# 1 投资组合

## 1.1 Factors

### 1.1.1 问题描述：如题

### 1.1.2 题目

Volatility is one of the three most important macro factors. Each of the following statements about volatility, as a macroeconomic factor, is true EXCEPT which is false?

A. There is a negative correlation between stock returns and the VIX index

B. Volatility has a negative "price of risk" in aggregate markets including equities, fixed income, currency, and commodity markets

C. Due to volatility's negative "price of risk," an increase in volatility implies higher subsequent stock returns because there is a natural upper limit on volatility somewhere around 100%

D. The "leverage effect" refers an increase in stock volatility (riskier equities) due to a general increase in firm's financial leverage (i.e., assets divided by equity) caused by a drop in stock returns

Answer: C

**解答：**

C 选项第一句话，volatility‘s negative price of risk，他表示的含义是这样的，通常我们说的资产都是有一个正的 premium 的，所以我们会去买它，我们对他会有一个正的预期收益率，但是 volatility 他作为一个要素，它是有一个负的 premium 的。后面的一句话说的是，风险越高，股票的收益率就是越高的，这句话是错误的，应该是越低的。

## 1.2 Risk Management and Hedge Fund

### 1.2.1 问题描述：如题

### 1.2.2 题目

Which of the following statements about risk management in the pension fund industry is correct?

A. A pension plan’s total VaR is equal to the sum of its policy-mix VaR and active-

management VaR.

B. Pension fund risk analysis does not consider performance relative to a benchmark.

C. In most defined-benefit pension plans, if liabilities exceed assets, the shortfall does not create a risk for the plan sponsor.

D. From the plan sponsor's perspective, nominal pension obligations are similar to a short position in a long term bond.

Answer: D

**解答：**

A 选项，一个基金的绝对收益是来源于两个部分的，一个是跟踪大盘得到的收益（policy-mix），还有一个来源就是通过主动选股来得到收益（active management），那么既然收益是来源于这两个部分，那么对应的风险也是来源于这两个部分，但是 A 的说法是不正确的，因为整个的风险不应该是单个组成风险的简单加和。

D 选项，说的是从基金发起人的角度，基金的义务就是相当于是 short 长期债券。这个说法是正确的。

### 1.3 Risk Management and Hedge Fund

#### 1.3.1 问题描述：如题

#### 1.3.2 题目

Which of the following statements about risk management in the pension fund industry is correct?

A. A pension plan's total VaR is equal to the sum of its policy-mix VaR and active-management VaR.

B. Pension fund risk analysis does not consider performance relative to a benchmark.

C. In most defined-benefit pension plans, if liabilities exceed assets, the shortfall does not create a risk for the plan sponsor.

D. From the plan sponsor's perspective, nominal pension obligations are similar to a short position in a long term bond.

Answer: A

**解答：**

这个题目想要问的是最简单的收获非流动性资产风险溢价的方式是什么。ABD 选项其实都是描述收获非流动性资产风险溢价的方式，C 选项应该是吧 less 变成 more 就是方法了。原版书对于这四种方式都是有一个描述的，其中对于动态调整的说法有这样一句，就是他是最简单的方式。所以这个题目的正确答案是 A 选项。

## 1.4 Factors

### 1.4.1 问题描述：如题

### 1.4.2 题目

We can add a momentum factor to the Fama-French so that it becomes a four-factor model. This momentum factor is denoted by WML (i.e., past winners minus past losers) or UMD (i.e., stocks that have gone up minus stocks that have gone down). At least with respect to the historical window analyzed, which is the long period from January 1965 to December 2011, which of the following statements is TRUE about the momentum factor?

