Professional Liability and The Economy:

Medical Professional Liability

Prepared for: **CAS Annual Meeting**
Boston, MA

Prepared by: **Susan J. Forray, FCAS, MAAA**
Consulting Actuary
susan.forray@milliman.com
(262) 796-3328

Date: **November 17, 2009**

Overview of Presentation

- Introduction
- Overview of an Econometric Analysis
- Results of the Analysis
  - Claim Severity
  - Claim Frequency
  - Calendar Year Underwriting Results
- Closing Thoughts
- Other Considerations

Introduction

Introduction

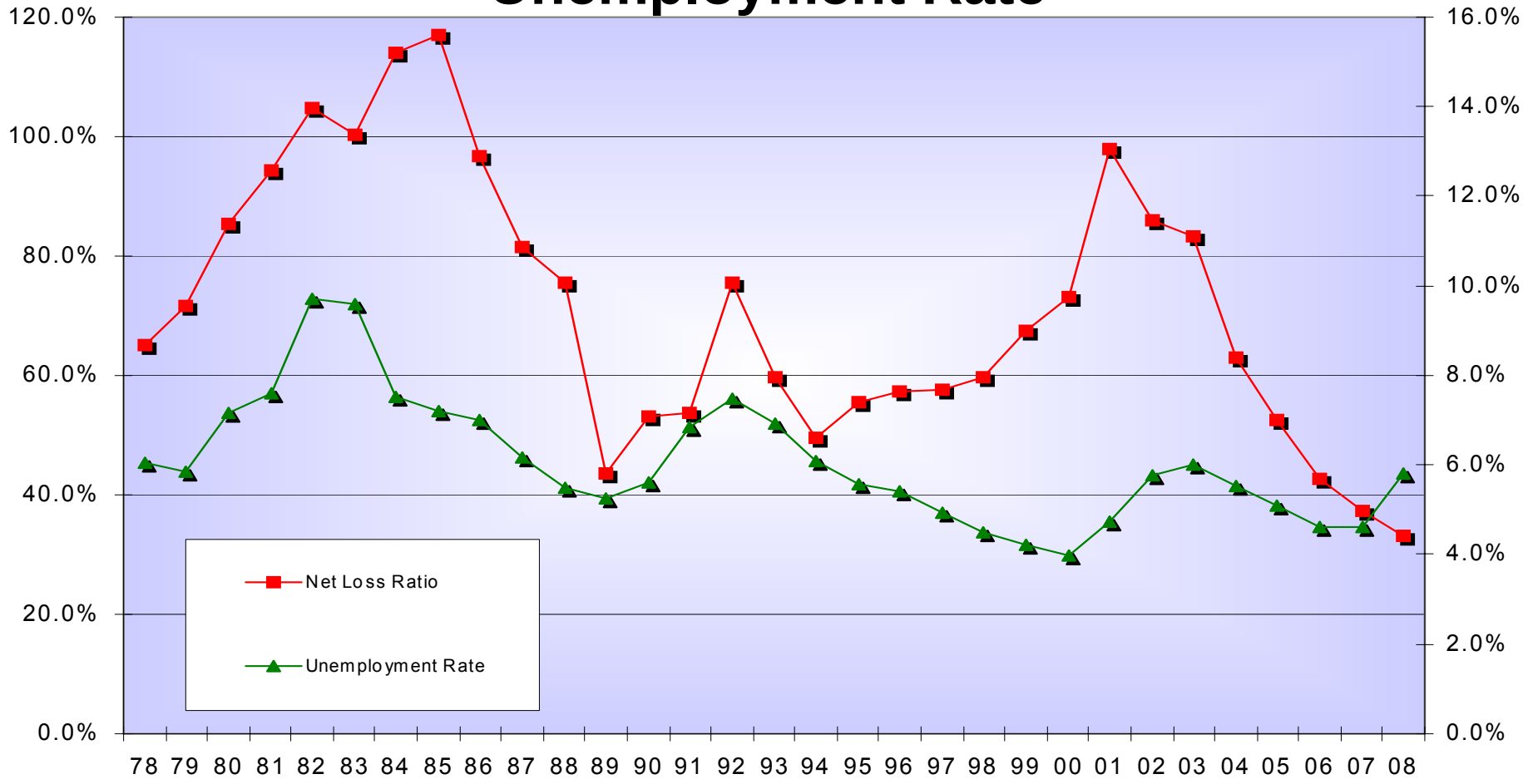
- Is There a Relationship Between The Economy and Medical Professional Liability?
  - Industry perception
  - Relatively long time period required to test hypothesis
    - NAIC MPL line dates to 1978
    - NPDB claim collection started in 1991
  - Statistical analysis
    - Econometric analyses
    - Correlation in relationships at state level

Overview of an Econometric Analysis

Overview of an Econometric Analysis

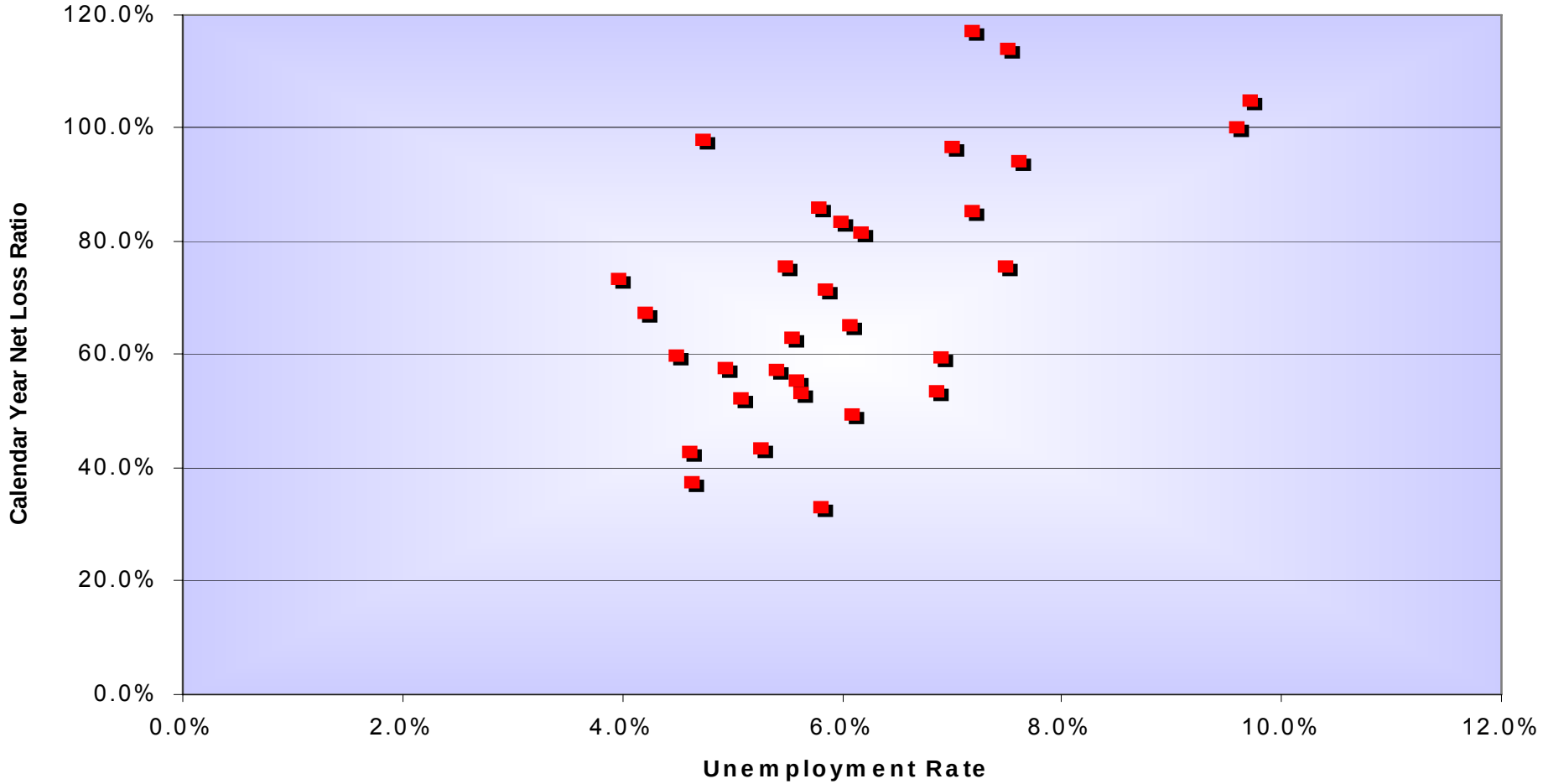
- Can we develop an equation for one (e.g., calendar year net loss ratio) based on the other (e.g., unemployment rate)?
- Yes, and it's simpler than you would think:
  - Y = calendar year net loss ratio
  - X = unemployment rate
  - $Y \approx a \cdot X + b$
- How can we choose a and b?
  - Most common technique is based on "least squares"
    - i.e., Minimize the sum of $[Y - (a \cdot X + b)]^2$ over all Y, X combinations
  - Other fitting techniques typically produce similar indications

