美国生猪行业的价格形成和价格风险管理
Price Formation and Price Risk Management in the U.S. Swine Industry

舒立，艾奥瓦州大学经济系

Lee Schulz, Department of Economics, Iowa State University
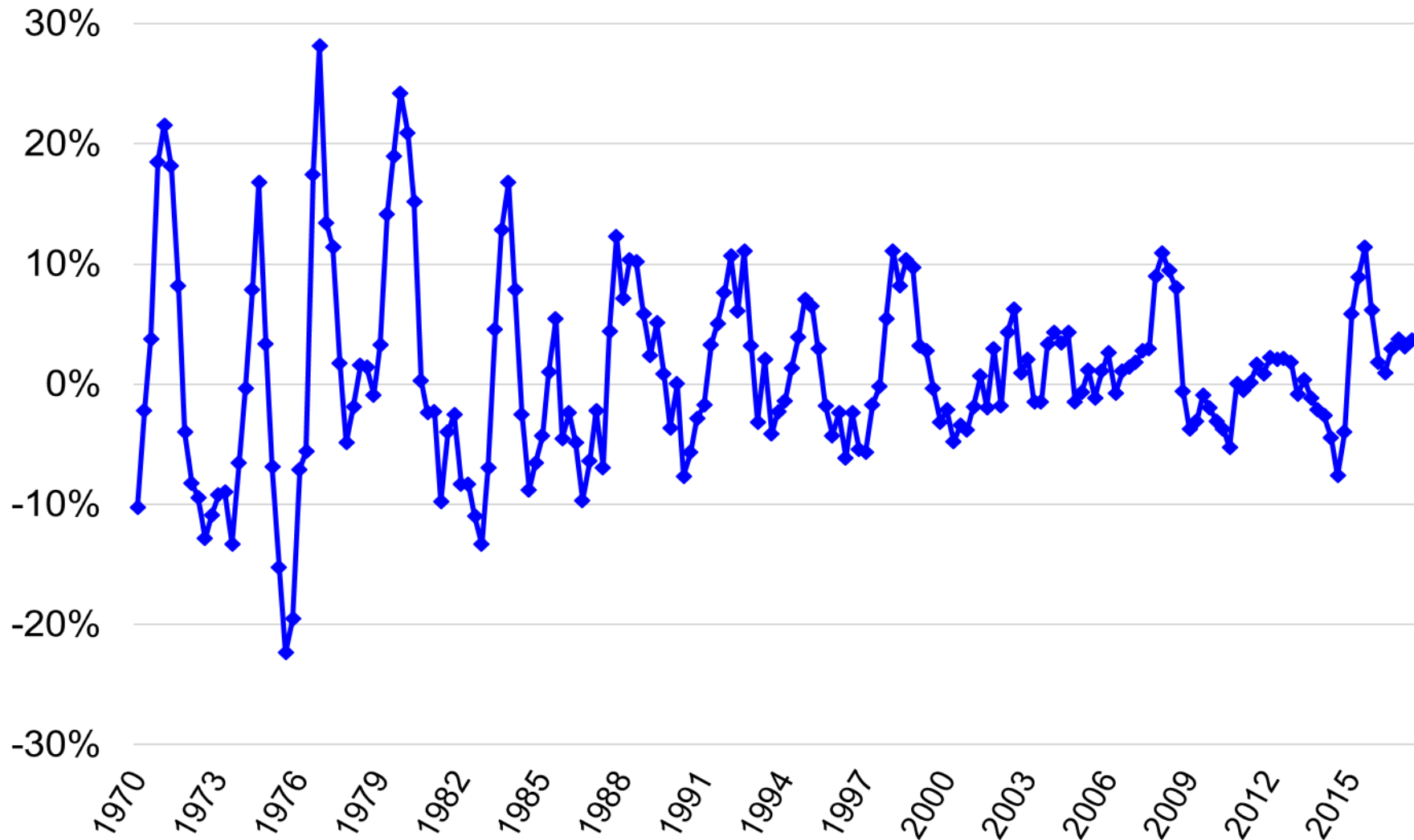
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美国商品猪的屠宰
1970-2017季度数据
U.S. Commercial Hog Slaughter
Quarterly Data, 1970-2017

去年同比%变化
% change from year ago

猪周期
HOG CYCLE

✓ 从顶部到顶部或从底部到底部通常经历3-4年
Runs 3 to 4 years from peak to peak or trough to trough.
- 从育种到上市1年，生产者的加工决定又滞后1年
Caused by 1-year lag from breeding to marketing and another 1-year lag for decision process of producers.
- 生产者的决定和滞后时间的长短，取决于累积的利润率或者是否赔钱Decisions of producers and length of final lag, depends on rate at which profits are accumulated or money is lost.

