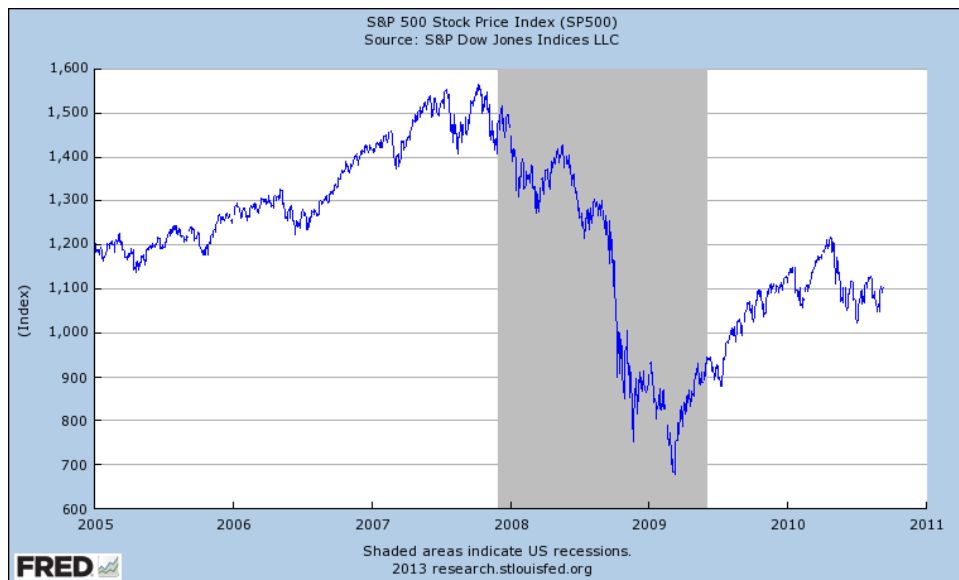**Introduction: Problems**

1. Re-write the following stochastic process using lag operators:

$$x_t = \delta + \alpha_1 x_{t-1} + \alpha_3 x_{t-3} + \alpha_4 x_{t-4} + u_t + \theta_1 u_{t-1} + \theta_3 u_{t-3} \tag{1}$$

2. Suppose that you have a time-series measured annually. Under what conditions might it be appropriate to simply run OLS and ignore the chronological component of the data.

Consider the following graph of the S&P 500 from 2005-2011:

3. Based on a visual examination of these data, do you suspect that this time series is ergodic?

4. Based on a visual examination of these data, do you suspect that this time series is stationary?

Consider the following time series:

$$x_t = \delta + t u_t \tag{2}$$

where u_t is white noise with mean equal to $\bar{u}$

5. Is this process mean-stationary?

6. Is this process weakly stationary?

7. Suppose that I take a white noise process and draw from it in two separate time periods. The sample means and variances are then different in the two periods. Does this suggest that the time series is non-stationary.

8. True or False? House of Cards has jumped the shark.