



What Does Higher Interest Rates Mean for Net Farm Income and Land Values?

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Outline of Presentation

- Trends in Cash Rents and Land Values
- Trends in Interest Rates
- Impact of Higher Interest Rates
 - Net Farm Income
 - Land Value
- Ag Economy Barometer
- Take Away Message

Trends in Cash Rents and Land Values

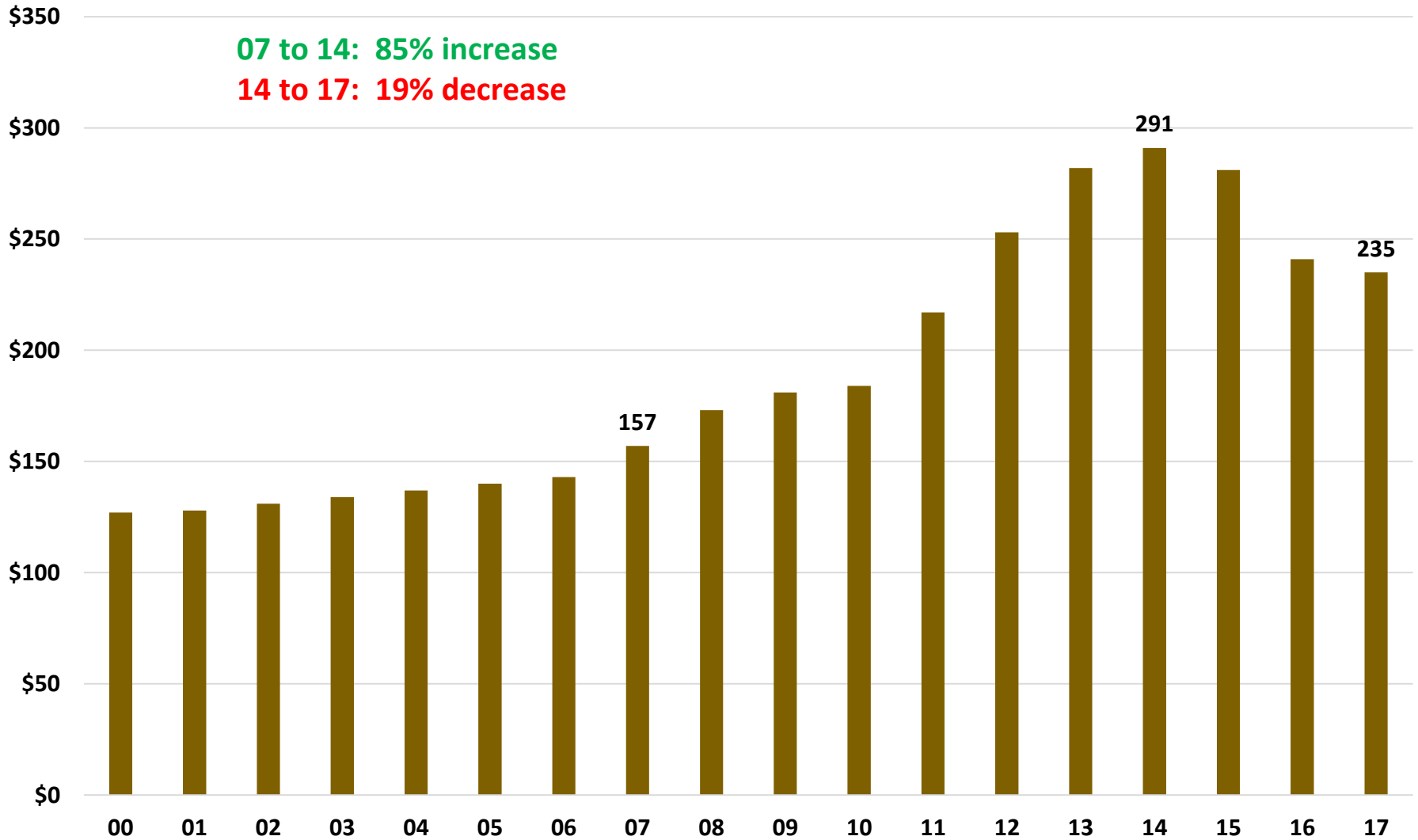
Recent State Survey Results: Cash Rents

University	Category	2017 Cash Rent Per Acre	Typical Corn Yield
Iowa State	High Quality	256	191
	Medium Quality	219	162
	Low Quality	182	124
Purdue	Top	253	200
	Average	205	169
	Poor	163	139

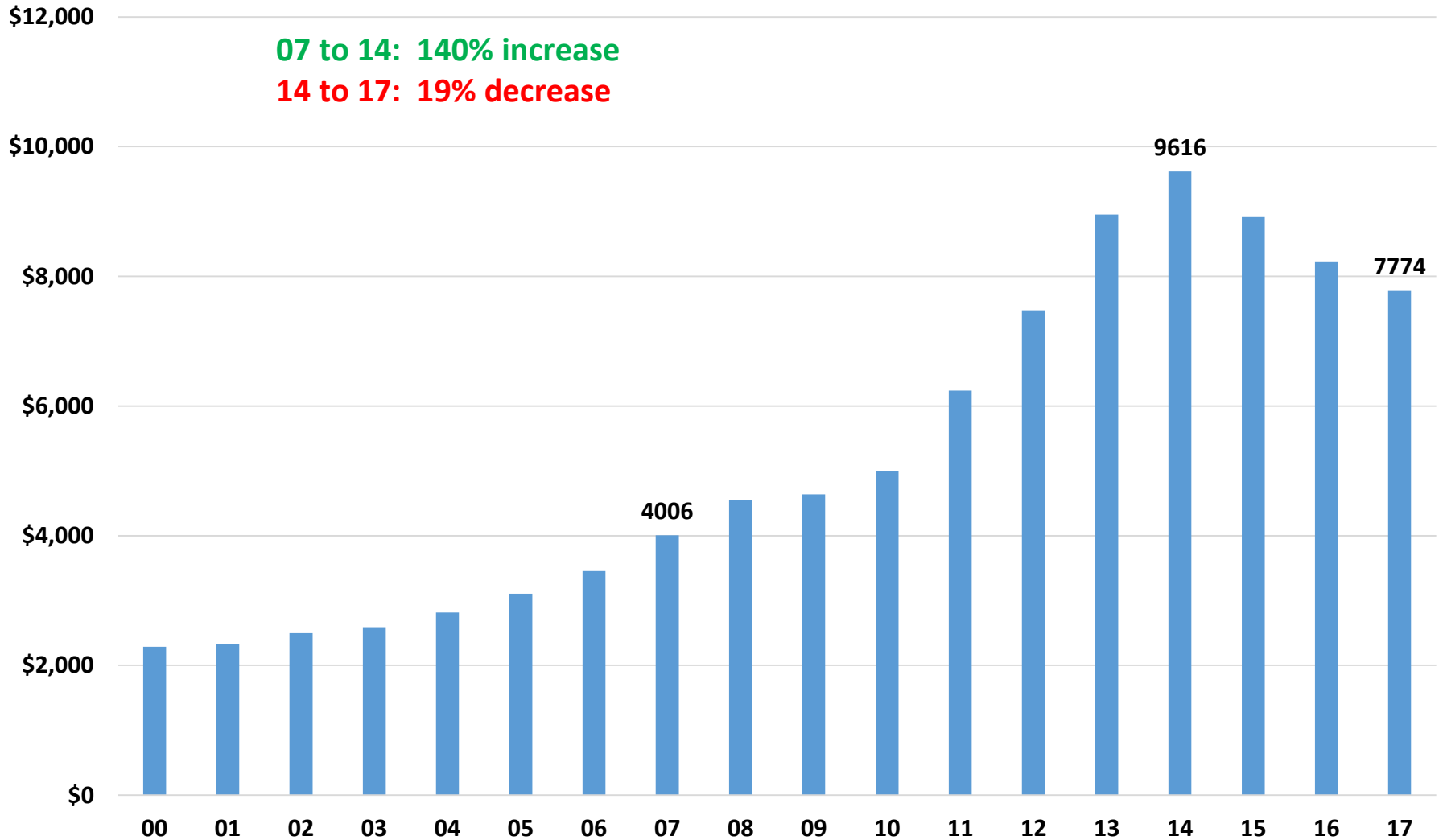
Recent State Survey Results: Land Values

