

# Beta Stability: Is It Recession Proof?

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# What is Beta?

- Beta measures the risk associated with a security
- Relative statistic
- Modeling
- Formal Definition: The covariance of a portfolio and the market relative to the variance of the market.

# What is Beta?



- Mathematical Representation:

$$\beta = \frac{Cov_{pm}}{\sigma_m^2}$$

- Where the components can be expressed as:

$$Cov_{pm} = \frac{\sum_{t=1}^n (R_{pt} - \bar{R}_p)(R_{mt} - \bar{R}_m)}{n - 1} \text{ and } \sigma_m^2 = \frac{\sum_{t=1}^n (R_{mt} - \bar{R}_m)^2}{n - 1}$$

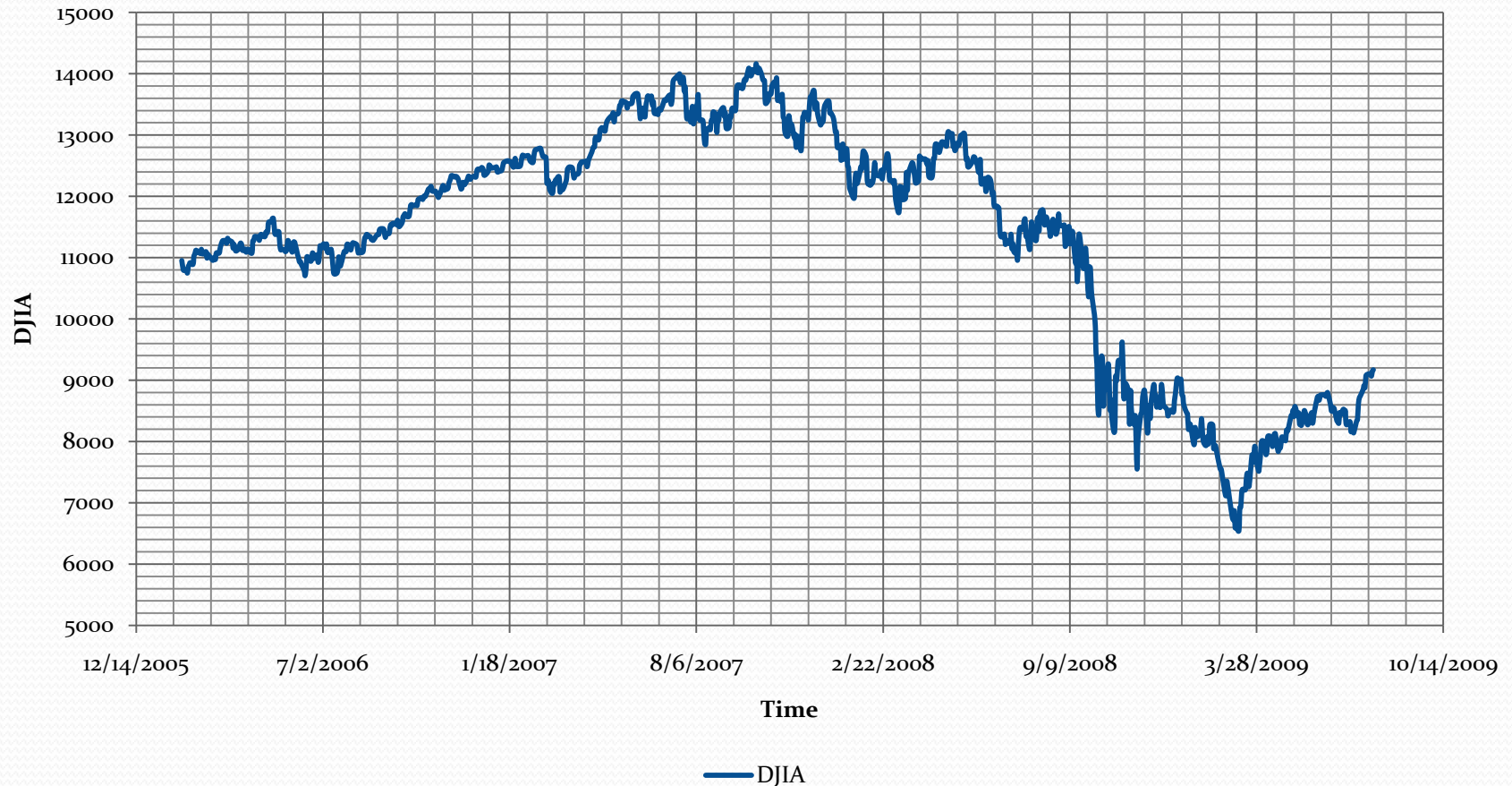
# What is Beta?

- Example:
- Portfolio Beta = 2
- 10% market increase  20% portfolio increase.
- 10% market decrease  20% portfolio decrease.
- What if Beta = 1 or 0.5?

