

## Asset Pricing 3 (Nasruddin)

### Linear Factor Models

### Performance Measurement

**Risk\_Factors.xlsx** contains monthly observations of the risk-free rate and the three Fama–French risk factors (expressed as percentages), over the ten-year period from Jan 2004 through Dec 2013.

Regress the monthly excess returns for each industry portfolio on the three Fama–French risk factors:

- Create a table showing the factor loadings on SMB and HML for the ten industry portfolios.

	Alpha	Fama_French Rm Beta	Fama_French SMB Beta	Fama_French HML Beta
<b>NoDur</b>	0.386704	0.712134	-0.229102	-0.023342
<b>Durbl</b>	-0.474342	1.447452	0.670878	0.240949
<b>Manuf</b>	0.153285	1.142282	0.087388	0.027727
<b>Enrgy</b>	0.523007	1.028354	-0.259360	-0.008158
<b>HiTec</b>	-0.065979	1.152803	0.335674	-0.556947
<b>Telcm</b>	0.200724	0.924137	-0.080299	-0.019063
<b>Shops</b>	0.255941	0.770227	0.280191	-0.039080
<b>HLth</b>	0.257472	0.751976	-0.212655	-0.143765
<b>Utils</b>	0.474411	0.631827	-0.387961	-0.016881
<b>Other</b>	-0.404412	1.123473	-0.061676	0.547325

Using monthly excess returns for the ten industry portfolios, calculate the following performance metrics:

- Sharpe ratio
- Sortino ratio (using risk-free rate as target)
- Treynor ratio (using CAPM  $\beta$ )
- Jensen's  $\alpha$
- Fama–French three-factor  $\alpha$

The sample semi-variance can be estimated as:

$$\frac{1}{T} \sum_{t=1}^T \min\{R_{it} - R_{ft}, 0\}^2$$

where  $R_i$  is return on industry portfolio and  $R_f$  is risk-free rate.

- Create a table showing the performance metrics for the ten industry portfolios.

	Sharpe Ratio	Sortino Ratio	Treynor Ratio	Jensen's Alpha	Fama-French Alpha
<b>NoDur</b>	0.231099	0.350804	1.186372	0.369717	0.386704
<b>Durbl</b>	0.072356	0.111967	0.367463	-0.417903	-0.474342
<b>Manuf</b>	0.166616	0.241260	0.758251	0.160494	0.153285
<b>Enrgy</b>	0.181708	0.273612	1.143330	0.504485	0.523007
<b>HiTec</b>	0.118552	0.170620	0.564295	-0.064024	-0.065979
<b>Telcm</b>	0.169064	0.244940	0.836363	0.194348	0.200724
<b>Shops</b>	0.191753	0.293032	0.951258	0.274093	0.255941
<b>Hlth</b>	0.172529	0.270294	0.971435	0.236968	0.257472
<b>Utils</b>	0.210948	0.290044	1.452334	0.446523	0.474411
<b>Other</b>	0.064693	0.087351	0.299781	-0.387508	-0.404412

- Plot your results as a bar chart for each performance metric.



- **Briefly explain (in words, without mathematical equations or formulas) the economic significance and pricing implications of each of the three performance ratios (but not  $\alpha$ 's).**

### Sharpe Ratio

The Sharpe ratio measures how much excess return an investment generates for each unit of total risk. Economically, it highlights the trade-off between risk and return, helping investors understand if they're being adequately compensated for the risk they are taking. A higher Sharpe ratio indicates better risk-adjusted returns. In pricing terms, assets with higher Sharpe ratios are often viewed as more efficient investments, potentially justifying higher prices as they provide better compensation for risk.

### Sortino Ratio

The Sortino ratio is a variation of the Sharpe ratio that focuses specifically on downside risk by considering only negative deviations from the risk-free rate or target return, rather than total risk. Its economic significance lies in penalizing investments that have high downside volatility; thus, it shows an investment risk when evaluating potential returns. This means that investments with a high Sortino ratio are priced higher if they offer better protection against downside risk, such as adverse market conditions, while still delivering good returns. Thus, making it attractive for risk-averse investors.

### Treynor Ratio

The Treynor ratio measures the excess return generated for each unit of systematic risk (market risk), measured by beta. Its economic significance is in helping investors understand how well an investment performs relative to its exposure to overall market movements. A higher Treynor ratio suggests that the investment delivers good returns for its level of market risk. In terms of pricing, assets with higher Treynor ratios may be valued more because they efficiently manage market-related risks while delivering returns, as investors seek to optimize their investment

Each ratio provides a different lens through which to assess an investment's risk-return tradeoff and contributes to determining its fair market value.