University	Period	Category	Value	Percent Change
Iowa State	2017	High	8,933	+2.0%
		Medium	6,849	+2.1%
		Low	4,689	+0.5%
Illinois	2017	Excellent	10,606	-2.3%
		Good	8,389	-1.7%
		Average	6,057	-5.3%
Purdue	2017	Top	8,529	+0.2%
		Average	6,928	-1.6%
		Poor	5,280	-1.4%

Average Productivity Land Cash Rent for West Central Indiana Purdue Farmland Value Survey



Average Productivity Land Value for West Central Indiana Purdue Farmland Value Survey



P/E and P/rent Ratios

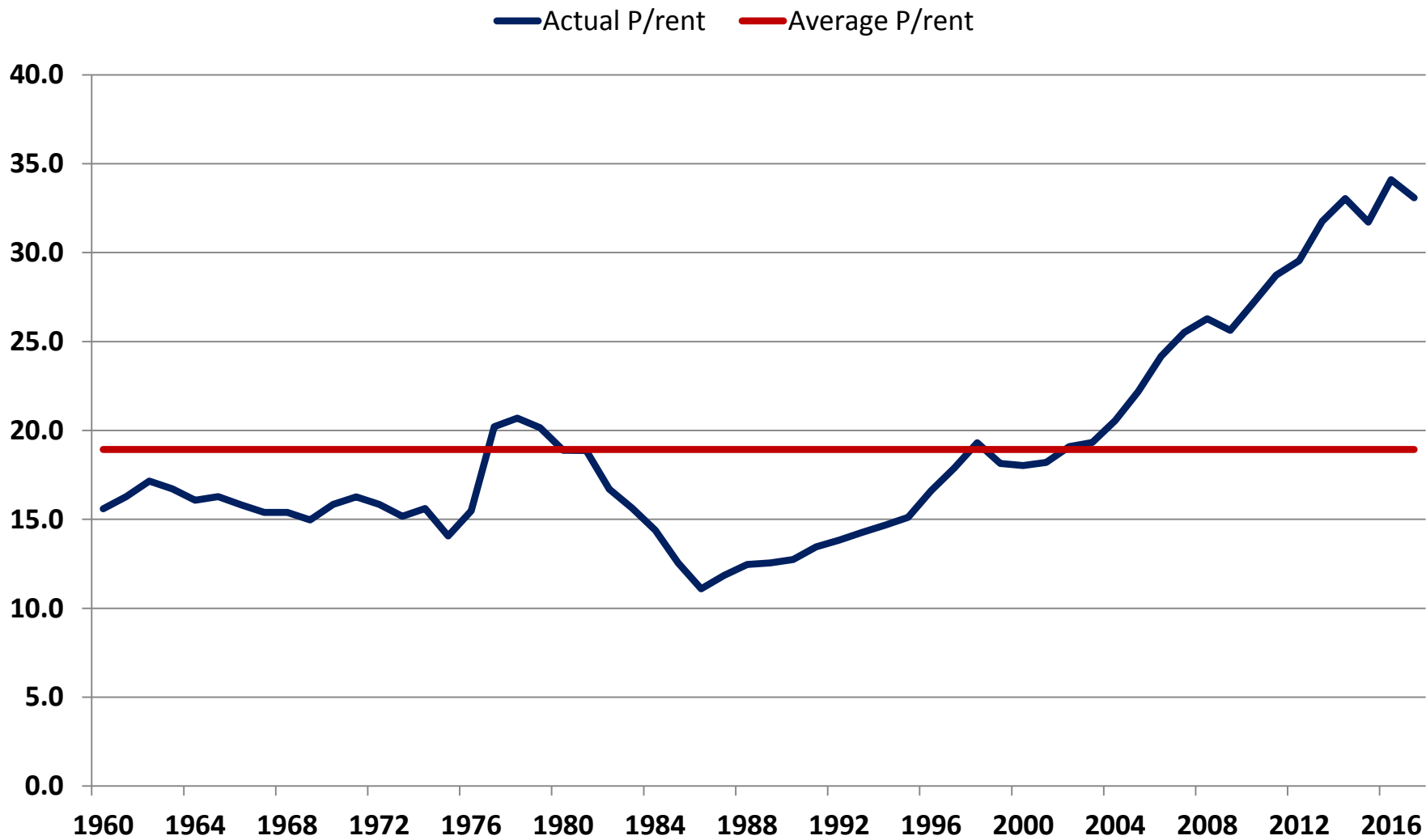
- **P/E Ratio for Stock**

- $P/E = \text{Market Value per Share} / \text{Earnings per Share}$
- A high P/E ratio indicates that investors anticipate higher growth of earnings in the future.

- **P/rent for Farmland**

- $P/\text{rent} = \text{Farmland Price} / \text{Cash Rent}$
- West Central Indiana

Farmland Price to Cash Rent Multiple for West Central Indiana, 1960 to 2017.



Cyclically Adjusted P/E and P/rent Ratios

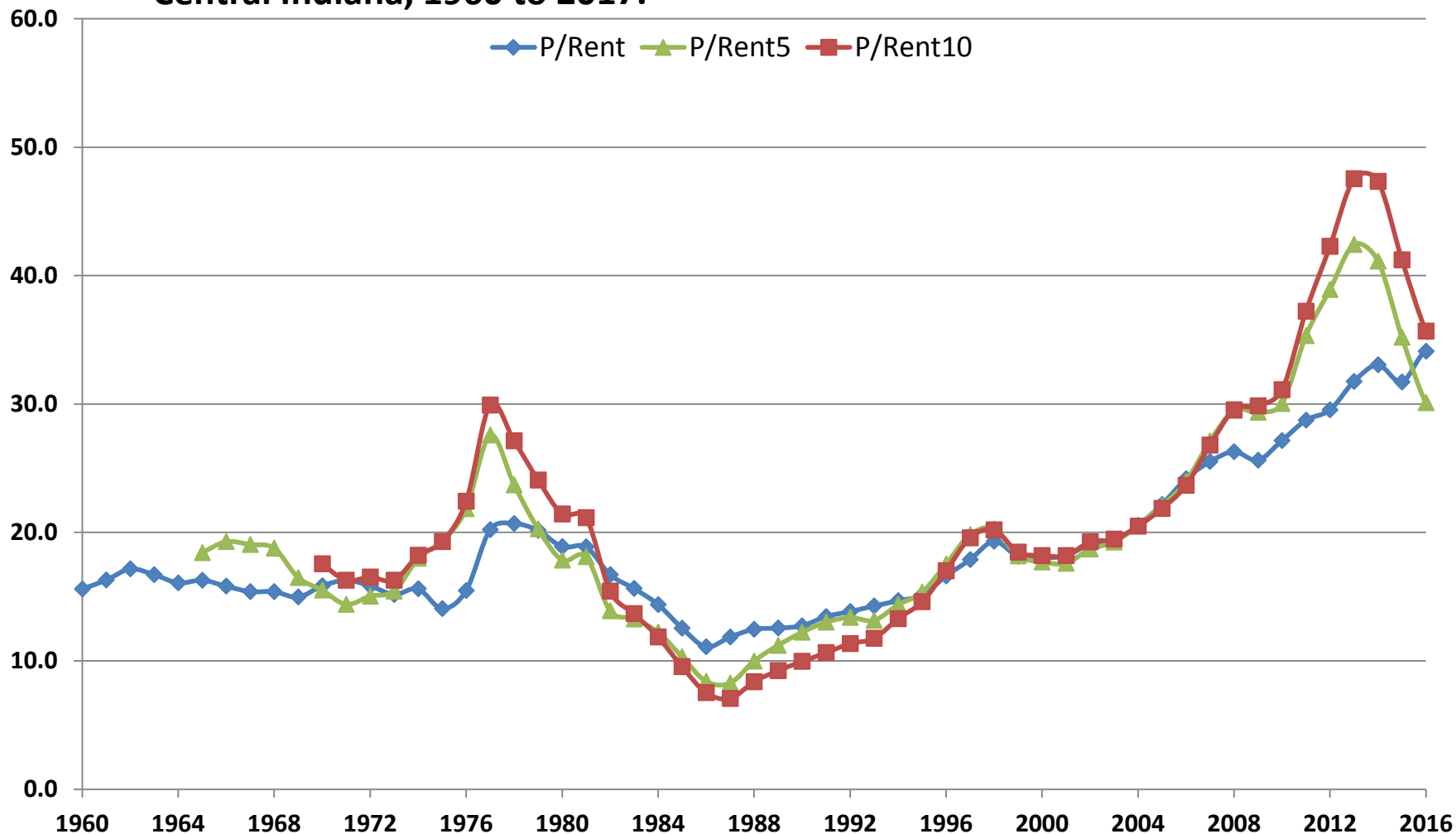
- **P/E Ratios**

- Shiller uses a ten-year moving average for earnings (P/E10) to remove the effect of the economic cycle.
- P and E are expressed in real dollars.