Example: Calendar Year Net Loss Ratio and Unemployment Rate



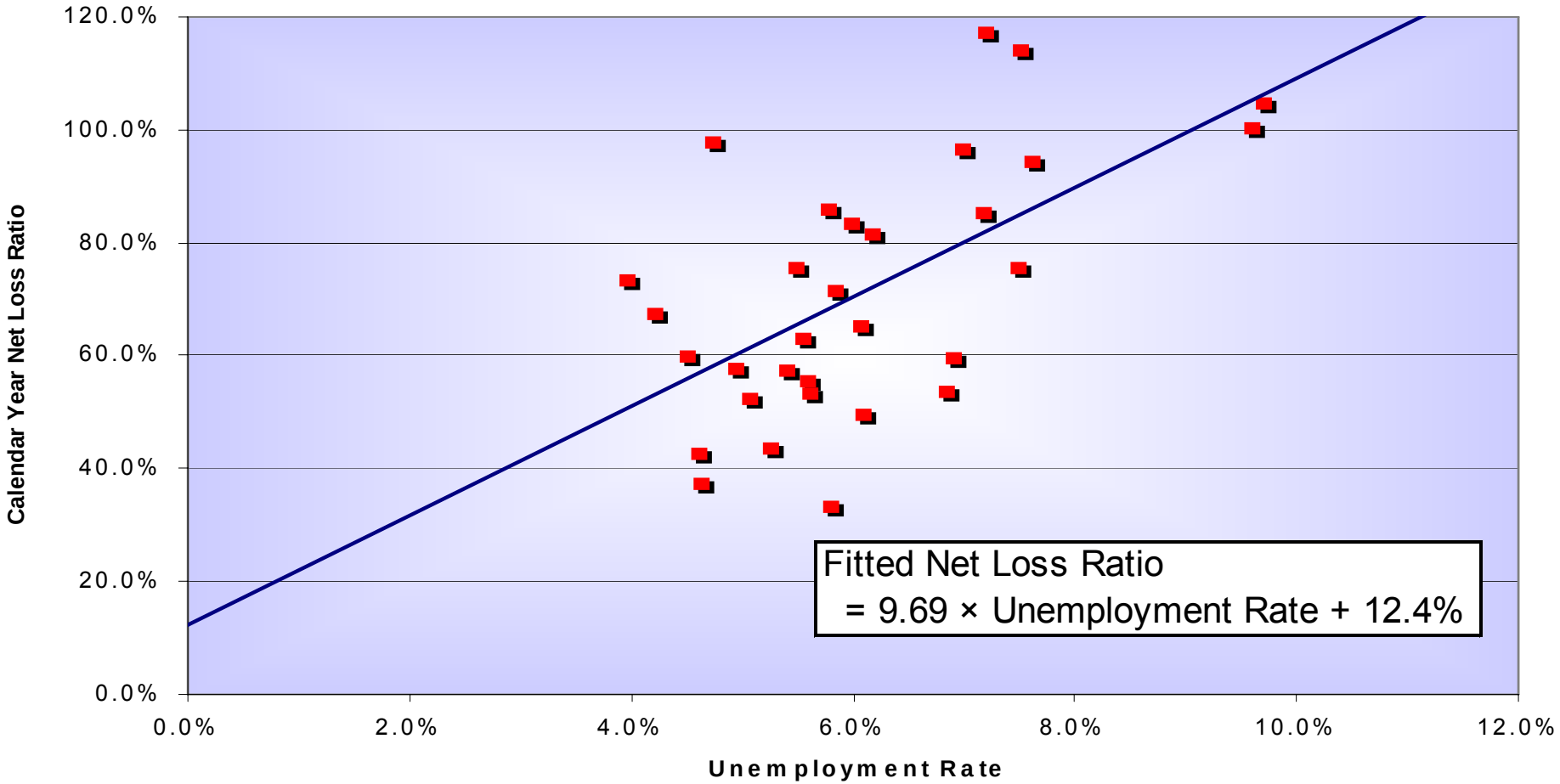
Sources: **Milliman analysis of National Underwriter Insurance Data Services from Highline Data and Bureau of Labor Statistics data**

