AN INTRODUCTION TO USE OF GARCH

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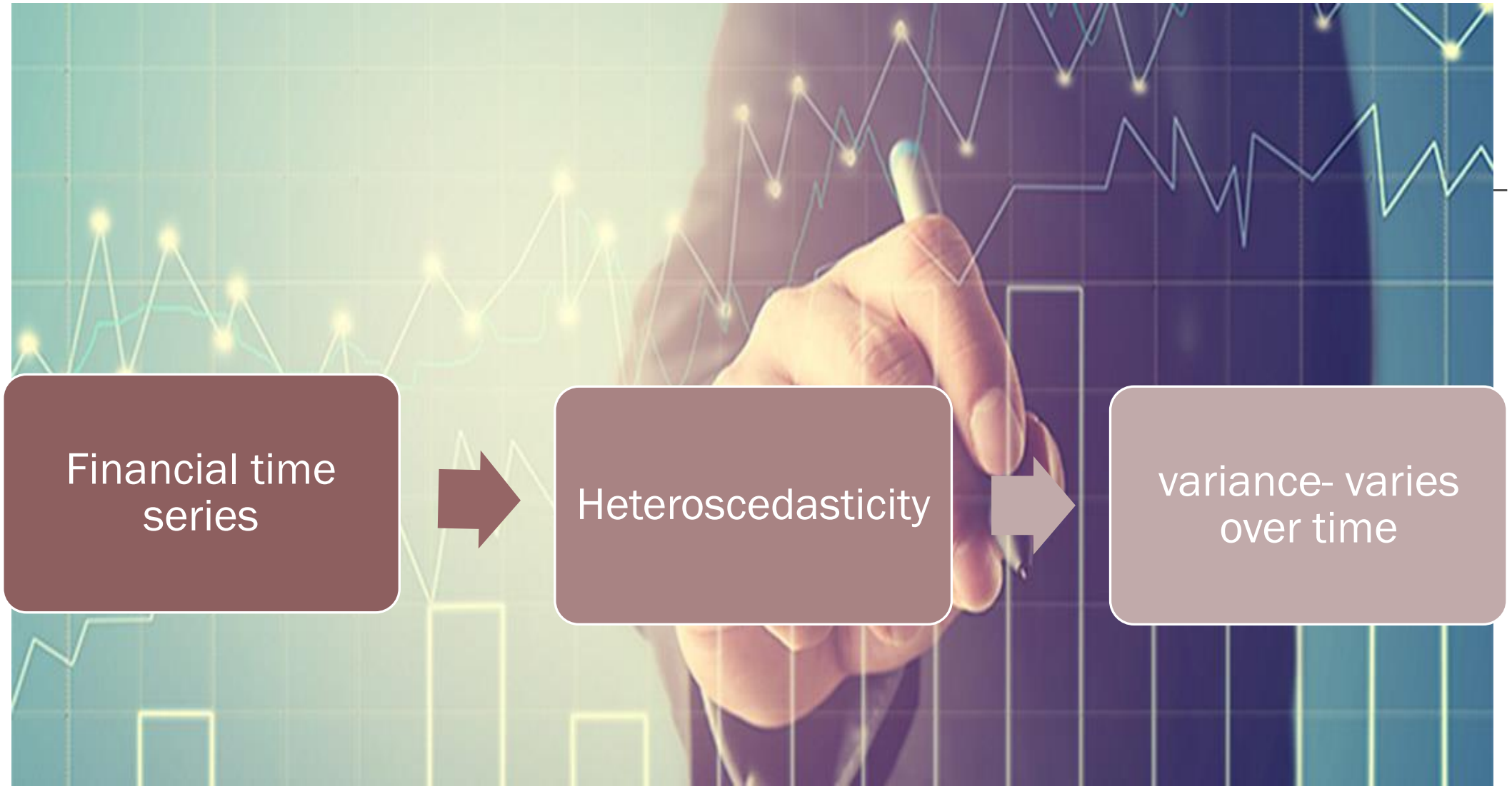
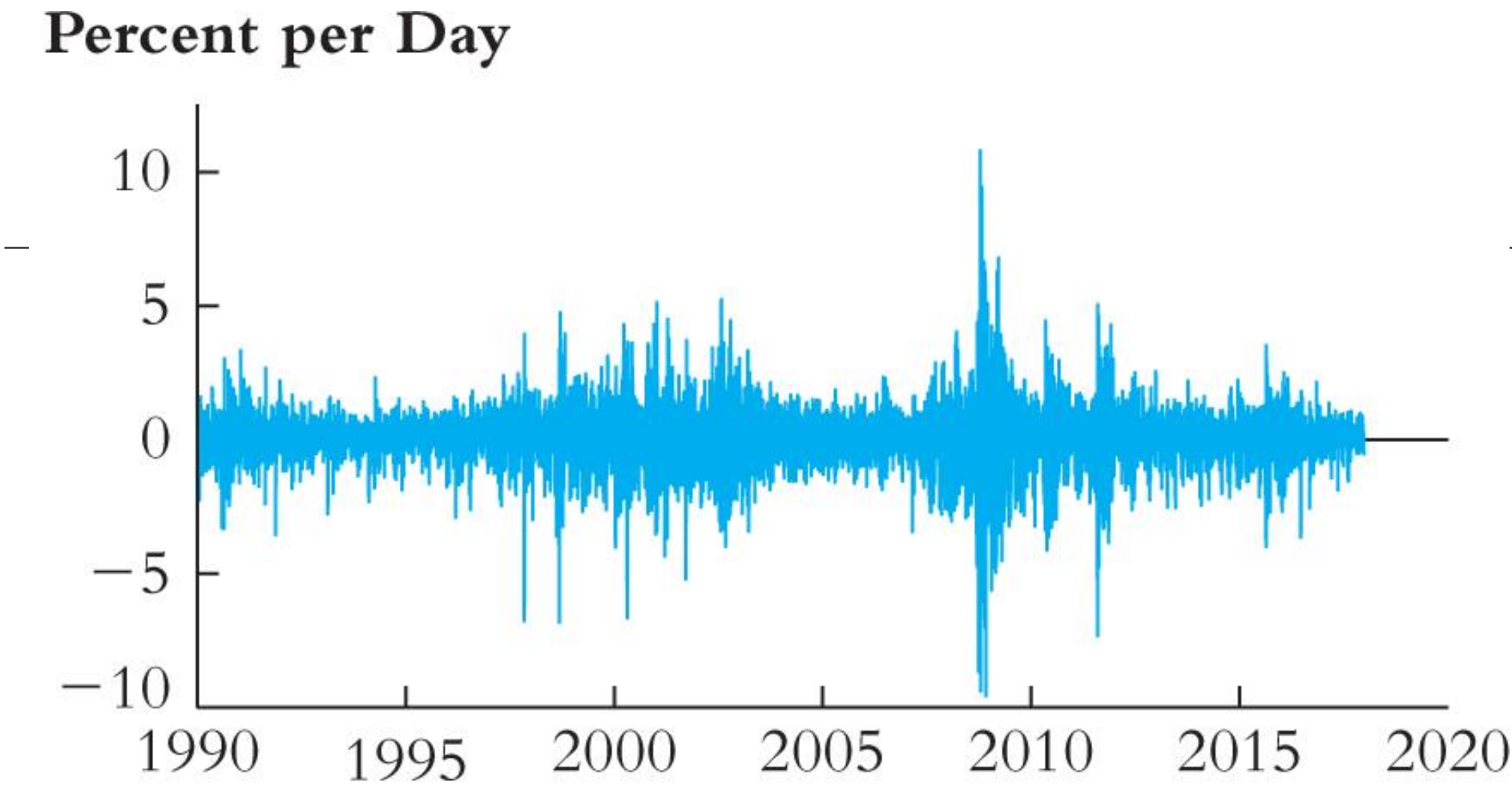
Outline