✓ 1970年代， +/- 20% 的变化是不正常的
During 1970s, changes of +/- 20% were not unusual
- 公司生产的结果就是，市场好的时候"入局"，市场不好的时候"出局"
Result of production by firms that were "in" when conditions were profitable and "out" when conditions were unfavorable.
- 随着技术发展，周期的平缓期也会出现，并且改变行业结构
Flattening of cycle has occurred over time due to technology developments and changes in industry structure.

✓ 生产仍然在变化
Production does still vary
- 利润回归时吸引新的入市者或使现有的生产者可以扩大生产，而负利润则令生产收紧。
Profitable returns attract new entrants or allow existing producers to expand and negative returns drive contraction.
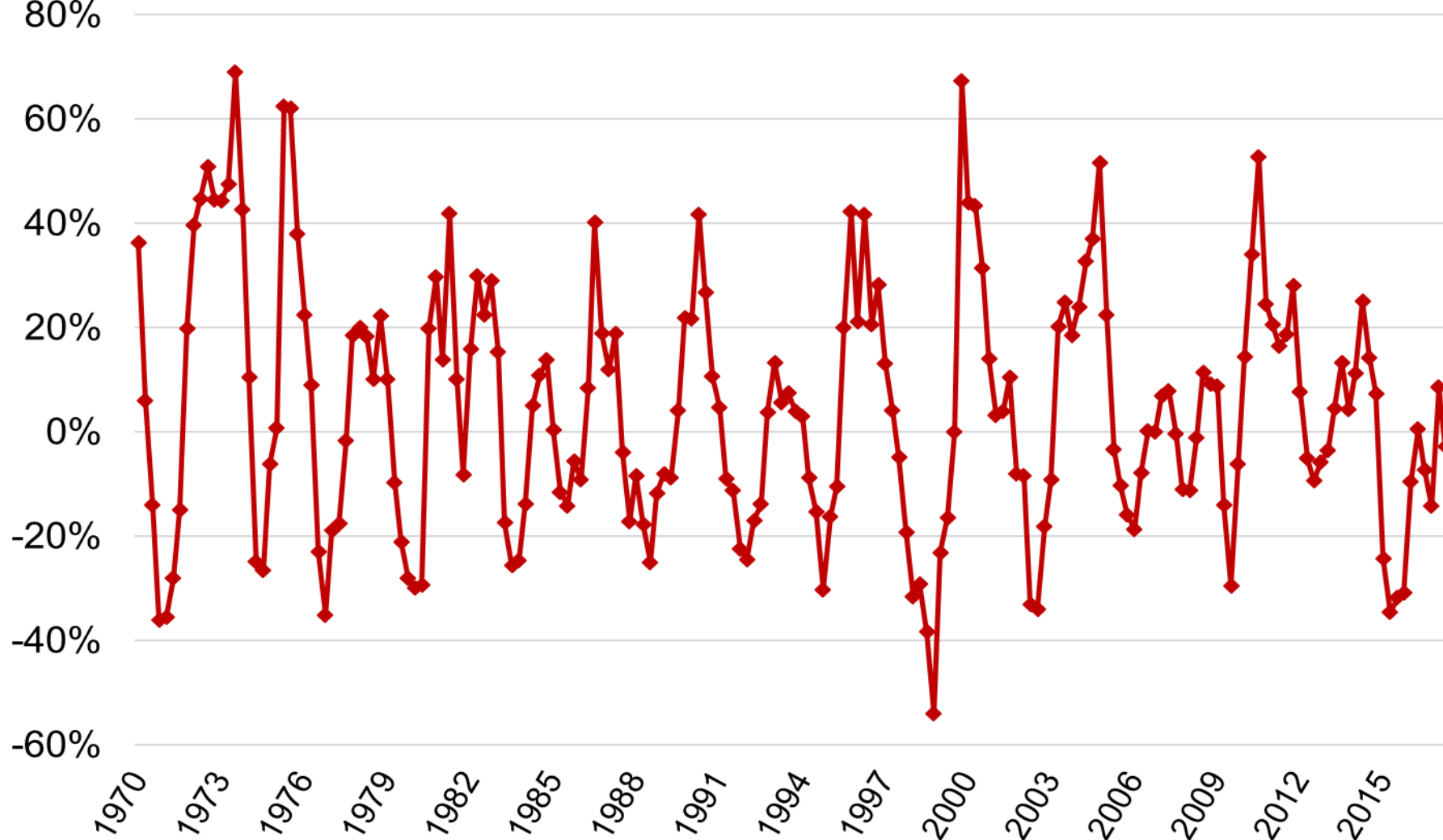
美国农产品集散市场的猪价
1970-2017季度数据
U.S. Terminal Market Hog Price
Quarterly Data, 1970-2017