A. Momentum is a negative feedback strategy which is inherently stabilizing

B. The momentum factor is observed in equities but is NOT observed in bonds, commodities and real estate

C. Momentum investing by definition is an anti-value strategy; correlations between HML and WML are strongly negative

D. The cumulated profits on momentum strategies have been an order of magnitude larger than cumulated profits on either size or value

Answer: D

**解答：**

这个题目的正确答案是 D 选项，momentum 策略其实就是一个追涨杀跌的策略，那么其实如果根据我们的价值投资的思路，这种方式很显然是不可取的，但是这个方式却在我们真实的市场中是有效的，原因就是我们身处的市场是有惯性的，所以运用这种策略其实是可以赚钱的，而且在我们原版书中对于这个策略的介绍就是根据之前出现过的历史信息，momentum 的平均收益率是高于我们价值投资的收益率的，这个是一个实证结

论。

## 1.5 Factors

### 1.5.1 问题描述：如题

### 1.5.2 题目

We can add a momentum factor to the Fama-French so that it becomes a four-factor model. This momentum factor is denoted by WML (i.e., past winners minus past losers) or UMD (i.e., stocks that have gone up minus stocks that have gone down). At least with respect to the historical window analyzed, which is the long period from January 1965 to December 2011, which of the following statements is TRUE about the momentum factor?

A. Momentum is a negative feedback strategy which is inherently stabilizing

B. The momentum factor is observed in equities but is NOT observed in bonds, commodities and real estate

C. Momentum investing by definition is an anti-value strategy; correlations between HML and WML are strongly negative

D. The cumulated profits on momentum strategies have been an order of magnitude larger than cumulated profits on either size or value

Answer: C

**解答：**

首先这个策略是 long 一个 interest rate swap，然后 short treasury，所以这个策略对于利率来讲是一个对冲的策略，这个对冲的策略对于利率来讲是没有头寸的，或者说是没有风险的。但是他也不是一成不变的，因为有一个资产是 swap，所以说，如果这个 swap 和 Treasury 的 spread 扩大的话，那么可能就会有问题。举个例子，如果说一开始假设二者的利率分别是 5.5%和 5%，现在利率下降了，二者的利率变成了 5.3%和 4.5%，那么这个时候，首先在利率下降的时候，他们两个的价值都是上升的，其次他们之间的 spread 是扩大的，那么由于 Treasury 下降的幅度是比较大的，我又是 short Treasury，所以我损失的相较于我 long swap 得到的收益是大很多的，所以此时，我是会损失的，所以说我怕的就是他们二者之间的 spread 是变大的。所以这个题目的正确答案就是 C 选项。

## 1.6 Illiquid Asset

### 1.6.1 问题描述：如题

### 1.6.2 题目

To adjust the infrequent trading bias introduced that is introduced into reported returns, we can "unsmooth" or "de-smooth" the reported returns. Ang suggests this is a filtering problem: "Filtering algorithms are normally used to separate signals from noise. When we're driving on a freeway and talking on a cell phone, our phone call encounters interference—from highway overpasses and tall buildings—or the reception becomes patchy when we pass through an area without enough cell phone towers. Telecommunication engineers use clever algorithms to enhance the signal, which carries our voice, against all the static. The full transmission contains both the signal and noise, and so the true signal is less volatile than the full transmission. Thus standard filtering problems are designed to remove noise. The key difference is that unsmoothing adds noise back to the reported returns to uncover the true returns."

$$r^*_t = c + \phi r^*_{t-1} + \varepsilon_t$$
$$r_t = \frac{1}{1-\phi} r^*_t - \frac{\phi}{1-\phi} r^*_{t-1}$$
$$r^*_t = (1-\phi) r_t + \phi r^*_{t-1}$$

In these formulas r*(t) is the reported (aka, observed) return and r(t) is the true but unobserved return. Importantly, as is almost always the case in finance, the model used in this particular unsmoothing process makes key assumptions. However, if the assumptions are correct, then each of the following statements about the unsmoothing process is true EXCEPT which is false?

