own company.

2. Valuation

a) The advantages of DCF:

i. It's less exposed to market moods and perceptions.

ii. If good investors buy businesses, rather than stocks, it's the right way to think about what you are getting when you buy an asset.

iii. It forces you to think about the underlying characteristics of the firm and understand its business. If nothing else, it brings you face to face with the assumptions you are making when you pay a given price for an asset.

iv. If you buy into the notion of value being driven by a company's cash flows, you are immunized from what the market thinks about your investment.

The disadvantages of DCF:

i. It requires far more explicit inputs and information than other valuation approaches.

ii. These inputs and information are not only noisy, difficult to estimate, but can be manipulated by the analyst to provide the conclusion he or she wants.

iii. In an intrinsic valuation model, there is no guarantee that anything will emerge as under or overvalued. Thus, it is possible in a DCF valuation model to find every stock in a market to be over-valued.

The advantages of relative valuation:

i. It is much more likely to reflect market perceptions and moods than DCF valuation, which is important when the objective is to sell an asset at that price today (IPO, M&A) or

investing on "momentum" based strategies.

ii. There will always be a significant proportion of securities that are under-valued and over-valued.

iii. It requires less explicit information than DCF valuation.

iv. In relative valuation, you are playing the "incremental" game, where you hope to make money by getting the next increment right.

The disadvantages of relative valuation:

i. A portfolio that is composed of stocks which are under-valued on a relative basis may still be over-valued, even if the analysts' judgments are right.

ii. If markets are over or under valued in the aggregate, relative valuation will fail.

iii. Maybe some implicit assumptions are made about other variables, which would have been required in a DCF valuation. To the extent that these implicit assumptions are wrong, the relative valuation will also be wrong.

b) Firm Value = Market Capitalization + Market Value of Debt – Cash and Equivalent

Allocating net income as dividends or retained earning only affects market capitalization.

$$\frac{P}{E} = \frac{(1-b)}{r - b * ROE}$$

, where (1-b) is the payout ratio. Derivates both sides in terms of b, we can get

$$P' = \frac{ROE - r}{(r - b * ROE)^2} * E$$

① When ROE=r, P'=0. No matter how b changes, p is constant. Therefore, paying dividends has no influence on firm value.

② When ROE>r, P'>0. When b goes up, p goes up. That means paying dividends will decrease firm value.

③ When ROE<r, P'<0. When b goes up, p goes down. That means paying dividends will increase firm value.

3. Efficient Market Hypothesis

a) In general, the Efficient Market Hypothesis says that all known information about investment securities is already factored into the prices of those securities. Therefore, no amount of analysis can give an investor an edge over other investors, collectively known as "the market".

There are three forms of EMH: weak, semi-strong and strong.

Weak form suggests that all previous market prices are already taken into account in the price of a stock. Investors can't predict where a stock is moving by following previous price patterns through technical analysis.

Semi-strong form means that all public information is already fully reflected by the stock price. Recent events and current financial statements are worthless in analyzing a security.

Strong form claims that all information is fully reflected in the stock price. Even insider information is worthless when looking for opportunities.

b) Evidence supporting EMH:

i. Professional money managers do not beat the market on average. Professional money managers make investment decisions by analyzing public information and historical stock prices. If the market is inefficient in semi-strong EMH sense, they should find mispriced opportunities from this information and beat the market on average.

ii. New information appears to be quickly incorporated into prices. For a certain event happening in hundreds of companies, look at the target firms' stock price average reaction to the news, we can see the typical pattern which reflects abnormal return due to the certain event.

Evidence against EMH:

i. There are some cases where prices seem to move even though there is no new information. For example, in one day in October 1987, the stock market drop 20% even though there were no the big event happened. That means the stock price doesn't reflect all information.

ii. There are investment strategies that seem to have earned higher average returns than is consistent with their risk. If the market is efficient, the average return of two equally risky assets should be the same.

iii. Shiller(1981) provided evidence that the stock market prices are too volatile to be explained by changes in fundamentals. In DCF model, only future cash flow, risk-free rate, and risk premium are used to calculate the stock price. The aggregated cash flow and risk-free rate are impossible to be too volatile. But the risk premium, if totally influenced by the fundamental information, is also impossible to be so volatile. Therefore, the market is inefficient.

4. CAPM&APT

a) CAPM: $E[r_i] = r_f + \beta_i\big(E[r_m] - r_f\big)$

APT: $E[\tilde{r_i}] = \alpha_i = \alpha_p = r_f + \beta_{i1}\lambda_1 + \cdots + \beta_{iK}\lambda_K$

b) CAPM requires strong consumptions that the investors must be mean-variance preference, and everyone knows the same set of information, all have the same estimates of expected returns variances, covariances, etc. But it is widely applicable on any individual asset and tells us there is one market portfolio factor. In the contrast, the only assumption for APT is that no arbitrage exists. But APT is less widely applicable and only applied to well-diversified portfolios. In addition, APT is less specific. It does not tell us how many factors or what those factors are.