# Project Goal

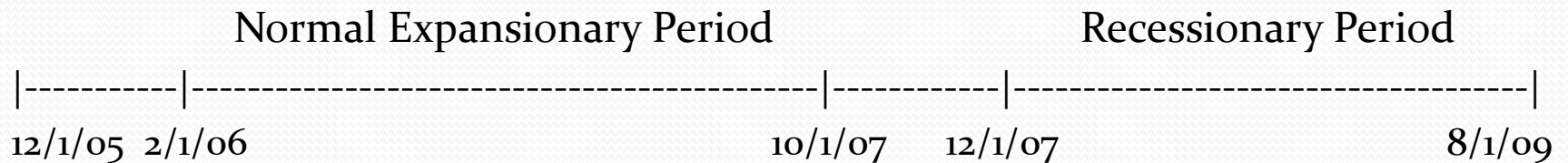
- To determine the effect that the state of the economy has on beta stability of a portfolio.

# Dow Jones Industrial Average



# Methodology

- Isolate two time periods
  - Recessionary
    - National Bureau of Economic Research
  - Expansionary

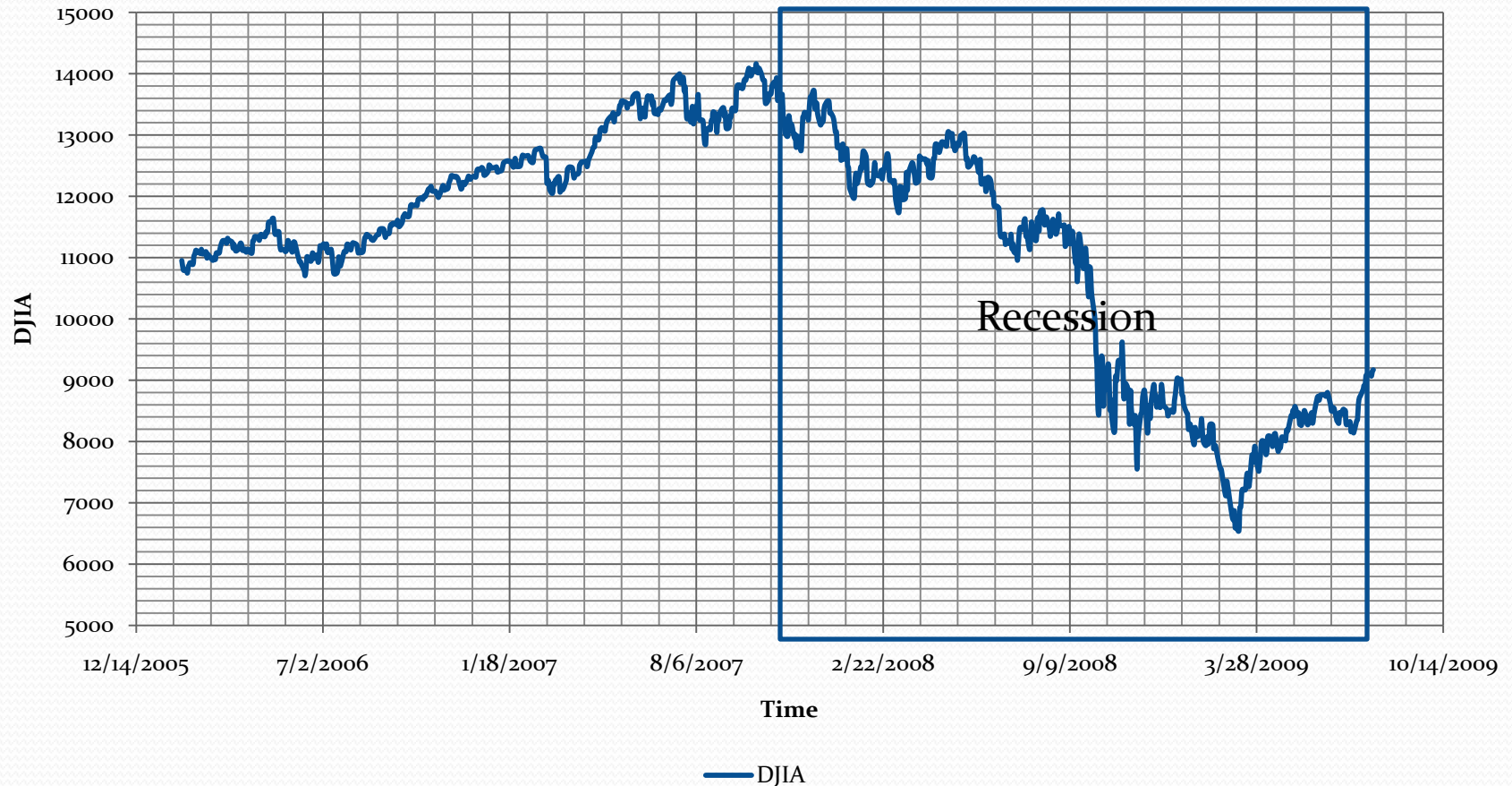


# Dow Jones Industrial Average





# Dow Jones Industrial Average



# Methodology

- Create three portfolios:
  1. Diversified
    - Variety of sectors and industries
    - $B = 1$
  2. Leisure
    - Cruise, resort, casino
    - $B > 1$
  3. Necessities
    - Staple foods, supermarkets, utilities
    - $B < 1$

