

HISTORY OF AI ASSISTED BUSINESS ANALYTICS

- The following slides are part of an overview of the course “Healthcare Management and Finance”.
- It is a course for health professionals who have no experience in accounting.
- The book is the end product of years of confronting many challenges in analyzing healthcare programs.
- The main path for the authors success was to combine the academic disciplines of accounting and statistics.
- The path to success to say the least was not always smooth.

Dr. Joseph Boffa -Boston University

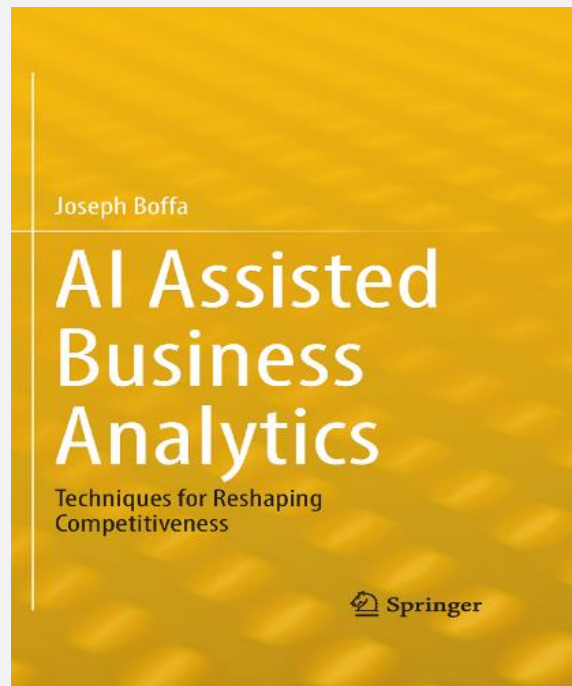
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AuditmetricsAI.com

- Require Text:
- [Book Link](#)



- Suggested Text:
- [Book Exectuvie Summary](#)
- [Book Link](#)

HealthLink Wellness
An Exercise In
Prevention


"Taking Control" [©]

HealthLink Wellness Model
Science for the Individual

Introducing:
Wellness-Comorbidity Matrix
HealthLink Risk Profile

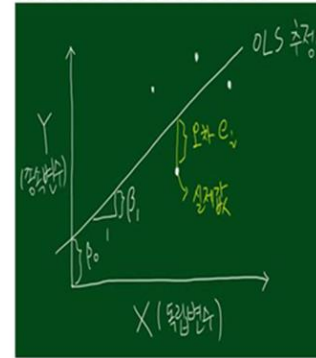
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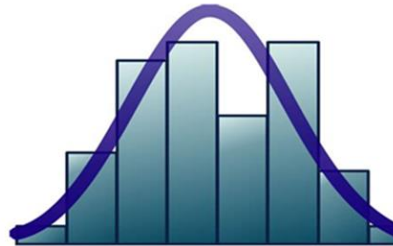
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IN THE BEGINNING PATH TO AI ANALYTICS STARTED WITH ACCOUNTANTS VS STATISTICIANS THE DRIVING ENERGY FOR THE AI APPROACH

ANOVA



$$s^2 = \frac{\sum(x-\bar{x})^2}{n-1}$$



THE MASSACHUSETTS RATE SETTING COMMISSION

- Mandated by the Commonwealth to do prospective budgeting of hospitals and other healthcare facilities.
- This required a periodic audit of the facility by a team headed by an existing staff accountant and a recruited MPH graduate from either the Boston University or Harvard University School of Public Health.
- Existing experienced staff auditors were teamed with young recent graduate statisticians led to growing animosity between the two numbers people.
- The Commission was broken down into several bureaus such as hospital, long term care, ambulatory care etc. headed by a CPA.
- The debate was raging when I was asked by the Commissioners to do a statistical course for the auditors.
- This was the environment I entered.
- My relation with the staff auditors, generally who had a BS or AS degree in business administration, was excellent.
- In fact after my course I helped them in handling large datasets.

