## Contents

*Preface*  
page xi

### I Econophysics

1 WHY ECONOPHYSICS? 2  
1 Newton’s apple paradigm revisited 4  
1.1 Newton’s apple 5  
1.2 An economic parallel 7  
2 Simple phenomena first 8  
2.1 Two-body problems 9  
2.2 Complexity classification 10  
2.3 The role of time: Simon’s bowl metaphor 11  
2.4 Simple aspects of complex systems 12  
3 From plausible reasons to regularities 14  
3.1 The pot of yoghurt paradigm 15  
3.2 Plausible causes versus scientific explanations 17  
3.3 Regularities 20  
3.4 Circumstantial causes versus structural factors 21  
3.5 Models need accurate empirical targets 21  
4 Conclusion 22  
4.1 The primacy of observation 22  
4.2 “Modest goals” 23  
4.3 Clusters of events and comparative analysis 23

### 2 THE BEGINNINGS OF ECONOPHYSICS 25  
1 Pre-econophysics 26  
1.1 Pre-econophysicists 27  
1.2 Assessment of pre-econophysics 28
## Contents

2 Institutional econophysics
   2.1 Idiosyncrasies of economic journals 29
   2.2 The beginnings of econophysics 30
   2.3 Neurophysics 31
   2.4 The fractal revolution 33
   2.5 Formation of an econophysical community 33
   2.6 A personal note 34
   2.7 The future of econophysics 35

II How do markets work?

3 SOCIAL MAN VERSUS HOMO ECONOMICUS
   1 The social man and the Zeitgeist 40
      1.1 Connection between fast growth sectors and Zeitgeist 41
      1.2 Quantitative measure of the role of the Zeitgeist 45
      1.3 Ways and means of the Zeitgeist 47
   2 Regularities 48
      2.1 The search for uniformities and regularities 48
      2.2 Examples of speculative peaks 49

4 ORGANIZATION OF SPECULATIVE MARKETS 55
   1 Trends 56
      1.1 Concentration 56
      1.2 The thorny question of commission rates 60
   2 Trading techniques 62
      2.1 Short selling, futures, options 63
      2.2 How to create a successful financial product? 66
      2.3 Protection against market crashes 68
      2.4 Sources of instability: the boomerang effect 70
   3 Organization of the banking system 72
      3.1 The United States 73
      3.2 Canada versus the United States 73
   4 Time series for stock prices and bankruptcies 74
      4.1 Stock prices 74
      4.2 Downgrades, failure rate, and suspensions 78

III Regularities in speculative episodes

5 COLLECTIVE BEHAVIOR OF INVESTORS 83
   1 High-tech booms 84
      1.1 The high-tech boom of the automobile industry 84
# Contents

1.2 The phase of “natural selection” 85  
1.3 High-tech booms backed by venture capital 87  

2 Flight to safety 89  
2.1 Grain panics 91  
2.2 Nineteenth-century banking panics 91  
2.3 Relationship with grain crisis 92  
2.4 “Deliver us from inflation” 93  
2.5 Flight to quality in equity markets 97  

3 To sell or not to sell? 103  
3.1 Formulation of the problem 104  
3.2 Some methodological points 108  
3.3 Short-term response (weekly fluctuations) 108  
3.4 Long-term response (yearly fluctuations) 109  
3.5 Effect of mutual funds purchases on stock prices 112  
3.6 Conclusion 114  

4 Connection between property and stock markets 115  
4.1 Impact of property crashes on economic growth 115  
4.2 Delay in the response of real estate markets 117  
4.3 The connection between property and stock bubbles 118  

6 SPECULATIVE PEAKS: STATISTICAL REGULARITIES 122  
1 A “thermometer” of speculative frenzy 122  
1.1 Real estate 124  
1.2 Bonds 125  
2 Shape of price peaks 126  
2.1 Empirical evidence for asymmetry parameters 128  
2.2 Mathematical description of the shape of peaks 130  
2.3 Empirical evidence for shape parameters 131  
3 Stock market crashes 133  
3.1 When? 134  
3.2 How? 135  
3.3 Overnight crashes 137  
3.4 Lawsuits in the wake of market crashes 139  
4 Trading volume 140  
4.1 Volume at the level of individual stocks 140  
4.2 Volume movements at market level 141  
5 Economic consequences of stock market collapses 143  
5.1 Consumer confidence 144
Contents

5.2 Relationship between stock price levels and commission rates 149
5.3 Effect on the distribution of income 151

IV Theoretical framework 155
7 TWO CLASSES OF SPECULATIVE PEAKS 157
   1 Speculative peaks: two illustrative examples 158
      1.1 Wheat price peaks 158
      1.2 Real estate prices 158
   2 The price multiplier criterion 160
   3 The ensemble dispersion criterion 163
   4 Two classes 167
   5 Bond market 172
   6 Differences in response times 175
      6.1 Dispersion of peak times 175
      6.2 Relationship between amplitude and response time 176

8 DYNAMICS OF SPECULATIVE PEAKS: THEORETICAL FRAMEWORK 177
   1 Main ideas 178
      1.1 A comparative perspective 178
      1.2 Shock versus permanent monitoring 179
      1.3 Users and speculators 179
      1.4 Transaction friction 180
      1.5 Agents and markets form a compound 182
   2 Implementation 183
      2.1 Recapitulation of empirical regularities 183
      2.2 Dynamic equations: first order 183
      2.3 Dynamic equations: second order 184
      2.4 Dynamic equations: higher orders 185
      2.5 Light or heavy damping? 186
   3 Implications 188
      3.1 Amplitude versus duration of the ascending phase 188
      3.2 Peak amplitude and proportion of investors 190
      3.3 Synchronization effects 193
      Appendix A: Green’s function for a fourth-order equation 195

9 THEORETICAL FRAMEWORK: IMPLICATIONS 198
   1 The resilience effect 199
      1.1 Description 199
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 Interpretation</td>
<td>200</td>
</tr>
<tr>
<td>1.3 Statistical evidence</td>
<td>202</td>
</tr>
<tr>
<td>2 Breakdown of scaling</td>
<td>203</td>
</tr>
<tr>
<td>2.1 First-order process</td>
<td>204</td>
</tr>
<tr>
<td>2.2 Second-order process</td>
<td>207</td>
</tr>
<tr>
<td>3 Ensemble coefficient of variation</td>
<td>208</td>
</tr>
<tr>
<td>4 The stochastic spatial arbitrage model for U-class goods</td>
<td>211</td>
</tr>
<tr>
<td>5 Perspectives</td>
<td>214</td>
</tr>
</tbody>
</table>

*Main data sources* 216

*References* 219

*Index* 227