Equity Funds: Management and Assessment

FN 451

Outline

- Fund introduction: Key terms
- Investment company/mutual funds in Thailand
- Return and risk
  - Geometric vs Arithmetic, Holding period returns
  - Dollar weighted vs time weighted returns
  - Composite portfolio performance measures
  - Performance attribution
  - Risk attribution: VaR, Volatility, Tracking error
- Lab exercise: Measuring tracking error and fund performances

INTRODUCTION TO FUNDS: KEY TERMS

Mutual funds

- Asset under management (AUM) A mutual fund's total net assets, not to be confused with Net Asset Value (NAV), represents the total of all investor dollars invested in all share classes of the fund. The net amount includes shares to redeemed at the end of the day, which would have the effect of lowering the total assets under management, to arrive at net assets.
- Fund value per share value is known as net asset value (NAV)
- Fund NAV = (Total MV of fund – Fund expenses)/Total fund shares

NAV

- Ex. An investment firm with Bt 100 mn stock portfolio and 10 mn shares has NAV of Bt10.
- If during the holding period, the value of portfolio increases to Bt 112.5 mn while fund incurred Bt0.1 mn trading expenses and management fees. What is the new NAV?
- New NAV = 112.5-0.1/10 = Bt 11.24

Fund types

- Open-end: Continues to sell and repurchase shares after IPO.
- Additional shares can be bought or sold at NAV.
- Closed-end: Offers no further shares and does not repurchase shares on demand.
- Closed-end fund market price usually at discount NAV.
- Hedge funds: A fund, usually used by wealthy individuals and institutions, which is allowed to use aggressive strategies that are unavailable to mutual funds, including selling short, leverage, program trading, swaps, arbitrage, and derivatives.

Value vs Growth

- Value focus
  - The price must be cheap
  - Less emphasis on current earnings and drivers of earnings growth
  - Low P/E, P/BV, high dividend yield
- Growth focus
  - Focus on EPS and economic prospects
  - Target firms with rapid earnings growth
  - High EPS growth, high profits, higher valuations, small firms

Portfolio management strategies

- Passive management: A long term buy and hold strategy in which stocks are purchased so that portfolio returns will track those of an index over time. “Indexing”
- Active management: Management attempts to outperform on a risk adjusted basis the passive benchmark portfolio.

Index portfolio construction techniques

- Full replication
- Sampling
- Quadratic optimization

Active management strategies

- Fundamental analysis:
  - Top down (Tactical asset allocation, sector rotation)
  - Bottom up
- Technical analysis:
  - Contrarian
  - Momentum trading
- Anomalies and attributes:
  - Calender affects
  - Security characteristics: (size, P/E, P/B)
  - Investment style (value, growth)

Fundamental strategies

- Tactical asset allocation: Asset class mix in portfolio is adjusted frequently to account for changing market conditions.
- Sector rotation: Positioning the portfolio to take advantage of the market's next move.

Technical strategies

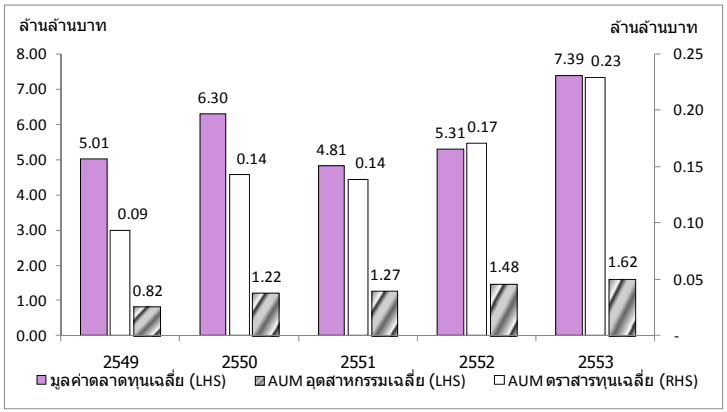
- Contrarian: Buying (selling) stocks near its lowest (highest) price.
- Momentum: Winners (losers) will continue to win (lose).