去年同比%变化

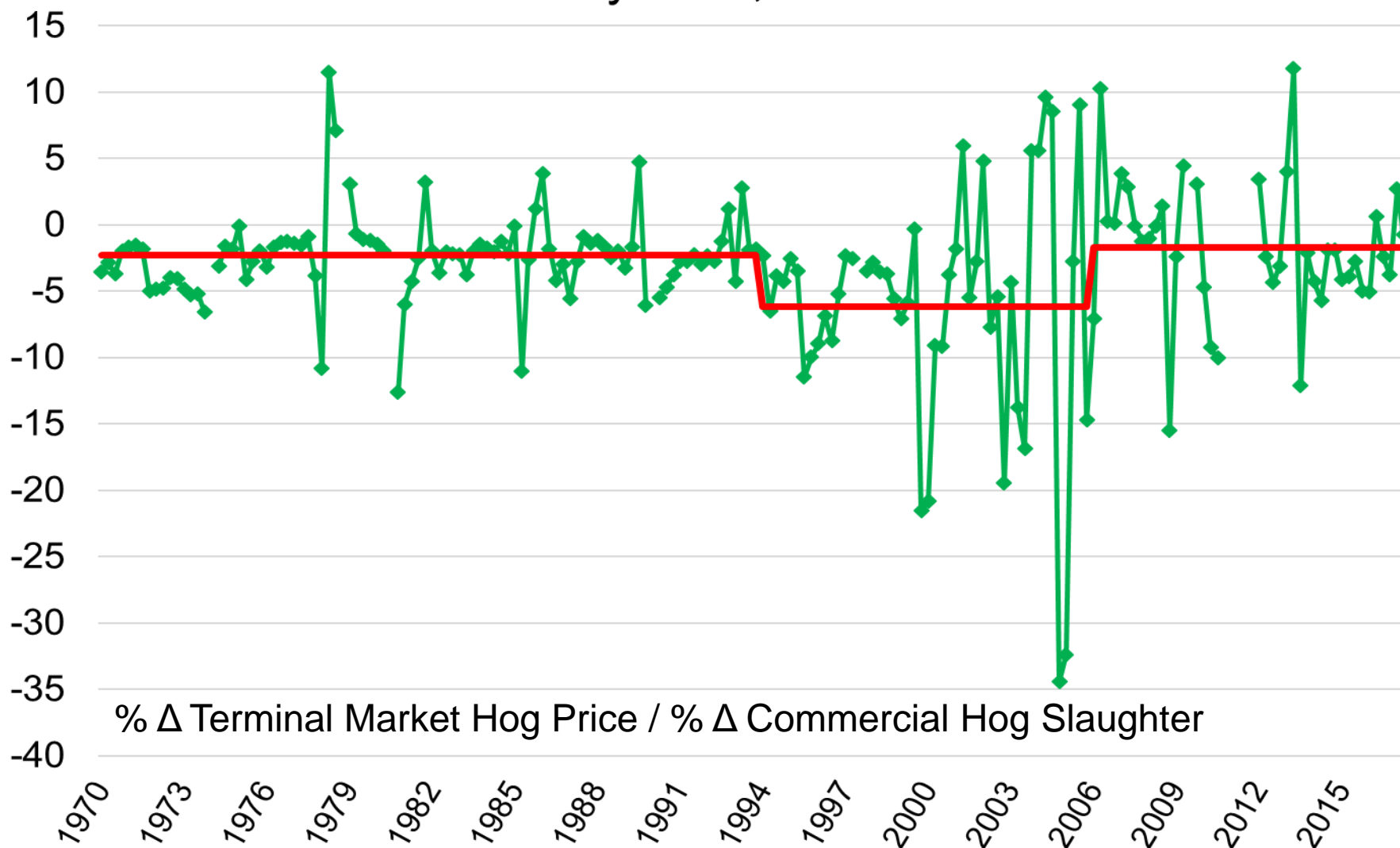% change from year ago

Data Source: USDA-NASS

猪价弹性
1970-2017季度数据
Hog Price Flexibility
Quarterly Data, 1970-2017

% Δ Terminal Market Hog Price / % Δ Commercial Hog Slaughter

Data Source: USDA-NASS

美国生猪日屠宰量平均

Average U.S. Daily Hog Slaughter
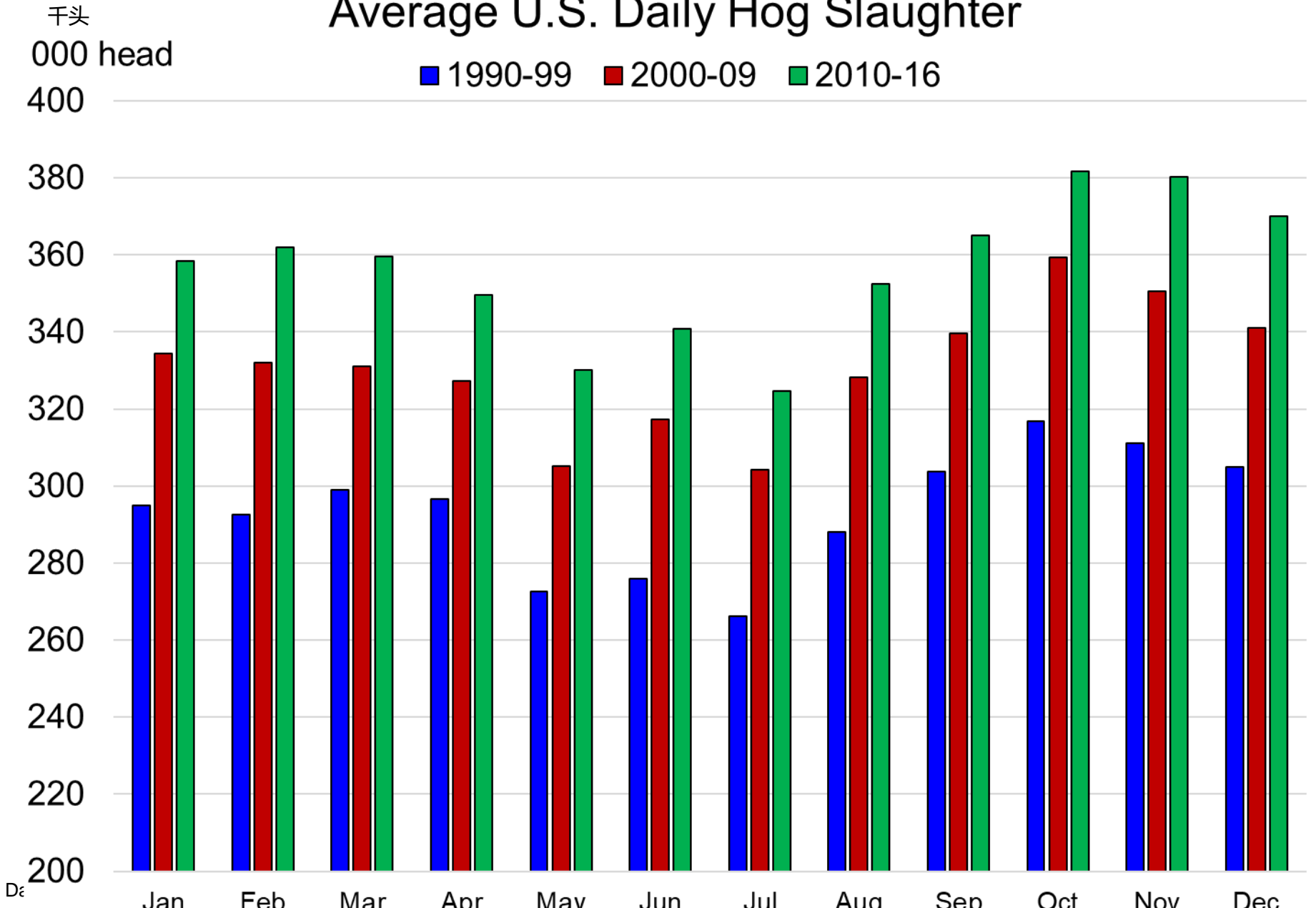
美国联邦预计每周生猪屠宰量
Hog Slaughter, Federally Inspected, Weekly

