**Chapter 20**

**Index Numbers**

**Learning Objectives**

1. Know how to compute price relatives and understand how they represent price changes over time.

2. Know how to compute aggregate price indexes and understand how the choice of a base period affects the index.

3. Become familiar with the Consumer Price Index, the Producer Price Index and the Dow Jones averages.

4. Learn how to deflate a time series to measure changes over time in constant dollars.

5. Learn how to compute an aggregate quantity index and how to interpret it.

**Solutions:**

1. a.

|  |  |
| --- | --- |
| Item | Price Relative |
| A | 103 = (7.75/7.50)(100) |
| B | 238 = (1500/630)(100) |

b. 

c. 

d. 

2. a. From the price relative we see the percentage increase was 32%.

b. Divide the current cost by the price relative and multiply by 100.

1994 cost =(100) = $8.14

3. a. Price Relatives A = (6.00 / 5.45)100 = 110

B = (5.95 / 5.60)100 = 106

C = (6.20 / 5.50)100 = 113

b. 

c. 

9% increase over the two year period.

4. 

5. 

Paasche index

6.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Item | Price Relative | Base Period  Price | Base Period  Usage | Weight | Weighted Price Relatives |
| A | 150 | 22.00 | 20 | 440 | 66,000 |
| B | 90 | 5.00 | 50 | 250 | 22,500 |
| C | 120 | 14.00 | 40 | 560 | 67,200 |
|  |  |  |  | 1250 | 155,700 |



7. a. Price Relatives A = (3.95 / 2.50) 100 = 158

B = (9.90 / 8.75) 100 = 113

C = (.95 /.99) 100 = 96

b.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Item | Price Relatives | Base  Price | Quantity | Weight  Pi0Qi | Weighted Price Relatives |
| A | 158 | 2.50 | 25 | 62.5 | 9875 |
| B | 113 | 8.75 | 15 | 131.3 | 14837 |
| C | 96 | .99 | 60 | 59.4 | 5702 |
|  |  |  |  | 253.2 | 30414 |



Cost of raw materials is up 20% for the chemical.

8.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Stock | Price Relatives | Base  Price | Quantity | Weight | Weighted Price Relatives |
| Holiday | 110 | 15.50 | 500 | 7750 | 852500 |
| NY Electric | 109 | 18.50 | 200 | 3700 | 403300 |
| KY Gas | 97 | 26.75 | 500 | 13375 | 1297375 |
| PQ Soaps | 108 | 42.25 | 300 | 12675 | 1368900 |
|  |  |  |  | 37500 | 3922075 |
|  |  |  |  |  |  |



Portfolio up 5%

9.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Item | Price Relatives | Base  Price | Quantity | Weight | Weighted Price Relatives |
| Beer | 115 | 17.50 | 35,000 | 612,500 | 70,437,500 |
| Wine | 118 | 100.00 | 5,000 | 500,000 | 59,000,000 |
| Soft Drink | 110 | 8.00 | 60,000 | 480,000 | 52,800,000 |
|  |  |  |  | 1,592,500 | 182,237,500 |



10. a. Deflated 2001 wages: 

Deflated 2011 wages: 

b.  The percentage increase in actual wages is 11%.

c.  The percentage increase in real wages is 2%.

11. Deflated 2001 wages: 

Deflated 2011 wages: 

 The percentage change in real wages is a decrease of 3.1%.

12. a. 2009: 

2010: 

2011: 

b. 2009: 

2010: 

2011: 

c. PPI is more appropriate than CPI because these figures reflect prices paid by retailers (rather than by consumers).

13. 2007: 

2008: 

2009: 

2010: 

2011: 

The company’s real revenue has been growing with the exception of 2010.

From 2009 to 2010:



Therefore, there was a decrease in real revenue of 3.3% from 2009 to 2010.

14. 

15. 

Quantities are down slightly.

16.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model | Quantity Relatives | Base  Quantity | Price ($) | Weight | Weighted Quantity Relatives |
| Sedan | 85 | 200 | 15,200 | 3,040,000 | 258,400,000 |
| Sport | 80 | 100 | 17,000 | 1,700,000 | 136,000,000 |
| Wagon | 80 | 75 | 16,800 | 1,260,000 | 100,800,000 |
|  |  |  |  | 6,000,000 | 495,200,000 |



17. a. 2007: 

2008: 

2009: 

2010: 

b. 2007: 

2008: 

2009: 

2010: 

18. a. Price Relatives A = (15.90 / 10.50) (100) = 151

B = (32.00 / 16.25) (100) = 197

C = (17.40 /12.20) (100) = 143

D = (35.50 / 20.00) (100) = 178

b. 

19. 

20. 



Market is down compared to 2007.

21. Price Relatives: Jan Mar

Oil (22.75 / 31.50) (100) = 72.2 71.4

Computer (49.00 / 65.00) (100) = 75.4 73.1

Steel (32.00 / 40.00) (100) = 80.0 73.8

Real Estate (6.50 / 18.00) (100) = 36.1 20.8

IJan = 73.5 IMar = 70.1

22.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Price Relatives | Base Price | Quantity | Weight | Weighted Price Relatives |
| Item | (Pit/Pi0)100 | Pi0 | Qi | Wi = Pi0Qi | (Pit/Pi0)100 Wi |
| Handle | 126.9 | 7.46 | 1 | 7.46 | 946.67 |
| Blades | 153.7 | 1.9 | 17 | 32.30 | 4,964.51 |
|  |  |  | Totals | 39.76 | 5,911.18 |

I= (5911.18 / 39.76) = 148.7

23. a.

|  |  |
| --- | --- |
| Seafood | Price Relatives |
| Halibut | (2.33/1.91) (100) = 122.0 |
| Lobster | (3.09/3.62) (100) = 85.4 |
| Tuna | (1.97/1.87) (100) = 105.3 |

b.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Weights (PioQio) | Price Relative | Product |
| Halibut | 143,613 | 122.0 | 17,520,786 |
| Lobster | 301,112 | 85.4 | 25,714,964 |
| Tuna | 94,957 | 105.3 | 9,998,972 |
| Totals | 539,682 |  | 53,234,722 |



Seafood prices have decreased by 1.4% over the 9-year period according to the index.

24. 2008 (84810/215.3)100 = $39,392

2009 (87210/214.5)100 = $40,657

2010 (87650/218.1)100 = $40,188

2011 (91060/224.9)100 = $40,489

(40489/39392) = 1.028

The median salary increased 2.8% over the period

25. 2007 (198.08/210.0) = $94.32

2008 ( 85.35/210.2) = $40.60

2009 (210.73/215.9) = $97.61

2010 (322.56/219.2) = $147.15

2011 (405.00/225.7) = $179.44

Over the period 2007-2011, the stock price has nearly doubled.

26. 

Quantity is up 43%.