Anomalies and attributes

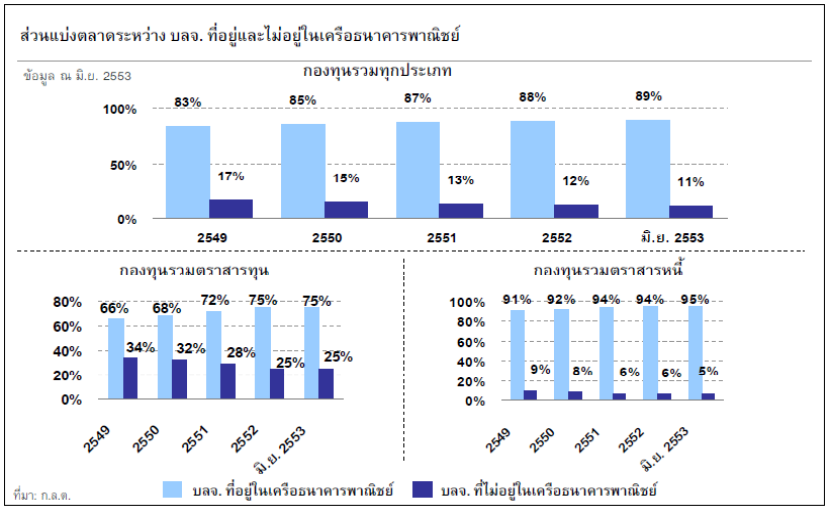
- Day of the week effect
- January effect
- Small firm premium
- Low P/E, P/BV portfolios tend to perform well

MUTUAL FUNDS IN THAILAND

การเติบโตของอุตสาหกรรมกองทุนรวมไทย



ธนาคารพาณิชย์ถือครองตลาดส่วนใหญ่



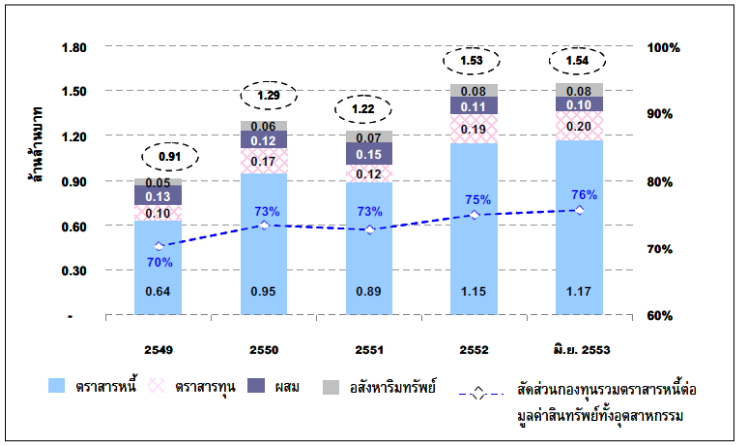
Fund types in Thailand

ตารางที่ 1: เกณฑ์ในการจัดประเภทกองทุนรวม แบ่งตามนโยบายการลงทุน

ประเภทกองทุนรวม	เกณฑ์ในการจัดประเภทกองทุนรวม
กองทุนรวมตราสารหนี้ (รวมกองทุนรวมตลาดเงิน)	ตามเกณฑ์ ก.ล.ต. และกองทุนรวมที่มีลักษณะคล้ายเงินฝาก
กองทุนรวมตราสารทุน	ตามเกณฑ์ ก.ล.ต.
กองทุนรวมผสม	ตามเกณฑ์ ก.ล.ต.
กองทุนรวมอสังหาริมทรัพย์	ตามเกณฑ์ ก.ล.ต.