千头
Thou. head

Avg 2009-13 ‥‥2014 2015 2016 2017

Estimated Fall-2017 Capacity at 5.4 days/week = 2.632 million head/week

Estimated Fall-2016 Capacity at 5.4 days/week = 2.453 million head/week

Data Source: USDA-NASS
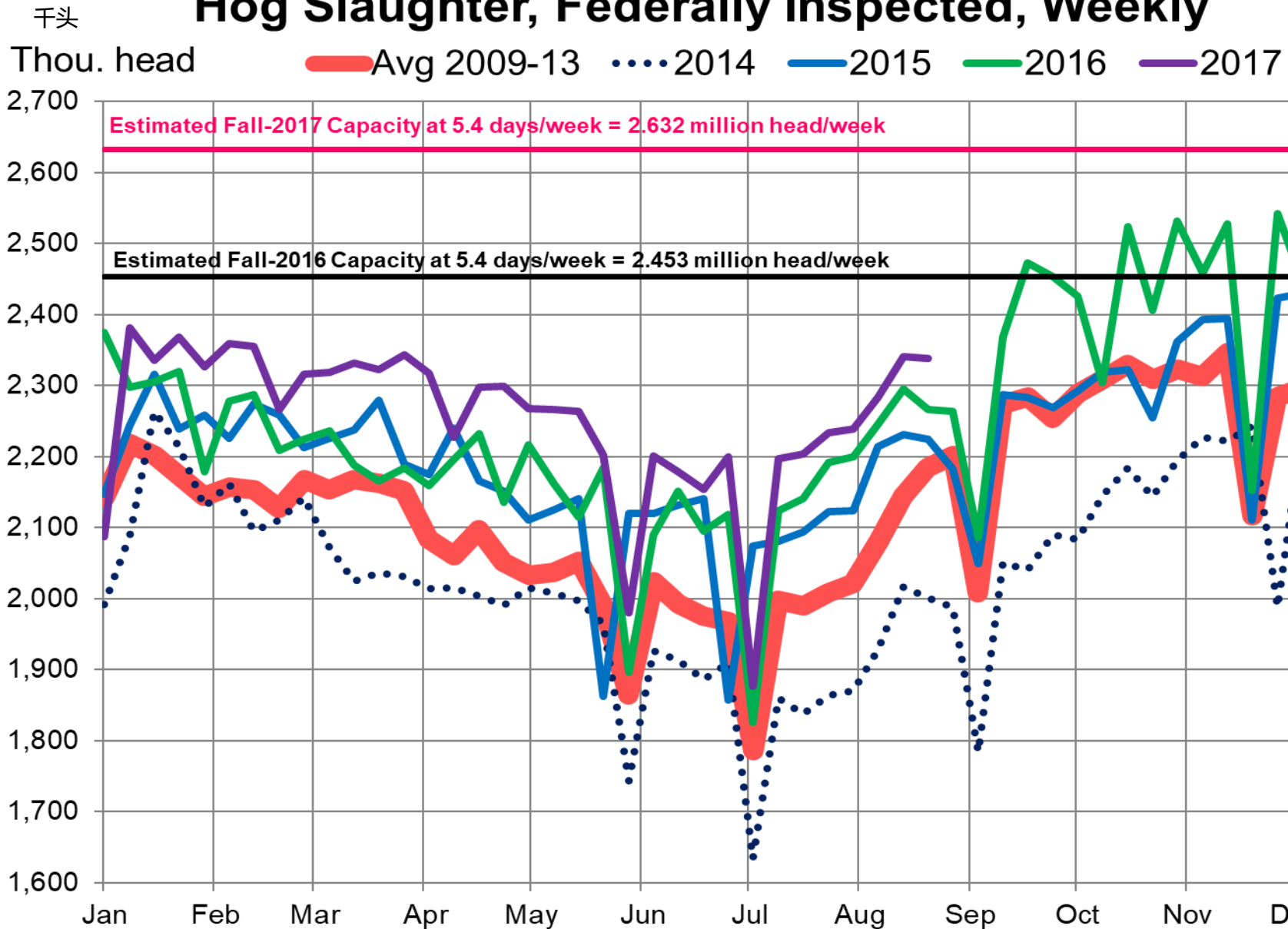
美国去势公猪和青年母猪月平均价格
Average U.S. Monthly Live Barrow & Gilt Price