Example: Calendar Year Net Loss Ratio and Unemployment Rate



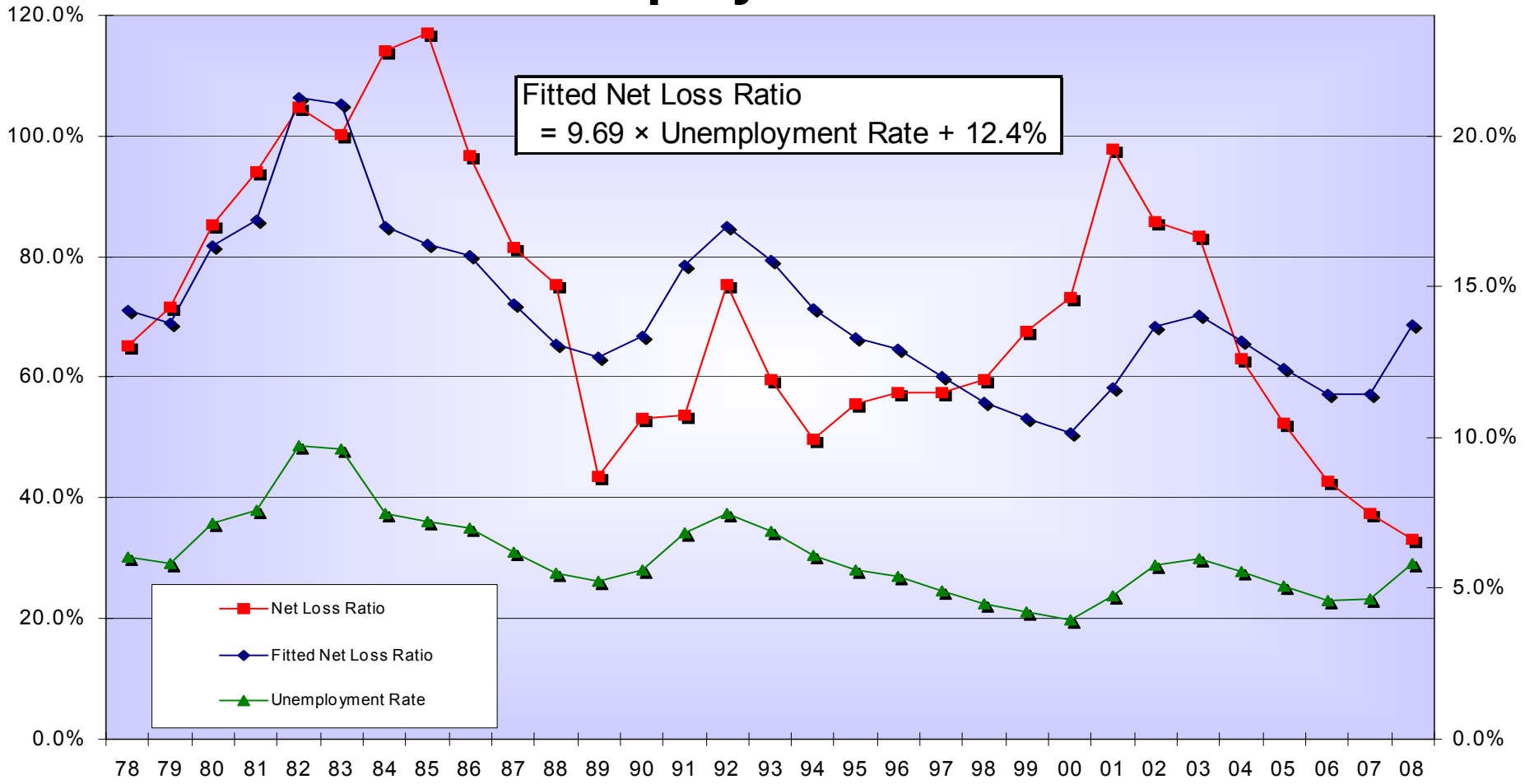
Sources: Milliman analysis of National Underwriter Insurance Data Services from Highline Data
Milliman analysis of Bureau of Labor Statistics data

Example: Calendar Year Net Loss Ratio and Unemployment Rate



Sources: **Milliman analysis of National Underwriter Insurance Data Services from Highline Data**
Milliman analysis of Bureau of Labor Statistics data

Example: Calendar Year Net Loss Ratio and Unemployment Rate



Sources: **Milliman analysis of National Underwriter Insurance Data Services from Highline Data**
Milliman analysis of Bureau of Labor Statistics data

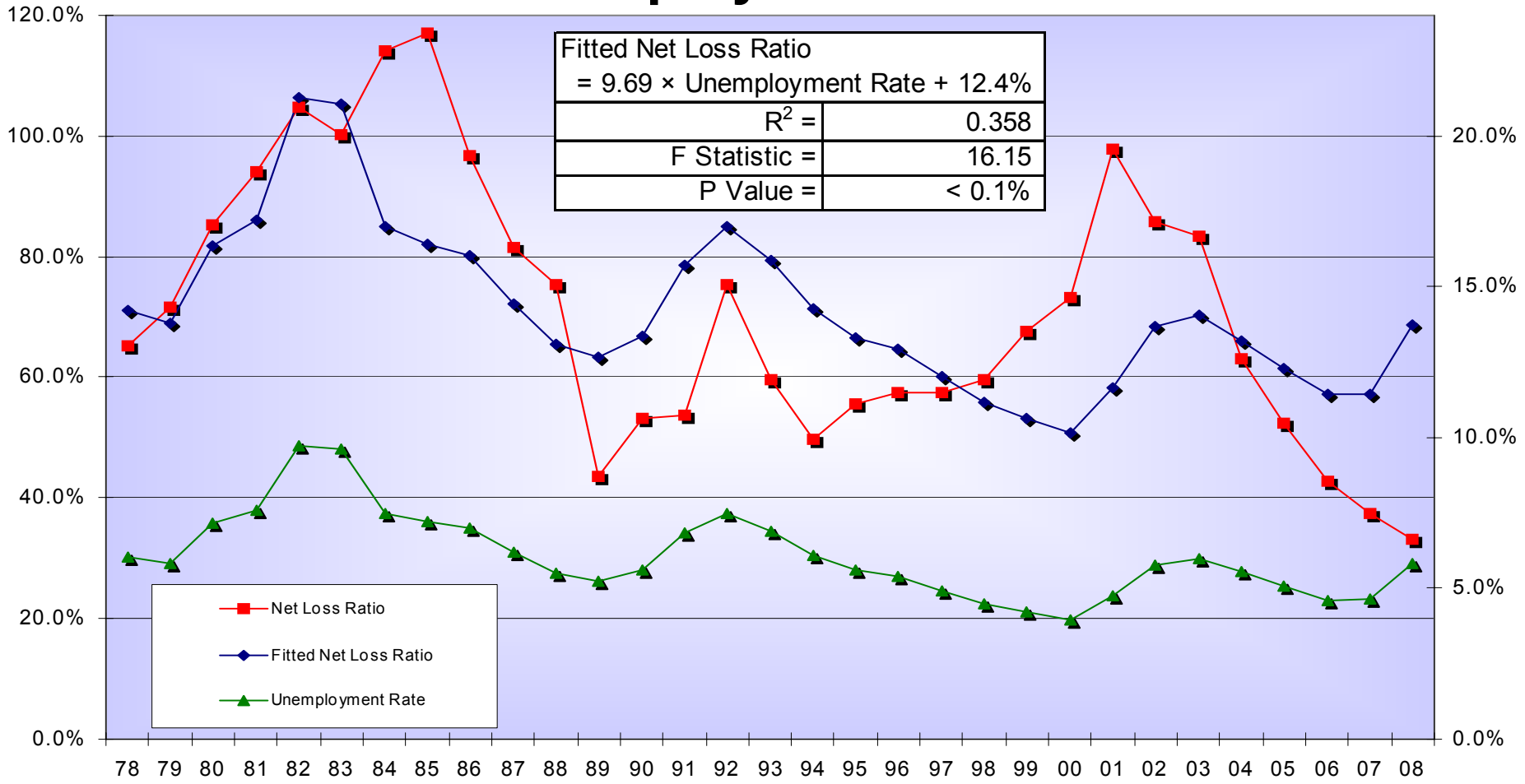
How Good is this Equation?

- Two measures of “good”
  - How well does the equation fit the historical data?
  - How well will it forecast the future?
- Second question typically more important
  - But, more difficult to answer
  - Generally, the better the equation fits the historical data, the better it will forecast the future
  - Recent deviations from historical patterns complicate forecasting
  - Forecasting ability strongly dependent on ability to estimate the “independent variable” (e.g., unemployment rate)

How Well Does the Equation Fit the Historical Data?

- R^2
  - How much of the historical variation in the *Y* variable is due to variation in the *X* variable?
- Adjusted R^2
  - Used for equations with multiple independent variables
- *P*-Value
  - Likelihood that the data points happened to fall this way even though no relationship between the variables exists
- *F*-Statistic
  - Used to calculate the *P*-Value

Example: Calendar Year Net Loss Ratio and Unemployment Rate



Sources: **Milliman analysis of National Underwriter Insurance Data Services from Highline Data**
Milliman analysis of Bureau of Labor Statistics data

What if Relationship Isn't Linear?