FINANCIAL STATEMENT BUILDING BLOCKS

Financial or Accounting statements are used:

- For reporting business/corporate activity.
- For reporting public/non-profit activity.
- However the statisticians had no background in this discipline.

Generally Accepted Accounting Principles (GAAP) is the standard framework of guidelines for financial accounting used in any given jurisdiction; generally known as accounting standards or standard accounting practice. These include the standards, conventions, and rules that accountants follow in recording and summarizing and in the preparation of financial statements.

BASIC GAAP FINANCIAL STATEMENTS

- The Balance Sheet
- The Income Statement
- Statement of Cashflows
 - It is the Auditmetrics software that focuses on cashflow

THE BALANCE SHEET

- Balance sheet is an accountant's snapshot of an organization's accounting value on a particular date, as if the firm stood momentarily still.
- In business, balance sheet states what assets the firm owns and liabilities are assets creditors can claim.
- In non-profit world net assets means what is owned after deducting liabilities from assets.

Assets are anything of value expressed in monetary terms. for example, cash, property, equipment, stocks, or intangible assets such as patents and trademarks but must be expressed in dollars

THE BALANCE SHEET (CONT.)

For-Profit Business

Assets = Liabilities + Owner's Equity

Liabilities - Assets creditors can claim

Owners Equity – Capital and earnings claimed by owners

Non-Profit Organizations

Assets = Liabilities + Net Assets

Net Assets - Assets left over after what is owed to creditors

INTANGIBLE ASSET CASE STUDY

- The Auditmetrics Software was developed for the Massachusetts Department of Revenue to get the staff auditors quickly up to speed in implementing Computer Assisted Audit Techniques (CAATs)
- Rather than calling it Dr. Boffa's Software I coined the term Auditmetrics. It just took off and everyone was calling it Auditmetrics, the name stuck.
- I decided to register the name since I had for many years taught in this course the concept on intangible assets and decided to go through the process of registering it with the US Patent & Trademark Office and also copyrighting the Auditmetrics software.
- Many years later I went through the process of submitting my software for Microsoft certification (I'll give it a shot, why not).
- To be accepted by Microsoft I had to be reviewed and accepted by Dunn & Bradstreet that provides commercial data, analytics, and insights for businesses.

INTANGIBLE ASSET CASE STUDY

- When interviewed by the D&B analyst I was constantly asked “What is Auditmetrics?”
- I came up with various responses: name of software, registered website, various consulting contracts etc.
- Finally in desperation I said “well, it is registered with the Patent & Trademark Office” and the Auditmetrics software is copyrighted.
- That was what the interviewer was looking for because without a U. S. protected name Microsoft would not consider it a legitimate business.
- So submitted my financials with a copy of U. S. Patent & Trademark Office Certificate of Registration and was approved.
- I can now claim I am a Microsoft Partner.
- Of course I still had to survive the certification process but that is another story.
- As you can see I survived:



Microsoft Certified

INCOME STATEMENT

The income statement measures financial performance over a specific period of time for example 1 year.

- The accounting definition of net income is:

$$\text{Revenue} - \text{Expenses} = \text{Net Income}$$

- Essentially same for profit & non-profit entities.
- For-profit business use Net Income deductions (for example depreciation, charitable contributions etc.) to calculate Net Taxable Income.
- $\text{Net Taxable Income} = \text{Net Income} - \text{Tax Deductions}$

CASE STUDY OF STATISTICIAN/AUDITOR TEAM

- It started when the Rate Setting Commission was facing a law suit buy home health care agencies for changing reimbursement policies.
- They provide nursing care for elderly in their home.
- I had to attend a trial discovery conference because the plaintiff team included a statistician.
- I reviewed the budget allocations and found something unusual, 15% of direct labor costs was added to fixed overhead costs. That is not proper allocation since it is double counting.
- This was in response to solve at the time a nursing shortage and it was a temporary stop gap to shore up the tremendous increase in overtime pay and to provide sign on bonus for new hires.