# Methodology

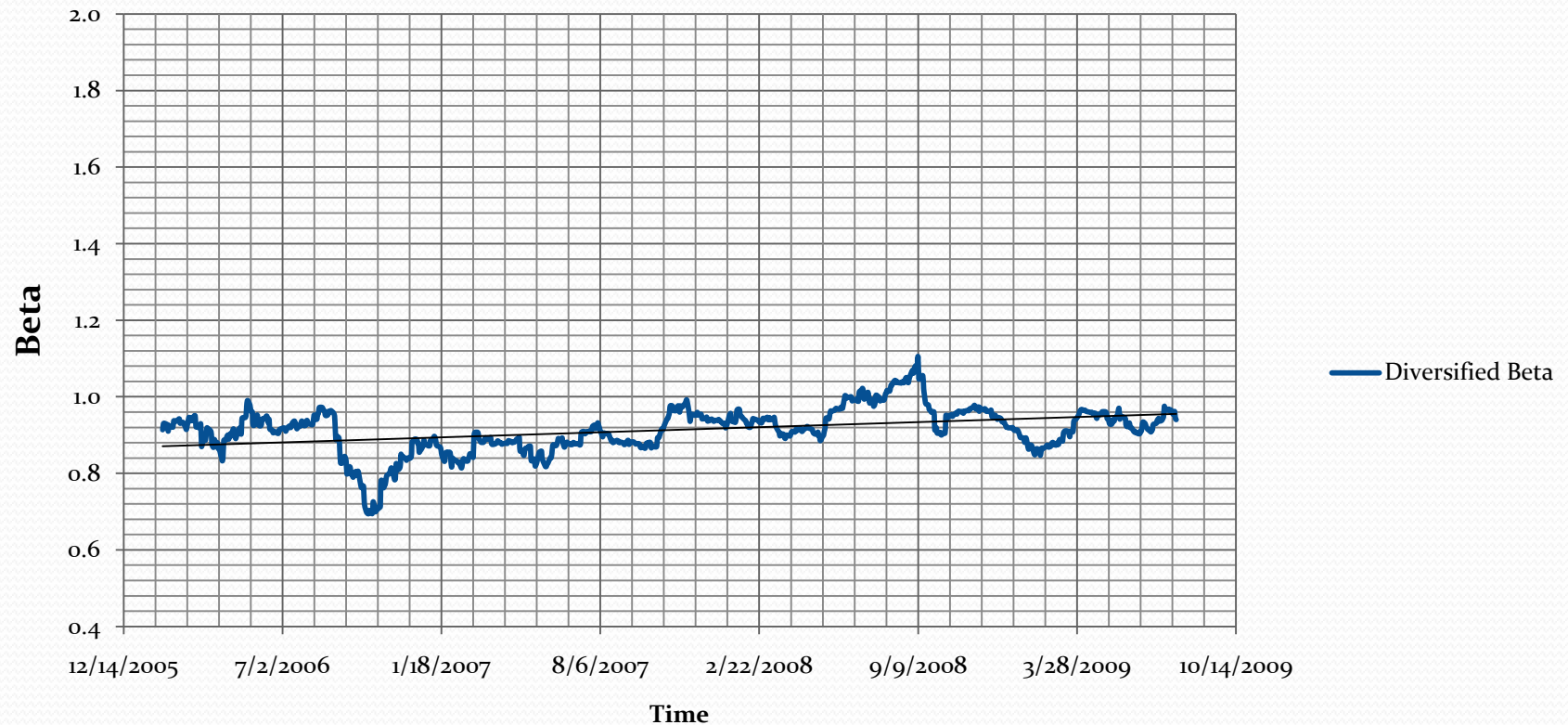
- Calculate betas throughout the normal economic growth period and the recessionary period.

$$\beta = \frac{Cov_{pm}}{\sigma_m^2}$$

- Calculate the standard deviation of the betas in each time period.
- Test to see if there is a statistically significant change in the standard deviation.
  - F-test at 5% significance level