c) i. Download the monthly returns of Pingan Bank (000001) and Shenzhen Airport (000089) from CSMAR.

ii. Calculate the mean and standard deviation of Pingan Bank and Shenzhen Airport,$E[r_x], E\big[r_y\big], \sigma_x, \sigma_y$, respectively.

iii. Construct portfolios by investing different weights in these two assets.

$$E\big[r_p\big] = w_x E[r_x] + (1 - w_x)E\big[r_y\big]$$

$$\sigma_p = \sqrt{w_x^2\sigma_x^2 + w_y^2\sigma_y^2 + 2w_x w_y \sigma_{xy}^2}$$

iv. Eliminate those portfolios which gain lower expected return at the same risky level.

v. Plot $E\big[r_p\big]{\sim}\sigma_p$ [Figure1], and the final equation is $\sigma_p = \sqrt{1021.47E\big[r_p\big]^2 - 25.76E\big[r_p\big] + 0.17}$.

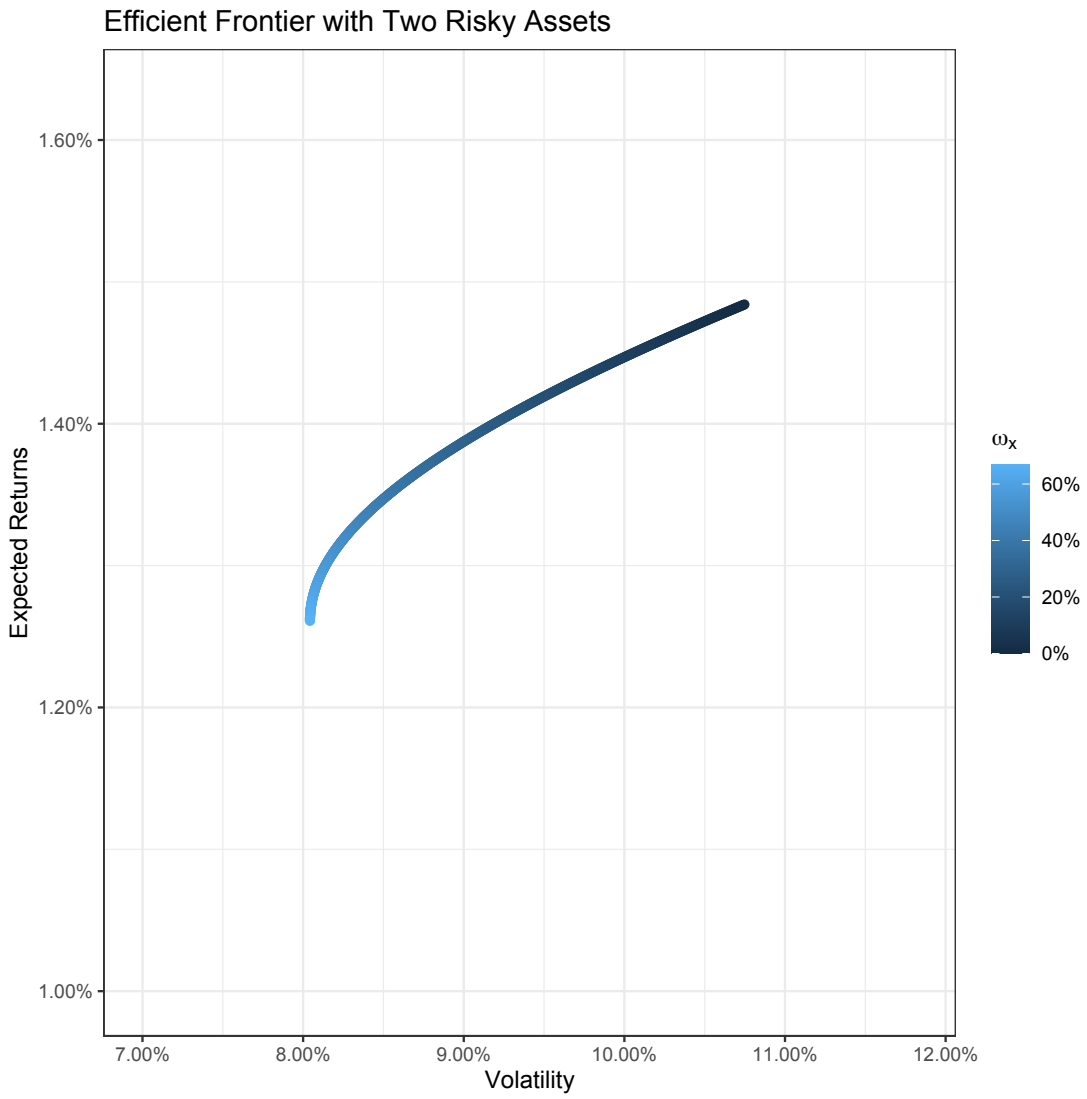

figure 1

d) Efficient Frontier equation: $E[r_p] = 0.003 + 0.1235175\sigma_p$
The Sharpe ratio of market portfolio is 0.1235175.