■ 1990-99 ■ 2000-09 ■ 2010-16

$/cwt

Data Source: USDA-NASS
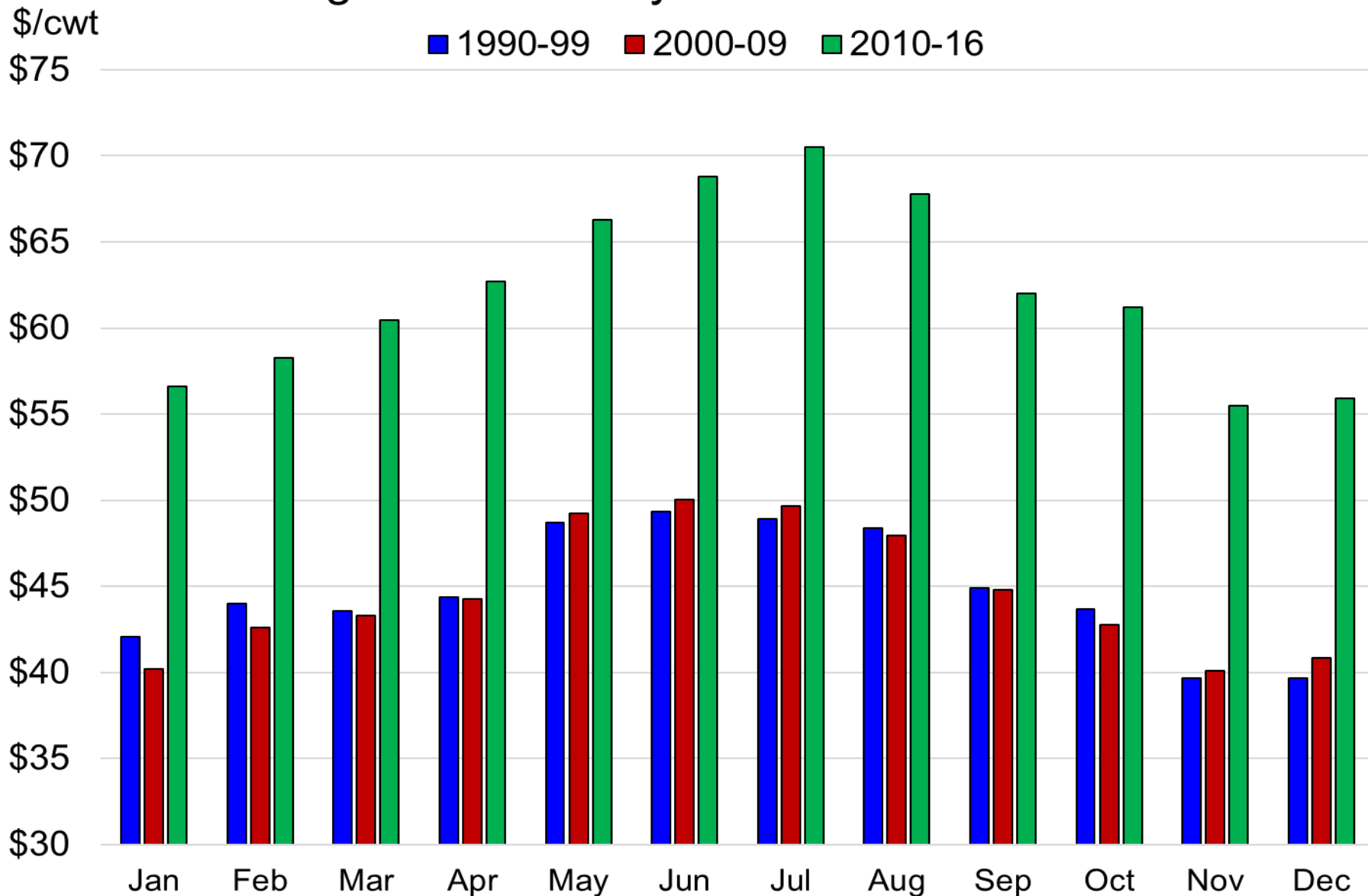
猪周期
HOG CYCLE

7月到11月的变化
July to November Changes

生猪日屠宰量
Daily Hog Slaughter

- 1990s   +17%

- 2000s   +15%

- 2010s   +17%

