

**THE WASHINGTON AND LEE
UNIVERSITY
PRICE INDEX**

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Bachelor of Science

Business Administration and Accounting

WASHINGTON AND LEE UNIVERSITY

LEXINGTON, VIRGINIA

**Submitted to Dr. Philip L. Cline
of Washington and Lee University
in fulfillment of the requirements
for Administration 403.**

February 7, 1982

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Preface

The following three men made this project possible through many hours of patient work, and their genuine commitment to the creation of an accurate report: Dr. Philip L. Cline, Mr. E. Stewart Epley, and Mr. L. Vernon Snyder. Gratitude is also extended to Dr. L. K. Johnson and Miss Maida Elaine Meyer who constantly added the moral support necessary for the completion of this research paper. A special thank you is extended to Mr. and Mrs. William L. Bergmann (Mom and Dad) who laid the solid foundation that created the inspiration for a study of this nature.

Thanks is also expressed to the following persons for their help:

Mr. Todd C. Alexander	Dr. Thomas C. Imeson, II
Mr. James L. Arthur	Miss Jeannette Jarvis
Dr. Edward C. Atwood, Jr.	Mr. David E. Jensen
Mr. William G. Benson	Dr. W. David Jones
Dr. Jay D. Cook, Jr.	Dr. Lawrence M. Lamont
Dr. John F. DeVogt	Mr. Maurice D. Leach, Jr.
Dr. Joseph Goldsten	Mr. William N. Mohler
Mr. Richard F. Grefe	Dr. Charles F. Phillips, Jr.
Mrs. Jeffrey Hanna	Mr. William M. E. Rachal, Jr.
Dr. Titus H. Harris, III	Mr. Karl R. Sening
Mr. Donald G. Holt	Mr. Curtis J. Turpan
Mr. Richard W. Houston	Mrs. Anne Zeigler
Mrs. Jane Hughes	Mrs. Myrna Zybko

I. Project Name: Washington and Lee University Price Index

II. Leader: J. Robert Bergmann

III. Research Director: Dr. Philip L. Cline, Associate Professor of Economics and Administration

IV. Abstract: Past expenditure patterns for Washington and Lee (fiscal years 1978-1981) are described through the use of price indexes. The expenditures included are a representative sample of total spending at Washington and Lee. The indexes are computed by three popular methods, and are used to analyze past trends for different expenditures. This analysis is helpful in viewing how different components of the University budget are reacting to general price changes. The indexes are also forecasted five years into the future under alternative micro and macroeconomic scenarios. These data will be used by the Treasurer's Office to assist in budgeting and other financial matters.

V. Need for a Separate Washington and Lee Index:

While some organizations have chosen to use the Consumer Price Index (CPI) as a measure of inflation, this is not always appropriate, especially for institutions. The CPI attempts to gauge the expenditure patterns of an urban family of four. It assumes, for instance, that this family finances a house and a car at current market rates of interest. "Although the October 1980 CPI showed an annual rate of infla-

tion of 12.7 percent, the rate would have been only 8.7 percent if mortgage interest rates had not been included, and only 4.9 percent if in addition, used car prices had been left out."¹ Thus, it is evident that the CPI does not accurately measure price changes for an institution such as Washington and Lee.

D. Kent Halstead, an economist at the National Institute of Education, has constructed the Higher Education Price Index (HEPI). The HEPI measures the price changes for many colleges and universities through current fund educational and general expenditures. The quantities of goods and services purchased are based on 1971-72 buying patterns. However, Halstead's sample included many large state supported universities whose expenditure patterns vary from that of a small, private, liberal arts university with relatively minor emphasis on research facilities.² Therefore, a separate price index for Washington and Lee should be constructed to accurately depict its price changes.

¹Irvin M. Grossack, "The Weighting Bias in the Consumer Price Index," Business Horizons, Sept./Oct. 1981, p. 17.

²D. Kent Halstead, "Higher Education Price and Price Indexes: 1979 UPDATE," Business Officer (National Association of College and University Business Officers), October 1979, pp. 14-17.

VI. Nature and Construction of Price Indexes:

"An index number is a ratio or an average of ratios expressed as a percentage. Two or more time periods are involved, one of which is the base time period. The value at the base time period serves as the standard point of comparison, while the values at the other time periods are used to show the percentage change in value from the standard value of the base period."³ All indexes have been computed using three popular methods: The Laspeyres, Paasche, and Fisher's "Ideal" Index. The formulas for the indexes are in Appendix A.

The Laspeyres index uses base year quantities, thus giving too much weight to the commodities whose prices have increased. This leads to a slight "overstating" of price increases. On the other hand, the Paasche index uses reference year weights, and this tends to "understate" price increases. Fisher's "Ideal" index alleviates these problems by combining the over and underweighting into a geometric mean.⁴

VII. Base Year: Fiscal 1981 will be the base year (the standard basis of comparison) for the indexes. According to E. Stewart Epley, Treasurer of Washington and Lee Univers-

³William Mendenhall and James E. Reinmuth, Statistics for Management and Economics, 3rd ed., (North Scituate, Mass: Duxbury Press, 1978), p. 522.

⁴Ibid., pp. 525-7.

ity, the expenditure patterns in 1981 are more likely to approximate future years than 1978, 1979 or 1980. While the basic expenditure pattern has remained fairly consistent over the four year period, 1981 expenditures will include The University Library, the new School of Commerce, Economics, and Politics, and renovated Newcomb Hall.

VIII. Explanation of terms: For purposes of this report the following terms will be used:

Overall index - includes all expenditures considered

Subindex - the eight major components of the overall index

Category - the individual components of a particular subindex

For an example, refer to the following table.

IX. Subindexes and categories

<u>Subindex</u>	<u>Category</u>
1. Salary and Wages	<ul style="list-style-type: none"> a) Administrative Salaries b) Secretary and Clerical Salaries c) Full Professor Salaries d) Associate Professor Salaries e) Assistant Professor Salaries f) Instructors' Salaries g) Buildings and Grounds, Food Service, and Printshop Employee Wages
2. Fringe Benefits	<ul style="list-style-type: none"> a) Unemployment and Workman's Compensation b) Group Insurance c) Faculty Children's Education Expense d) FICA e) Retirement
3. Utilities	<ul style="list-style-type: none"> a) Gas b) Electric c) Water
4. Library Acquisitions	Books purchased by the University Library for educational purposes
5. Travel	Total University expenditures for all trips taken
6. Subscriptions	Total expenditures for all serials (magazines, newspapers, and continuations)
7. Telephone	Monthly charges for service and long distance expense
8. Building Maintenance Costs	Total expenditures for building, heating and plumbing, electrical, and janitorial materials

X. Quantities for subindexes and categories

Table X shows the quantities that correspond with the expenditures presented in Table IX. Thus, by dividing the expenditures in Table IX by the quantities in Table X, a price can be determined for each subindex and category.

- | | |
|-------------------------------|---|
| 1. Salary and Wages | <ul style="list-style-type: none"> a) Number of Administrators, both full and part time b) Number of full time secretaries and clerical workers c) Number of Full Professors d) Number of Associate Professors e) Number of Assistant Professors f) Number of Instructors g) Number of Buildings and Grounds, Food Service and Printshop Employees |
| 2. Fringe Benefits | <ul style="list-style-type: none"> a) Total number of employees b) Total number of employees c) Number of administrators and all professors and instructors d) Total number of employees e) Total number of employees |
| 3. Utilities | <ul style="list-style-type: none"> a) Total number of MCF's used (1 MCF = 1,030 BTU per cubic foot) b) Total number of 1,000 kilowatt hour units used c) Total number of 100,000 cubic foot units of water used |
| 4. Library Acquisitions | Number of books purchased |
| 5. Travel | Number of administrators and all professors |
| 6. Subscriptions | Number of serials (magazines, newspapers, and continuations) purchased |
| 7. Telephone | Total number of telephones on campus |
| 8. Building Maintenance Costs | Total number of 1,000 square foot units used by the University |

XI. Explanation of subindexes and categories

The following is an explanation of what is actually shown by each price. Note: Price equals expenditure (Table IX) divided by quantity (Table X).

1. Salary and Wages The price shows the average outlay for salary and wages per employee in each category.
2. Fringe Benefits The price shows the average outlay per employee that enjoys the particular benefit.
3. Utilities The price shows the average outlay per unit measure (as described in Table X) for each utility.
4. Library Acquisitions The price shows the average outlay per book purchased by the University Library.
5. Travel The price shows the average outlay of travel per total number of administrators and professors. This basis was chosen because the actual number of trips taken was not available.
6. Subscriptions The price shows the average outlay per serial (magazine, newspaper, and continuation) purchase.
7. Telephone The price shows the average outlay (monthly charges and long distance expense) per telephone on campus.
8. Building Maintenance Costs The price shows the outlay per 1,000 square foot unit for all building, heating, plumbing, electrical and janitorial materials used. This basis was chosen because the number of square feet actually shows the quantity that is being serviced.

XII. The expenditures included in the overall index are only a sample of total expenditures by Washington and Lee. This is a representative sample taken from different areas of the budget, and encompasses almost 67% of all current fund unrestricted expenditures. Therefore, it does approximate the expenditure trends for the University as a whole.

XIII. The four following tables show the expenditure, quantity, and price for each subindex and category. These are the raw data that are used to compile the indexes in accordance with the formulas shown in Appendix A.

1978

	<u>Expenditure</u>	<u>Quantity</u>	<u>Price</u>
1. Salary and Wages			
a) Administrators	\$ 724,081	58.0	\$ 12,484.20
b) Secretary and Clerical	535,343	88.0	6,083.40
c) Full Professor	1,551,744	64.0	24,246.00
d) Associate Professor	407,792	22.0	18,536.00
e) Assistant Professor	535,885	35.0	15,311.00
f) Instructor	77,802	6.0	12,967.00
g) Buildings and Grounds, Food Service, and Print Shop Employees	1,099,950	146.0	7,533.90
2. Fringe Benefits			
a) Unemployment and Workman's Com- pensation	54,166	419.0	129.80
b) Group Insurance	120,174	419.0	286.80
c) Faculty Children's Education Ex- pense	113,158	185.0	611.70
d) FICA	298,224	419.0	711.80
e) Retirement	260,261	419.0	621.10
3. Utilities			
a) Gas	191,079	81,310.0	2.40
b) Electric	189,288	6,256.8	30.30
c) Water	54,246	3,089.3	17.60
4. Library Acquisitions	102,469	7,269.0	14.10
5. Travel	240,400	185.0	1,299.50
6. Subscriptions	103,061	2,443.0	42.20
7. Telephone	103,886	338.0	307.40
8. Building Maintenance Costs	89,774	769.4	116.70

1979

	<u>Expenditure</u>	<u>Quantity</u>	<u>Price</u>
1. Salary and Wages			
a) Administrators	\$ 820,420	60.0	\$ 13,673.70
b) Secretary and Clerical	605,417	87.0	6,958.80
c) Full Professor	1,646,016	64.0	25,719.00
d) Associate Professor	523,908	27.0	19,404.00
e) Assistant Professor	597,106	37.0	16,138.00
f) Instructor	39,999	3.0	13,333.00
g) Buildings and Grounds, Food Service, and Print Shop Employees	1,145,167	149.0	7,685.70
2. Fringe Benefits			
a) Unemployment and Workman's Com- pensation	62,681	427.0	146.80
b) Group Insurance	164,983	427.0	386.40
c) Faculty Children's Education Ex- pense	128,600	191.0	673.30
d) FICA	337,044	427.0	789.30
e) Retirement	298,614	427.0	699.30
3. Utilities			
a) Gas	202,073	83,671.0	2.40
b) Electric	306,923	9,874.8	31.10
c) Water	64,442	3,057.9	21.10
4. Library Acquisitions	98,236	6,303.0	15.60
5. Travel	279,913	191.0	1,465.50
6. Subscriptions	123,302	2,501.0	49.30
7. Telephone	112,380	348.0	322.90
8. Building Maintenance Costs	104,737	772.2	135.60