- Example: Claim severity and medical CPI
- Possible relationships:
  - Severity ≈ b · Med CPI
    - Example: Severity ≈ 1,000 · Med CPI
  - Severity ≈ b · Med CPI + Constant
    - Example: Severity ≈ 1,000 · Med CPI + $10K
    - "Constant" would probably change over time
  - Severity ≈ b · Med CPI^a
    - Example: Severity ≈ 1,000 · Med CPI$^{1.1}$
- Can be converted to a linear relationship
  - Ln Severity ≈ a · Ln Med CPI + Ln b
- Currencies and currency indices tend to exhibit exponential growth
  - I've converted them to linear variables throughout

Results of the Analysis

Variables Considered (Dependent)

- Medical Professional Liability
  - NPDB Severity
  - NPDB Frequency (uses AMA active physicians)
  - NPDB Pure Premium
  - Calendar Year Ratios (Highline Data composite)
    - Net Loss Ratio
    - Net LAE Ratio
    - Net Expense Ratio
    - Net Dividend Ratio
    - Net Combined Ratio

Variables Considered (Independent)

- The Economy
  - Unemployment rate
  - Unemployment duration
  - Inflation (i.e., CPI)
  - Medical inflation (i.e., Medical CPI)
  - Wage level (nominal)
  - Wage level (real)
  - Physicians per capita

Total Variable Combinations

- Eight dependent variables
- Seven independent variables
- Lagging indications of up to two years
- 8 × 7 × 3 = 168 combinations considered
- Other variable relationships considered in response to these results
  - Models with multiple independent variables
  - Additional lagging indications
  - LAE as a function of loss
  - Relationships at the state level

Variables I Would Have Loved to Have Had

- Quantification of patient safety initiatives
- Physician-quantified medical mistakes
- Public perception of tort reform and MPL
- MPL data over a longer time frame (1970s & 80s)

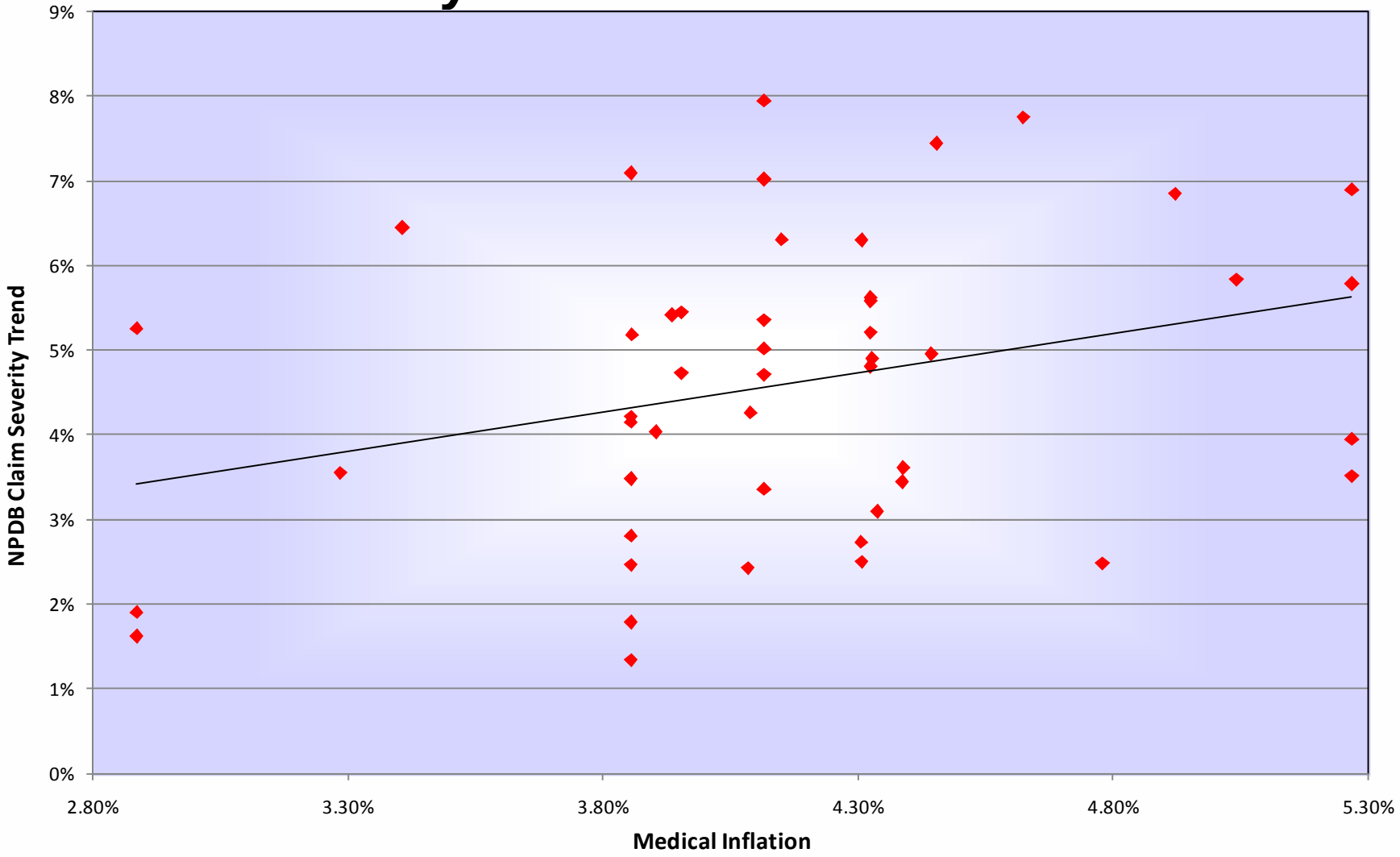
Claim Severity

Claim Severity Trend versus Inflation Indexes (1991 – 2008)

Index	Per Annum Increase	Inflated Value of $1 over 20 Years
CPI	2.6%	$1.67
Wage Level	3.2%	$1.88
Medical CPI	4.1%	$2.23
NPDB Severity	4.5%	$2.41

Sources: **Milliman analysis of National Practitioner Data Bank Public Use Data File, December 31, 2008**
Milliman analysis of Bureau of Labor Statistics data

Claim Severity Trend versus Medical Inflation



Note: Excludes three states with significant changes in tort law during 1991-2008 time period.