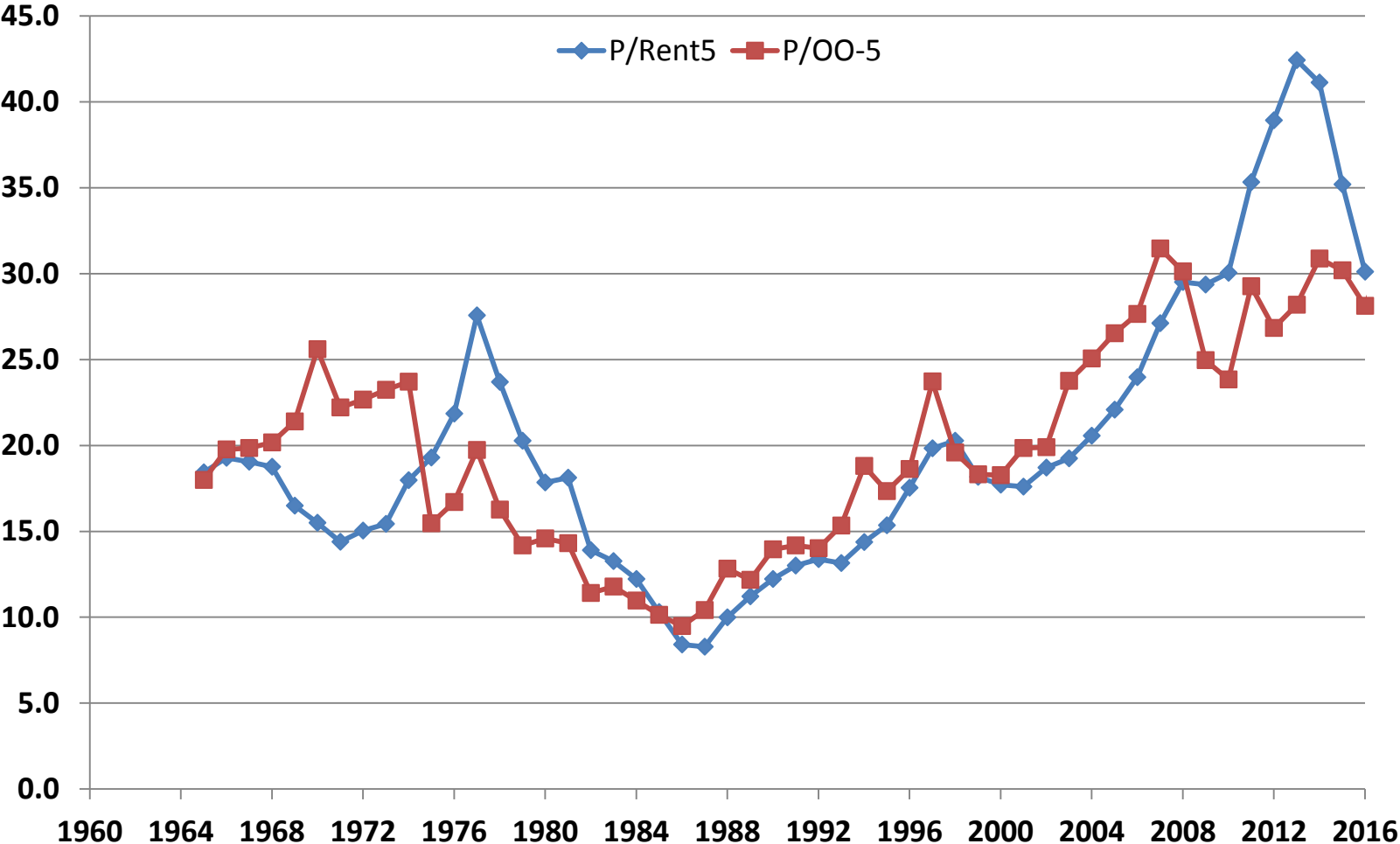
- **P/rent Ratios**

- Use real farmland price as numerator
- Use five-year or ten-year moving average of real rent (P/rent5 or P/rent10) for denominator

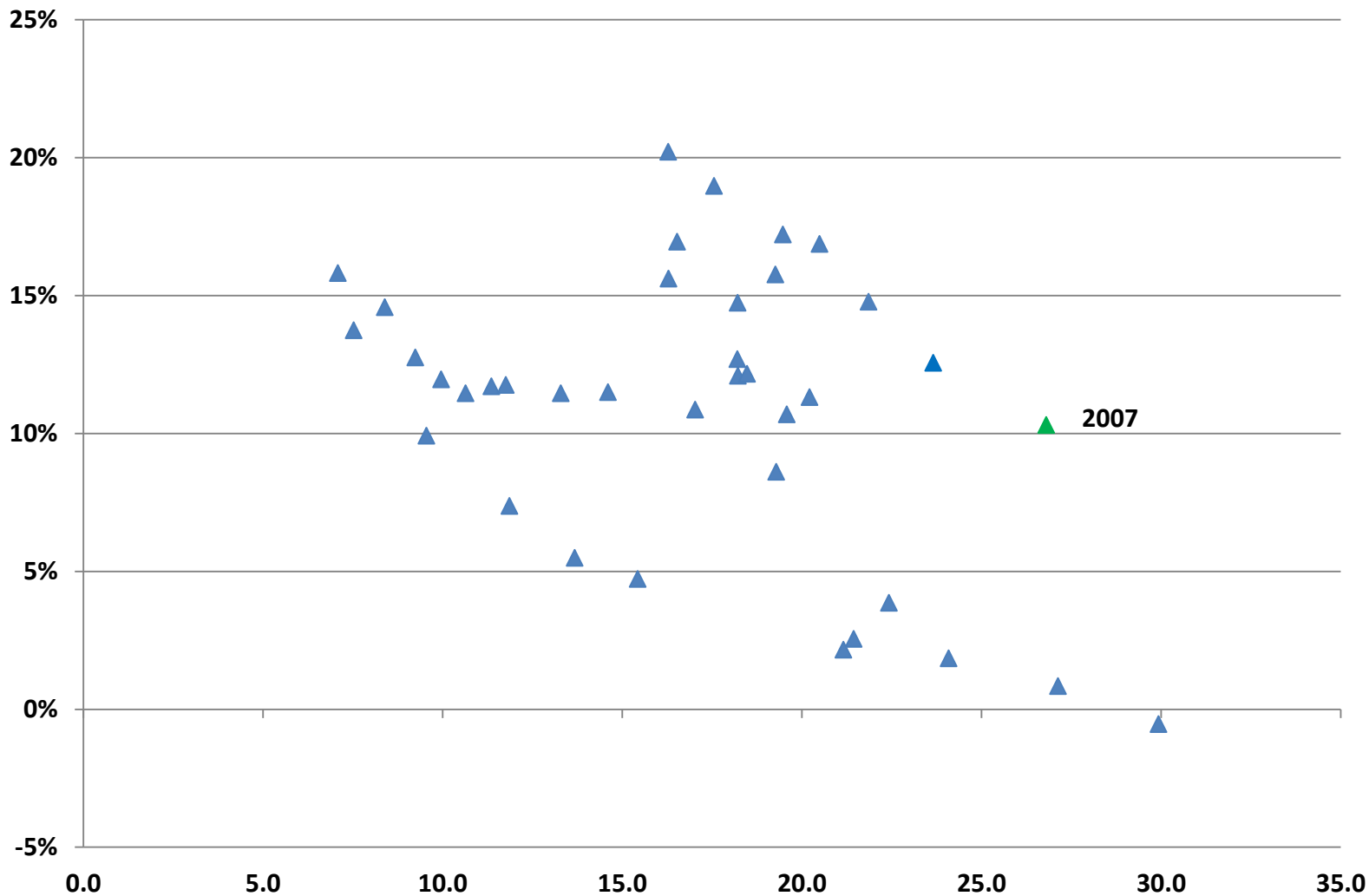
Current, 5-Year, and 10-Year Cyclically Adjusted P/rent Ratios for West Central Indiana, 1960 to 2017.



