Learning Goals:
Students will analyze the relationship between the real and financial sectors of the economy. They will also develop statistical skills for understanding financial time series data, with an appreciation of the market structure behind the data generating mechanism.

Course Motivation:
The class will be run like a seminar with required student participation and presentations. Articles with a — are older references or other papers not eligible for presentation. Articles marked with . may be presented in class.

Optional Useful Texts:

Requirements:
(a) Class presentation (10%); (b) a final exam (30%); (c) Five data exercises (20%). (d) 10-15 page paper graded on content and presentation (40%).

Skills:
(a) Econometric software: You must be able to perform data exercises in R.
(b) Beamer: All class presentations must be done in Beamer, a LaTex package for slide preparation.

Data:
I have created a class account on the Wharton Research Data Services (WRDS). The login is: ec514 and password: FinaEc16.
(a) Center for Research in Security Prices (WRDS)
(b) New York Stock Exchange Trade and Quote (TAQ) Data (WRDS)
(c) Nasdaq Totalview Historical ITCH Datafeed. Will be provided by me.
## Agenda

<table>
<thead>
<tr>
<th>5 classes</th>
<th>Unit 1</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 8</td>
<td>1(a)</td>
<td>Macro Finance</td>
</tr>
<tr>
<td>September 12</td>
<td>1(a)</td>
<td>Pricing Kernel</td>
</tr>
<tr>
<td>September 15</td>
<td>1(a)</td>
<td>Equity Premium</td>
</tr>
<tr>
<td>September 19</td>
<td></td>
<td>Data Exercise #1</td>
</tr>
<tr>
<td>September 19</td>
<td>1(b)</td>
<td>CAPM</td>
</tr>
<tr>
<td>September 22</td>
<td>1(b)</td>
<td>Factor Models</td>
</tr>
<tr>
<td>September 26</td>
<td></td>
<td>Data Exercise #2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5 classes</th>
<th>Unit 2</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 26</td>
<td>2(b)</td>
<td>Inventory</td>
</tr>
<tr>
<td>September 29</td>
<td>2(b)</td>
<td>Asymmetric Information</td>
</tr>
<tr>
<td>September 29</td>
<td>2(c)</td>
<td>Spread Models</td>
</tr>
<tr>
<td>October 3</td>
<td>2(c)</td>
<td>Level II</td>
</tr>
<tr>
<td>October 6</td>
<td>2(c)</td>
<td>Order Book Models</td>
</tr>
<tr>
<td>October 10</td>
<td></td>
<td>Data Exercise #3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9 classes</th>
<th>Unit 3</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 10</td>
<td>3(a)</td>
<td>Market breakdowns</td>
</tr>
<tr>
<td>October 13</td>
<td>3(a)</td>
<td>HFT</td>
</tr>
<tr>
<td>October 17</td>
<td>3(a)</td>
<td>Hidden liquidity</td>
</tr>
<tr>
<td>October 21</td>
<td>3(a)</td>
<td>Reg. NMS</td>
</tr>
<tr>
<td>October 24</td>
<td></td>
<td>Data Exercise #4</td>
</tr>
<tr>
<td>October 24</td>
<td>3(b)</td>
<td>Treasury market</td>
</tr>
<tr>
<td>October 27</td>
<td>3(b)</td>
<td>Treasury market</td>
</tr>
<tr>
<td>October 31</td>
<td>3(c)</td>
<td>Commodities</td>
</tr>
<tr>
<td>November 3</td>
<td>3(c)</td>
<td>Petroleum market</td>
</tr>
<tr>
<td>November 7</td>
<td>3(c)</td>
<td>Carbon market</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9 classes</th>
<th>Unit 4</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 10</td>
<td>4(a)</td>
<td>GARCH</td>
</tr>
<tr>
<td>November 10</td>
<td>4(a)</td>
<td>Stochastic volatility</td>
</tr>
<tr>
<td>November 14</td>
<td>4(a)</td>
<td>Realized volatility and jumps</td>
</tr>
<tr>
<td>November 14</td>
<td>4(b)</td>
<td>Binomial trees</td>
</tr>
<tr>
<td>November 17</td>
<td></td>
<td>Data Exercise #5</td>
</tr>
<tr>
<td>November 17</td>
<td>4(b)</td>
<td>Black Scholes/American puts</td>
</tr>
<tr>
<td>November 21</td>
<td>4(b)</td>
<td>OTC and microstructure</td>
</tr>
<tr>
<td>November 22</td>
<td>4(c)</td>
<td>Stochastic vol. and skew</td>
</tr>
<tr>
<td>November 28</td>
<td>4(c)</td>
<td>Implied PDFs</td>
</tr>
<tr>
<td>December 1</td>
<td>4(d)</td>
<td>Credit default swaps</td>
</tr>
<tr>
<td>December 5</td>
<td>4(d)</td>
<td>CDOs</td>
</tr>
<tr>
<td>December 8</td>
<td>4(e)</td>
<td>Financial crisis</td>
</tr>
<tr>
<td>December 12</td>
<td></td>
<td>Student presentations</td>
</tr>
</tbody>
</table>
1. The Standard Models
   (a) Consumption based models

   (b) Factor models
   - Stambaugh, Robert F. and Yu Yuan (2015), “Mispri...
(ii) Asymmetric information

(iii) Limit order books

(c) Empirical Models
(i) Models of the spread

(ii) Informed trading

(iii) Limit order books

(iv) Level II

(v) Information Shares

3. Market Structures
(a) Equities
(i) Market breakdowns
- U.S. Securities and Exchange Commission Report on the Flash Crash

(ii) HFT
(ii.a) Theory
(ii.b) Empirical

(iii) Hidden liquidity

(iv) Current Issues in Market Structure

(b) Treasury market


c) Commodities

(i) Metals


(ii) Petroleum


(iii) Greenhouse gases


(d) Foreign exchange


4. Volatility Models and Derivatives

(a) Volatility models

(i) GARCH


(ii) Realized volatility and jumps


(b) Options

(i) Binomial trees

- Cox, John, Stephen Ross, and Mark Rubenstein, “Option pricing: a simplified approach,”
(ii) Black-Scholes

(c) Beyond Black-Scholes
(i) Volatility smile and skew

(ii) Implied probability densities

(d) Credit derivatives
(i) Credit default swaps

(ii) CDOs and structured finance