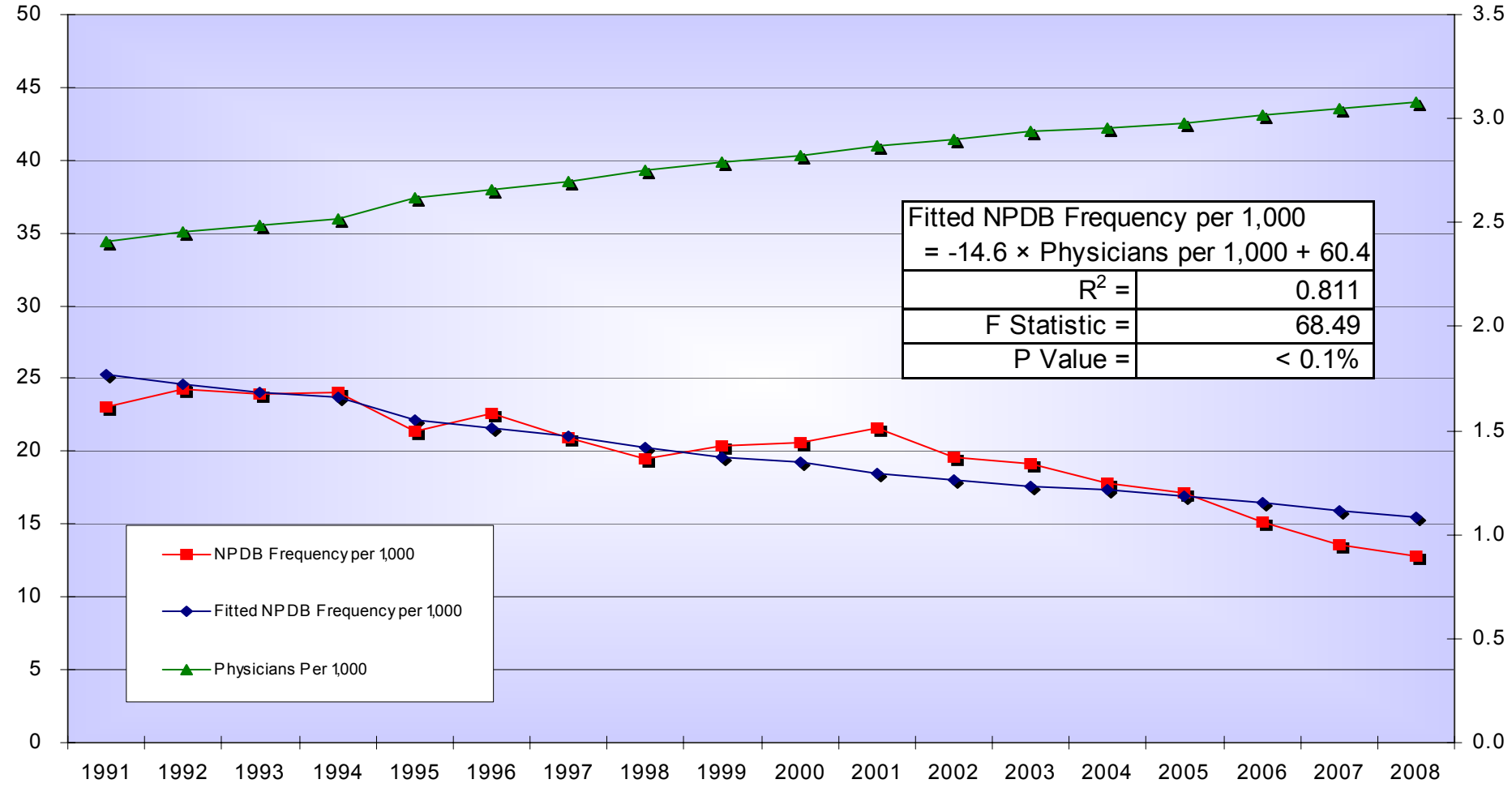
Sources: Milliman analysis of National Practitioner Data Bank Public Use Data File, December 31, 2008
Milliman analysis of Bureau of Labor Statistics data

Claim Severity – Conclusions

- Has increased at a rate greater than medical inflation
- States with higher medical inflation exhibit greater increases in claim severity
- Implications:
  - Inflationary environment will significantly impact severity
    - Analysis suggest medical inflation of 5.0% would result in claim severity increase of 5.5%
  - Controlling cost of health care will help control MPL severity