1980

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	<u>Expenditure</u>	<u>Quantity</u>	<u>Price</u>
1. Salary and Wages			
a) Administrators	\$ 897,029	59.0	\$ 15,203.90
b) Secretary and Clerical	656,268	90.0	7,291.90
c) Full Professor	1,788,006	66.0	27,091.00
d) Associate Professor	526,994	26.0	20,269.00
e) Assistant Professor	636,997	37.0	17,216.10
f) Instructor	37,500	3.0	12,500.00
g) Buildings and Grounds, Food Service, and Print Shop Employees	1,325,058	150.0	8,833.70
2. Fringe Benefits			
a) Unemployment and Workman's Com- pensation	104,544	431.0	242.60
b) Group Insurance	225,890	431.0	524.10
c) Faculty Children's Education Ex- pense	158,963	191.0	832.30
d) FICA	397,588	431.0	922.50
e) Retirement	321,883	431.0	746.80
3. Utilities			
a) Gas	244,118	84,647.0	2.90
b) Electric	474,538	11,078.8	42.80
c) Water	61,946	2,632.0	23.50
4. Library Acquisitions	111,535	6,303.0	17.70
5. Travel	288,610	191.0	1,511.00
6. Subscriptions	135,064	2,501.0	54.00
7. Telephone	103,305	360.0	287.00
8. Building Maintenance Costs	114,999	888.0	129.50

1981

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	<u>Expenditure</u>	<u>Quantity</u>	<u>Price</u>
1. Salary and Wages			
a) Administrators	\$ 1,086,749	61.0	\$ 17,815.60
b) Secretary and Clerical	701,222	93.0	7,540.00
c) Full Professor	2,046,800	70.0	29,240.00
d) Associate Professor	551,512	26.0	21,212.00
e) Assistant Professor	592,896	32.0	18,528.00
f) Instructor	52,899	3.0	17,633.00
g) Buildings and Grounds, Food Service, and Print Shop Employees	1,408,163	148.0	9,514.60
2. Fringe Benefits			
a) Unemployment and Workman's Com- pensation	135,739	433.0	313.50
b) Group Insurance	187,817	433.0	433.80
c) Faculty Children's Education Ex- pense	157,211	192.0	818.80
d) FICA	471,515	433.0	1,088.90
e) Retirement	358,993	433.0	829.10
3. Utilities			
a) Gas	292,381	94,712.0	3.10
b) Electric	459,914	11,052.0	41.60
c) Water	78,970	2,476.6	31.90
4. Library Acquisitions	135,644	7,269.0	18.70
5. Travel	337,049	192.0	1,755.50
6. Subscriptions	161,401	2,443.0	66.10
7. Telephone	114,452	366.0	312.70
8. Building Maintenance Costs	99,720	891.2	111.90

XIV. For comparison from year to year, the following three tables are provided.

Expenditures

	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
1. Salary and Wages				
a) Administrators	\$ 724,081	\$ 820,420	\$ 897,029	\$ 1,086,749
b) Secretary and Clerical	535,343	605,417	656,268	701,222
c) Full Professor	1,551,744	1,646,016	1,788,006	2,046,800
d) Associate Professor	407,792	523,908	526,994	551,512
e) Assistant Professor	535,885	597,106	636,997	592,896
f) Instructor	77,802	39,999	37,500	52,899
g) Buildings and Grounds, Food Service, and Print Shop Employees	1,099,950	1,145,167	1,325,058	1,408,163
2. Fringe Benefits				
a) Unemployment and Workman's Com- pensation	54,166	62,681	104,544	135,739
b) Group Insurance	120,174	164,983	225,890	187,817
c) Faculty Children's Education Ex- pense	113,158	128,600	158,963	157,211
d) FICA	298,224	337,044	397,588	471,515
e) Retirement	260,261	298,614	321,883	358,993
3. Utilities				
a) Gas	191,079	202,073	244,118	292,381
b) Electric	189,288	306,923	474,538	459,914
c) Water	54,246	64,442	61,946	78,970
4. Library Acquisitions	102,469	98,236	111,535	135,644
5. Travel	240,400	279,913	288,610	337,049
6. Subscriptions	103,061	123,302	135,064	161,401
7. Telephone	103,886	112,380	103,305	114,452
8. Building Maintenance Costs	89,774	104,737	114,999	99,720

Quantities

	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
1. Salary and Wages				
a) Administrators	58.0	60.0	59.0	61.0
b) Secretary and Clerical	88.0	87.0	90.0	93.0
c) Full Professor	64.0	64.0	66.0	70.0
d) Associate Professor	22.0	27.0	26.0	26.0
e) Assistant Professor	35.0	37.0	37.0	32.0
f) Instructor	6.0	3.0	3.0	3.0
g) Buildings and Grounds, Food Service, and Print Shop Employees	146.0	159.0	150.0	148.0
2. Fringe Benefits				
a) Unemployment and Workman's Com- pensation	419.0	427.0	431.0	433.0
b) Group Insurance	419.0	427.0	431.0	433.0
c) Faculty Children's Education Ex- pense	185.0	191.0	191.0	192.0
d) FICA	419.0	427.0	431.0	433.0
e) Retirement	419.0	427.0	431.0	433.0
3. Utilities				
a) Gas	81,310.0	83,671.0	84,647.0	94,712.0
b) Electric	6,256.8	9,874.8	11,078.8	11,052.0
c) Water	3,089.3	3,057.9	2,632.0	2,476.6
4. Library Acquisitions	7,269.0	6,303.0	6,303.0	7,269.0
5. Travel	185.0	191.0	191.0	192.0
6. Subscriptions	2,443.0	2,501.0	2,501.0	2,443.0
7. Telephone	338.0	348.0	360.0	366.0
8. Building Maintenance Costs	769.4	772.2	888.0	891.2

Prices

	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
1. Salary and Wages				
a) Administrators	\$ 12,484.20	\$ 13,673.70	\$ 15,203.90	\$ 17,815.60
b) Secretary and Clerical	6,083.40	6,958.80	7,291.90	7,540.00
c) Full Professor	24,246.00	25,719.00	27,091.00	29,240.00
d) Associate Professor	18,536.00	19,404.00	20,269.00	21,212.00
e) Assistant Professor	15,311.00	16,138.00	17,216.10	18,528.00
f) Instructor	12,967.00	13,333.00	12,500.00	17,633.00
g) Buildings and Grounds, Food Service, and Print Shop Employees	7,533.90	7,685.70	8,833.70	9,514.60
2. Fringe Benefits				
a) Unemployment and Workman's Com- pensation	129.30	146.80	242.60	313.50
b) Group Insurance	286.80	386.40	524.10	433.80
c) Faculty Children's Education Ex- pense	611.70	673.30	832.30	818.80
d) FICA	711.80	789.30	922.50	1,088.90
e) Retirement	621.10	699.30	746.80	829.10
3. Utilities				
a) Gas	2.40	2.40	2.90	3.10
b) Electric	30.30	31.10	42.80	41.60
c) Water	17.60	21.10	23.50	31.90
4. Library Acquisitions	14.10	15.60	17.70	18.70
5. Travel	1,299.50	1,465.50	1,511.00	1,755.50
6. Subscriptions	42.20	49.30	54.00	66.10
7. Telephone	307.40	322.90	287.00	312.70
8. Building Maintenance Costs	116.70	135.60	129.50	111.90

XV. Computed Index Numbers: The following indexes were computed by the methods described in Section VI. Note that the subindexes consisting of only one component will be equal whether using the Laspeyres, Paasche or Fisher Index because the weights (quantities) will cancel themselves in all three types of indexes, and will therefore, be listed only as a Fisher index.

	<u>Laspeyres Index</u>	<u>Paasche Index</u>	<u>Fisher Index</u>
Total 1978	77.37	77.26	77.31
1. Salary and Wages	79.97	79.84	79.90
a) Administrators			70.07
b) Secretary and Clerical			80.68
c) Full Professor			82.92
d) Associate Professor			87.38
e) Assistant Professor			82.64
f) Instructor			73.54
g) Buildings and Grounds, Food Service, and Print Shop Employees			79.18
2. Fringe Benefits	66.71	66.71	66.71
a) Unemployment and Workman's Com- pensation			41.24
b) Group Insurance			66.11
c) Faculty Children's Education Ex- pense			74.71
d) FICA			65.37
e) Retirement			74.91
3. Utilities	72.23	71.26	71.74
a) Gas			77.42
b) Electric			72.70
c) Water			55.10
4. Library Acquisitions			73.06
5. Travel			74.02
6. Subscriptions			70.57
7. Telephone			98.31
8. Building Maintenance Costs			104.29

	<u>Laspeyres Index</u>	<u>Paasche Index</u>	<u>Fisher Index</u>
Total 1979	83.38	83.29	83.33
1. Salary and Wages	95.09	85.03	85.06
a) Administrators			76.25
b) Secretary and Clerical			92.29
c) Full Professor			87.96
d) Associate Professor			91.48
e) Assistant Professor			87.10
f) Instructor			75.61
g) Buildings and Grounds, Food Service, and Print Shop Employees			80.78
2. Fringe Benefits	76.62	76.63	76.62
a) Unemployment and Workman's Com- pensation			46.83
b) Group Insurance			89.07
c) Faculty Children's Education Ex- pense			82.23
d) FICA			72.49
e) Retirement			84.34
3. Utilities	75.12	74.79	74.95
a) Gas			77.42
b) Electric			74.69
c) Water			66.11
4. Library Acquisitions			80.83
5. Travel			83.48
6. Subscriptions			82.44
7. Telephone			103.26
8. Building Maintenance Costs			121.18

	<u>Laspeyres Index</u>	<u>Paasche Index</u>	<u>Fisher Index</u>
Total 1980	92.41	92.41	92.41
1. Salary and Wages	91.99	92.02	92.00
a) Administrators			85.34
b) Secretary and Clerical			96.71
c) Full Professor			92.65
d) Associate Professor			95.55
e) Assistant Professor			92.92
f) Instructor			70.89
g) Buildings and Grounds, Food Service, and Print Shop Employees			92.84
2. Fringe Benefits	92.63	92.62	92.62
a) Unemployment and Workman's Com- pensation			77.38
b) Group Insurance			120.81
c) Faculty Children's Education Ex- pense			101.65
d) FICA			84.72
e) Retirement			90.07
3. Utilities	96.82	96.82	96.82
a) Gas			93.55
b) Electric			102.93
c) Water			73.83
4. Library Acquisitions			90.16
5. Travel			86.07
6. Subscriptions			86.79
7. Telephone			91.78
8. Building Maintenance Costs			115.73

1981

The overall index, all subindexes, and all categories will equal 100.00 under each type of index because 1981 is the base year (refer to Section VII).

XVI. As mentioned in Section VI, the Fisher's "Ideal" index alleviates the problem of over and understating, and therefore will be used for comparative purposes. The following table shows the Fisher index in each year for the overall index, subindexes and categories. For a graphic representation see Appendix J.

	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
Overall Index	77.31	83.33	92.41	100.00
1. Salary and Wages	79.90	85.06	92.00	100.00
a) Administrators	70.07	76.25	85.34	100.00
b) Secretary and Clerical	80.68	92.29	96.71	100.00
c) Full Professor	82.92	87.96	92.65	100.00
d) Associate Professor	87.38	91.48	95.55	100.00
e) Assistant Professor	82.64	87.10	92.92	100.00
f) Instructor	73.54	75.61	70.89	100.00
g) Buildings and Grounds, Food Service, and Print Shop Employees	79.18	80.78	92.84	100.00
2. Fringe Benefits	66.71	76.62	92.62	100.00
a) Unemployment and Workman's Com- pensation	41.24	46.83	77.38	100.00
b) Group Insurance	66.11	89.07	120.81	100.00
c) Faculty Children's Education Ex- pense	74.71	82.23	101.65	100.00
d) FICA	65.37	72.49	84.72	100.00
e) Retirement	74.91	94.34	90.07	100.00
3. Utilities	71.74	74.95	96.82	100.00
a) Gas	77.42	77.42	93.55	100.00
b) Electric	72.70	74.69	102.93	100.00
c) Water	55.10	66.11	73.83	100.00
4. Library Acquisitions	73.06	80.83	90.16	100.00
5. Travel	74.02	83.48	86.07	100.00
6. Subscriptions	70.57	82.44	86.79	100.00
7. Telephone	98.31	103.26	91.78	100.00
8. Building Maintenance Costs	104.29	121.18	115.73	100.00

XVII. General Conclusions

It is evident that salary and wages, and fringe benefits clearly dominate total expenditures (in 1981 they included 82.19%). Any other single expenditure is relatively minor when compared with these two. It is therefore safe to refer to Washington and Lee as a "labor intensive institution." Note also that the number of employees has remained fairly constant over the four year period, and this is not expected to change in the near future.