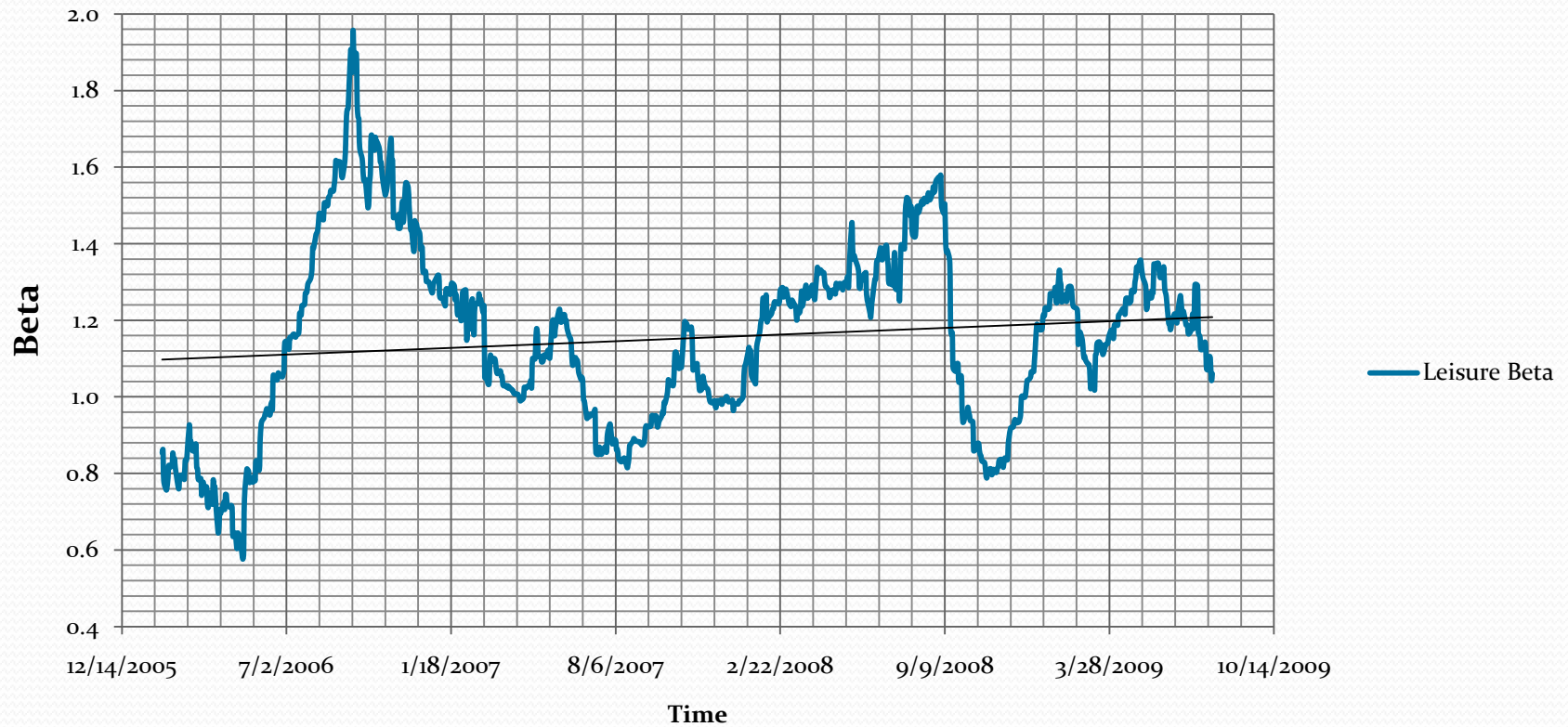
# Results

## Diversified Beta



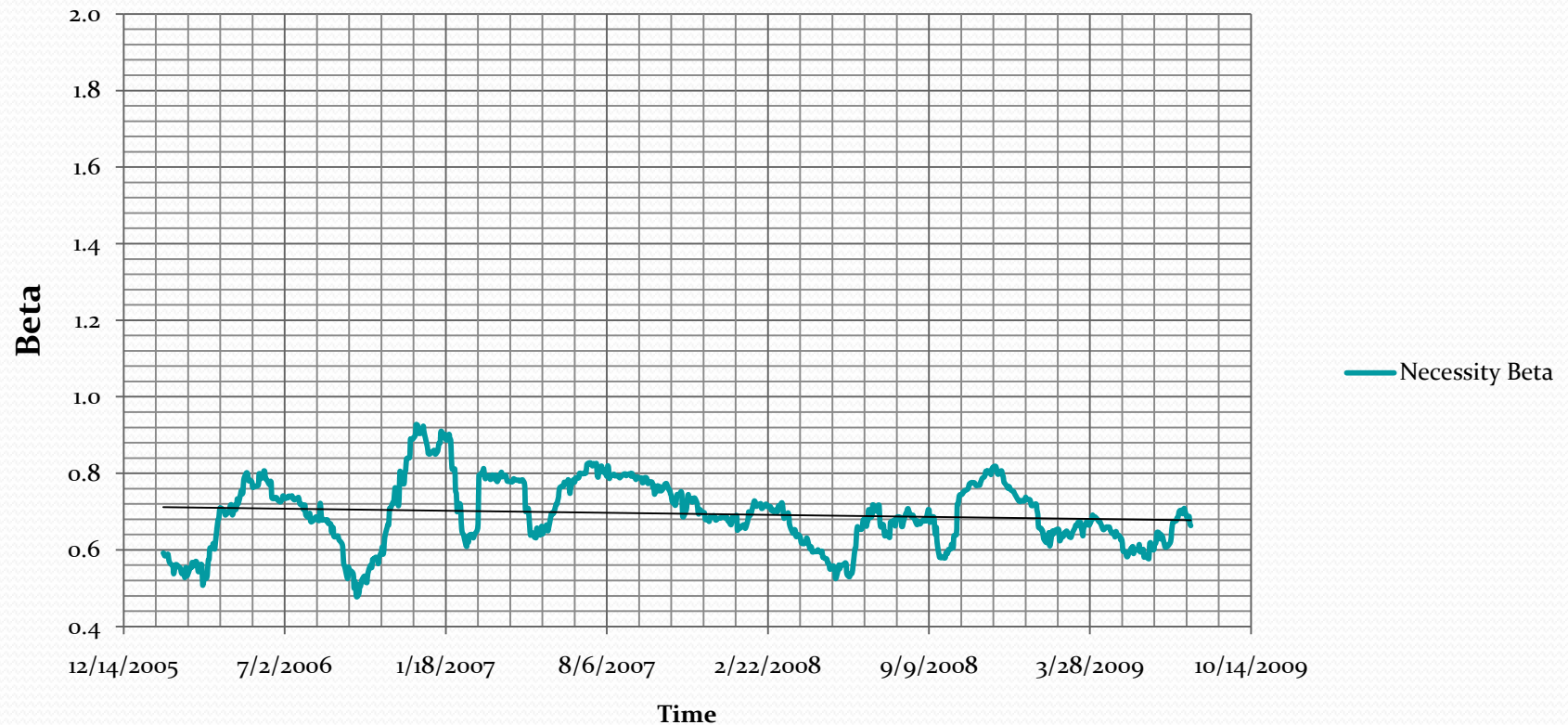
# Results

## Leisure Beta



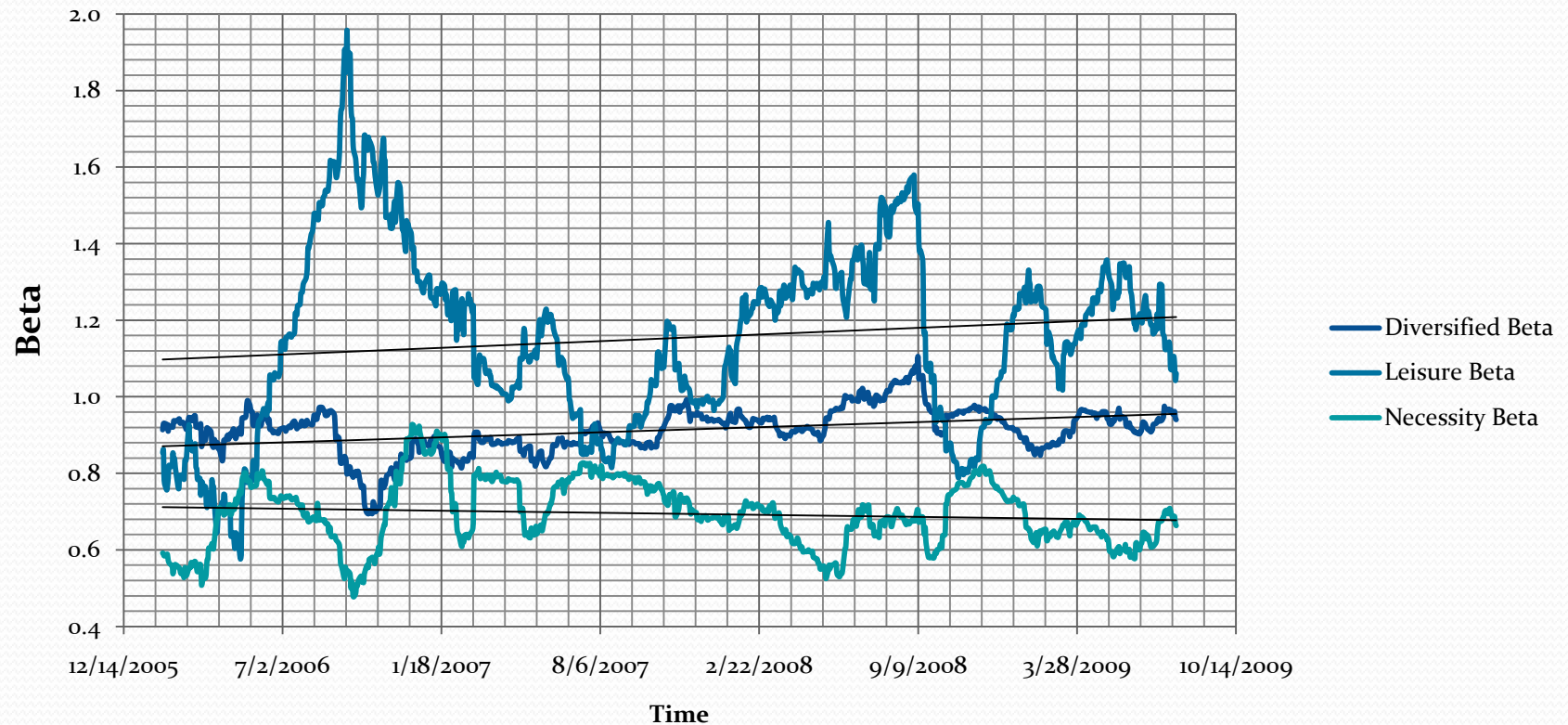
# Results

## Necessity Beta



# Results

## Diversified, Leisure, and