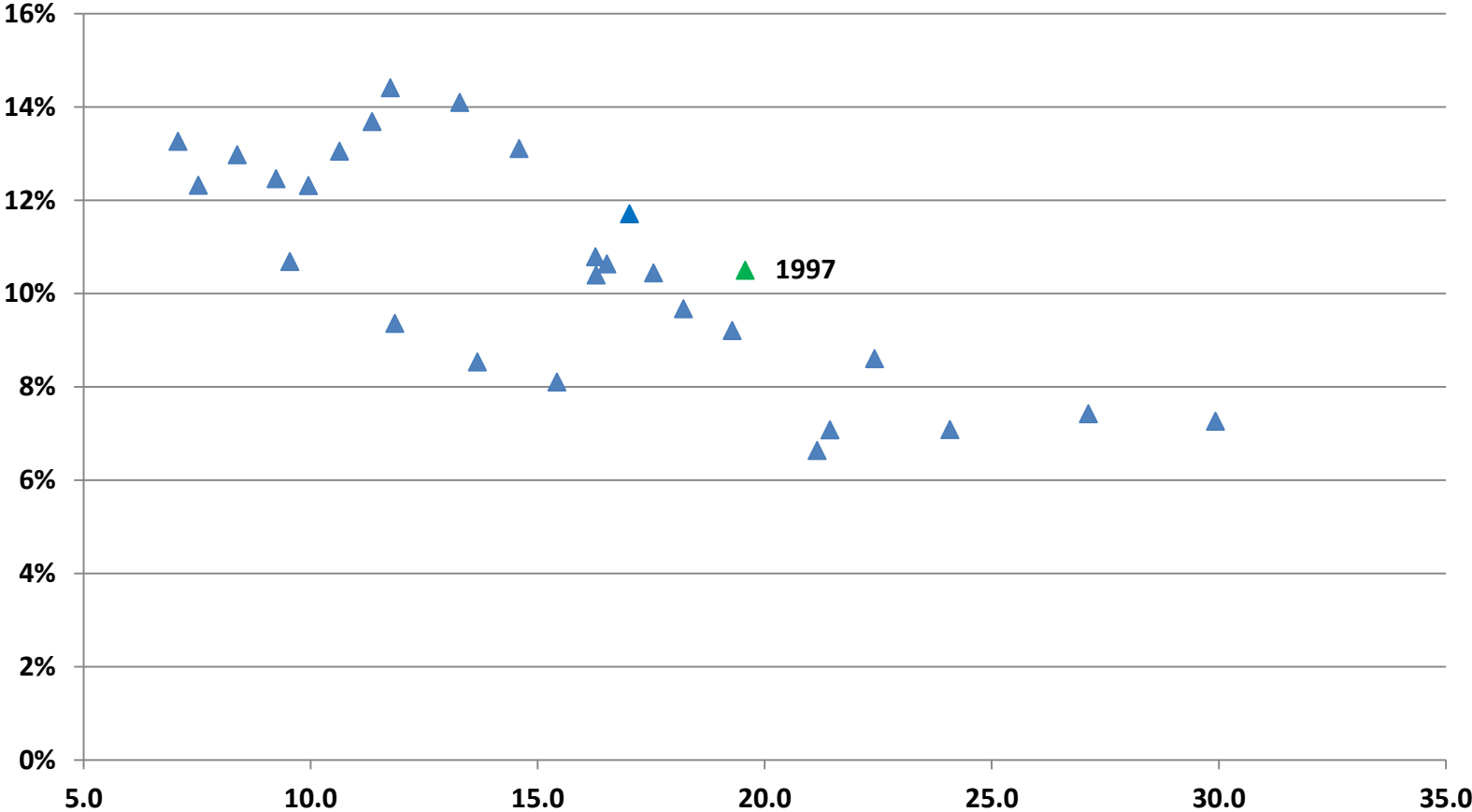
Five-Year Moving Average Cyclically Adjusted Price to Earnings Multiples for Cash Rent and Owner Operator Returns.



Ten-Year Rate of Return (left axis) and P/rent10 at the Time of Purchase, 1960 to 2007.



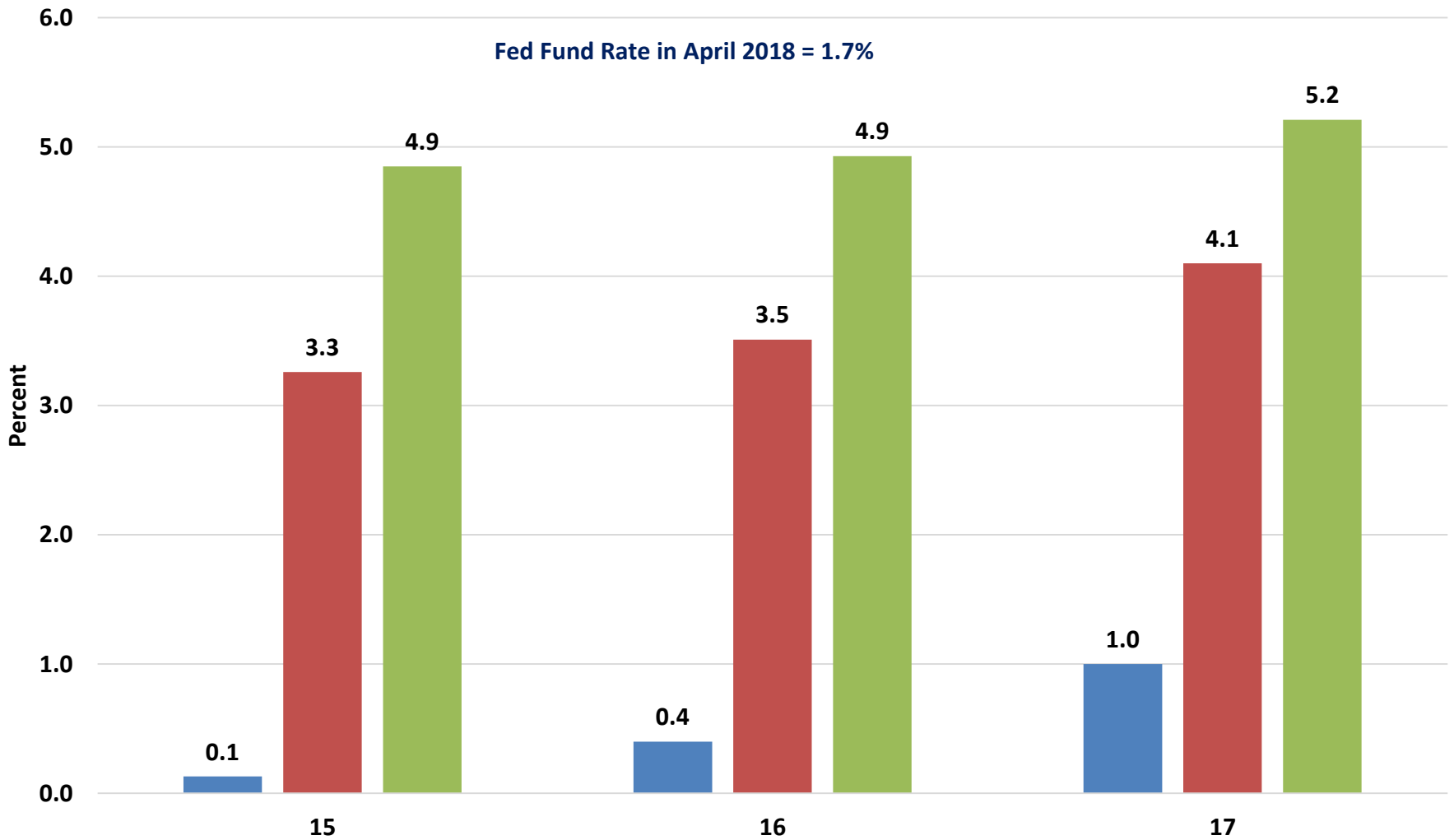
Twenty-Year Rate of Return (left axis) and P/rent10 at the Time of Purchase, 1960 to 1997.