While the indexes for full, associate, and assistant professors have been increasing over the four years, the average associate professor salary has only risen 14.4%, as compared with approximately 20.8% increases for the other two. Some factors that influence these average salaries include turnover, number of promotions, and length of service. For example, if in a given year there are many promotions from assistant to associate professor (and assuming the newer associate professors are in the lower spectrum of that pay scale) the "average" increase in salary would be lower.

Washington and Lee's expenditures for unemployment and workman's compensation have increased approximately 142% over the four year period. This is attributed to drastic increases by the government in the rates used to calculate the amounts due. Washington and Lee also has many nine month employees. If these people do not find other em-

ployment during the summer months, they are eligible for unemployment compensation, and this increase in persons drawing from the fund causes a rise in the rate charged to the University. The FICA tax has also increased at a faster rate than the overall index. This again can be attributed to increased demands by the government.

The outlay for group insurance increased considerably in 1980. This can be explained in part by Washington and Lee changing from Travelers Insurance to Pilot Life. There were onetime expenditures involved in both closing the old account and opening the new one. The expenditure did then decline in 1981.

The expenditures and quantities used for the analysis of utilities are only a sample of the total. All major buildings on campus were included, and this sample remained the same for the four year period. The amount paid for water increased 35.4% from 1980 to 1981. Much of this stems from an increased water bill from the City of Lexington.

When analyzing the prices for both Library Acquisitions and Subscriptions, one must realize that these are only averages, with a wide range of variance. For instance, a yearly subscription to a popular magazine is below the 1981 average of \$66.10, but the subscriptions to certain technical commerce publications are considerably higher.

As expected, prices in general have been increasing during the four years for all subindexes with the exception of Building Maintenance Costs, whose price has decreased over the four year period. This can be explained by the fact that over the time period analyzed, Washington and Lee has had extensive construction and renovation. This can be seen by the increase in total square footage annually. Thus, the price decrease stated here does not indicate that the actual cost of materials purchased has declined, but that Washington and Lee is becoming more efficient, and thereby spending less per 1,000 square foot unit on maintenance due to the modern buildings.

XVIII. Comparison of Overall Index with the CPI

	<u>Overall Index</u>	<u>CPI</u>
1978	77.31	72.61
1979	83.33	80.82
1980	92.41	91.83
1981	100.00	100.00

To make an accurate comparison to the overall index, the base year for the CPI was changed from 1967 to 1981. The actual computations are in Appendix B.

While both indexes have been rising, Washington and Lee prices are increasing more slowly (a 22.69 point rise from 1978-1981) than the CPI (a 27.39 point rise from 1978-1981).

XIX. Projection

The following broad assumptions will be the base for all projections. Specific assumptions will be stated in

reference to individual subindexes.

Macroeconomic

1. The unemployment rate is projected as follows:

<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
7.2%	6.6%	6.4%	5.9%	5.6% ⁵

2. "Less government spending and restrained monetary policy will be cooling inflation . . . [However], accelerating inflation is all people have known for 15 years. It will take time to convince them that inflation is slowing, and have them make pricing decisions accordingly. Net Result: a drop of only a few percentage points in the inflation rate, to 6-7% in 1986."⁶

3. The Gross National Product is projected as follows:

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Current Dollars					
Amount (billions of dollars)	\$ 3,323	3,734	4,135	4,541	4,963
Percent Change, year to year	13.0%	12.4%	10.8%	9.8%	9.3%
Constant (1972) dollars					
Amount (billions of dollars)	\$ 1,572	1,651	1,725	1,797	1,872
Percent Change, year to year	4.1%	5.0%	4.5%	4.2%	4.2% ⁷

⁵Keith M. Carlson, "Trends in Federal Spending: 1955-86," Federal Reserve Bank of St. Louis, Nov. 1981, p. 21.

⁶"The Panel's Prognosis: We've Turned the Corner," Purchasing, 25 June 1981, p. 71.

⁷Carlson, p. 21.

4. The prime rate is projected as follows:

<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
15.00%	15.00%	14.25%	13.75%	13.00% ⁸

5. The interest rate on 91-day Treasury Bills is projected as follows:

<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
10.5%	9.4%	8.2%	7.0%	6.0% ⁹

6. The Implicit Price Deflator is projected as follows:

<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
8.1%	7.6%	7.2%	7.0%	7.0% ¹⁰

7. The CPI (all urban consumers) is projected as follows:

<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
7.5%	7.0%	6.5%	6.2%	7.1% ¹¹

Microeconomic

During personal interviews with both Robert E. R. Huntley, President of Washington and Lee, and Mr. Epley, it was determined that the 1986 expenditure patterns will not vary greatly from 1981. The only exceptions will be a few new educational programs, and the possibility of con-

⁸"Value Line's Outlook for the U. S. Economy," The Value Line Investment Survey, 8 Jan. 1982, pp. 300-301.

⁹Carlson, P. 21.

¹⁰"Value Line's Outlook for the U. S. Economy," pp. 300-301.

¹¹Ibid., pp. 300-301.

structing one or two small buildings. No major construction is foreseen, and the current enrollment will remain fairly constant. The undergraduate campus will also maintain its single sex status.

Explanation of Assumptions

The following projections will encompass the macro and microeconomic assumptions previously stated, plus any other assumptions pertaining directly to an individual subindex. All of the projections will include a "most likely" change in price, plus an estimate of what may happen if the economy takes a slight upswing or downturn. Therefore, each projection will have "optimistic," "most likely" and "pessimistic" scenarios.

1. Salary and Wages

Salary and wages is the largest single component of the unrestricted current fund expenditures. The microeconomic assumptions that were stated earlier will be most evident in this subindex. Also, according to Mr. Epley, Washington and Lee will continue its policy of having faculty salaries above the national average for four year institutions. These facts coupled with the macroeconomic assumptions show that the expenditure patterns will not vary greatly from 1978-1981. Therefore, a regression equation using the Fisher Index as the dependent variable, and time as the independent variable, is used to establish a "line of best fit". By setting approximate forecast intervals about the

line, the alternative scenarios will be determined. The projections are as follows:

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Optimistic	101.65	108.37	115.09	121.81	128.53
Most likely	106.00	112.72	119.44	126.16	132.88
Pessimistic	110.35	117.07	123.79	130.51	137.23

An analysis of the regression equation is in Appendix C.

The method used to set the approximate forecast intervals is in Appendix D.

2. Fringe Benefits

The variables that determine the price changes for fringe benefits are the same ones that affect price changes in salary and wages. Therefore a regression equation will also be used to forecast future fringe benefits.

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Optimistic	102.29	113.89	125.49	137.09	148.69
Most likely	113.00	124.60	136.20	147.80	159.40
Pessimistic	123.71	135.31	146.91	158.51	170.11

See Appendix E.

It is evident that these forecasts cover a wider range than the salary and wages subindex. This variance can be explained by the fact that the fringe benefits subindex has five components all acting independent of each other. Therefore, the composite projection will have a broader variance.

3. Utilities

Unlike the previous subindexes, the expenditures for

utilities have not been very constant in 1978-1981, nor are utilities expected to follow any set pattern in the future. In addition, Washington and Lee has been going through a period of major construction and renovation during the past few years. It is for these reasons that a regression is inappropriate. Therefore, it will be assumed that the consumption patterns for gas, electricity, and water that were set in 1981 will continue through 1986 because no major construction is planned. Using 1981 as the base year, macroeconomic assumptions will be made to project through 1986.

GAS: Due to the current issue of the schedule for the deregulation of gas (if it is accelerated, how rapidly?), it is very difficult to make any definite assumptions. However, with the help of Dr. Charles F. Phillips, Jr., Professor of Economics, the following assumptions were made.

The rate of increase in 1982-1986 will be higher than that of the CPI. Yet, it will be lower than the approximately 19.5% annual compound increase that was experienced during 1970-1980. OPEC will probably not expose the United States to the drastic increases that were experienced in the 1970's.

Assume for an "optimistic" scenario, CPI + 1%, "most likely," CPI + 3%, and "pessimistic," CPI + 5%. (Refer to number 7 of the macroeconomic assumptions that were previously stated concerning the projected CPI.)

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Optimistic	108.58	117.34	126.21	135.38	146.44
Most likely	110.73	122.03	133.86	146.43	161.53
Pessimistic	112.88	126.82	141.81	158.13	177.83

ELECTRICITY: Washington and Lee purchases all of its electricity from VEPCO. Its rates are determined by the amount of increase that will be allowed by the State Corporation Commission. There are obviously too many unknown factors to make an accurate prediction, so again, Dr. Phillips used his knowledge of the industry to help construct the following table.

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Optimistic	107.00	114.49	122.50	129.85	138.94
Most likely	107.50	115.56	124.23	132.93	142.89
Pessimistic	108.00	116.64	125.97	136.05	146.93

WATER: The water used by Washington and Lee is purchased from the City of Lexington. Any change in price would be a direct effect of a price change levied by the City. The following table was constructed with the help of Dr. Thomas C. Imeson, Lexington City Councilman.

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Optimistic	100.00	110.00	110.00	110.00	121.00
Most likely	100.00	115.00	115.00	115.00	132.25
Pessimistic	100.00	120.00	120.00	120.00	144.00

To determine the projection for the utility subindex, apply a weighted average, using 1981 as the base year, to each category: Gas - 35.17%, Electricity - 55.33%, and water - 9.50%.

Utility Subindex

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Optimistic	106.89	115.07	122.62	129.91	139.87
Most likely	107.92	117.78	124.05	135.97	148.43
Pessimistic	108.96	120.54	130.97	142.29	157.52

4. Library Acquisitions

The level of price change has remained fairly constant from 1978-1981. Therefore, a regression equation will be used as the method of forecasting.

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Optimistic	105.32	114.33	123.34	132.35	141.36
Most likely	108.55	117.56	126.57	135.58	144.59
Pessimistic	111.78	120.79	129.80	138.81	147.82

See Appendix F

5. Travel

A regression equation will also be used to predict future travel expenditures. Note that the wide range between the "optimistic" and "pessimistic" scenarios can be explained by past fluctuations in the prices of gasoline and airplane tickets, and the uncertainty of these prices in the future.

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Optimistic	91.94	99.99	108.04	116.09	124.14
Most likely	106.05	114.10	122.15	130.20	138.25
Pessimistic	120.16	128.21	136.26	144.31	152.36

See Appendix G.

6. Subscriptions

Due to the fairly stable level of price increases, a regression equation will again be used to predict future

prices.

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Optimistic	96.78	106.04	115.30	124.56	133.82
Most Likely	108.10	117.36	126.62	135.88	145.14
Pessimistic	119.42	128.68	137.94	147.20	156.46

See Appendix H.

7. Telephone

The current reorganization of AT&T has left much uncertainty as to future prices for telephone usage. Charles L. Brown, Chairman of AT&T has recently stated that he "expects local rates to go up 8 percent to 10 percent annually for the next several years."¹² Being a spokesman for the company, Mr. Brown is obviously biased. For this reason the "optimistic" scenario will be an 8% annual increase, 10% for the "most likely," and 12% for the "pessimistic".

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Optimistic	108.00	116.64	125.97	136.05	146.93
Most likely	110.00	121.00	133.10	146.41	161.05
Pessimistic	112.00	125.44	140.49	157.35	176.23

8. Building Maintenance Costs

This subindex is dependent upon two variables: the actual costs of the materials used, and the total square footage of the university. There has been a fairly sharp decline over the past three years for this subindex which

¹²"AT&T Chief: Accord won't bloat phone bills," Roanoke Times & World-News, 26 January 1982, p. A-10.

indicates that the university is becoming more efficient in its use of the materials in the new and renovated buildings. However, the construction is scheduled to cease, meaning that this subindex will be much more responsive to the actual costs of the materials used. According to Mr. James Arthur, Superintendent of Buildings and Grounds, the rate of increase of these materials will closely parallel the increases in CPI. Using 1981 as the base year, and a 1% deviation from the CPI to determine the alternative scenarios, the following table was constructed:

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Optimistic	106.50	112.89	119.10	125.29	132.93
Most likely	107.50	115.03	122.50	130.10	139.33
Pessimistic	108.50	117.18	125.97	135.04	145.98

9. Overall Index

The overall index is the sum of the eight subindexes. Therefore, the forecast for the overall index is determined by applying a weighted average (using 1981 as the base year) to all the projections of the subindexes. See Appendix I.