- At the pre-trial conference the statistician did present some interesting past research with the elderly but it did not have anything to do with the issue of removing the temporary added allocation to fixed overhead.
- The nursing shortage was eventually solved by the Commonwealth increasing funding for nursing programs and an increase of immigrant nurses with green cards.
- The discovery conference became heated with the industry side stating the reduction of funding to the agencies would “cause increased deaths of the elderly”.
- At the trial the judge stated there would be a pause as she reviews the process to date. She wanted to do a review before proceeding with the “battle of statisticians”.
- In the interim I planned to
 - review available account data and do some indirect and direct labor ratios over time and with industry standards.
 - determine available agency account data to link statistical account data with outcome data such a patient visits and procedures performed.
 - link account data with health outcome measures, if available.

- The judge eventually dismissed the case since the Commonwealth followed the public open hearing process in announcing the temporary added allocation and also for the subsequent suspension of that temporary allocation.

At this time I reflected upon the earlier auditor/statistician conflict

- Only the auditors required additional training help was a mistake because it turned out to insult the CPA bureau directors who recruited some very talented analysts.
- The statisticians were young recent grads with little real world experience and unfortunately some thought only their thinking on numbers is of value.
- I had at that time worked a decade with accountants and actuaries analyzing health plans and should have suggested accounting training for the statisticians.
- They might not have listened to me but the process would have been even handed since both parties should have gone through a learning curve.

Income Statement

ABC Clinic

Revenue

Services Rendered	200,000	
Less: Adjustments /Refunds	(3,000)	
Net Revenue		\$ 197,000

Expenses

Insurance Expense	5,000	
Heat, Light and Water Expenses	1,080	
Miscellaneous	720	
Interest Expense	1,500	
Lab Expense	1,500	
Office Salaries Expense	60,000	
Rent Expense	9,000	
Total Expenses		\$ 78,800
Net Income		\$ 118,200

For-Profit Business:

Income Tax Deductions

Depreciation - Equipment	10,000	
Bad Debts Expenses	2,430	
Net Taxable Income		\$ 105,770
Taxes owed (15%)		\$ 15,866
Net Income after Taxes		\$ 89,905

STATEMENT OF CASH FLOW

- The statement of cashflows reports cash generated and used during a given time period, for example 6 months.
- This statement complements the balance sheet and income statement .
- The main components of the cashflow are cash from three areas:

Operating Activities- the business generating revenue. Auditmetrics is specifically designed to monitor this source.

Investing activities- investments in stocks, bonds and other securities

Financing activities- Equity (selling shares) or Debt (borrowing money)

Table 2.1 Income statement outlining income vs cashflow

Revenue		
Sales	2,500,000	
Less: Adjustments /Refunds	30,000	
Net Revenue		\$ 2,470,000
accrued in accounts Rec.	250,000	
Total Cash In-Flow		\$ 2,220,000 <---
Expenses		
Insurance Expense	50,000	
Heat, Light and Water Expenses	10,800	
Miscellaneous	7,200	
Interest Expense	25,000	
Materials Expense	40,000	
Office Salaries Expense	600,000	
Rent Expense	90,000	
Total Expenses		\$ 823,000
Loan Payment (principal)	50,000	
Total Cash Out-Flow		873,000 <---
Net Cash Flow Before Taxes		\$ 1,347,000 <---
Gross Income Before Taxes		\$ 1,647,000

Table 2.2 Net cashflow and net income after taxes

Net Cash Flow before Taxes		\$ 1,347,000 <---
Gross Income Before Taxes		\$ 1,647,000
Depreciation - Equipment	100,000	
Bad Debts Expenses	54,300	
Total Book Cost		\$ 154,300
Net Taxable Income		\$ 1,492,700
Taxes owed (30%)		\$ 447,810
Net Income After Taxes		\$ 1,044,890
Net Cash Flow After Income Tax		\$ 899,190 <---

WHAT IS THE SIGNIFICANCE ?