Trends in Interest Rates

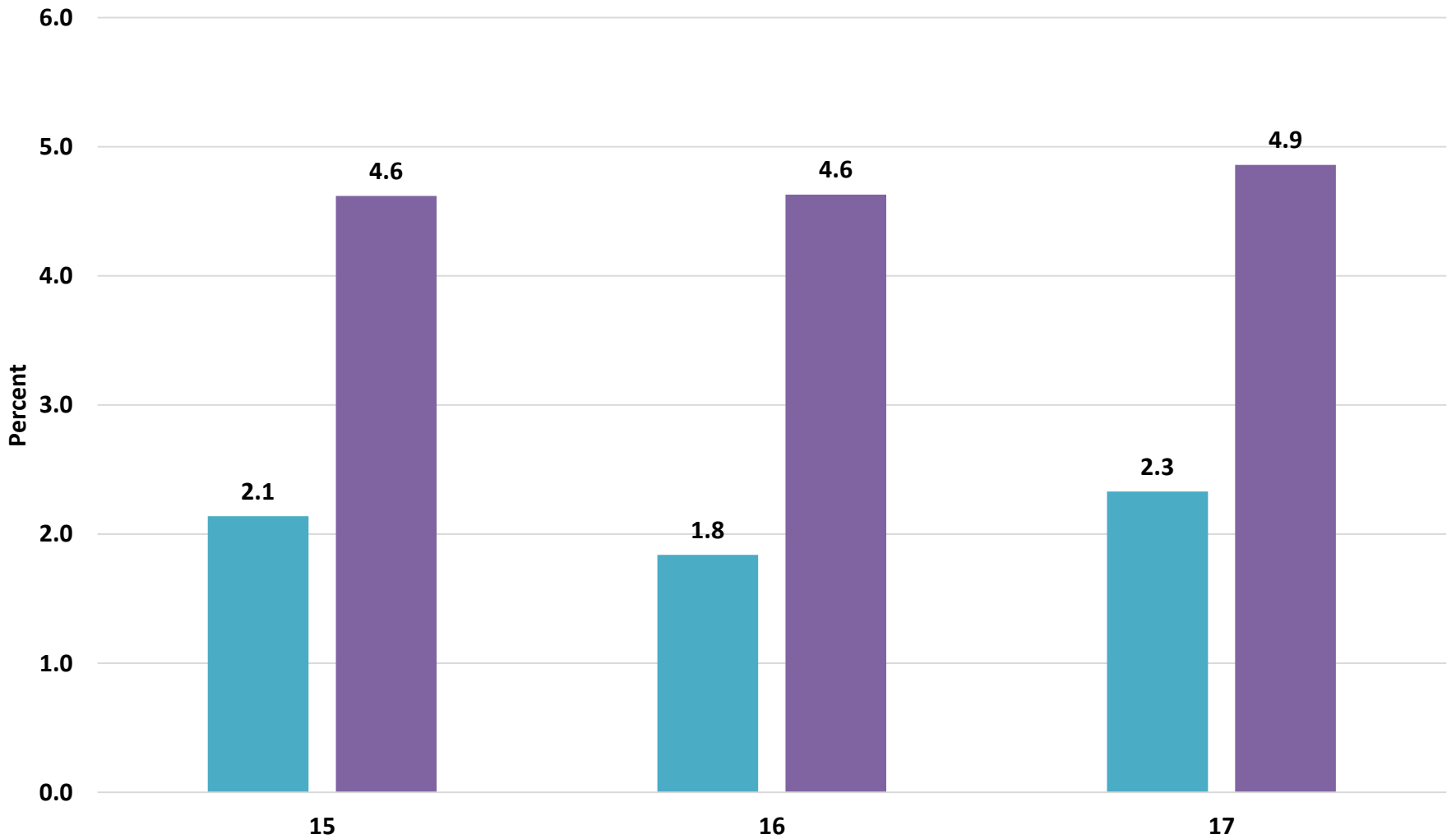
Short-Term Interest Rate Comparisons, 2015 to 2017