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Optimistic	101.95	109.62	117.25	124.85	132.72
Most likely	107.28	115.14	121.21	130.77	138.92
Pessimistic	112.61	120.67	128.80	136.71	145.17

XX. Comparisons of Projections

The following table shows the projections for the overall index and the "most likely" scenario. For a graphic representation, refer to Appendix J.

	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>
Overall Index	107.28	115.14	121.21	130.77	138.92
1. Salary and Wages	106.00	112.72	119.44	126.16	132.88
2. Fringe Benefits	113.00	124.60	136.20	147.80	159.40
3. Utilities	107.92	117.78	124.05	135.97	148.43
4. Library Acquisitions	108.55	117.56	126.57	135.58	144.59
5. Travel	106.05	114.10	122.15	130.20	138.25
6. Subscriptions	108.10	117.36	126.62	135.88	145.14
7. Telephone	110.00	121.00	133.10	146.41	161.05
8. Building Maintenance Costs	107.50	115.03	122.50	130.10	139.33

XXI. Analysis of Forecasts

The overall index is projected to increase from 1982-1986 at approximately the same rate as 1978-1981. The salary and wages subindex (which includes almost 69% of the total) is projected to increase at the slowest rate, 32.88%. All other subindexes bring the overall increase to 38.92%.

The projections that have the highest margin for error are the utilities and telephone subindexes because of the uncertainty that surrounds their respective industries currently. The travel subindex may also be subject to wide fluctuations if gasoline and airline ticket prices experience unexpected changes. The library acquisitions, subscriptions, and salary and wages subindexes are likely to

be the most accurate projections. Their expenditure patterns have remained fairly constant over the four year period, and no major changes are expected in the near future. Overall, the present volatility in the economy makes any projection of this nature speculative. However, these projections will approximate future trends.

APPENDIX A

$$\text{Laspeyres} = \frac{\sum_{i=1}^n P_{ki} q_{oi}}{\sum_{i=1}^n P_{oi} q_{oi}} \quad (100)$$

$$\text{Paasche} = \frac{\sum_{i=1}^n P_{ki} q_{ki}}{\sum_{i=1}^n P_{oi} q_{ki}} \quad (100)$$

$$\text{Fisher} = \sqrt{(\text{Laspeyres Index}) (\text{Paasche Index})}$$

$$100 \sqrt{\frac{\sum_{i=1}^n P_{ki} q_{oi}}{\sum_{i=1}^n P_{oi} q_{oi}} \cdot \frac{\sum_{i=1}^n P_{ki} q_{ki}}{\sum_{i=1}^n P_{oi} q_{ki}}}$$

- Where, P = price
 q = quantity
 k = reference year
 o = base year
 i = number of items

APPENDIX B

With 1967 = 100, the CPI is as follows:

1978	195.3
1979	217.4
1980	247.0
1981	268.9

Using 1981 as a base,

$$1978 = \frac{195.3}{268.9} = 72.61$$

$$1979 = \frac{217.4}{268.9} = 80.82$$

$$1980 = \frac{247.0}{268.9} = 91.83$$

$$1981 = \frac{268.9}{268.9} = 100.00$$

APPENDIX C

Salary and Wages Regression

$$y = 72.4 + 6.72 X$$

Rsquared = 98.7% adjusted for degrees of freedom

$$S = 1.01$$

The approximate forecast interval is ± 4.35 .

For an example of how the approximate forecast interval was constructed, See Appendix D.

APPENDIX D

Approximate Forecast Intervals

The following equation was used to set the interval

$$\hat{y}_t \pm t_{\alpha/2} s$$

$t_{\alpha/2}$ set for 95% confidence = 4.303, with 2 degrees of freedom. Using salary and wages for 1982 as an example:

$$106.00 \pm (4.303)(1.01)$$

APPENDIX E

Fringe Benefits Regression

$$y = 55.0 + 11.6 X$$

Rsquared = 97.3% adjusted for degrees of freedom

$$S = 2.49$$

The approximate forecast interval is ± 10.71

For an example of how the approximate forecast interval was constructed, see Appendix C.

APPENDIX F

Library Acquisition Regression

$$y = 63.5 + 9.01 X$$

$$R\text{squared} = 99.6\%$$

$$S = .750$$

The approximate forecast interval is ± 3.23 .

For an example of how the approximate forecast interval was constructed, see Appendix D.

APPENDIX G

Travel Regression

$$y = 65.8 + 8.05 X$$

Rsquared = 90.6% adjusted for degrees of freedom

$$S = 3.28$$

The approximate forecast interval is ± 14.11 .

For an example of how the approximate forecast interval was constructed, see Appendix D.

APPENDIX H

Subscriptions Regression

$$y = 61.8 + 9.26 X$$

Rsquared = 95.3% adjusted for degrees of freedom

$$S = 2.63$$

The approximate forecast interval is ± 11.32 .

For an example of how the approximate forecast interval was constructed, see Appendix D.

APPENDIX I

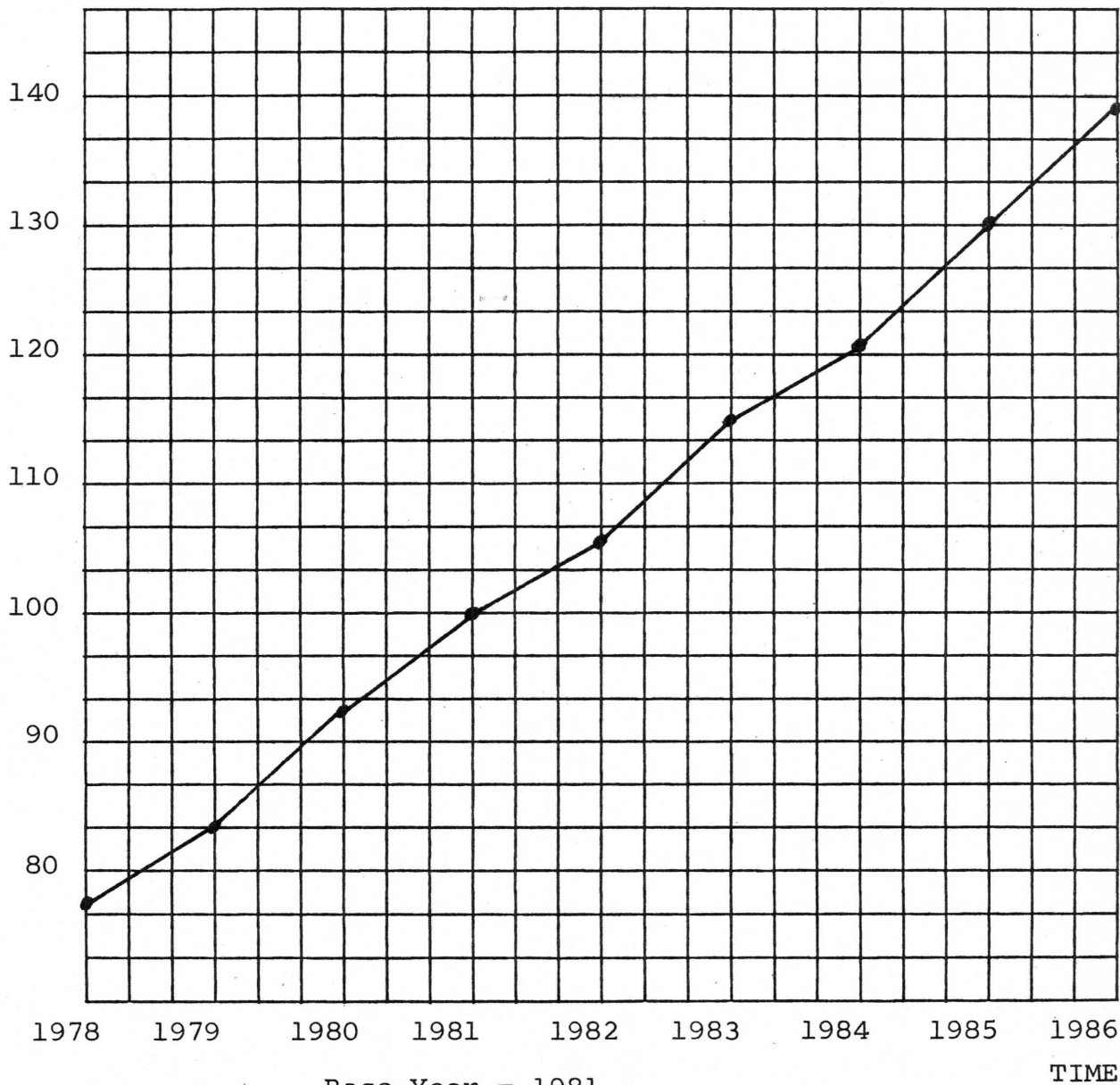
	<u>1981 Weights</u>
1. Salary and Wages	62.68%
2. Fringe Benefits	13.91
3. Utilities	8.81
4. Library Acquisitions	1.45
5. Travel	3.57
6. Subscriptions	1.71
7. Telephone	1.21
8. Building Maintenance Costs	<u>1.06</u>
	100.00%

APPENDIX J

The following graphs show data actually compiled from 1978-1981, and the "most likely" projections for 1982-1986.