Necessity Beta



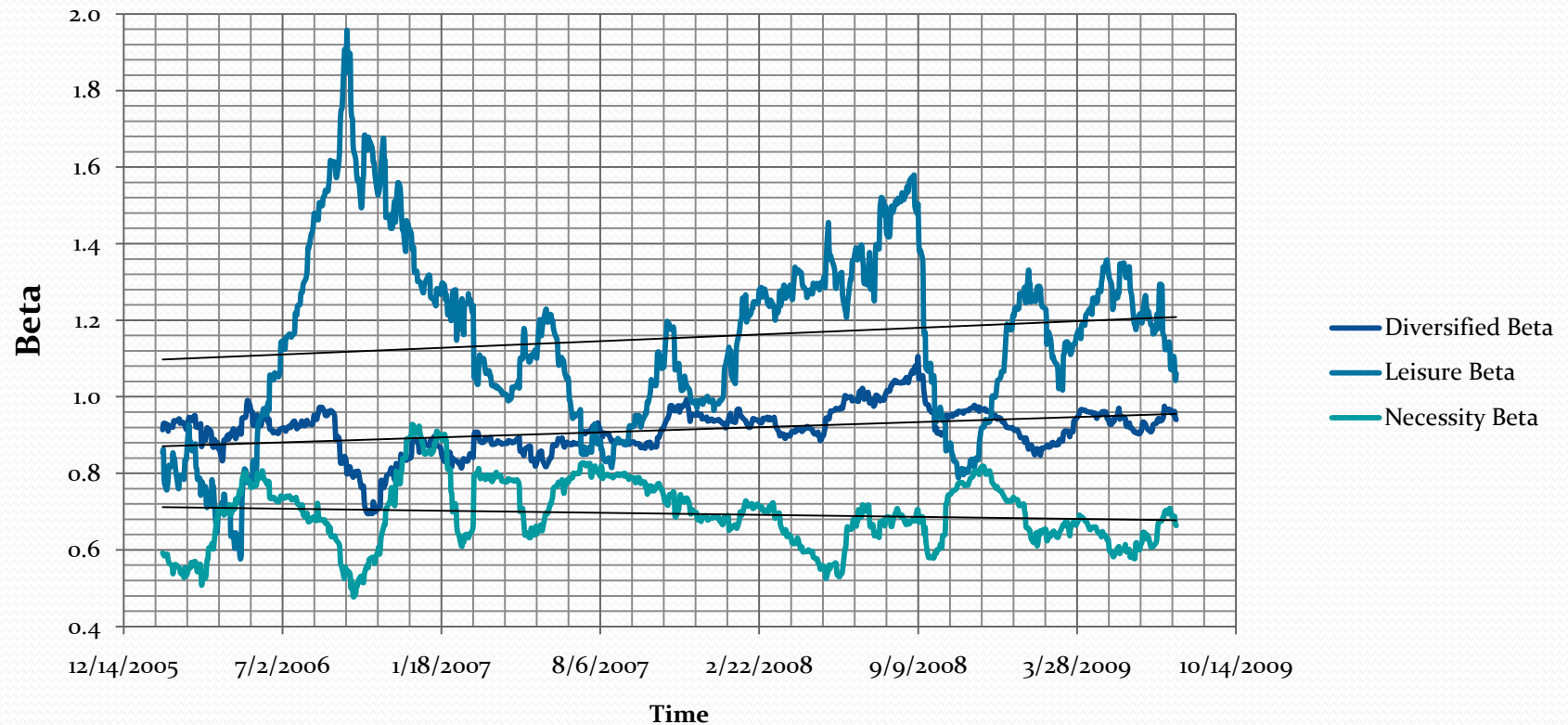
# Results

	Normal Economic Growth			Recession			F-Test	T-test
Portfolio Type	Beta Mean	Standard Deviation	Variance	Beta Mean	Standard Deviation	Variance	P-Value	P-Value