Fed Funds Prime FRB Chicago Operating

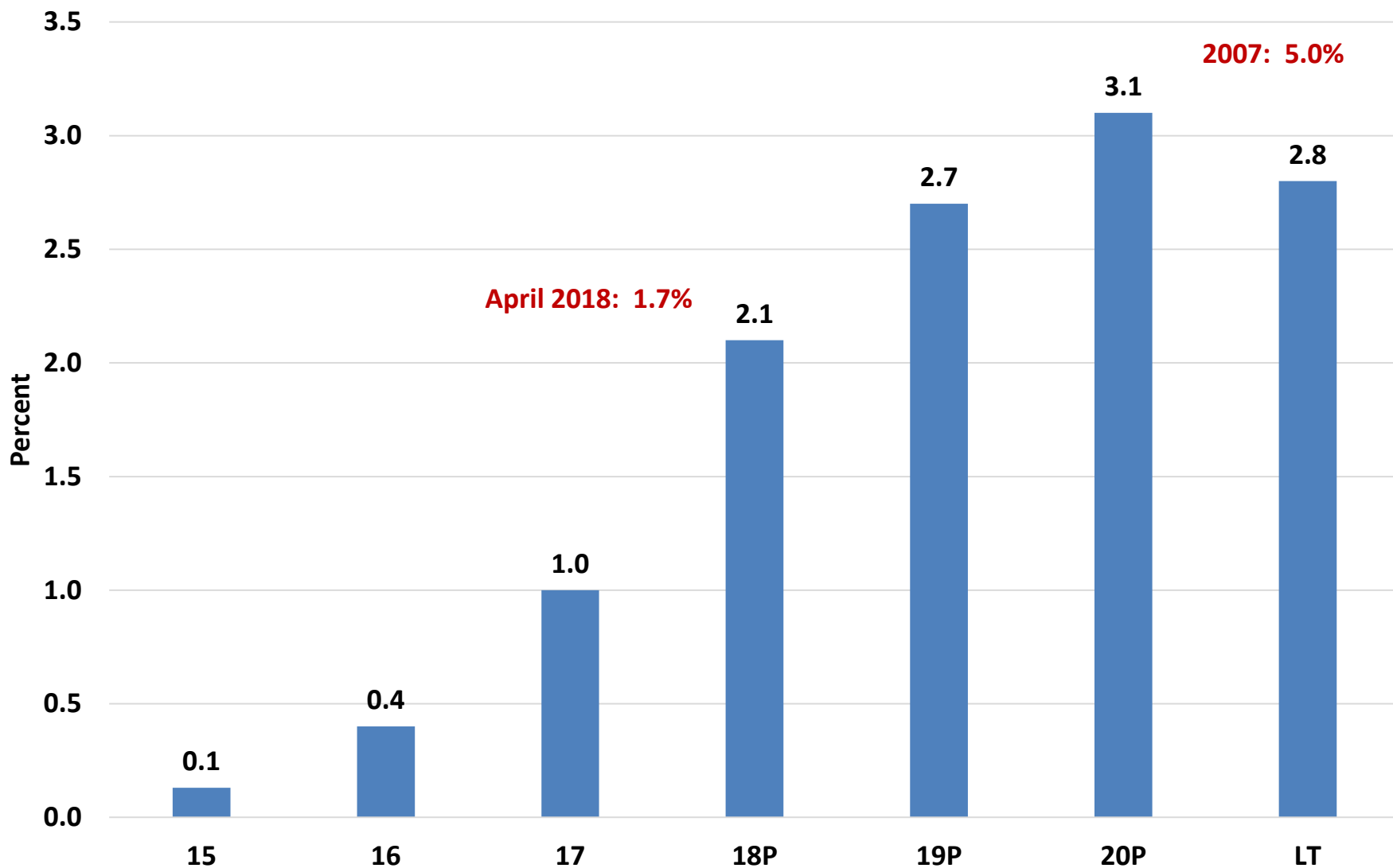


Long-Term Interest Rate Comparisons, 2015 to 2017

■ 10-Year Treasury ■ FRB Chicago Real Estate

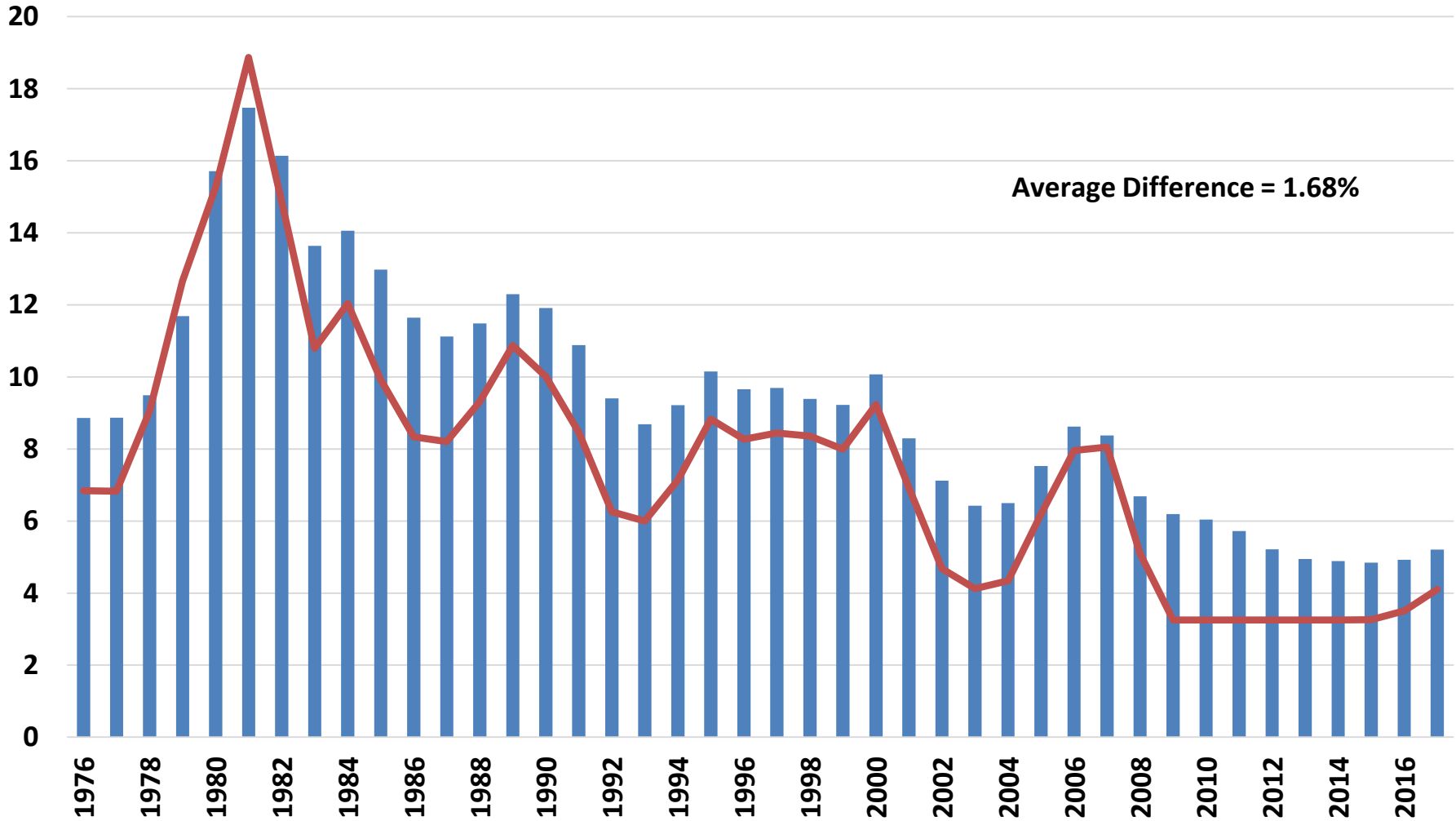


Federal Reserve Board, Federal Funds Rate



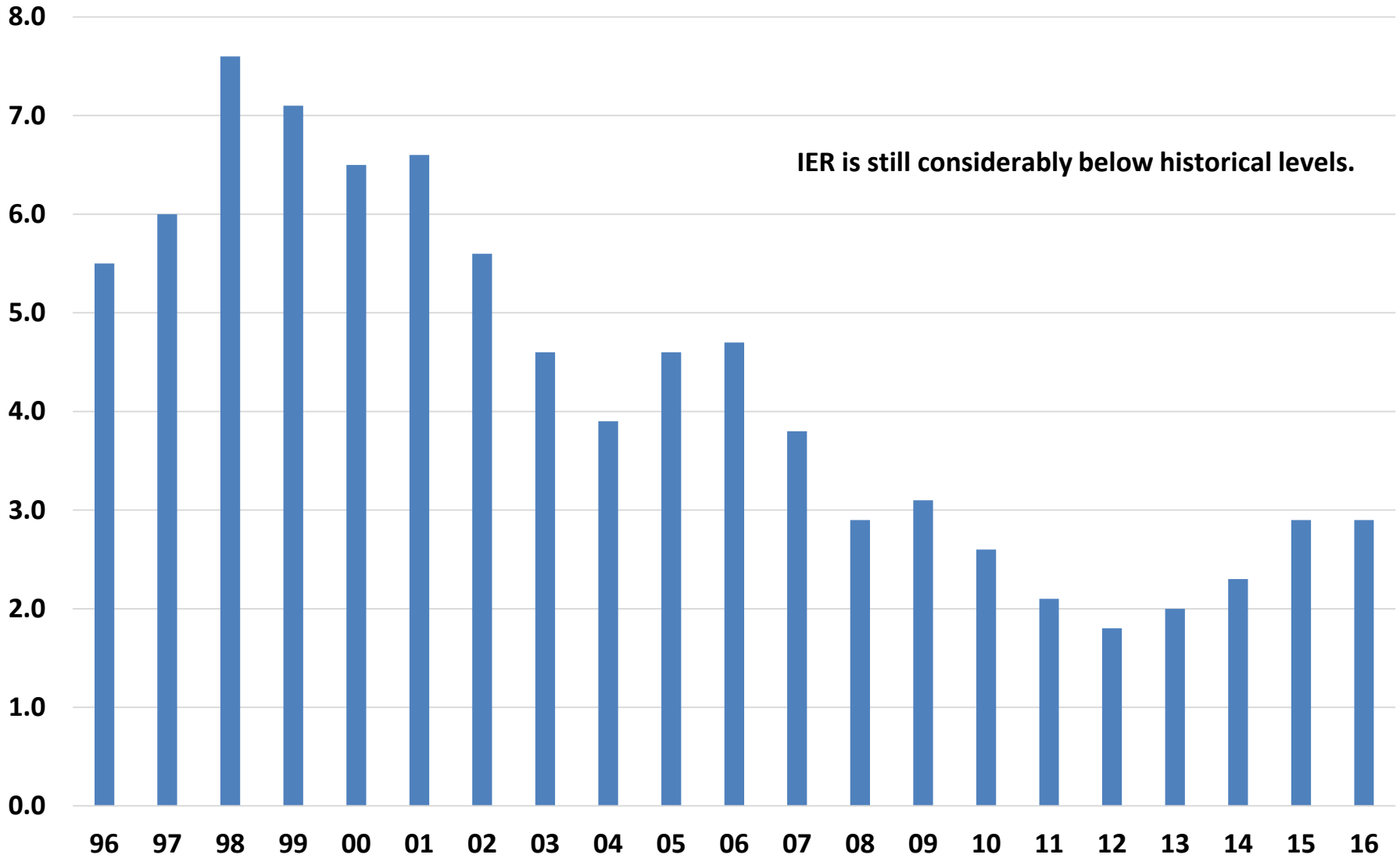
FRB of Chicago Operating Interest Rates and Prime Interest Rate

Operating Interest Rate Prime Interest Rate



Impact of Higher Interest Rates

Interest Expense Ratio (IER), Illinois FBFM, Grain Farms



Cash Rents and Land Values

- **Cash Rents**

- Net returns are closer to breakeven than they were from 2014 to 2017
- Implication: stable to slightly higher cash rents

- **Land Values**

- Stable to slightly higher cash rents
- Increase in long-term interest rates
- Increase in inflation
- Increase in risk premium for the farming sector
- Relatively high P/rent ratio

Land Values and Increasing Interest Rates

- **Direct Impact on Capitalization Formula**

- $LV = CR / r$

- LV = land value
- CR = cash rent
- r = capitalization rate

- Impact on r depends on nominal interest rate, inflation, and risk premium

- If inflation and risk premium stay the same, impact on capitalization rate and land values would be relatively large

Land Values and Increasing Interest Rates

- **Regression Analysis**

- $LV = f(LLV, CR, r)$

- LV = land value
 - LLV = lagged land value
 - CR = predicted cash rent
 - r = capitalization rate

- Using data from 1960 to 2017 for west central Indiana, a 1% increase in r , holding cash rent constant, would result in a decrease in land values of 5 to 7%.

