6.1: ARIMA models for nonstationary series

Taylor

University of Virginia

Motivation

This chapter is all about putting the “I” in ARIMA.

Definition

definition

If d is a nonnegative integer, then $\{X_t\}$ is an **ARIMA(p,d,q) process** if $Y_t = (1-B)^d X_t$ is a causal ARMA(p,q) process.

1. X_t now has d unit roots: it satisfies $\phi^*(B)X_t = \phi(B)(1-B)^d X_t = \theta(B)Z_t$
2. We've been doing this already when we difference our log-prices

Explanation

"I" stands for integrated (summed) because

$$X_t = X_0 + \sum_{j=1}^{t} Y_j$$

where each Y_j is from some stationary ARMA process. Clearly

$$Y_t = (1 - B)X_t$$

Mean versus Intercept

Writing the intercept or mean terms can be done in two different ways. Make sure you know what your software is giving you.

The equation

$$\phi(B)(1-B)^d(X_t - \mu t^d/d!) = \theta(B)Z_t$$

is the same as

$$\phi(B)(1-B)^d X_t = c + \theta(B)Z_t.$$

What's EX_t? What about μ. What is c?

A Common Bug

Warning!

By default, stats::arima() does not include a mean term when you fit ARIMA models. forecast::Arima() does. Make sure you are not forcing your expected returns to be 0. Fore more information, see 6.1.R