母猪和小猪价格
Barrow & Gilt Prices

- 1990s   -19%

- 2000s   -19%

- 2010s   -21%

大宗商品价格
COMMODITY PRICES

Data Source: CME Group, USDA-AMS
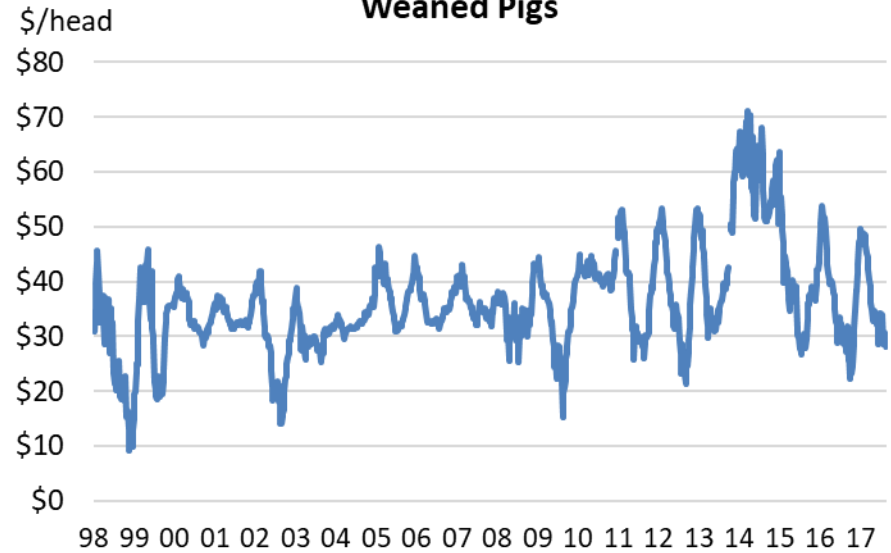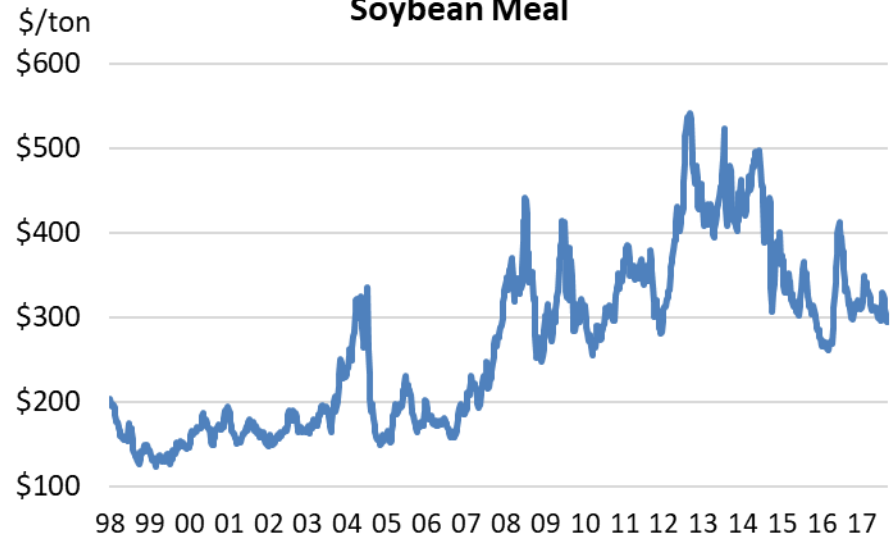
从产仔到育肥的每月成本，艾奥瓦州