A. Unsmoothing affects only risk estimates and not expected returns

B. Unsmoothing has no effect if the observed returns are uncorrelated.

C. The true returns implied by the "transfer function" and equation 13.2, r(t), should have zero autocorrelation and generally should not be themselves forecastable

D. Due to the autocorrelation assumption, $|\varphi| < 1$, the variance of the true returns will be less than the variance of the observed returns; i.e., variance[r(t)] < i.e., variance[r*(t)]

Answer: C

**解答：**

这个题干是截取的原版书的内容，这个段文字它主要想要表达的含义就是 unsmooth 的过程，unsmooth 的目的其实就是因为我们观测到的数据不多导致的，那么所以说我们的真实可观测到的数据是少的，然后我们在研究的时候就假设我们真的是数据是没有相关性的。所以 C 选项的说法是正确的。D 选项错在 less than 上，因为虽然我们观测到的数据是比较少的，但是不代表这个资产真实的数据就是少的，所以 unsmooth 其实就是尽可能地模拟我们真实的但是是不可观测到的数据，所以这里应该是 more than，而不是 less than。

## 1.7 Illiquid Asset

### 1.7.1 问题描述：如题

### 1.7.2 题目

When measuring risk in hedge funds that hold illiquid assets using monthly data, certain biases can create a misleading picture. For example, these hedge funds might have the appearance of low systematic risk. Which of the following represents an appropriate means of correction?

A. Account for negative serial correlation of returns by first differencing the data when extrapolating risk to longer time horizons.

B. Account for positive serial correlation of returns by aggregating the data

C. Use regressions with fewer lags of the market factors and sum the coefficients across lags.

D. Use regressions with additional lags of the market factors and sum the coefficients across lags.

Answer: D

**解答：**

这个题目的意思是这样的：这个题目考查的是非流动性资产的相关问题。题意是这样的：如果用 monthly return 来测算的话用的都是估计值而不是实际的交易值，这些估计值之间

是存在显著的自相关性的，由于是估计出来的值，那么它和市场数据的相关系数就会很小。从而导致低估风险。解决方法是，加入更多期的数据进行回归，最后将所有的β相加获得一个我们需要的 beta

### 1.8 Portfolio Performance

#### 1.8.1 问题描述：如题

#### 1.8.2 题目

A manager who obtains an average alpha of 2.5% with a tracking-error of 4%. If he wish the result to be significant to 95%, how many years it is necessary to observe the portfolio return?

A. 8.8 years

B. 9.8 years

C. 10.8 years

D. 11.8 years

Answer: B

**解答：**

这两个公式在这个题目当中其实是一样的，因为分子都是表示一个超额收益，分母都是对应的波动率，只不过 t 统计量中多了一个根号 n，这个 n 我们通常表示的都是天数，所以就可以代指时间。所以就有了这个题目以及相关的推导公式。

### 1.9 Portfolio Performance

#### 1.9.1 问题描述：如题

#### 1.9.2 题目

Assume you purchase a share of stock for $50 at time t = 0 and another share at $65 at time t = 1, and at the end of year 1 and year 2, the stock paid a $2.00 dividend. Also at the end of year 2, you sold both shares for $70 each. The time-weighted rate of return on the investment is:

A. 18.04%

B. 18.27%

C. 20.13%

D. 21.83%

Answer: D

**解答：**

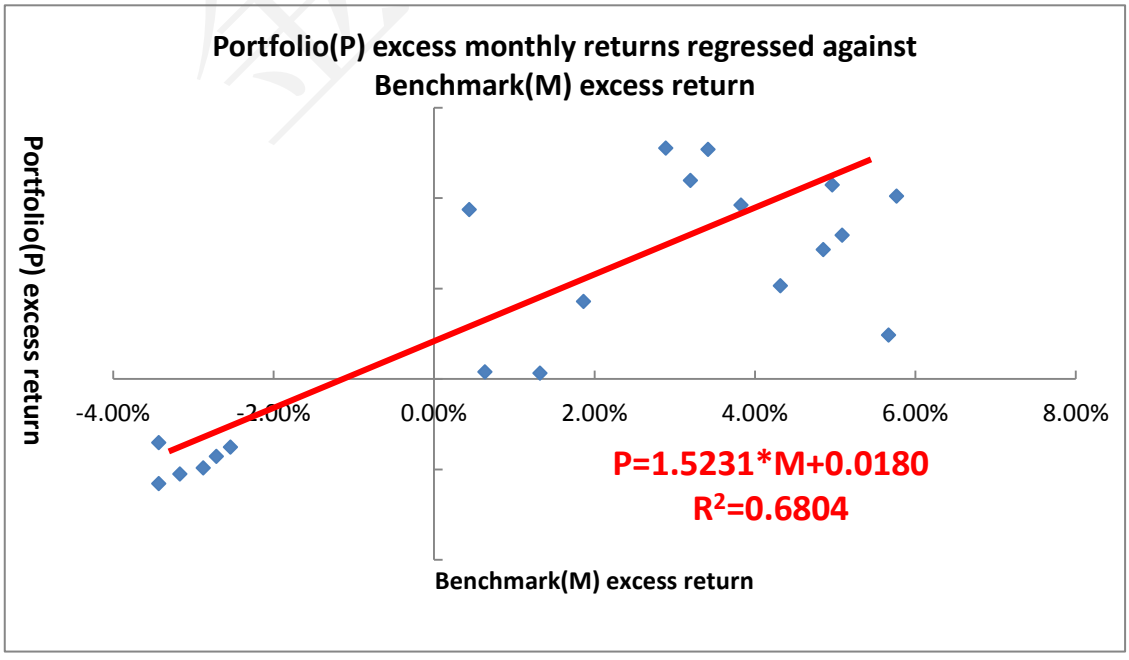
首先要清楚的是这个题目的问题问的是 TWR 的计算，那么他的计算方式就是现计算出每一个阶段的收益率，那么就是把这两年看成是两个阶段，第一个阶段就是花 50 块钱买的，现在价值 65 元，还有两块钱的红利，根据这个计算出第一阶段的收益率，第二阶段在 65 块钱的时候买入，后来价值 70 块钱，还是有两块钱的红利，只不过第一阶段只有一个股票，第二阶段有两只股票，把这个思路理清楚之后，这个题目就不难了

### 1.10 Alpha

#### 1.10.1 问题描述：如题

#### 1.10.2 题目

Below is the regression output of a portfolio's excess returns against its benchmark's excess return over the last three months (n = 60 trading days). Excess return is defined as return above the risk-free rate.



Key output from the regression includes:

- The sample size is 60 trading days
- With respect to the portfolio, its average excess return is 3.29% (in excess of the risk free rate) with volatility of 3.67%
- With respect to the benchmark, its average excess return is 0.98% (in excess of the risk free rate) with volatility of 1.99%
- The average difference in return between the portfolio and the benchmark, avg (P-M), is 2.31%; this is also called the active return
- The regression intercept is 0.0180 and the regression slope is 1.5231 (as displayed on plot)
- The tracking error (standard error of the regression) is 2.10%

Which of the following is nearest to the information ratio (IR) if we measure the IR as residual return per unit of residual risk?

A. 0.357

B. 0.630

C. 0.857

D. 1.102

Answer: C

**解答：**

这个问题是出在对于 IR 的定义有了一个调整，在这个题目中，他说 IR=residual return/residual risk，residual risk 我们知道就是 TEV，但是对于 residual return 这个概念，他不是等于 Rp-Rb 的，residual return=excess return-beta*benchmark excess return，等号右边的这一系列数字，其实就是对应的题目给出的那个回归方程，把 P 和 1.5231M 都放到一边，你就会知道其实这个 residual return 就是截距项。

## 1.11 Alpha

### 1.11.1 问题描述：如题

### 1.11.2 题目

The low-risk anomaly is a combination of each of the following three true effects EXCEPT which is false (and not technically included in the low-risk anomaly)?