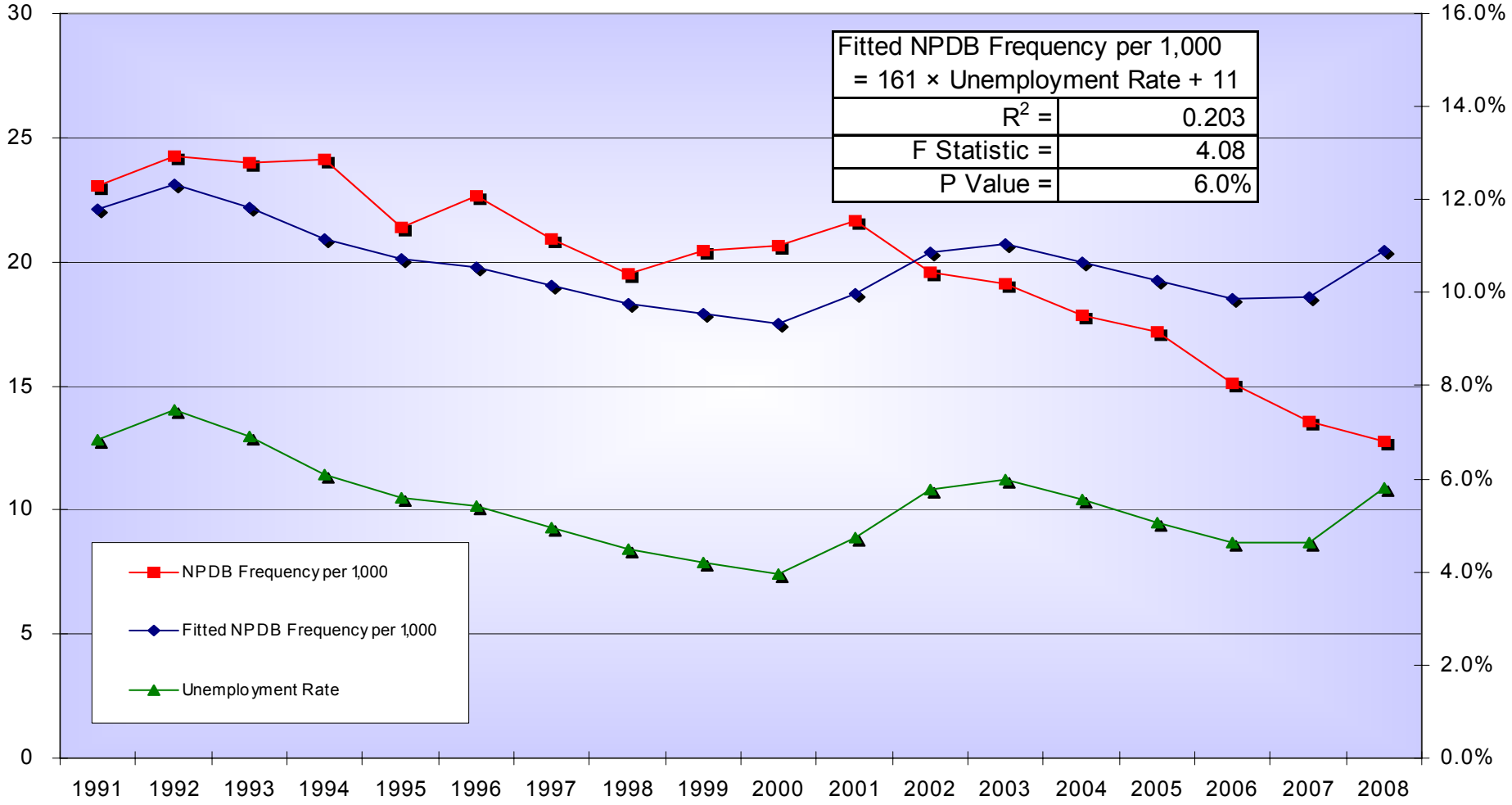
Claim Frequency

NPDB Frequency and Physicians per Capita



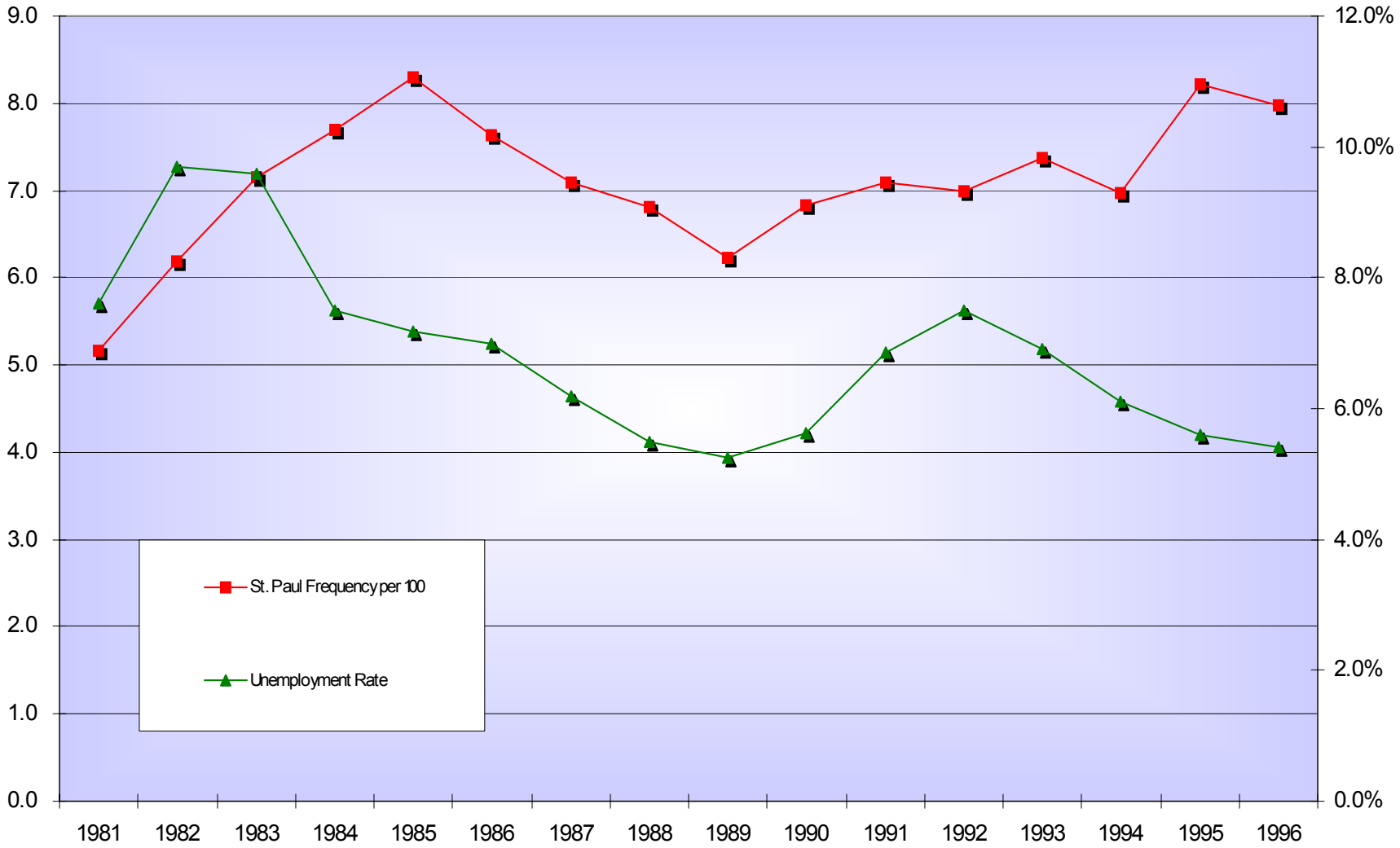
Sources: **Milliman analysis of National Practitioner Data Bank Public Use Data File, December 31, 2008, American Medical Association, and United States Census Bureau data**

NPDB Frequency and Unemployment Rate



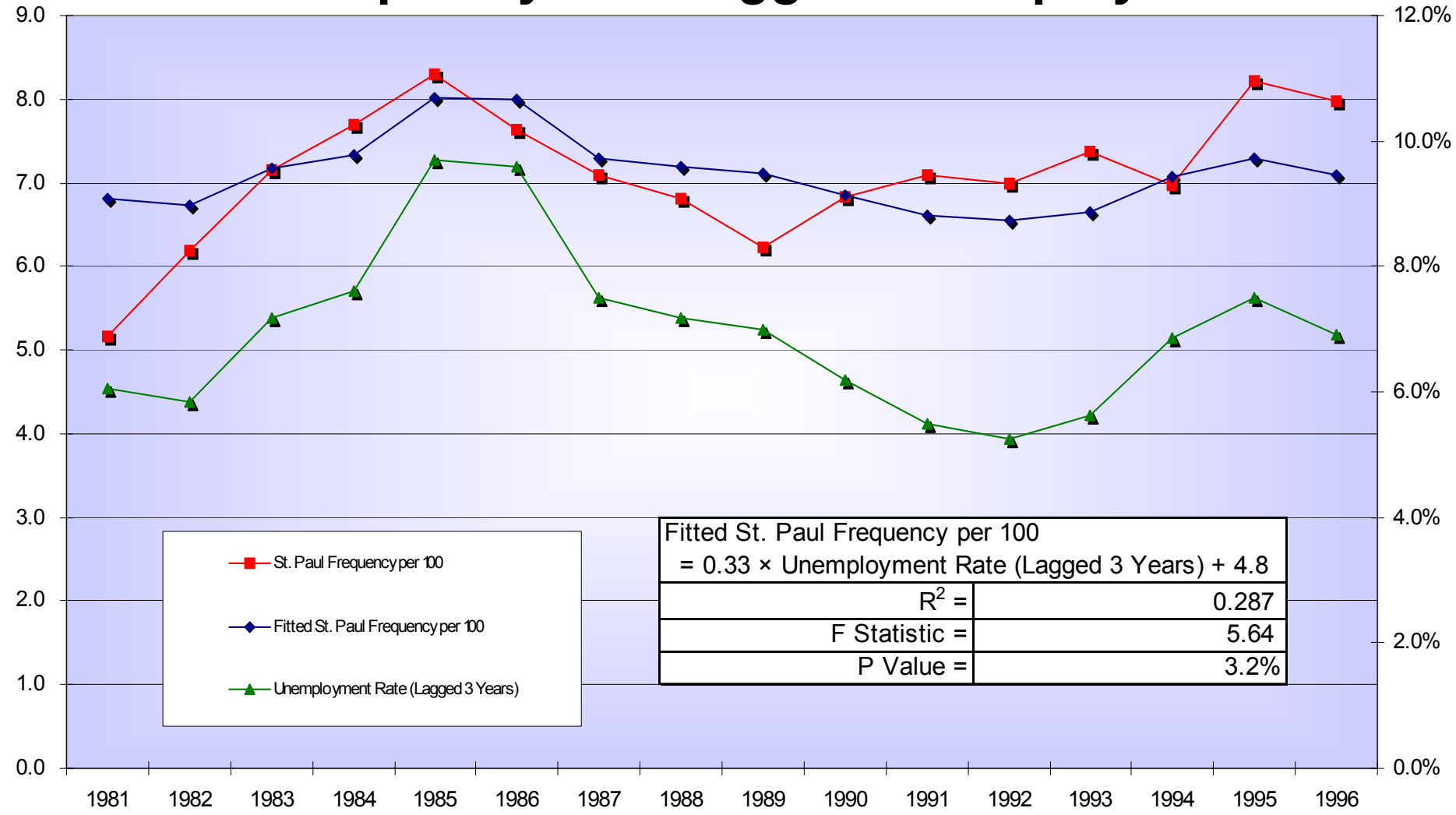
Sources: **Milliman analysis of National Practitioner Data Bank Public Use Data File, December 31, 2008, American Medical Association, and Bureau of Labor Statistics data**