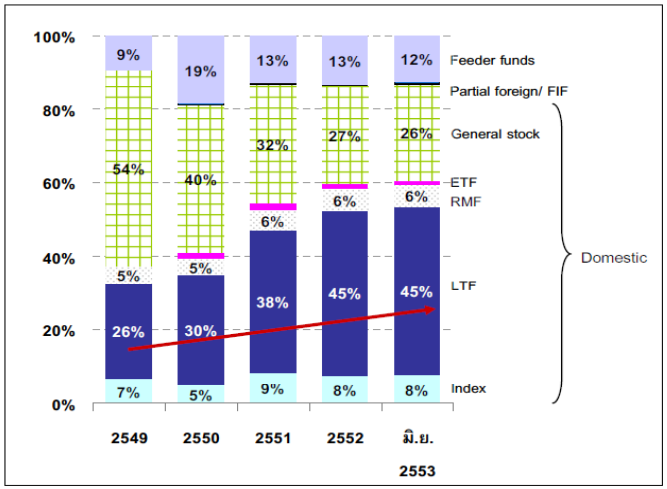
ที่มา: ก.ล.ต.

ภาพที่ 2: AUM แยกตามประเภทกองทุนรวม และสัดส่วน AUM ของกองทุนรวมตราสารหนี้ต่อ AUM ของอุตสาหกรรม



ที่มา: ก.ล.ต.

ภาพที่ 5: สัดส่วนกองทุนรวมตราสารทุน แยกตามผลิตภัณฑ์



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RETURN AND RISK

Simple net return vs gross return

- Simple net return on asset dates t-1 and t is defined as,

$$R_t = \frac{P_t}{P_{t-1}} - 1$$

- Simple gross return is defined as 1 + Rt
- Gross return over k periods from dates *t – k* to *t* as

$$1 + R_t(3) = (1 + R_1)\cdot(1 + R_2)\cdot(1 + R_3) = \frac{P_t}{P_{t-1}}\cdot\frac{P_{t-1}}{P_{t-2}}\cdot\frac{P_{t-2}}{P_{t-3}}$$

$$1 + R_t(k) = (1 + R_1)\cdot(1 + R_2)\cdots(1 + R_3) = \frac{P_t}{P_{t-1}}\cdot\frac{P_{t-1}}{P_{t-2}}\cdots\frac{P_{t-k+1}}{P_{t-k}} = \frac{P_t}{P_{t-k}}$$

Ways to annualized returns

- GM $$Annualized\left[R_t(k)\right] = \left[\prod_{t=1}^{k}(1 + R_t)\right]^{1/k} - 1$$
- AM $$Annualized\left[R_t(k)\right] \cong \frac{1}{k}\sum_{t=1}^{k} R_t$$

Will these two computation methods give close estimates?

Continuous compounding

- This is an important form in modeling asset price

$$r_t \equiv \ln(1 + R_t) = \ln\frac{P_t}{P_{t-1}} = p_t - p_{t-1}$$

$$r_t(3) = \ln(1 + R_t(3)) = \ln(1 + R_1) + \ln(1 + R_2) + \ln(1 + R_3)$$
$$= r_1 + r_2 + r_3$$

- Hence the continuously compounded multiperiod return is simply sum of compounded single period returns

Continuous compounding and simple return

- Continuous compounding vs simple return relationship

$$P_T = P_o e^{rT}$$
$$\frac{P_T}{P_0} = (1 + R) = e^{rT}$$
$$\ln(1 + R) = rT$$

From Gross Return to Holding-Period Returns: Geometric

- Recall gross return is

$$1+R_t(3)=(1+R_1)\cdot(1+R_2)\cdot(1+R_3)=\frac{P_t}{P_{t-1}}\cdot\frac{P_{t-1}}{P_{t-2}}\cdot\frac{P_{t-2}}{P_{t-3}}$$

$$1+R_t(k)=(1+R_1)\cdot(1+R_2)\cdots(1+R_3)=\frac{P_t}{P_{t-1}}\cdot\frac{P_{t-1}}{P_{t-2}}\cdots\frac{P_{t-k+1}}{P_{t-k}}=\frac{P_t}{P_{t-k}}$$

- The holding period return is the return that an investor would get when holding an investment over a period of *n* years, when the return during year *i* is given as R_i:

$$HPR=(1+R_1)\cdot(1+R_2)\cdots(1+R_n)-1$$

Holding Period Return: Example

- Suppose your investment provides the following returns over a four-year period:

Year	Return
1	10%
2	-5%
3	20%
4	15%

$$\text{Your holding period return} = (1+r_1)\times(1+r_2)\times(1+r_3)\times(1+r_4)-1$$
$$=(1.10)\times(.95)\times(1.20)\times(1.15)-1$$
$$=.4421=44.21\%$$

Holding Period Return: Example

- An investor who held this investment would have actually realized an annual return of 9.58%:

Year	Return
1	10%
2	-5%
3	20%
4	15%

$$\text{Geometric average return} = (1+r_g)^4=(1+r_1)\times(1+r_2)\times(1+r_3)\times(1+r_4)$$
$$r_g=\sqrt[4]{(1.10)\times(.95)\times(1.20)\times(1.15)}-1$$
$$=.095844=9.58\%$$

- So, our investor made 9.58% on his money for four years, realizing a holding period return of 44.21%

$$1.4421=(1.095844)^4$$

Holding Period Return: Example

- Note that the geometric average is not the same thing as the arithmetic average:

Year	Return
1	10%
2	-5%
3	20%
4	15%

$$\text{Arithmetic average return} = \frac{r_1+r_2+r_3+r_4}{4}$$
$$=\frac{10\%-5\%+20\%+15\%}{4}=10\%$$

AM vs GM

Year	Payoff	Return
0	-100	
1	50	-50%
2	100	100%

AM = [(-50%) + 100%]/2 = 50%
GM = $[(1-0.5)(1+1)]^{1/2} - 1 = (0.5x2)^{1/2} - 1 = 0$

Performance without intraperiod external cash flows

- An asset management firm manages a family account initially valued at USD 1 mn. One month later it was worth USD 1.08 mn. Assuming no external CF, what is the return on this account.

$$r_t = \frac{MV_1 - MV_0}{MV_0} = \frac{1.08 - 1.00}{1.00} = 8\%$$

Performance when external CF occur at beginning or end of eval. period

- Return to previous example, suppose the account received USD 50,000 contribution at beginning of month. What is rate of return for the month?

$$r_t = \frac{MV_1 - (MV_0 + CF)}{MV_0 + CF} = \frac{1.08 - (1.00 + 0.05)}{1.05} = 2.86\%$$

- If contribution had occurred at month-end. The return will be.

$$r_t = \frac{(MV_1 - CF) - MV_0}{MV_0} = \frac{(1.08 - 0.05) - 1.00}{1.00} = 3.00\%$$

Benchmarks

- Any portfolio equal to itself : P = P
- Now define a benchmark B, we add and subtract from RHS: P = B + (P-B) = B + A
- Thus, managed port P is benchmark B and active management A
- Now, let's introduced market index M, add and subtract RHS: P = M + (B-M) + A = M + S + A,
- A portfolio has 3 components, market, style, and active management.

Benchmark

- Suppose the same family account earns total return of 3.6% in a month of which portfolio benchmark has return of 3.8% and market index has return of 2.8%.
- Return due to style is S = B – M = 3.8% - 2.8% = 1%
- Return due to active management is A = P - B = 3.6% - 3.8% = -0.2%

Composite portfolio performance measures

- Treynor performance measure:

$$T = \frac{\overline{R}_i - RF\overline{R}_i}{\beta_i}$$

- Treynor ratio measures excess return per unit of systematic risk

Treynor measures

- Assume during the past 10 year period the average RF = 8% and average market return is 14%. Rank the following fund managers in terms of Treynor risk-adjusted performance.

Manager	Avg return	Beta
W	0.12	0.9
X	0.16	1.05
Y	0.18	1.2
Z	0.07	0.5
G	0.1	-0.2

Treynor measures

- How would you rank these funds?
- How would they plot on the SML?

$$T_M = \frac{0.14 - 0.08}{1.0} = 0.06$$

$$T_W = \frac{0.12 - 0.08}{0.9} = 0.044$$

$$T_X = 0.076$$

$$T_Y = 0.083$$

$$T_Z = \frac{0.07 - 0.08}{0.50} = -0.02$$

$$T_G = \frac{0.10 - 0.08}{-0.20} = -0.10$$

Sharpe ratio

- Measures excess return to total risk

$$T = \frac{\overline{R}_i - RF\overline{R}_i}{\sigma_i}$$

Sharpe ratio

- Using previous information plus STD of market is 20%, rank the following funds.