历史数据和与期货价格对应的基差
Cost of Farrow to Finish, Monthly, Iowa
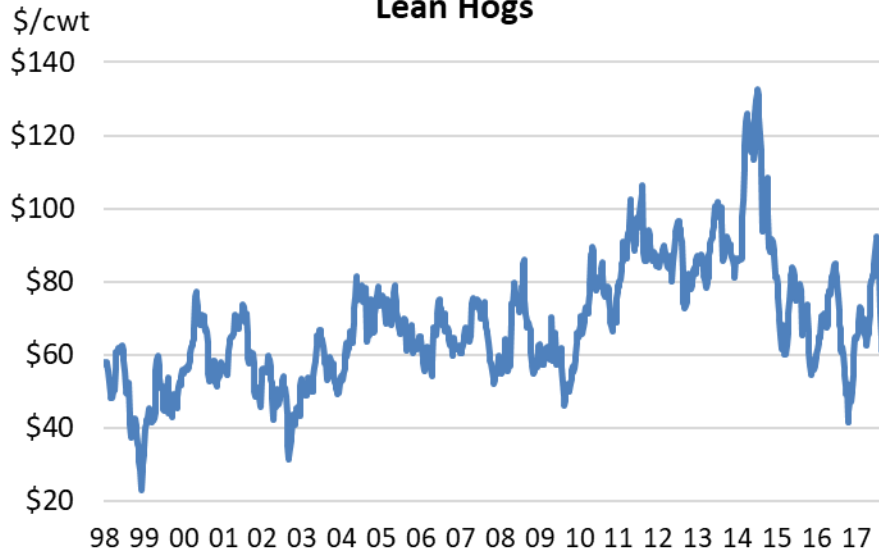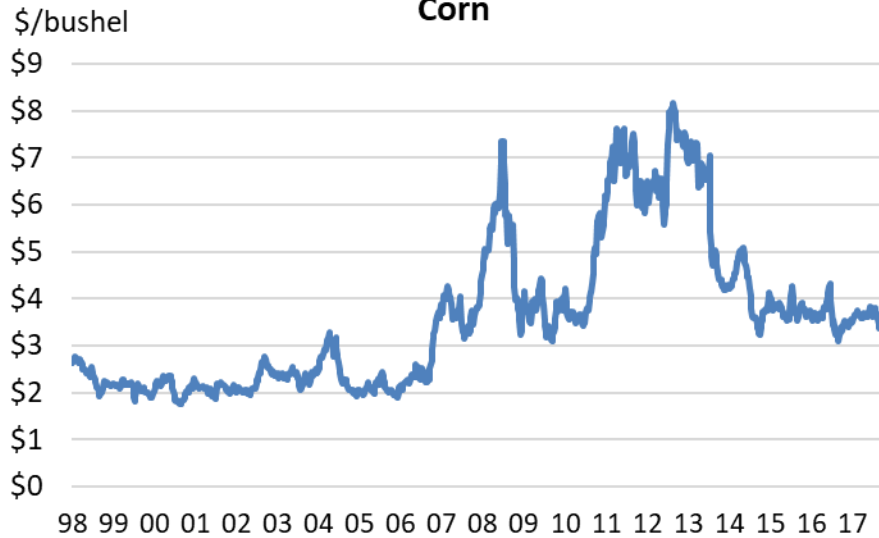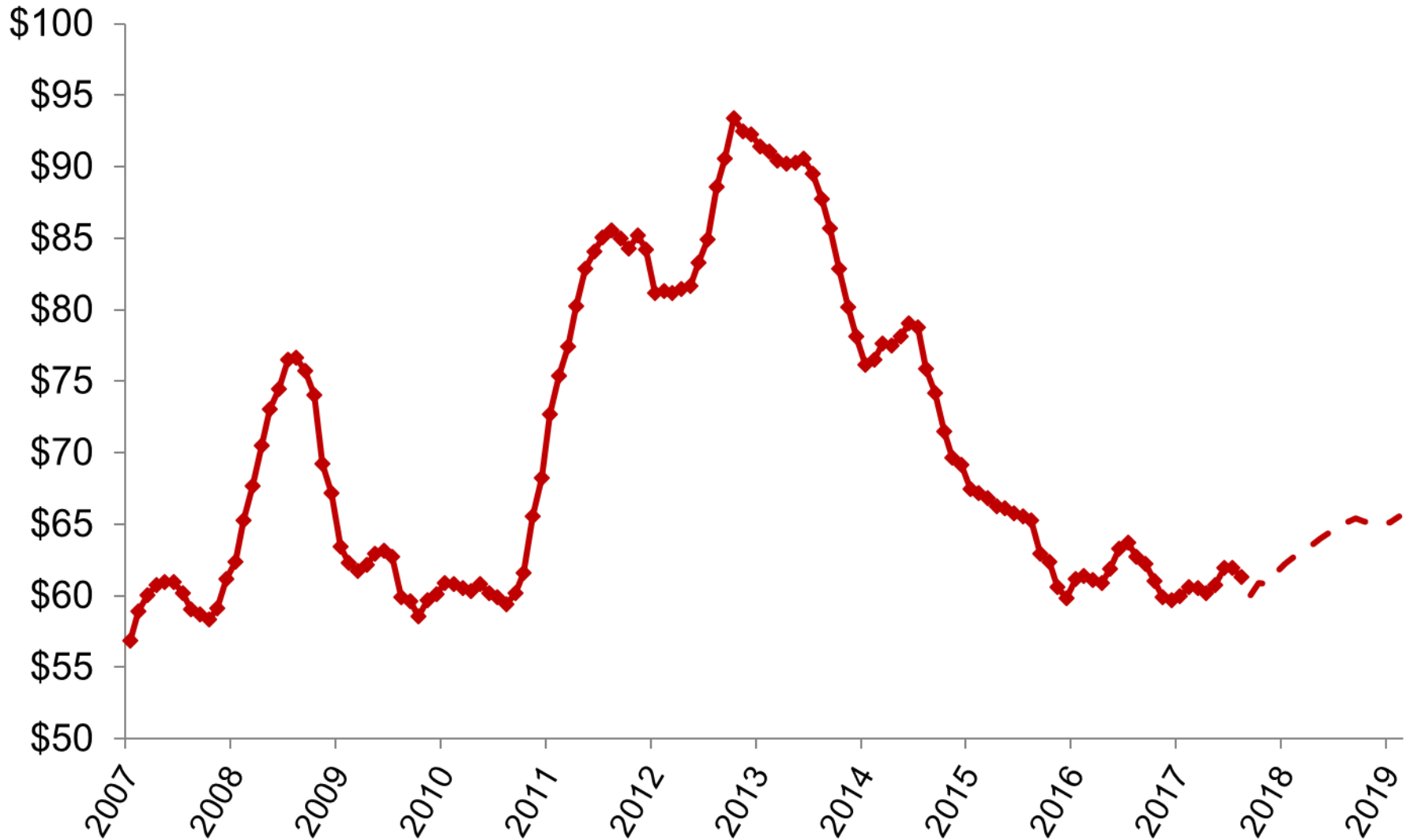## Historical and Projected with Basis Adjusted Futures