Diversified	0.88	0.0472	0.0022	0.94	0.0430	0.0018	0.3870	0.0050
Leisure	1.11	0.2793	0.0780	1.17	0.1741	0.0303	0.0760	0.2570
Necessities	0.71	0.1100	0.0121	0.66	0.0753	0.0057	0.1237	0.1063



# Results

## Diversified, Leisure, and Necessity Beta



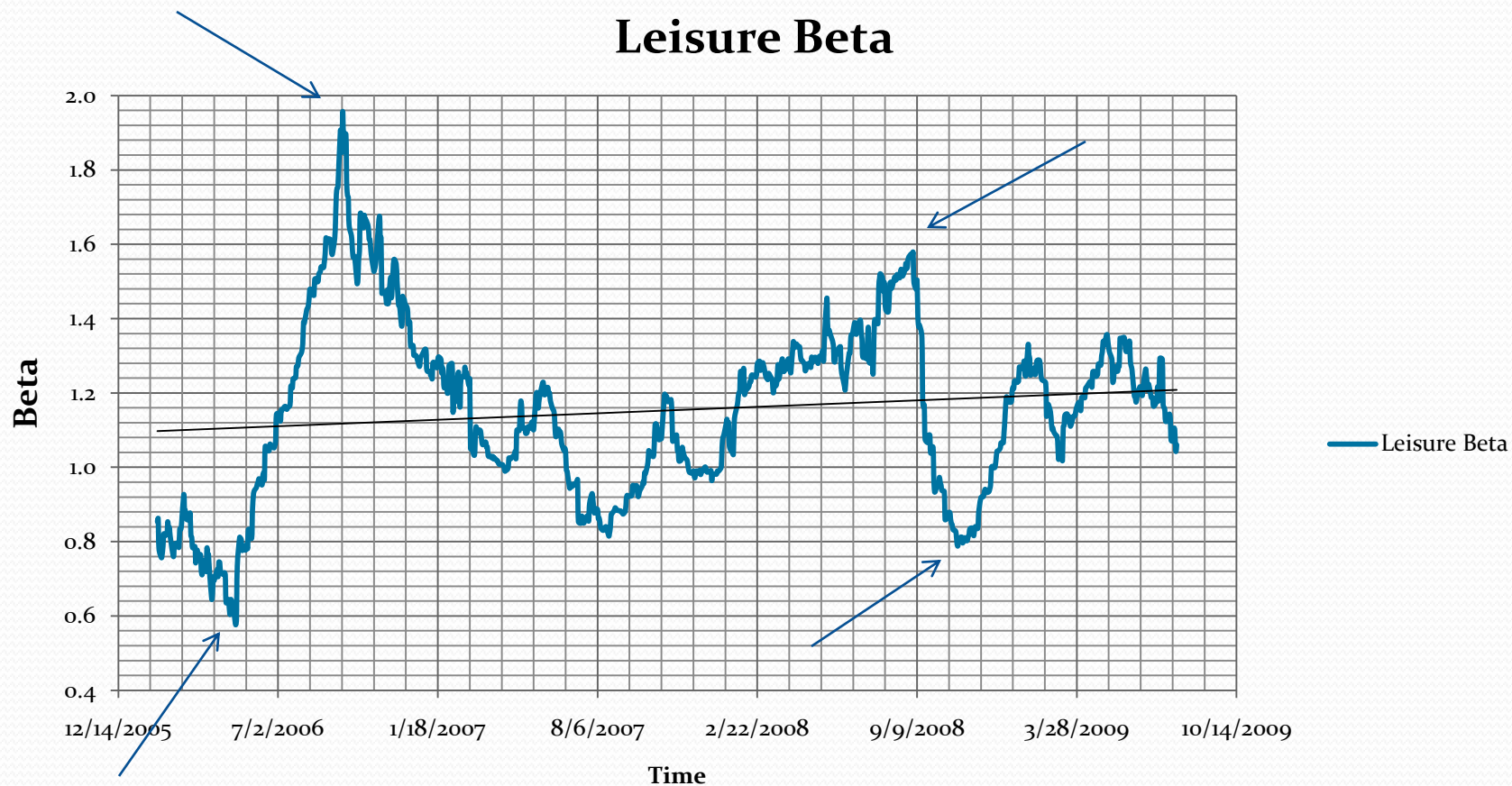
# Conclusions

- None of the portfolios had statistically significant change in the standard deviation during the recession.
- The recession did not effect beta stability at the 5% significance level.
- High volatility regardless of the state of the economy.