Manager	Avg return	Std
D	0.13	0.18
E	0.17	0.22
F	0.16	0.23

$$S_M = \frac{0.14 - 0.08}{0.20} = 0.30$$

$$S_D = \frac{0.13 - 0.08}{0.18} = 0.278$$

$$S_E = 0.409$$

$$S_F = 0.348$$

Treynor vs Sharpe ratio

- Should the two be equivalent?
- Which is more appropriate for a poorly diversified portfolio?

Jensen's alpha

- The alpha, α is computed from the regression,

$$R_{it} - RF_t = \alpha_i + \beta_i\left(R_{mt} - RF_t\right) + e_{it}$$

- A superior portfolio manager has significant positive alpha.

Information ratio

- Also known as appraisal ratio, measures a portfolio average return relative to benchmark portfolio.

$$IR_i = \frac{\overline{R}_i - \overline{R}_b}{\sigma_{ER}} = \frac{\overline{ER}}{\sigma_{ER}}$$

Value at Risk (VAR)

– The value at risk (VAR) of a portfolio is the loss in value in the portfolio that can be expected over a given period of time (e.g., 1-Day) with a probability not exceeding a given number (e.g., 5%).

– Probability (Portfolio Loss < - VAR) = K
– K = Given Probability

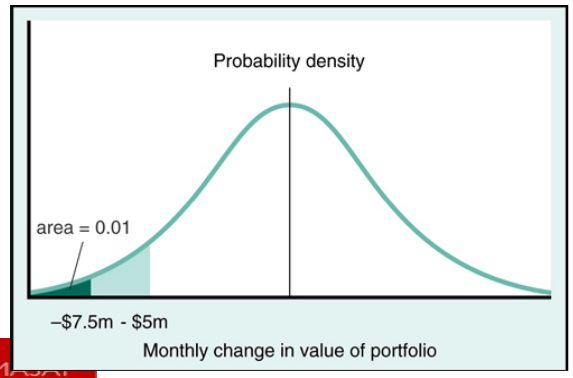
If the Value at Risk at the 5% level for the next week equals $20 million, then

- Prob(change in portfolio value < -$20 million) = 0.05
- In words, there is 5% chance that the portfolio will lose more $20 million over the next week

Value at Risk

– Example:

- Assume VAR at the 5% level =$5 million
- And VAR at the 1% level = $7.5 million



Important Properties of the Normal Distribution

- Often analysts use the following properties of the normal distribution to calculate VAR:

– Assume X is normally distributed with mean μ and standard deviation σ. Then

- Prob ($X > \mu - 2.33\sigma$) = 0.01
- Prob ($X > \mu - 1.645\sigma$) = 0.05

Computing the VaR metric

- Compute the maximum expected loss at 5% and 1% degrees of confidence of a portfolio with mean expected profit of Bt 5.0 mn and standard deviation of Bt 3.50 mn.
- At 1% confidence level, max expected loss is,
- 5.00 – 3.50 x 2.33 = 5.00 – 8.16 = - 3.16
- At 5% confidence level, max expected loss is,
- 5.00 – 3.50 x 1.645 = 5.00 – 5.75 = - 0.75 mn

VaR is a simple concept, but…

- Estimation is difficult.
- Requires prediction of portfolio returns and this requires rigorous maths, stats, and computing power.

Risk attribution

- Volatility: Volatility of return or volatility of excess return relative to risk free or benchmark.

Risk attribution

- Tracking error is computed from,

$$\Delta_t = R_{pt} - R_{bt}$$

- The variance of tracking error is,

$$\sigma_{\Delta}^2 = \frac{\sum_{t-1}^{T} \left(\Delta_t - \overline{\Delta}\right)^2}{T-1}$$

- Annualized tracking error is,

$$TE_{annual} = \sigma_{\Delta}\sqrt{P}$$

Where P = 12 for monthly returns and P = 250 for daily returns

Break-out sessions

- In-class problems
- Lab exercise