A. Both contemporaneous and lagged volatility are inversely (aka, negatively) related to returns

B. Contemporaneous beta is inversely (aka, negatively) related to raw returns

C. Lagged beta is inversely (aka, negatively) related to risk-adjusted returns

D. Minimum variance portfolios do better than the market

Answer: B

**解答：**

D 选项就是关于 risk anomaly 的结果。risk anomaly 包含两点，一个是波动率与收益率负相关，一个是 beta 与收益率负相关，如此一来，风险最小的组合就应该有最好的表现。这句话来源于原版书的原话，在 risk anomaly 这一章的开头部分

## 1.12 Alpha

### 1.12.1 问题描述：如题

### 1.12.2 题目

Peter the aspiring FRM candidate is estimating the alpha for his firm's (Martingale's) new low-volatility fund. His naive benchmark is the Russel 1000 large-cap index. He has collected the following (ex ante) statistics over the historical sample where the period returns are monthly:

- The regression slope coefficient, β, is 0.40
- The portfolio's average excess return is 3.15% per month
- The Russel index's average excess return is 0.65% per month

Excess returns refer to returns above the risk-free rate. Which of the following is TRUE?

A. The portfolio's alpha is about +289 basis points

B. He should assume a beta (aka, slope) coefficient, β, of 1.0 such that the portfolio's alpha is about +250 basis points; this is a lower alpha due to the implicit risk-adjustment

C. The Russel is NOT an appropriate benchmark because the low beta, β, implies that the Russel 1000 cannot be combined with another asset in order to generate a market adjusted portfolio

D. The Russel is NOT an appropriate benchmark because it represents a tradeable, low cost alternative but the firm's low-volatility fund is active and charges high fees; an ideal benchmark charges comparable fees

Answer: A

**解答：**

对于 alpha 的理解应该是这样的，portfolio 的收益率-benchmark 的收益率，但是你说的这个听起来是很有道理的，但是既然组合中有超额收益率，那么他就一定是跑赢了 benchmark，所以他一定出了 benchmark 还投了别的资产，那么对于 benchmark 的投资比重也就会产生影响，所以你最后减掉的 benchmark 的收益率应该是做一个折扣的，这个折扣就是 beta 系数。

### 1.13 Alpha

#### 1.13.1 问题描述：如题

#### 1.13.2 题目

1. Below are Andrew Ang's actual regression results for the annual gross returns of the CalPERS pension fund against a passive portfolio of index funds in stocks and bonds. Please note the returns are gross returns, not excess returns; i.e., they are NOT net of the risk free rate.

| CalPERS gross annual returns, R(p), versus benchmark portfolio | | |
|---|---|---|
| | Coefficient | Standard error (SE) |
| Alpha α | -1.110% | 0.957% |
| Bond loading, β（B） | 0.320 | 0.0229 |
| Stock loading, β（S） | 0.680 | 0.0487 |
| Adjusted $R^2$ | 0.900 | |

Which of the following statements about these regression results is TRUE?

A. The high adjusted R^2 validates a hypothesis that the CalPERS active fund managers do add value relative to the benchmark

B. Because the factor loadings are not statistically significant, different factors should be repeatedly tested until a set is found that is significant

C. This regression should be re-run with at least one additional factor because robust benchmark portfolios must include at least one risk-free asset

D. It is acceptable to exclude risk-free assets and regress gross returns against the benchmark portfolio conditional on a constraint that the factor loadings sum to one; in this case, we need β(B) + β(S) = 1.0

Answer: D

**解答：**

A 选项，SMB 指的是 long small cap stock short big cap stock strategy,所以前面的系数小于 0 表示 long large cap，HML 也是一样的道理。