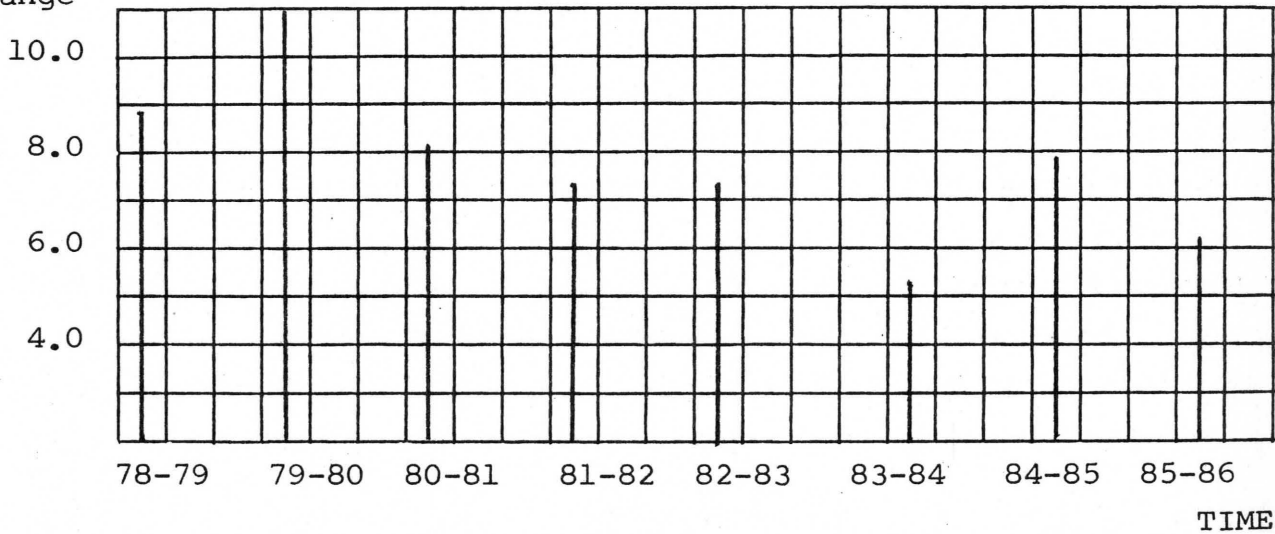
Overall Index

Fisher
Index



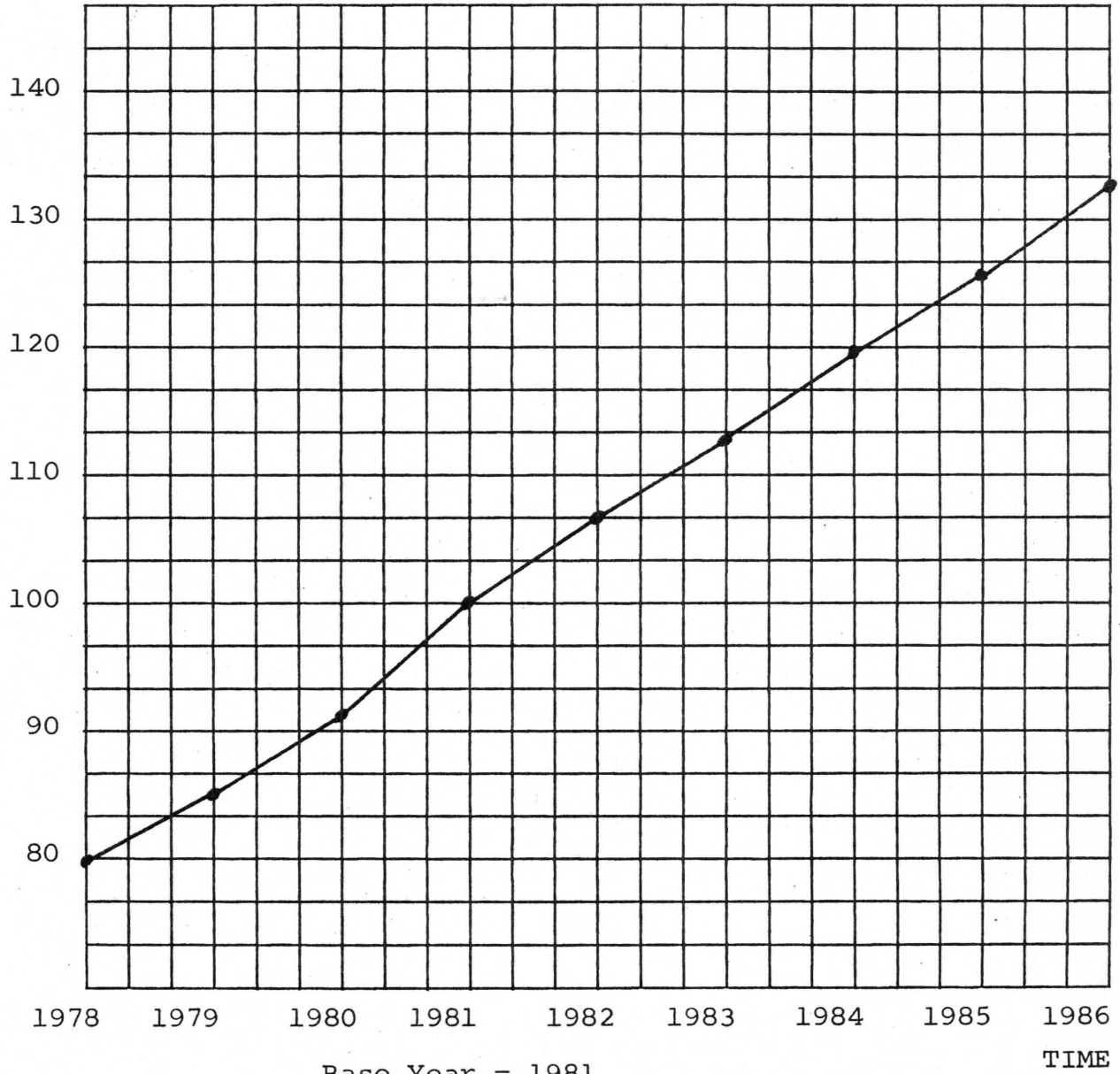
Base Year = 1981

Annual Rate
of Change



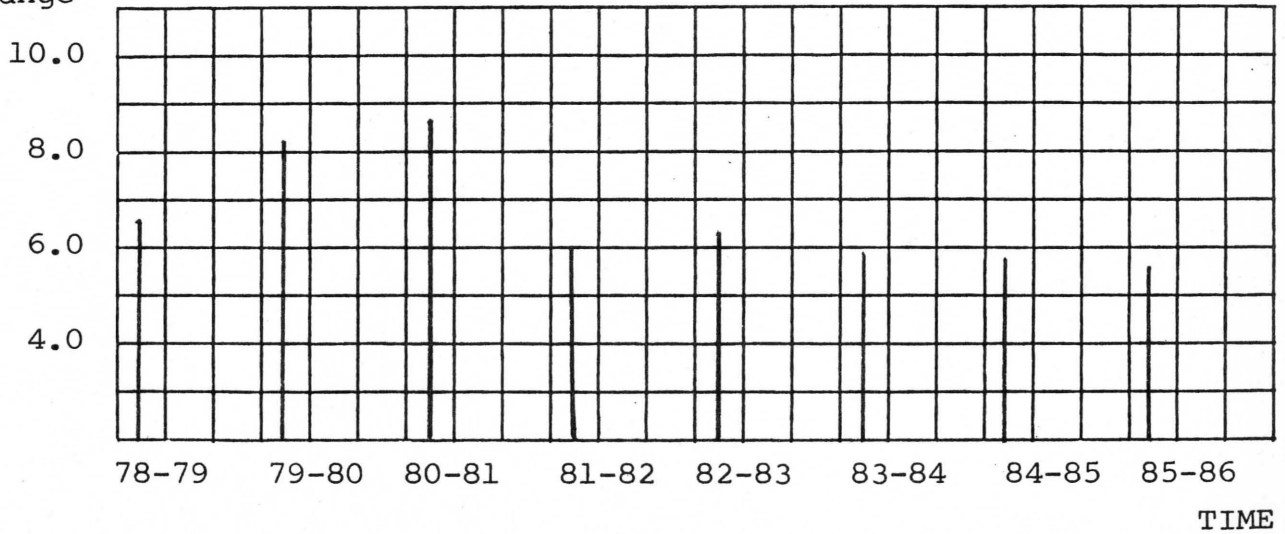
Salary and Wages Subindex

Fisher
Index



Base Year = 1981

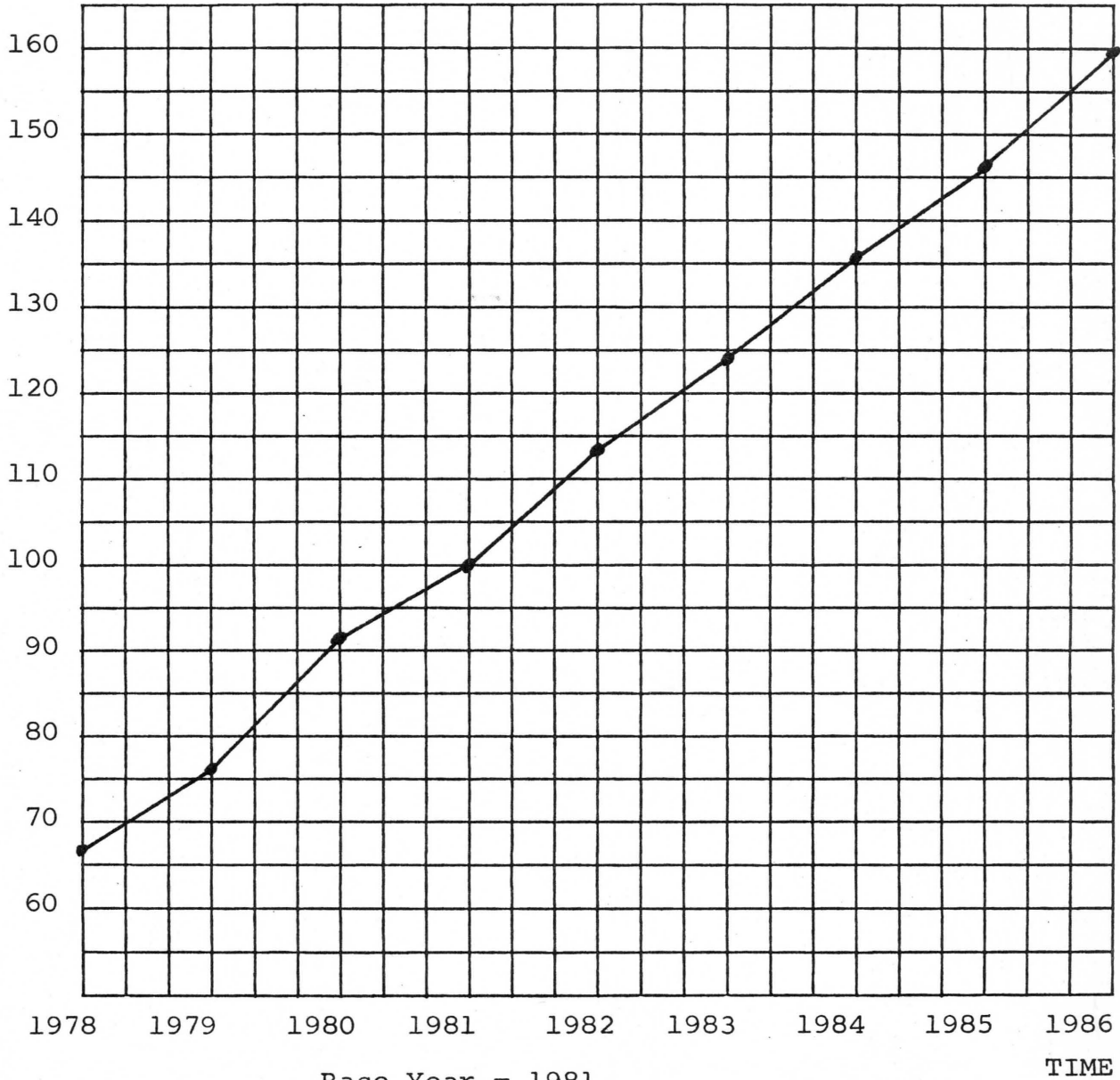
Annual Rate
of Change



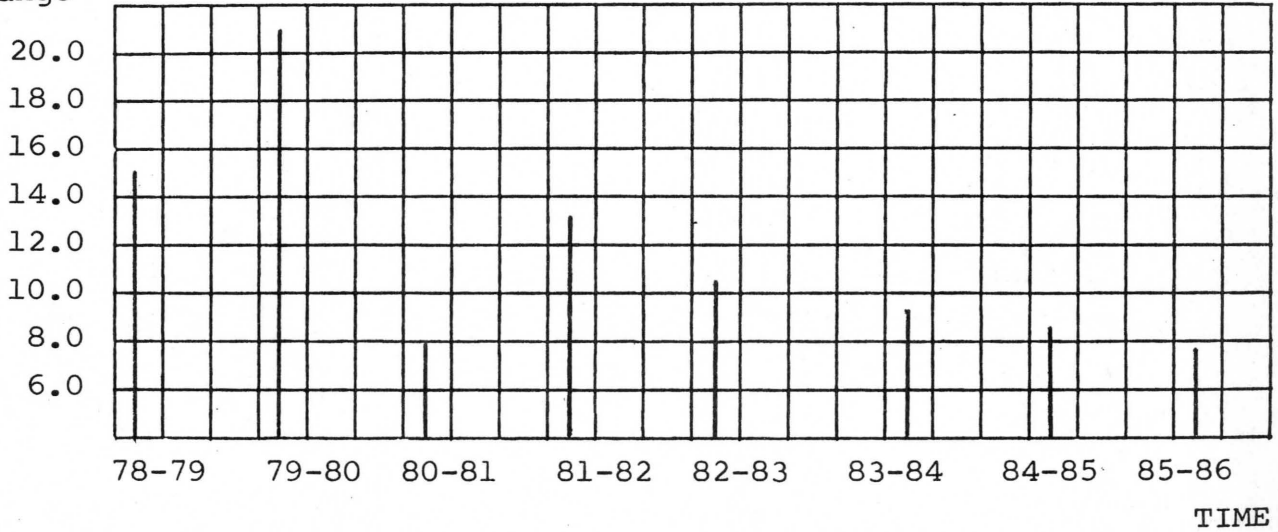
TIME

Fringe Benefits Subindex

Fisher
Index

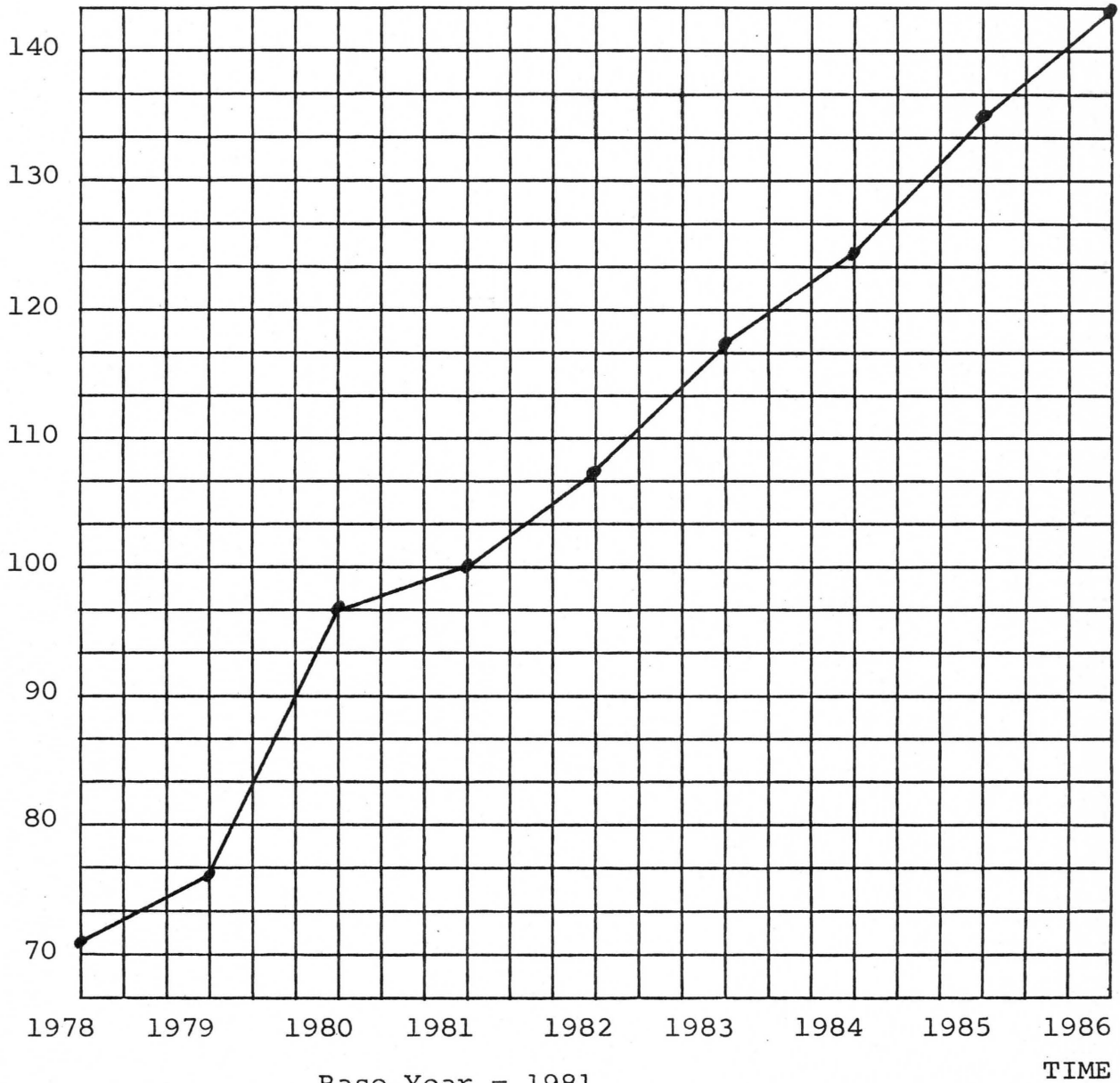


Annual Rate
of Change

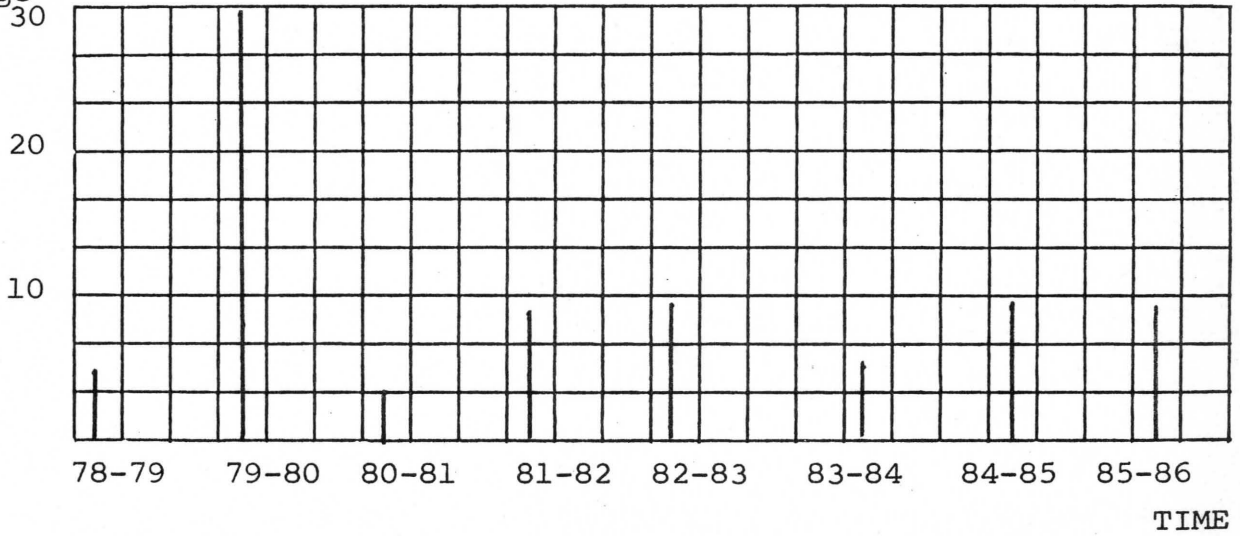


Utilities Subindex

Fisher Index

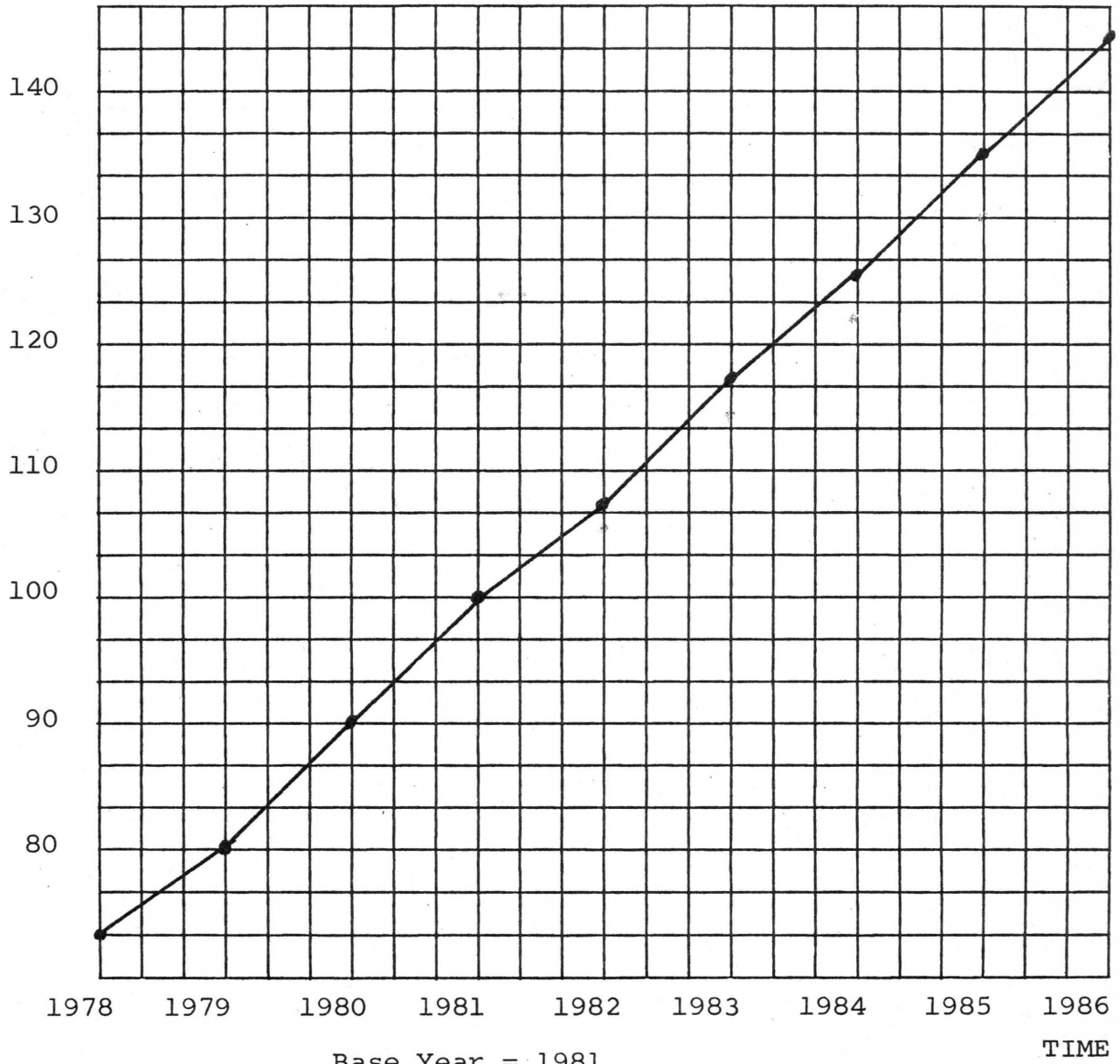


Annual Rate of Change