Ag Economy Barometer

Ag Economy Barometer Survey

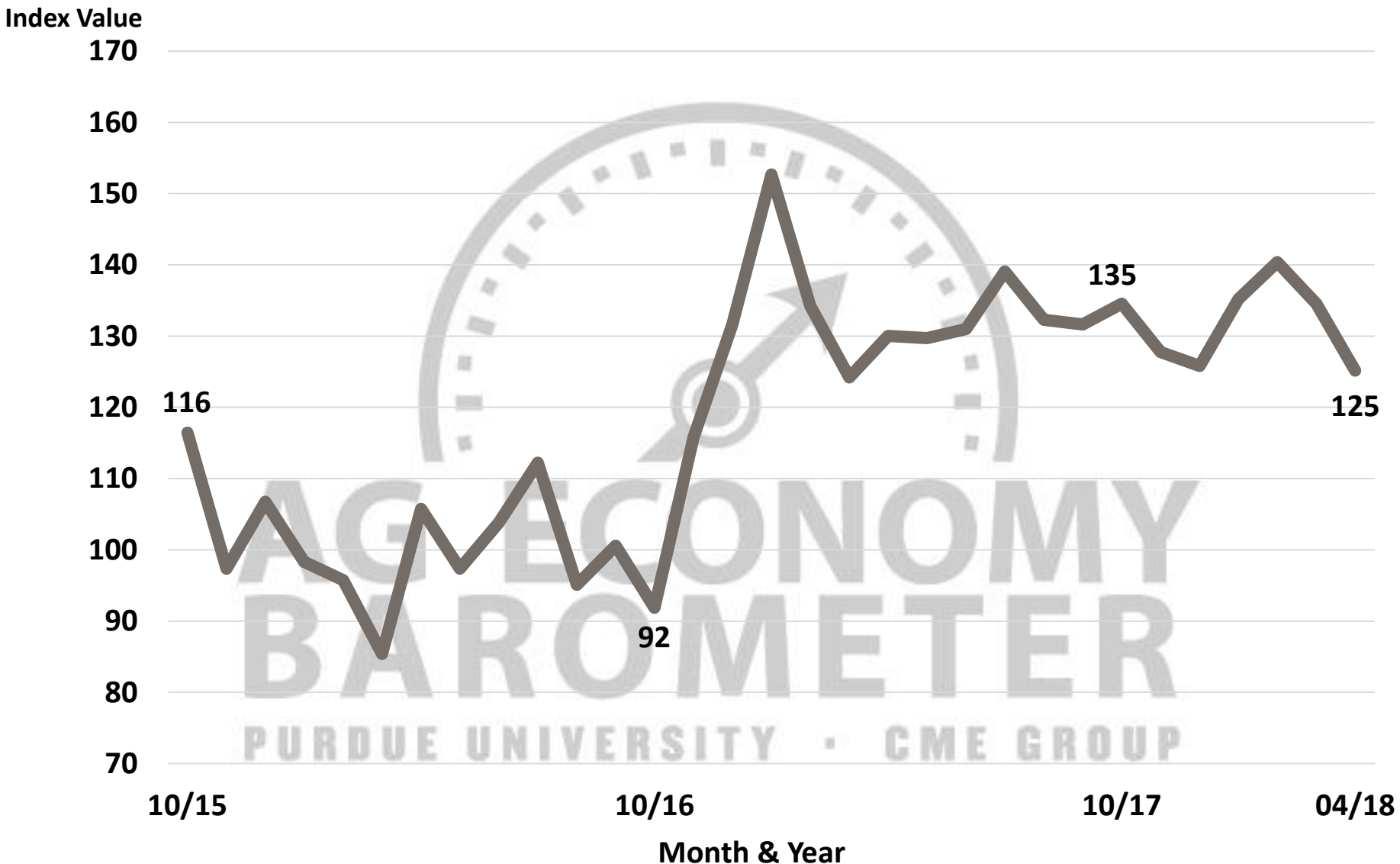
Details

- **Monthly survey of 400 U.S. agricultural producers, focused on major crop and livestock enterprises**
 - Corn and Soybeans: 53%
 - Wheat: 14%
 - Cotton: 3%
 - Beef: 19%
 - Swine: 6%
 - Dairy: 5%

Ag Economy Barometer Survey Details (continued)

- Respondents value of farm production is greater than \$500,000.
- Do not survey the same producers each month, but characteristics of survey sample are held constant from month to month.

Ag Economy Barometer



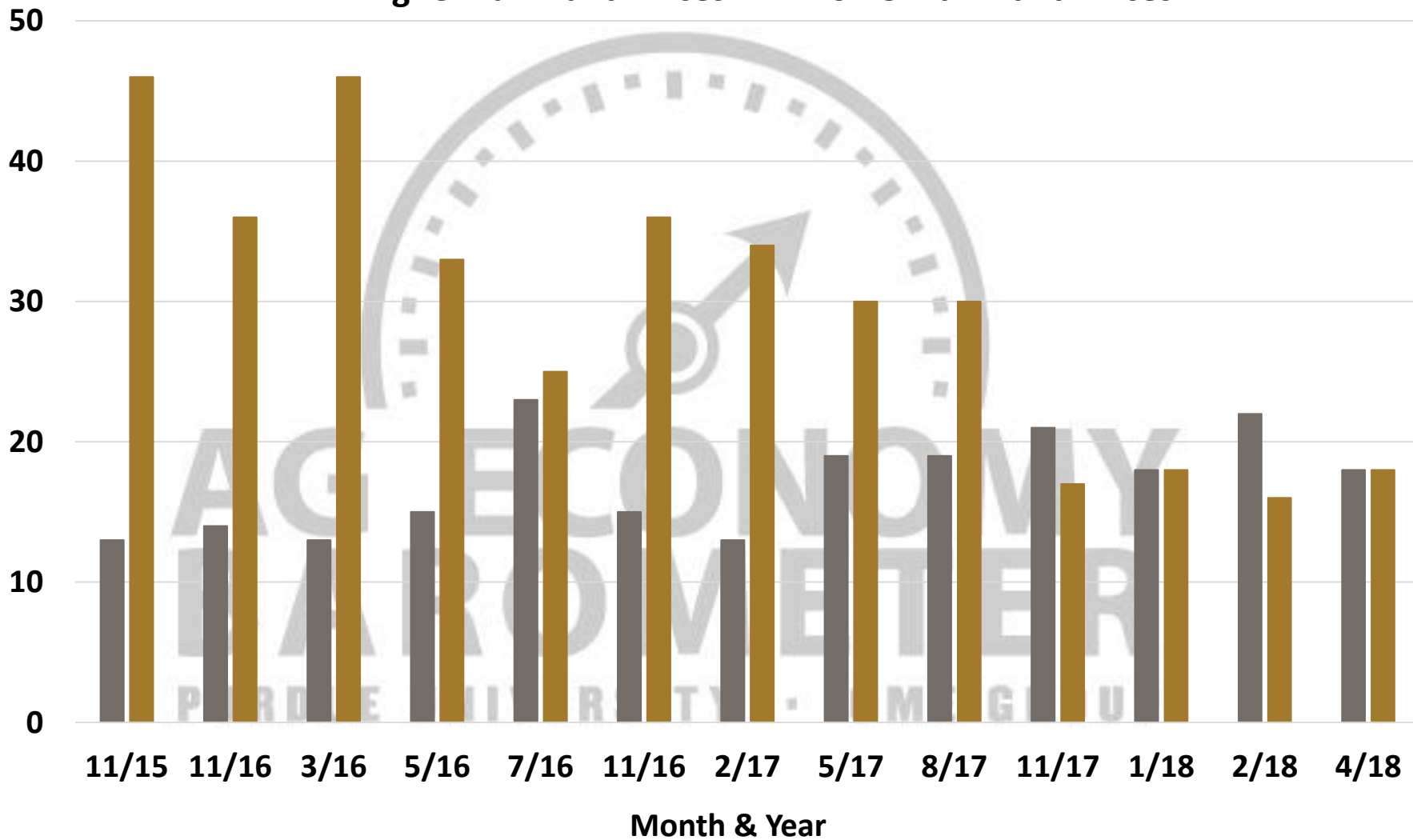
Source: Purdue University Center for Commercial Agriculture, Producer Survey, April 2018