$$\beta = \frac{Cov_{pm}}{\sigma_m^2}$$

# Discussion

## Leisure Beta

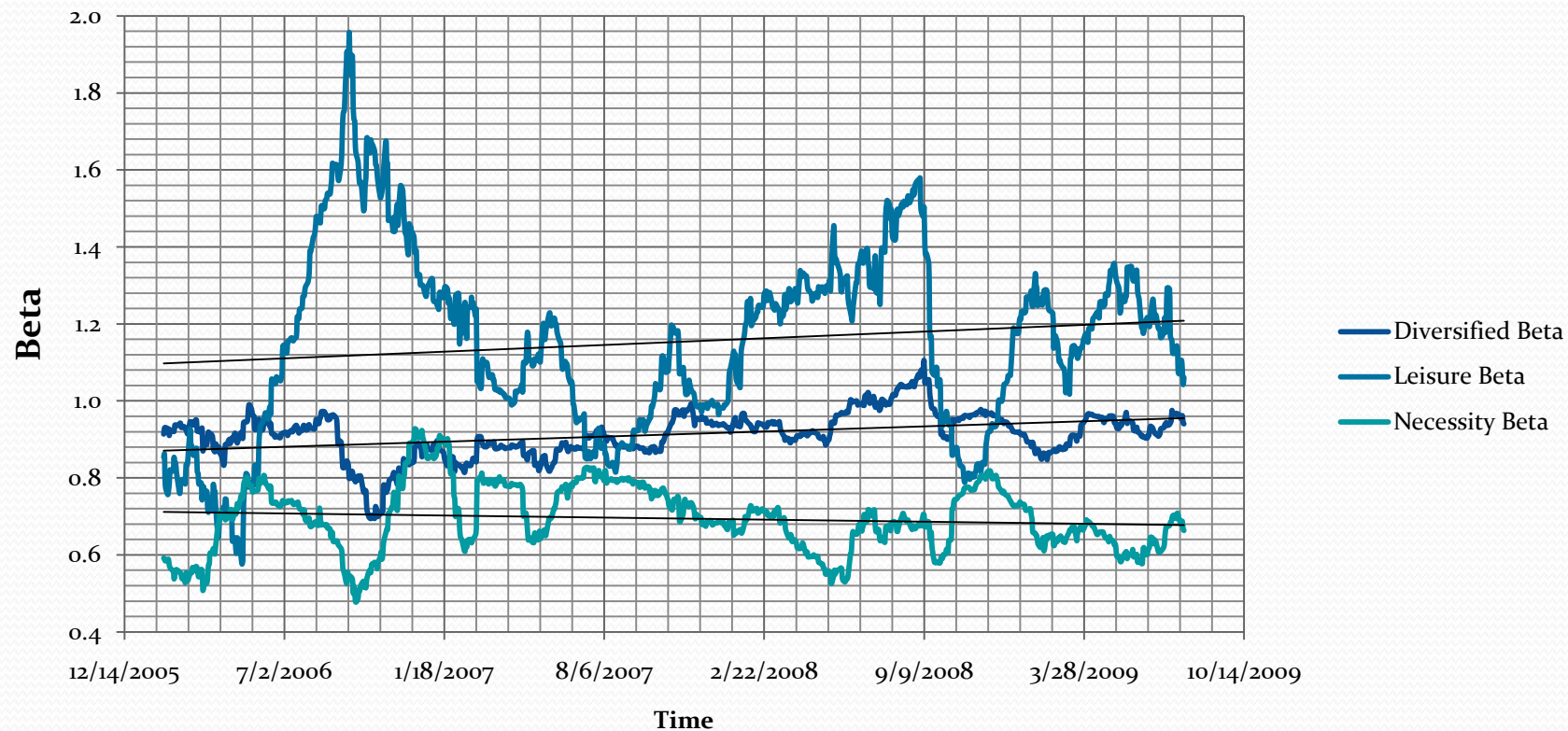


# Discussion

- Beta stability assumption does not consistently hold.
- Financial practitioners need to calculate high-risk portfolio betas frequently.
- Two characteristics identified for beta stability:
  - Diversification
  - Low average beta

# Discussion

## Diversified, Leisure, and Necessities Beta



# Discussion

- Further Study:
  - Find more determinants of beta stability
  - Show statistical significance
- Keep track of your portfolio beta!

# Bibliography

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