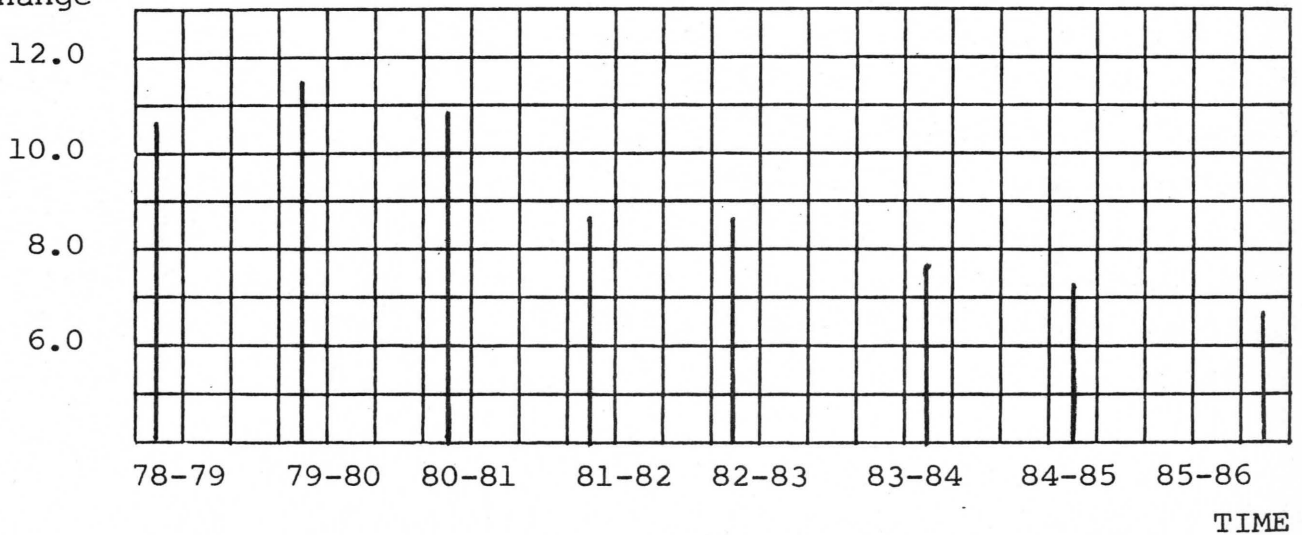
Library Acquisitions Subindex

Fisher
Index



Base Year = 1981

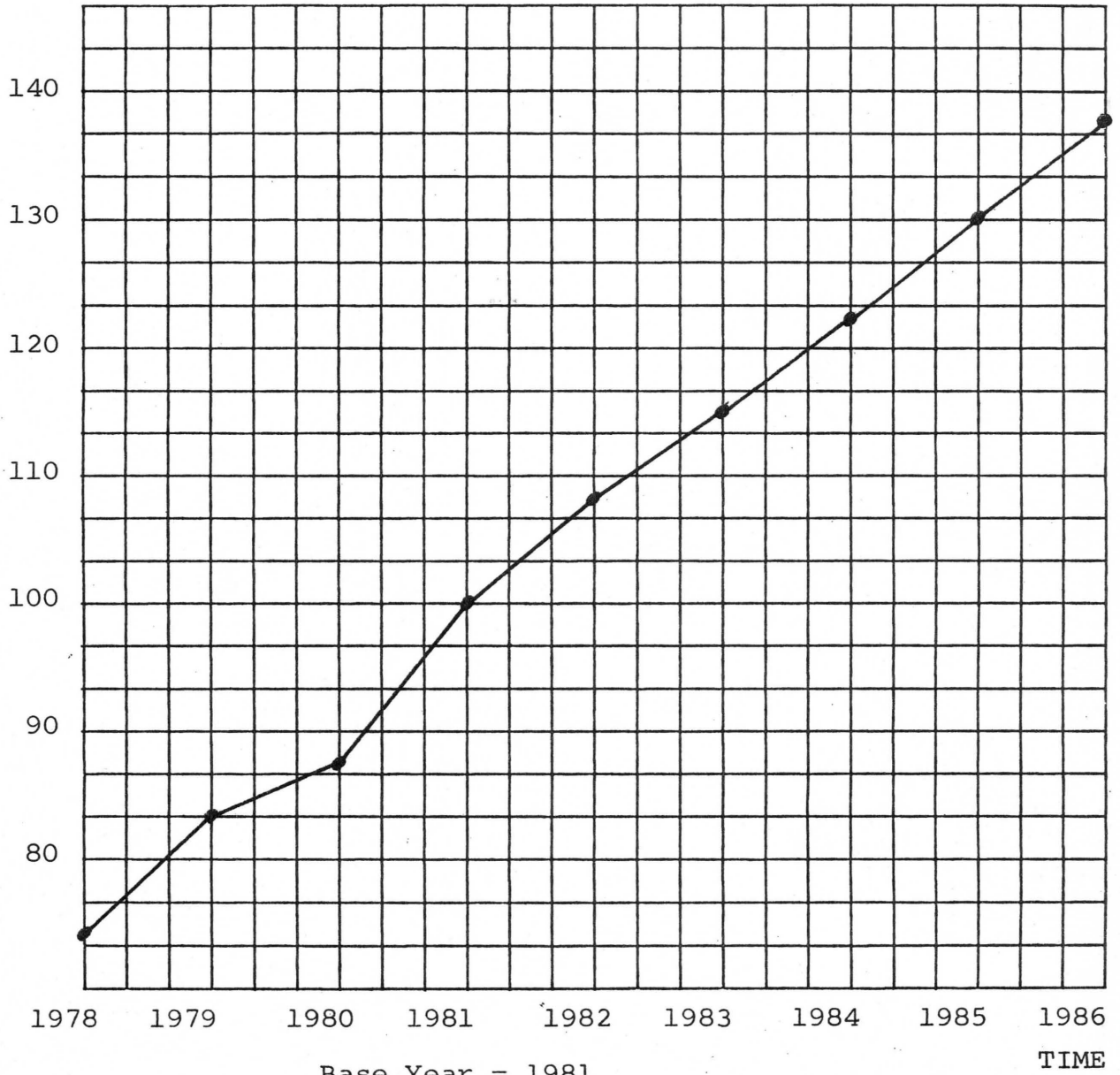
Annual Rate
of Change



TIME

Travel Subindex

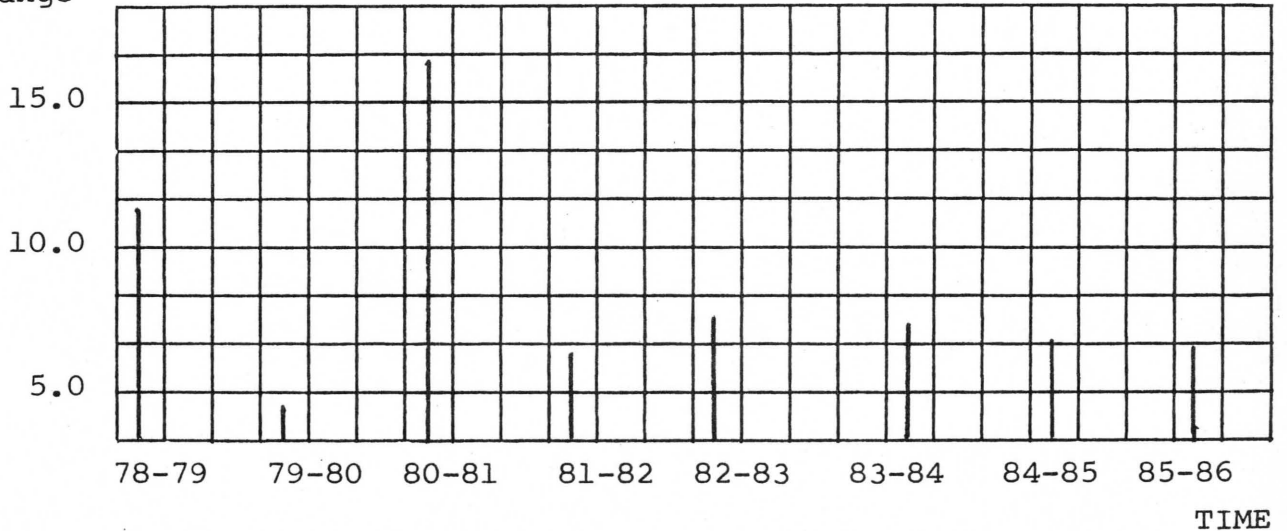
Fisher
Index



Base Year = 1981

TIME

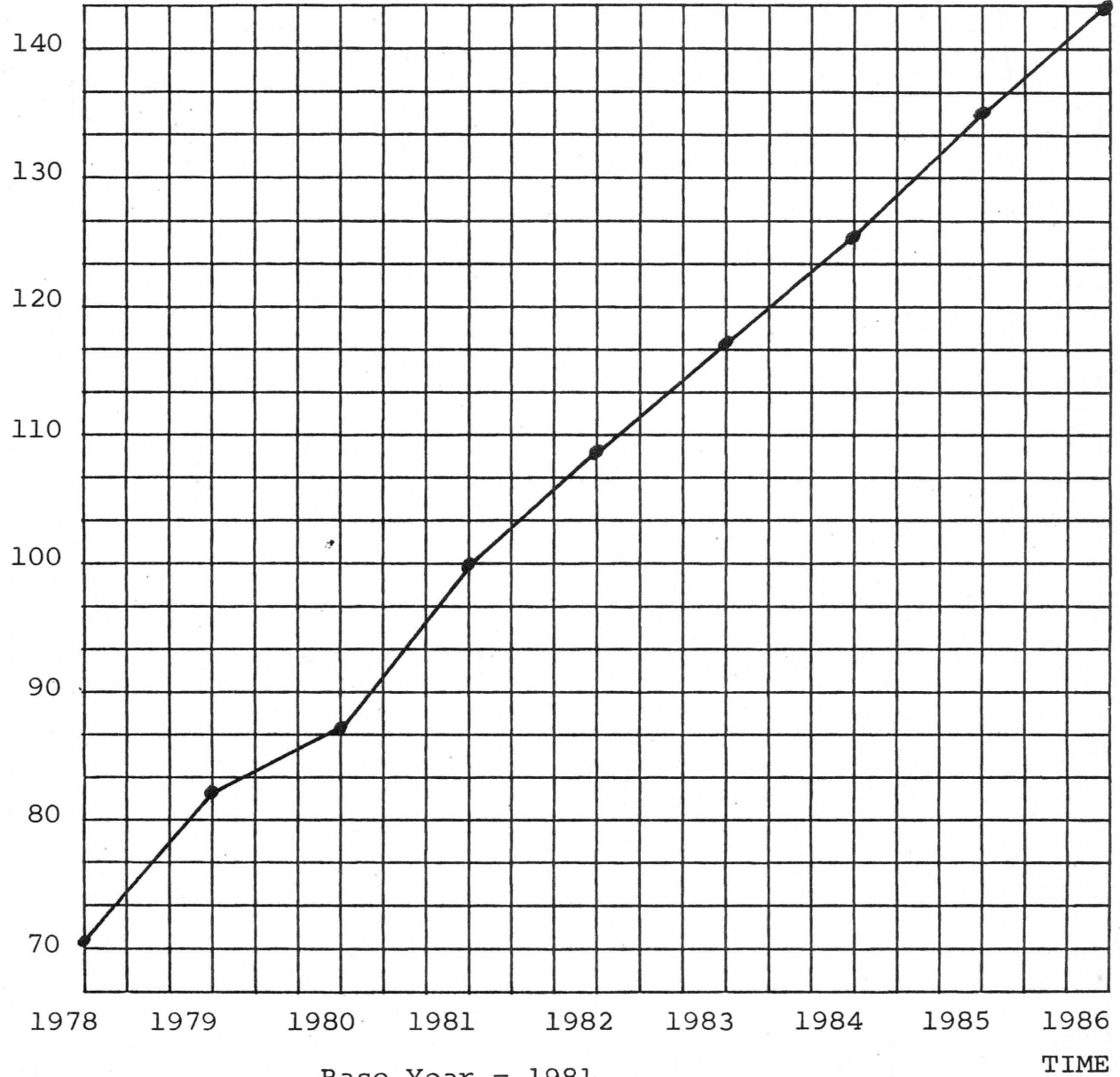
Annual Rate
of Change



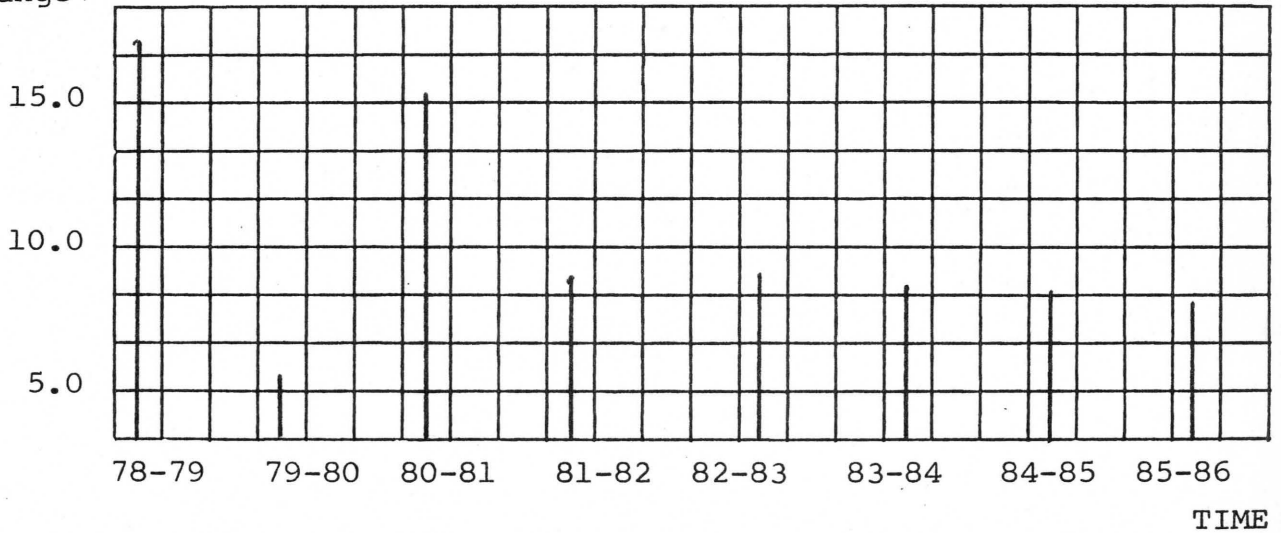
TIME

Subscriptions Subindex

Fisher Index

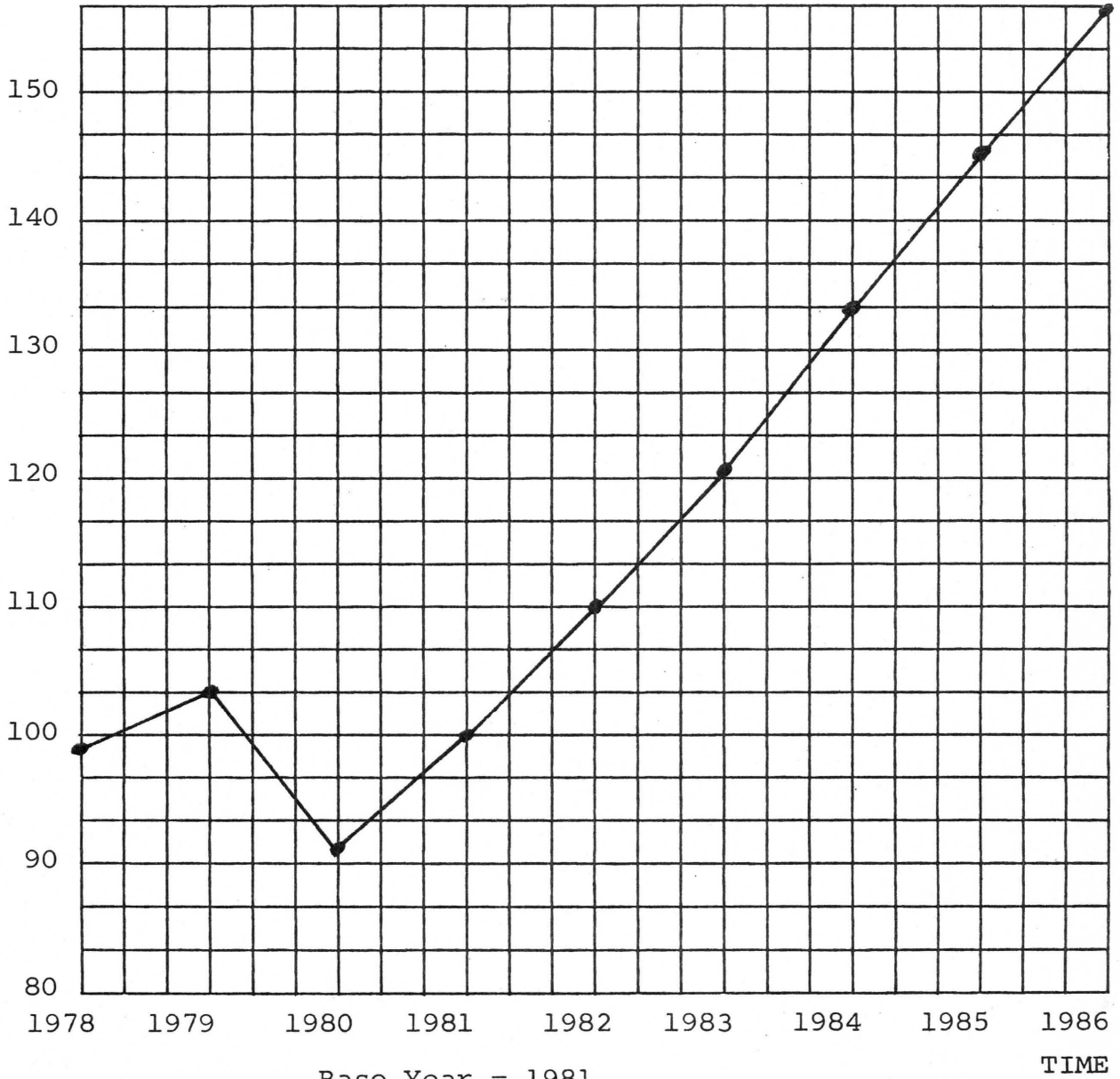


Annual Rate of Change

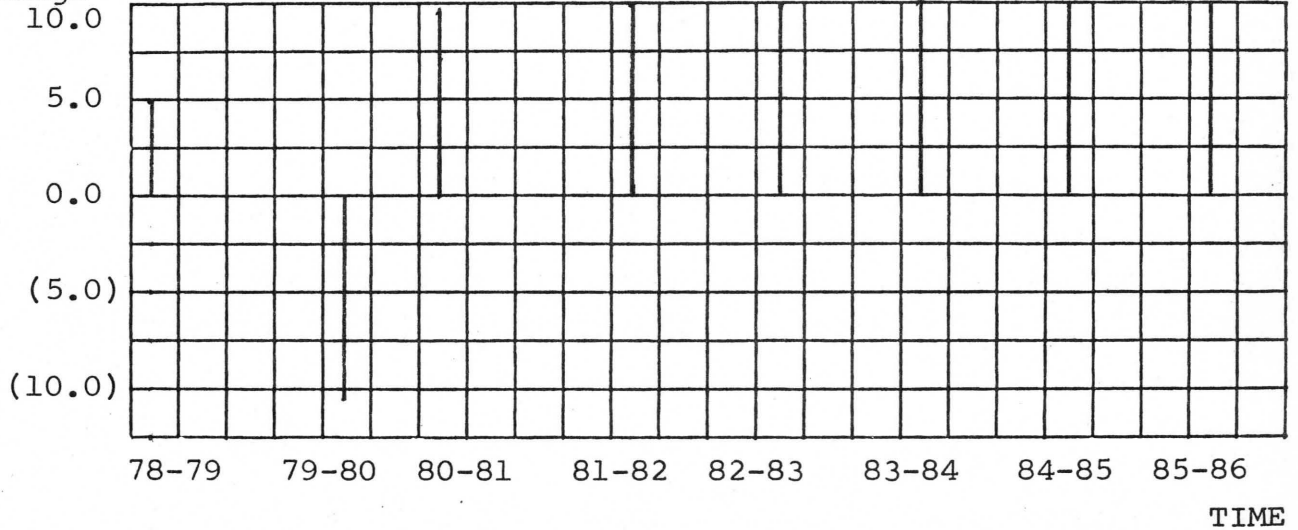


Telephone Subindex

Fisher
Index

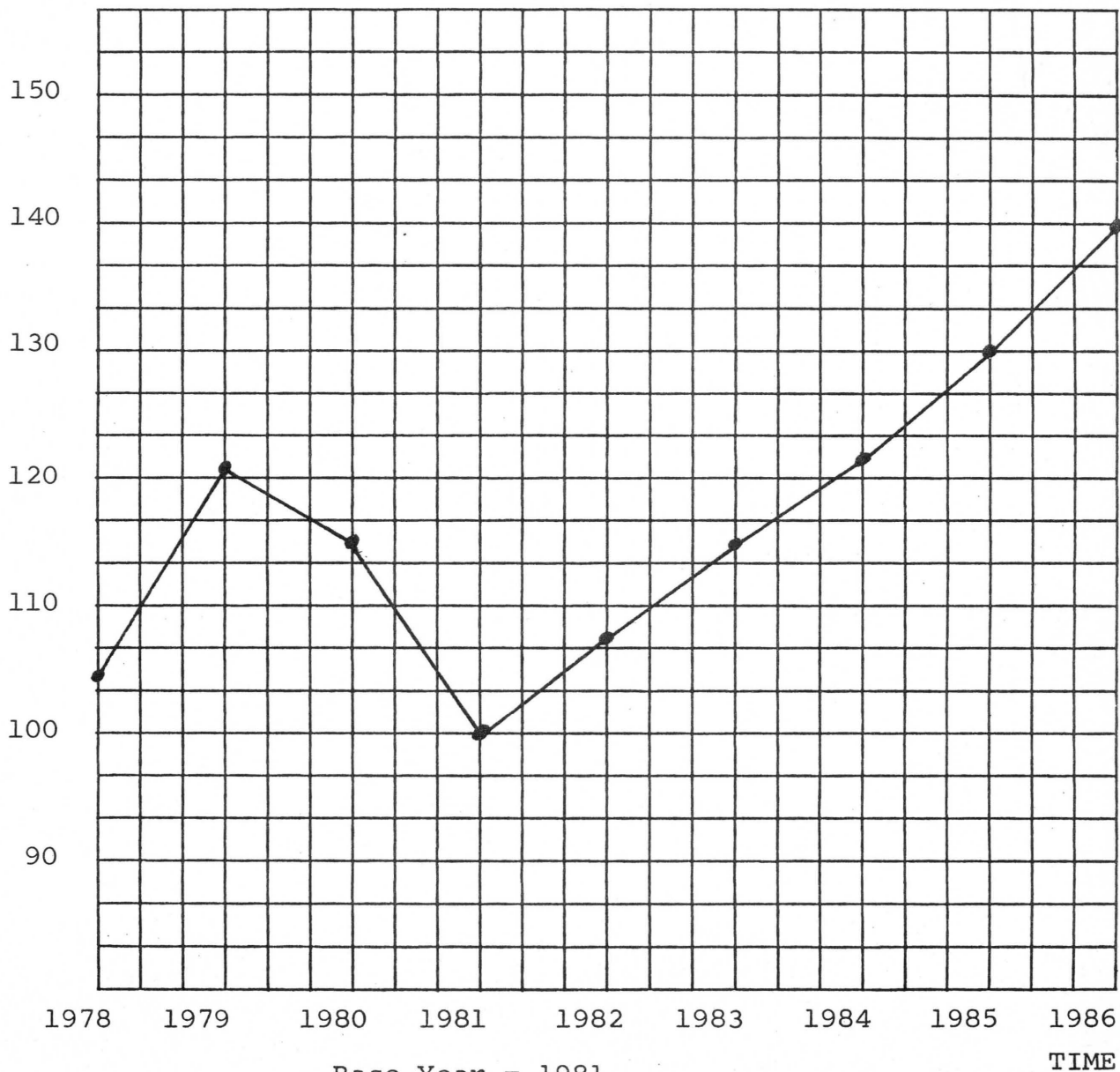


Annual Rate
of Change