B 选项，前一个回归的 A.R square 是 14%，后一个提高到了 27%，所以整体模型的拟合度提高。

C 选项，alpha 的 t 检验值为 2.02，文章的样本数量是 22*12=242，在 5%的显著性水平上显著，所以说 insignificant 不合理。

D 选项，回归的系数表示没 1 美元的投资在各个投资策略上的情况

### 1.14 Alpha

#### 1.14.1 问题描述：如题

#### 1.14.2 题目

2. A portfolio manager creates alpha relative to a benchmark by making bets that deviate from that benchmark. The more successful these bets, the higher the manager's alpha. Grinold's Fundamental Law of Active Management formalizes this intuition by asserting that the maximum attainable information ratio is given by IR $\approx$ IC * $\sqrt{BR}$ where IR is the information ratio, IC is the information coefficient (the correlation of the manager's forecast with the actual returns) and BR is the breadth of the strategy.

Breadth is the number of securities that can be traded and how frequently they can be traded. Each of the following statements about the Fundamental Law is true EXCEPT which is false?

A. The empirical evidence suggests that, on average, IC tends to fall as BR increases

B. A compelling advantage of the fundamental law is that it successfully incorporates downside risk and higher moment risk; specifically, it adjusts for skew and excess kurtosis

C. If we require an IR of 0.50, this can be achieved either by a highly skilled stock timer with an IC of 0.25 making only four bets a year; or the same IR can be achieved by a manager with only a slight edge, IC of 0.025, who makes fully 400 bets a year

D. A crucial assumption is that the forecasts are independent of each other. But due to realistically correlated factor bets, it is difficult to make truly independent forecasts in BR; e.g., an equity manager with overweight positions on 1,000 value stocks offset by underweight positions in 1,000 growth stocks has not placed 1,000 different bets

Answer: B

**解答：**

这道题目有一些超纲，考到了关于 Grinold rule 的细节知识，从考试的角度了解 ACD 三个选项即可。

A 选项：言多必失，所以猜的次数越多，预测准确性就越低。

B 选项：Grinold 的主要思想是先预测 active return，按这个要求选择合适的权重配置资产，要求找到 Sharpe ratio 最大的组合，Sharpe ratio 只考虑了均值和方差，没有考虑偏度和峰度

C 选项：直接代入计算即可，BR 就是一年猜测的次数，等于所持有的的资产数量乘以预测频率

D 选项：BR 表示的独立预测的次数，如果资产与资产之前有相关系数，那么 BR 会下调

## 1.15 Alpha

### 1.15.1 问题描述：如题

### 1.15.2 题目

Which of the following statements about the risk anomaly is TRUE?

A. The primary argument against the risk anomaly, with respect to either low volatility or low beta, is that economists have generally demonstrated that markets are efficient; i.e., efficient market hypothesis (EMH) is true

B. Due to time-varying reality, it is theoretically intractable (ie, not possible) to create a reproducible benchmark for either the low beta or low volatility risk anomalies such that empirical tests of the risk anomalies are not robust and the discussion remains "largely theoretical"

C. The risk anomaly might be explained by investors who are leveraged constrained (i.e., who cannot borrow so instead bid up high beta stocks) and/or have an "agency problem" created by a need to minimize tracking error with the benchmark (e.g., they cannot short low volatility or short low beta)

D. The presence of the low-risk anomaly (aka, low-risk effect) in several different contexts-- including U.S. equities, international stock markets, Treasury bonds, corporate bonds (across credit rating classes), commodity, option and foreign exchange markets—is compelling evidence that "data mining" almost surely creates an illusion of a relationship between idiosyncratic return volatility (IVOL) and future returns because diversification generally eliminates the impact of IVOL

Answer: C

**解答：**

A 选项中，对于 risk anomaly 的主要解释是市场是 near efficient 而不是 efficient；2、D 选项中，Data mining 的主要原因是因为数据只选到了流动性差的资产，smoothing 之后的 return 不变但是 volatility 变小了，而不是 IVOL，出现在原版书的一个附注中（可进一步参考 Bali and Cakici（2008）and Han and Lesmond(2011)的一篇论文）