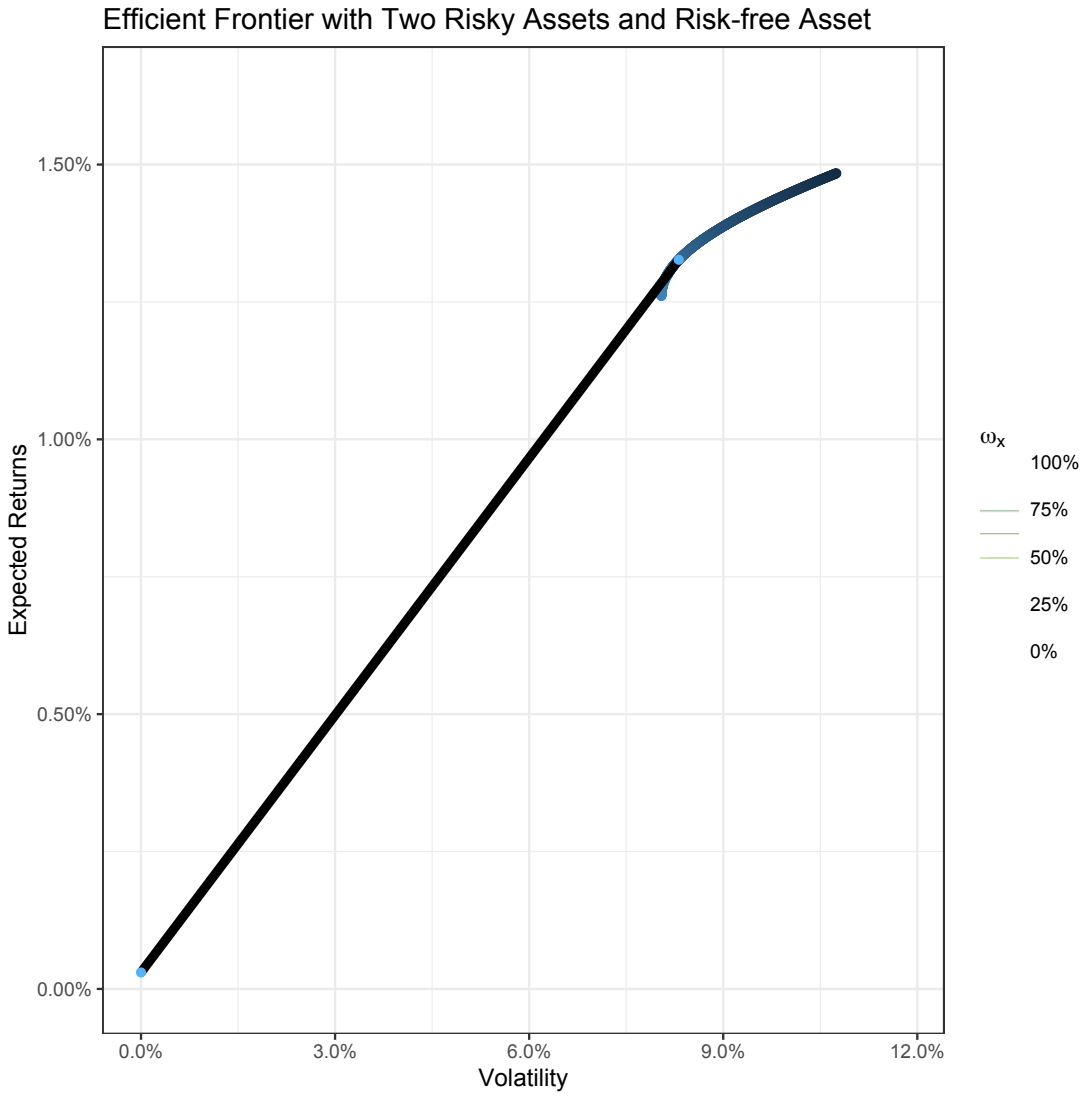

figure 2

e) i. Download the monthly returns of Pingan Bank (000001), Shenzhen Airport (000089) and Media Group (000333) from CSMAR.

ii. Calculate the mean and standard deviation of Pingan Bank, Shenzhen Airport and Media Group, $E[r_x], E[r_y], E[r_z]$ $\sigma_x, \sigma_y, \sigma_z$ respectively.

iii. Construct portfolios by investing different weights in these two assets.

$$E[r_p] = w_x E[r_x] + w_y E[r_y] + (1 - w_x - w_y) E[r_z]$$

$$\sigma_p = \sqrt{w_x^2\sigma_x^2 + w_y^2\sigma_y^2 + w_z^2\sigma_z^2 + 2w_x w_y \sigma_{xy}^2 + 2w_x w_z \sigma_{xz}^2 + 2w_z w_y \sigma_{zy}^2}$$

iv. Choose the portfolio with the Min(σ_p).

The minimum variance portfolio is

wx	wy	wz	er_p	sd_p
0.4194194	0.1791792	0.4014014	0.01778456	0.07353536