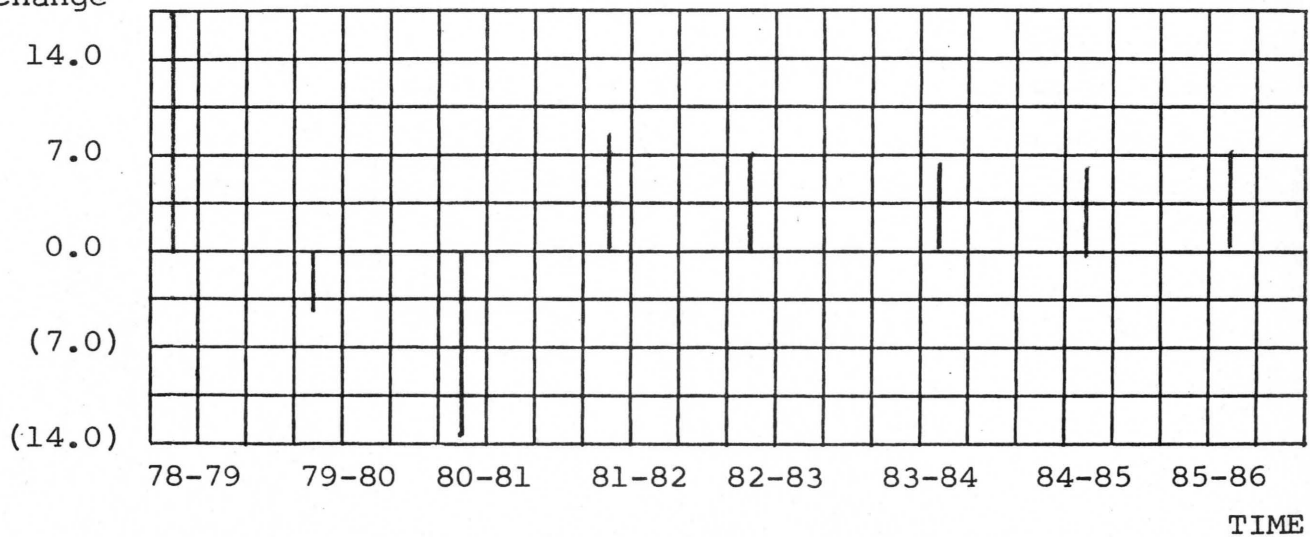


Building Maintenance Costs Subindex

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Annual Rate
of Change



APPENDIX K

Guide for the construction of the subindexes.

The following data can be found in the General Ledger for Washington and Lee University.

Item	Account Number
Salary and Wages	
a. Administrators	600
b. Secretary and Clerical	601 ¹
c. Full Professor	603 ¹
d. Associate Professor	603 ¹
e. Assistant Professor	603 ¹
f. Instructor	603
g. Buildings and Grounds, Food Service, and Print Shop Employees	604-608
Fringe Benefits	
a. Unemployment and Workman's Compensation	621-622
b. Group Insurance	630-632
c. Faculty Children's Education Expense	650
d. FICA	620
e. Retirement	633
Travel	770
Telephone	764-765

¹Also refer to AAUP reports for quantities which can be obtained from Vernon Snyder, Assistant Treasurer.

To find expenditures and quantities for all utilities, and total square footage of the University, consult Mr. James Arthur, Superintendent of Buildings and Grounds.

To find expenditures and quantities for Library Acquisitions and Subscriptions, contact Mr. Maurice Leach, University Librarian.

To find the number of telephones on campus, see Mr. William Mohler, Director of University Services.