St. Paul Frequency and Unemployment Rate



Sources: **St. Paul Companies rate filings and Milliman analysis of Bureau of Labor Statistics data**

St. Paul Frequency and Lagged Unemployment Rate

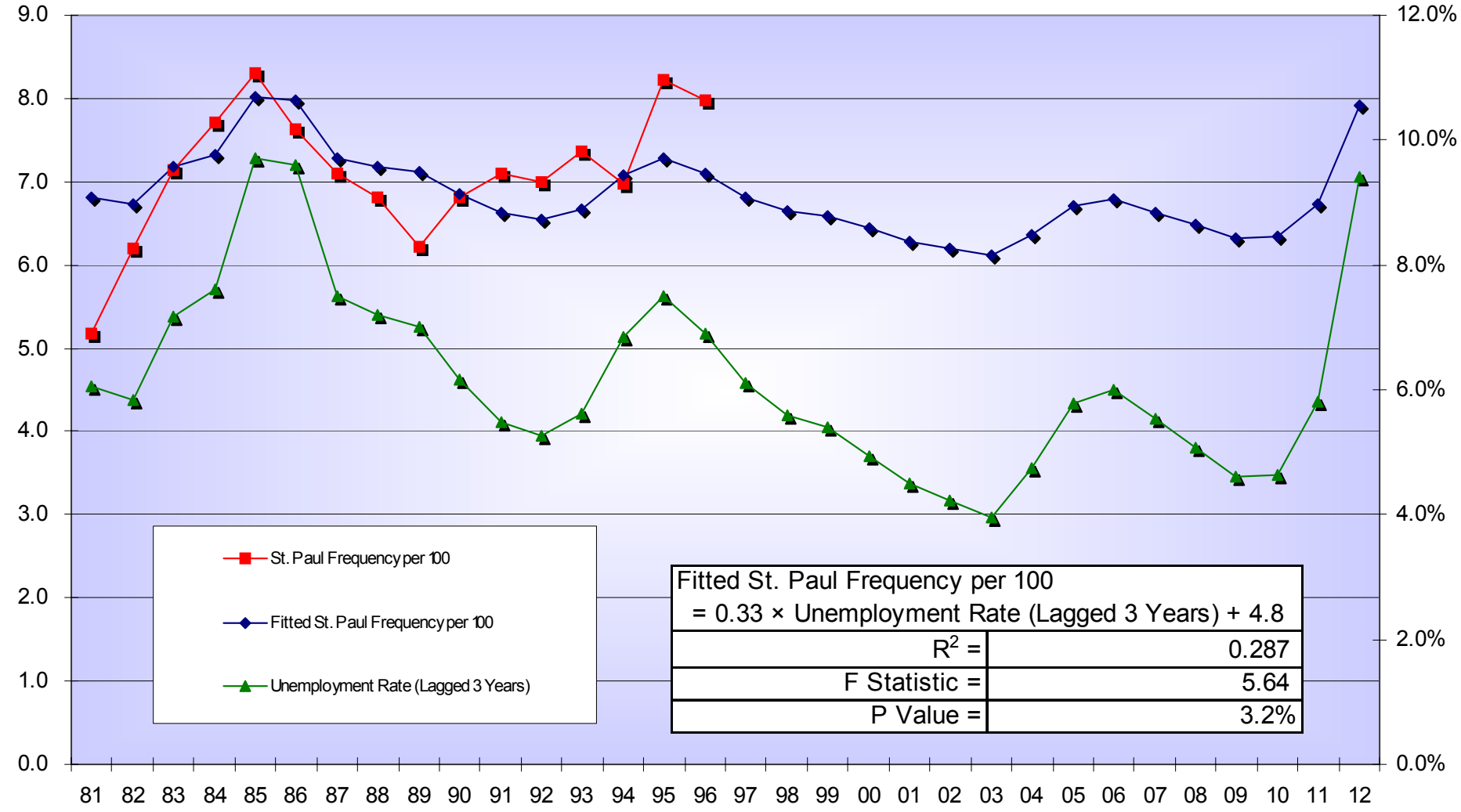


Sources: **St. Paul Companies rate filing and Milliman analysis of Bureau of Labor Statistics data**

Why a Three Year Shift?

- Measuring Economic Recession to Claim Report
- May be due to
  - Deferral of medical care
  - Shift in attorney practice

St. Paul Frequency Forecast



Sources: **St. Paul Companies rate filing and Milliman analysis of Bureau of Labor Statistics data**

Claim Frequency – Immeasurable Contributors

- Patient safety initiatives
- Claim prevention measures (e.g., “I’m Sorry” laws)
- Tort reform laws (may be an indirect effect)
- Educational initiatives
  - Physician demonstrations
  - Doctor’s office pamphlets
  - Earned press
  - Opinion articles

Claim Frequency – Conclusions

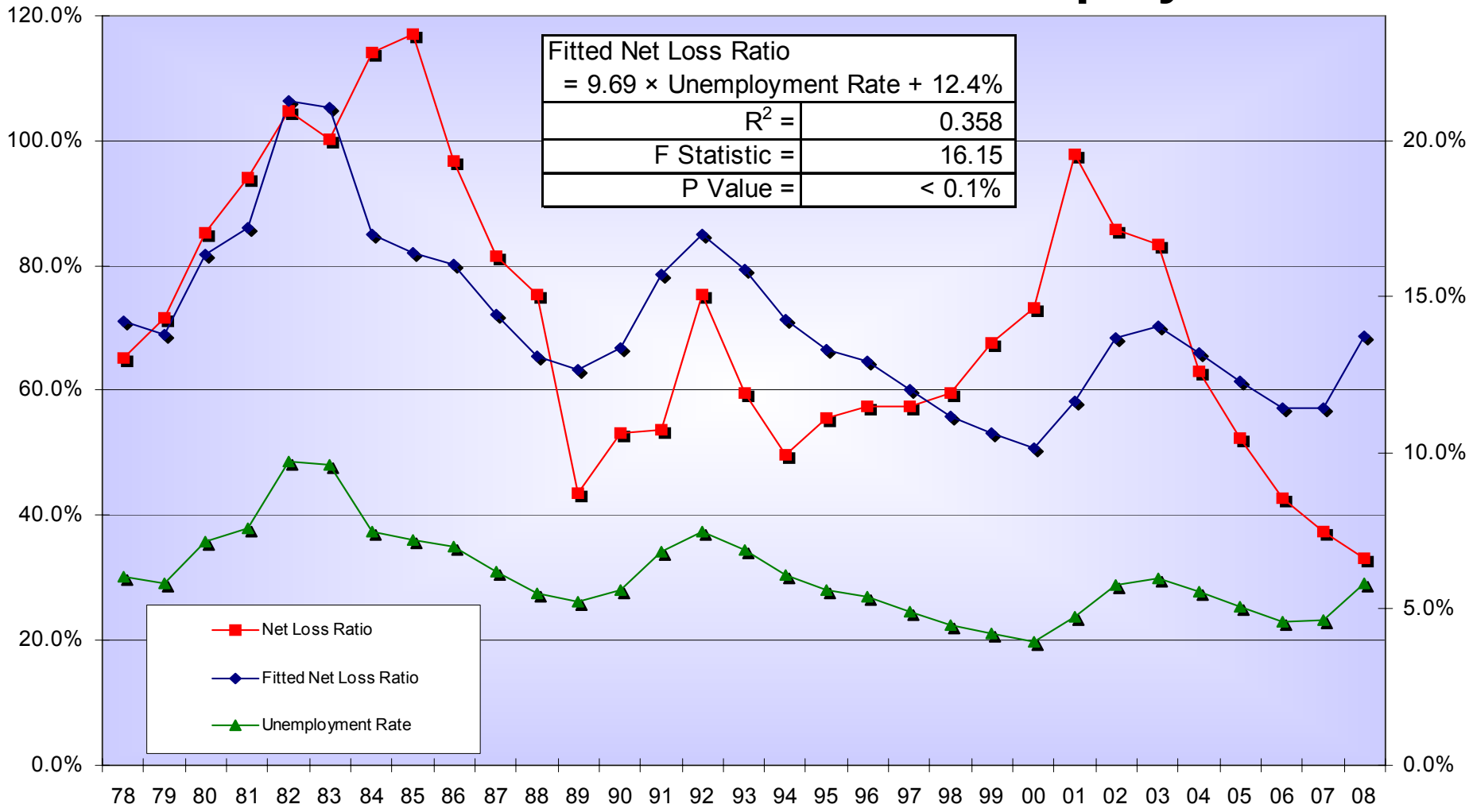
- Historically has decreased
  - As physicians per capita have increased
  - During low unemployment
  - Due to patient safety initiatives, etc.
- Is frequency tied to economic conditions?
  - Data suggests “yes”
  - Timing of frequency increase following economic downturn is unclear
  - Difficult to separate economic conditions from other influences