- Cash from operating activities is compared to the company's net income from the income statement.
- If the cash from operating activities is much less than net income then net income is weak in turning it into cash.
- It identifies cash flowing in and out of the company. If a company is consistently generating more cash than it is using, it can increase its dividend, buy back stock or reduce debt. All of these factors are perceived to be good for stockholder value.
- For non-profit it means more resources for public services.

Revenue is vanity, profit is sanity, but cash is king.

1. The origin of “cash is king” is unknown. The common consensus is that former Volvo CEO Pehr G. Gyllenhammar first used the expression in 1988 while discussing the global stock market crash of 1987. During that time, companies with ample cash reserves weathered the markets better than those who had poor cash management.
2. A company’s revenue figures are great to monitor, but they don’t ultimately mean much if cashflow is out of control.
3. Profit may offer peace of mind, but it doesn’t indicate that a business financials are sound. Only stable, reliable cashflow can truly demonstrate success.

A PATH TO VALUE ADDED

- Value added is the extra value created over and above the original value of something
- For private business it is usually the products sold to the consumer
- It is the difference between a product final selling price and the direct and indirect expenses incurred in providing that product
- Another term can be profitability
- In public health the challenge is how to measure value added, the value taxpayers are receiving for investment in public health and healthcare programs
 - Research into organizations that have achieved better health outcomes while often lowering costs suggests a strategic framework for value-based public health and healthcare implementation
 - Focusing on health outcomes aligns how patients experience their health with links to the investment incurred
 - This is the basis of cost effectiveness and cost benefit analysis of public health and healthcare programs

STATISTICIAN/ACCOUNTANT - PART 2

- When Massachusetts decided to get out of the rate setting business it converted the Rate Setting Commission into the Division of Healthcare Finance and Policy.
- Its new mission is to critically examine the Massachusetts healthcare delivery system to provide objective information, develop and recommend policies and implement strategies that benefit the people of the Commonwealth.
- My new role was to conduct econometric analysis of the Massachusetts healthcare delivery system during the time of the Massachusetts Healthcare Reform movement .
- It later became the basis of the Affordable Care Act of the U.S. Federal Government.
- I later was asked by a former rate setting bureau director to help him implement a Massachusetts Department of Revenue mandate to get sales tax auditors up to speed in implementing the Computer Assisted Audit Techniques(CAATs) program.

PARTNERING WITH AUDITORS AGAIN

- The CAATs program involves regular intervals of statistical audits.
- This time my experience has taught me the approach was not to start with lectures on statistical theory.
- I decided to modify the software I developed for my health plan analysis to specifically help auditors quickly obtain a random sample to be immediately used for an audit.
- That was the start of the current Auditmetrics statistical audit software.
- With only three inputs the end product is a spreadsheet containing a random sample ready for the audit.
- Though many auditors resisted change, eventually it became clear the time to complete an audit was greatly reduced.
- However there were some initial problems in that auditors statistical knowledge lagged behind the ability to conduct the audit.

PARTNERING WITH AUDITORS AGAIN (CONT.)

- For example one auditor decided to leave off the confidence intervals as too confusing and only presented the dollar amount of taxes not paid.
- When asked what did the 95% percent mean another explained it is 95% certain the audit result is true. Not quite the meaning of a 95% confidence interval.
- The CAATs program is for large corporations that can afford accounting firms with their own statisticians who started asking questions.
- Though I did provide statistical background for the auditor, it was this blowback that made the auditors more attentive to understanding statistical theory.
- At this time the specific auditing unit I trained is still using Auditmetrics through a next generation of auditors.