- ARCH
- GARCH


Financial time series
Heteroscedasticity
variance- varies over time



(d) Percentage change in daily value of the Wilshire 5000 Total Market Index

- CLR – assumption 5 – the disturbance should has constant

$$Y_t = \alpha + \beta X_t + u_t$$

$$u_t \sim \text{iid } N(0, \sigma^2)$$

- volatility clustering

The ARCH(1) model

- Engle (1982) – developed ARCH
- Allowing the variance of the residual (σ^2) to depend on history (heteroscedasticity)
- ARCH (1) -Variance depend on lagged period of the square error term

$$Y_t = \alpha + \beta X_t + u_t$$

$$u_t | \Omega_t \sim \text{iid } N(0, h_t)$$

$$h_t = \gamma_0 + \gamma_1 u_{t-1}^{\ 2}$$

ARCH (q)

ARCH (q) - he conditional variance can depend not just on one lagged realization but on more than one

$$\sigma_t^2 = \gamma_0 + \gamma_1 u_{t-1}^2 + \gamma_2 u_{t-1}^2$$

$$h_t^2 = \gamma_0 + \Sigma\, u_{t-1}^2$$

GARCH

Engle (1995) – drawback ARCH – it looks like moving average specification than an autoregression

GARCH – Bollerslev (1986)

$$h_t^2 = \gamma_0 + \Sigma\, u_{t-j}^{\ 2} + \Sigma\, h_{t-i}$$

GARCH (1,1) – infinite ARCH process


thank you