Farmland Price Expectations, 12 Months Ahead

% of respondents

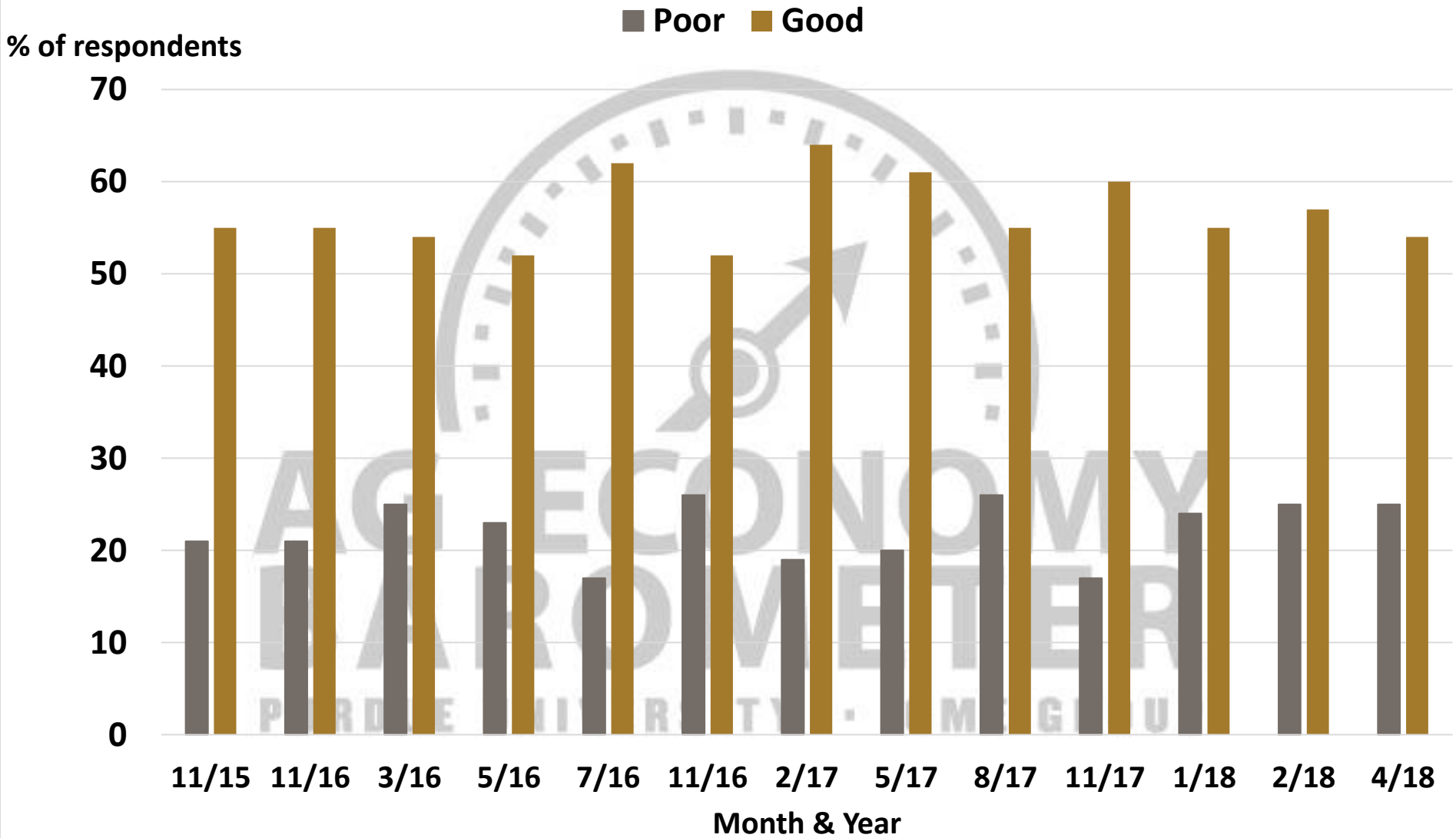
■ Higher Farmland Prices

■ Lower Farmland Prices



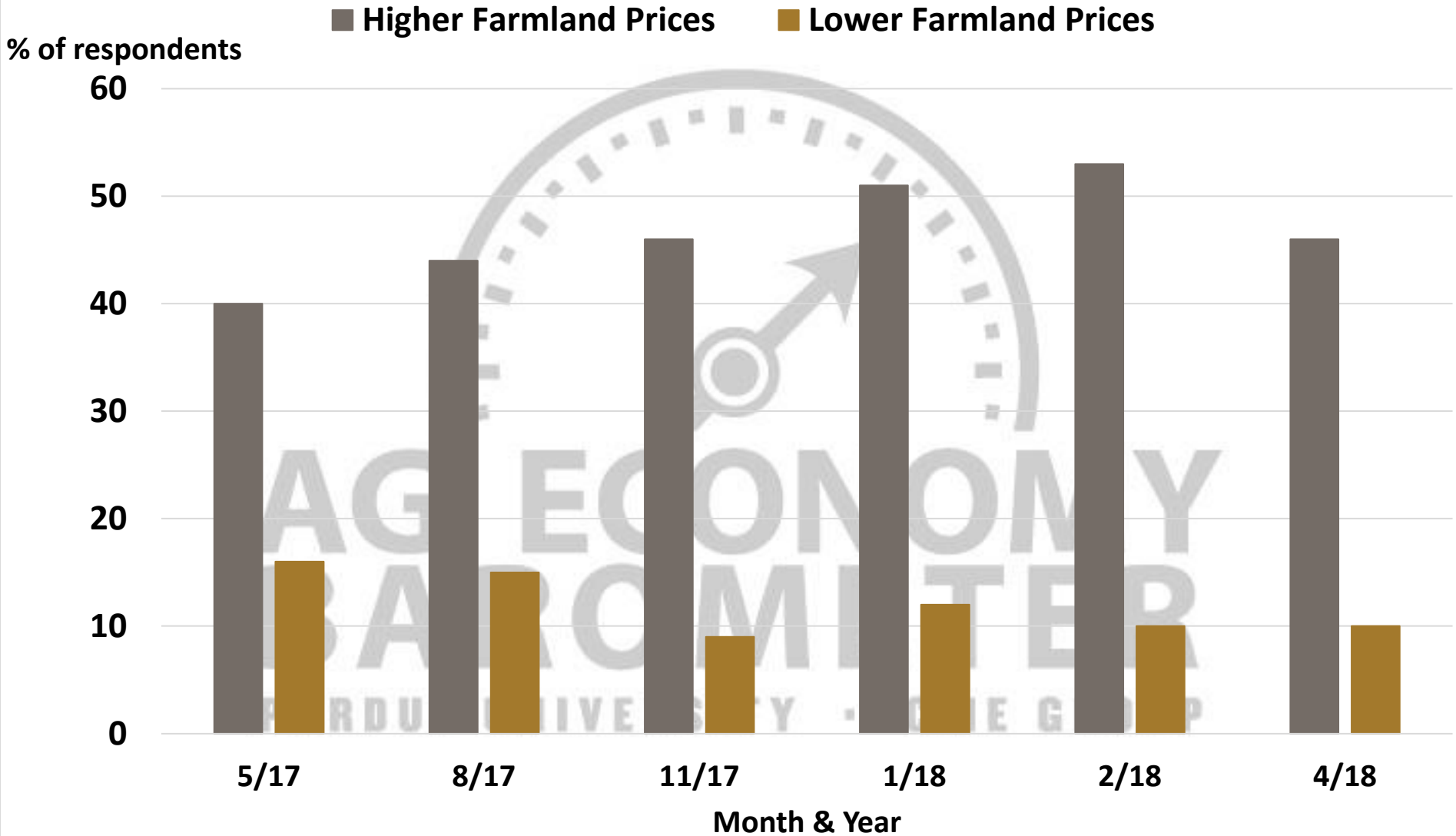
Source: Purdue Center for Commercial Agriculture, Producer Survey, April 2018

Rating Farmland as an Investment



Source: Purdue Center for Commercial Agriculture, Producer Survey, April 2018

Farmland Price Expectations, 5 years from now



Source: Purdue Center for Commercial Agriculture, Producer Survey, April 2018

Conclusions

- Increasing interest rates will have a relatively small impact on net farm income assuming debt levels do not increase substantially.
- Land values increased faster than cash rents during the last ten years. Even if cash rents are relatively stable, the increase in interest rates will put downward pressure on land values, or create a situation where cash rents increase faster than land values.