AUDITMETRICS PRODUCED AUDIT RANDOM SAMPLE

Transaction_ID	VENDOR_No.	amount	absamt	TxDate	ACCOUNT	DataSet	Zip?	CustomerID?
23975	2783	\$5.00	\$5.00	10/1/2020	6820	Ace Co.		
9368	680	\$5.34	\$5.34	3/1/2021	5060	Ace Co.		
875	555	\$5.60	\$5.60	12/1/2019	5050	Ace Co.		
560	555	\$5.80	\$5.80	9/1/2019	5050	Ace Co.		
19363	1481	\$6.38	\$6.38	11/1/2019	6245	Ace Co.		
8075	680	-\$6.49	\$6.49	11/1/2020	5060	Ace Co.		
2827	555	\$6.71	\$6.71	2/1/2021	5050	Ace Co.		
6703	1972	\$7.00	\$7.00	5/1/2020	5060	Ace Co.		
8399	506	\$7.01	\$7.01	11/1/2020	5060	Ace Co.		
8408	506	\$8.50	\$8.50	11/1/2020	5060	Ace Co.		
14375	585	\$8.50	\$8.50	5/1/2021	5715	Ace Co.		
18992	1477	\$8.95	\$8.95	9/1/2019	6245	Ace Co.		
8033	555	\$9.50	\$9.50	10/1/2020	5060	Ace Co.		
9070	566	\$9.68	\$9.68	2/1/2021	5060	Ace Co.		

CONVERSION OF SAMPLE DATA FOR REGRESSION

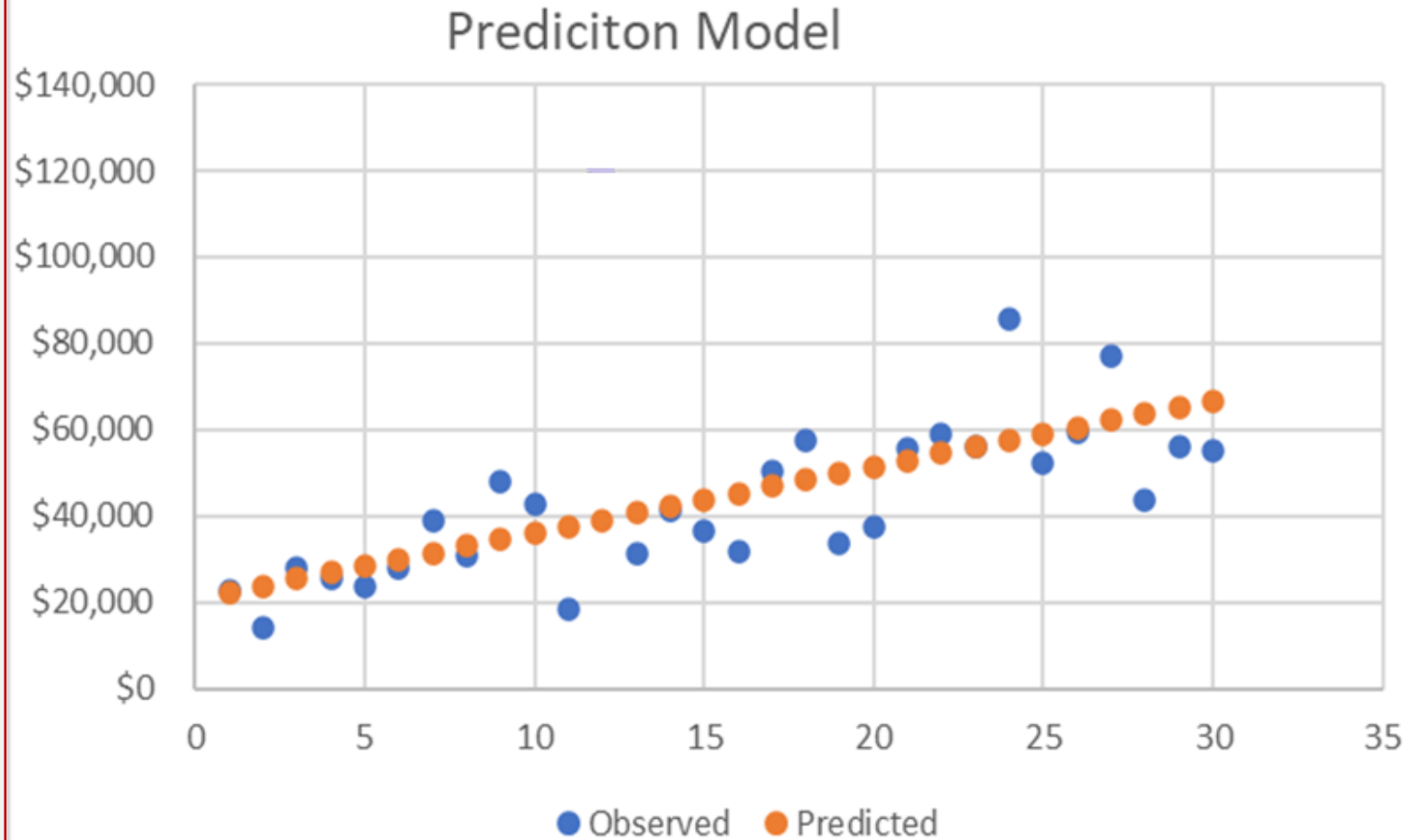
amount	absamt	TxDate	DataSet	Year	Month	Quarter	MonthCount	MonthTotal
-920	920	1/31/2019	Acme Inc.	2019	1	1	1	\$18,407
2107.99	2107.99	2/12/2019	Acme Inc.	2019	2	1	2	\$17,408
2000	2000	3/22/2019	Acme Inc.	2019	3	1	3	\$21,489
2047.9	2047.9	4/19/2019	Acme Inc.	2019	4	2	4	\$24,240
2045.04	2045.04	5/13/2019	Acme Inc.	2019	5	2	5	\$22,940
"	"	"	"	"	"	"	"	"
2400	2400	8/13/2019	Acme Inc.	2019	8	3	8	\$29,100
2302.84	2302.84	2/9/2021	Acme Inc.	2021	2	1	26	\$66,982
2381.32	2381.32	3/26/2021	Acme Inc.	2021	3	1	27	\$65,610
2250	2250	4/7/2021	Acme Inc.	2021	4	2	28	\$35,279
2403.32	2403.32	5/21/2021	Acme Inc.	2021	5	2	29	\$52,524
2229	2229	6/19/2021	Acme Inc.	2021	6	2	30	\$54,450

