Ethical and Professional Standards

I(A) Knowledge of the law: comply with the strictest law; disassociate from violations.

I(B) Independence and objectivity: do not offer, solicit or accept gifts; but small token gifts are ok.

I(C) Misrepresentation: do not guarantee performance; avoid plagiarism.

I(D) Misconduct: do not behave in a manner that affects your professional reputation or integrity.

II(A) Material nonpublic information: do not act or help others to act on this information; but mosaic theory is not a violation.

II(B) Market manipulation: do not manipulate prices/trading volumes to mislead others; do not spread false rumors.

III(A) Loyalty, prudence, and care: place client's interest before employer's or your interests.

III(B) Fair dealing: treat all client's fairly; disseminate investment recommendations and changes simultaneously.

III(C) Suitability: in advisory relationships, understand client's risk profile, develop and update an IPS periodically; in fund/index management, ensure investments are consistent with stated mandate.

III(D) Performance presentation: do not misstate performance; make detailed information available on request.

III(E) Preservation of confidentiality: maintain confidentiality of clients; unless disclosure is required by law, information concerns illegal activities, client permits the disclosure.

IV(A) Loyalty: do not harm your employer; obtain written consent before starting an independent practice; do not take confidential information when leaving.

IV(B) Additional compensation arrangements: do not accept compensation arrangements that will create a conflict of interest with your employer; but you may accept if written consent is obtained from all parties involved.

IV(C) Responsibilities of supervisors: prevent employees under your supervision from violating laws.

V(A) Diligence and reasonable basis: have a reasonable and adequate basis for any analysis, recommendation or action.

V(B) Communication with clients and prospective clients: distinguish between fact and opinion; make appropriate disclosures.

V(C) Record retention: maintain records to support your analysis.

VI(A) Disclosure of conflicts: disclose conflict of interest in plain language.

VI(B) Priority of transactions: client transactions come before employer transactions which come before personal transactions.

VI(C) Referral fees: disclose referral arrangements to clients and employers.

VII(A) Conduct as participants in CFA Institute programs: don't cheat on the exams; keep exam information confidential.

VII(B) Reference to CFA Institute, the CFA designation, and the CFA program: don't brag, references to partial designation not allowed.

Quantitative Methods

Simple linear regression: regression equation

$Y_i = b_0 + b_1X_i + \varepsilon_i$, i = 1, ..., n

t-test for testing the significance of the correlation coefficient

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$$

Confidence interval for regression coefficients

$$\hat{b_1} \pm t_c s_{\hat{b_1}}$$

$$t = \frac{\hat{b_1} - b_1}{s_{\hat{b_1}}}$$

Prediction interval for regression equation:

$\hat{Y} \pm t_c s_f$

s_f = Standard deviation of prediction error

R-squared (coefficient of determination) measures the fraction of the total variation in the dependent variable that is explained by the independent variable.

$$R^2 = \frac{\text{explained variation}}{\text{total variation}}$$

Total variation = unexplained variation + explained variation

F-statistic tests whether all the slope coefficients in a linear regression are equal to 0.

$$F = \frac{RSS/1}{SSE/(n-2)} = \frac{\text{Mean regression sum of squares}}{\text{Mean squared error}}$$

Standard error of estimate (SSE) measures how well a given linear regression model captures the relationship between the dependent and independent variables.

$$SEE = \left(\frac{\sum_{i=1}^{n}(Y_i - \hat{b}_0 - \hat{b}_0X_i)^2}{n-2}\right)^{\frac{1}{2}} = \left(\frac{\sum_{i=1}^{n}(\hat{e}_i)^2}{n-2}\right)^{\frac{1}{2}}$$

SEE = Square root of mean square error.

Test for serial correlation: DW ≈ 2 (1 – r)

Multiple regression: regression equation

$$Y_i = b_0 + b_1X_{1i} + b_2X_{2i} + \varepsilon_i$$

Violations of regression assumptions

- Heteroskedasticity: Variance of error term is conditional on X. Solution: Robust standard errors. Detect with Breuch-Pagan test: F-test is unreliable Standard error for coefficients will be underestimated, t-stat will be inflated. Solution: Generalized least squares.
- Serial correlation: Errors correlated across observations. Solution: Hansen Method. Detect by the DW test DW ≈ 2 (1 – r): t-stat and F-stat too high Solution: Modify the regression equation
- Multicollinearity: Two or more independent variables are highly correlated with each other high R2, significant F-stat, inflated standard error, low t-stat for coefficients. Solution: Omit one or more of the "X" variables.

Trend models

- Linear trend model: dependent variable changes at a constant rate with time. The independent variable is time: Y = b0+ b1t + εi , t = 1, 2, ..., T.
- Log-linear trends work well in fitting time series that have exponential growth.
- An autoregressive model (AR) is a time series where a given variable is regressed on its own past values.

$$X_t = b_0 + b_1X_{1-t} + \varepsilon_t$$

- For AR models to work the time series must be covariance-stationary: Constant expected value, variance and covariance.
- Durbin-Watson does NOT work for AR models.
- Test whether the autocorrelations of the error term (error autocorrelations) differ significantly from 0. Test-stat = residual autocorrelation / standard error
- Compare the out-of-sample forecasting performance of forecasting models by comparing their root mean squared error (RMSE), which is the square root of the average squared error.
- Mean-reverting level is given by:

$$x_t = \frac{b_0}{(1 - b_1)}$$