Claim Frequency – Forecast

- Three competing effects
  - Physicians per capita – will likely continue to increase ↓
  - Patient safety initiatives – likely continued effect ↓
  - Unemployment – highest in 25 years ↑
- We know more than the model
  - Can only go so low
  - Reported frequency decreased through at least 2007
    - Will cause closed frequency to decrease through 2010
- Overall effect on reported frequency
  - Has likely bottomed out
  - Any increase may be larger than expected

Calendar Year Underwriting Results

Calendar Year Net Loss Ratio and Unemployment Rate

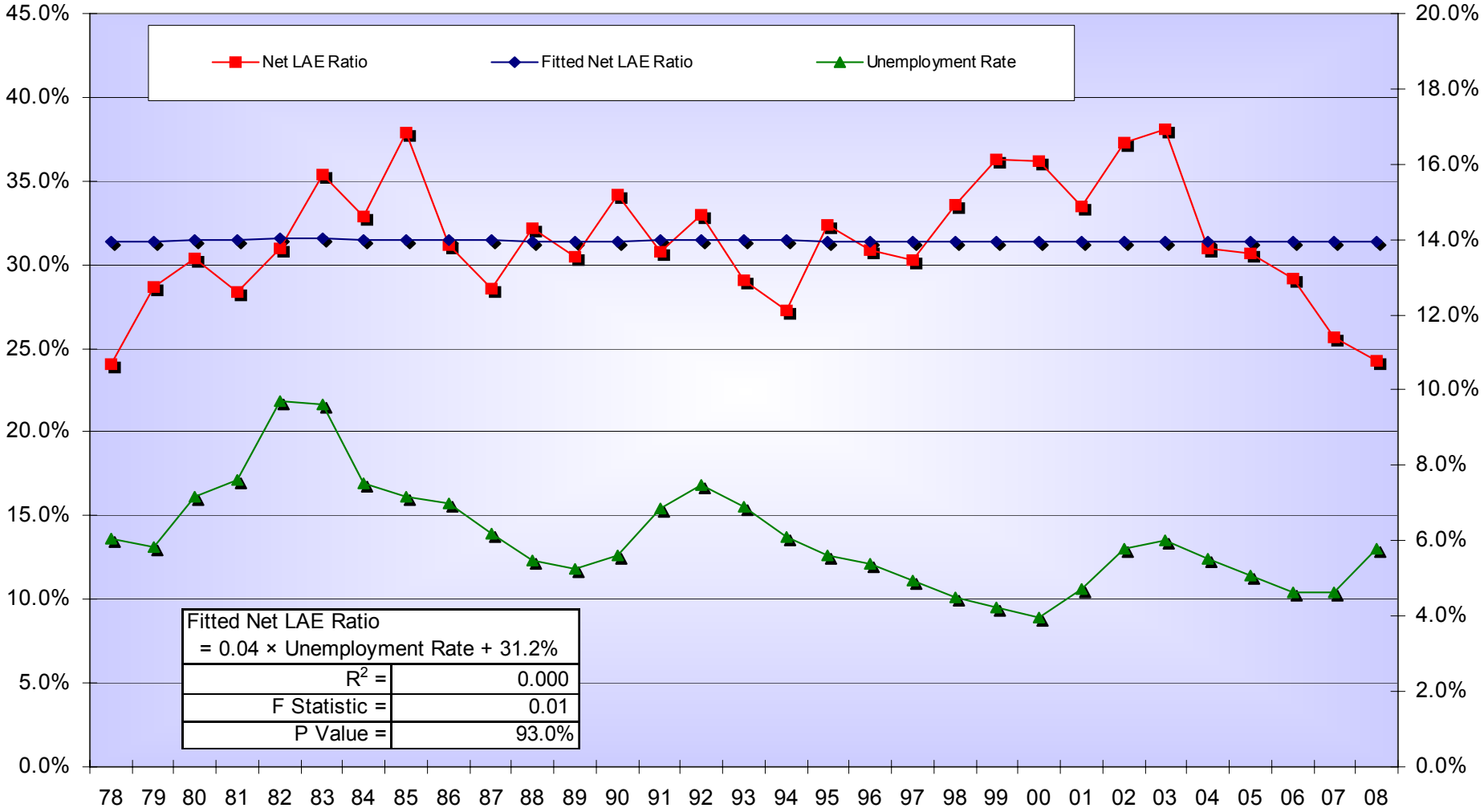


Sources: **Milliman analysis of National Underwriter Insurance Data Services from Highline Data**
Milliman analysis of Bureau of Labor Statistics data

Calendar Year Net Loss Ratio and Unemployment Rate

- Relationship between calendar year loss ratio and unemployment rate
  - Does not appear to result from frequency or severity changes
  - Likely results from rate adequacy and prior year reserve changes
- Suggests relationship between economic cycle and insurance cycle

Calendar Year Net LAE Ratio and Unemployment Rate



Sources: **Milliman analysis of National Underwriter Insurance Data Services from Highline Data**
Milliman analysis of Bureau of Labor Statistics data

Closing Thoughts

Observations

- Ratemaking
  - Frequency increase could be larger than expected
  - “Aberrations” in monthly frequency reports may be early indicators
  - Any change in medical inflation will affect rate adequacy
- Reserving
  - Inflation can be expected to impact unpaid loss as well
  - IBNR claims on occurrence business may be greater than expected

Other Considerations

Other Considerations

Accompanying Oral Discussion

- This document is not complete without the accompanying oral discussion and explanation of the underlying information and concepts as well as any interpretational limitations.

Limited Distribution

- This document should not be distributed, disclosed or otherwise furnished, in whole or in part, without the express written consent of Milliman.

Data Reliance

- We have relied upon data and other background information prepared by National Underwriter Insurance Data Services from Highline Data and A.M. Best without audit or independent verification. We have performed a limited review of the data for reasonableness and consistency and have not found material defects in the data. If there are material defects in the data, it is possible that they would be uncovered by a detailed, systematic review and comparison of the data to search for data values that are questionable or relationships that are materially inconsistent. Such a review was beyond the scope of our assignment.