REGRESSION PREDICTION MODEL USING EXCEL

REGRESSION SUMMARY OUTPUT

<i>Regression Statistics</i>					
Multiple R	0.70	1. Two and a half years of sales data			
R Square	0.49	2. Sample Size n =1,158			
Standard Error	13022	3. Derived from an account of over 22,000 records			
Observations	30	4. Monthly Sales = \$19,056 + \$1,439 x MonthCount			
ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	4652827901	4652827901	27.4	0.0000
Residual	28	4747670722	169559669		
Total	29	9400498623			
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	
Intercept	19056	4876.2	3.91	0.00054	
MonthCount	1439	274.7	5.24	0.00001	

REGRESSION SUMMARY CASHFLOW BY MONTH



FROM AUDIT TO FORECASTING

1. The data conversion from audit to regression uncovered a business with a healthy growth rate.
2. Next quarterly projections can be compared to what actually unfolds.
3. Any significant deviation from the trend should be carefully investigated.
4. Model can be augmented with other data to analyze customer satisfaction and conduct market research.
5. One cannot do this broad systematic analysis without also being closely connected to the personnel and operations of the business.

GETTING STARTED WITH AUDITMETRICS®

Auditmetrics AI 6.5 - Learning Version

for help: info@Auditmetrics.com

Detail

No. Strata

6

Precision

.03

(Margin of Error)

Efficiency

Total Sample

Sample Size Excel File

Sample Validation Excel File

Potential Detail Cutoffs

1. Sample Size Calculations

There are only three required inputs by the user.

Auditmetrics does the heavy lifting in the AI Assisted background.

Auditmetrics will analyze account data and provide feedback about options to meet AICPA standards. Excel sample and reports are generated to conduct Audit and provide documentation.