$ per carcass cwt

Source: Lee Schulz, Iowa State University

价格决定VS价格发现
PRICE DETERMINATION VS
PRICE DISCOVERY

价格决定- 广义的供求力量互动"决定"或者产生市场价格水平
Price determination - Interaction of the broad forces of supply and demand which "determine" or cause the market price level.

- 猪肉的广义供应因素
  Broad supply factors for pork

  – 投入价格（生猪和母猪、饲料、利率）
    Input prices (hogs and pigs, feed, interest rates)

  – 技术（繁殖、营养管理、动物健康管理）
    Technology (reproduction, nutrition management, animal health management)

  – 从投入到产出价格（零售猪肉产品和食品服务）
    Price of outputs from inputs (pork products for retail and food service)

  – 进口（净进口，取决于汇率及出口国和进口国的供求情况）
    Imports (net of exports, depending on exchange rates and supply-demand conditions in exporting and importing countries)

  – 蛋白竞争价格或主菜产品（牛肉、猪肉、鱼等）
    Prices of competing protein or main-dish products (beef, poultry, fish, etc.)

- 猪肉的广义需求因素Broad demand factors for pork

  – 消费者可支配收入
    Consumer disposable income

  – 消费者口味和偏好（包括健康和营养偏好、产品品类和大小、调味和风味，一致性、方便加工）
    Consumer tastes and preferences (including health and nutrition preferences, type and size of products, seasonings and flavorings, consistency, convenience in preparation)

价格决定VS价格发现
PRICE DETERMINATION VS
PRICE DISCOVERY

价格发现 – 买家和卖家的作用"发现"或就特定数量和质量的生猪在特定时间和地点达成交易价格

Price discovery - Process of buyers and sellers "discovering" or arriving at transaction prices for given qualities and quantities of hogs at a given time or place.

- 影响价格发现的因素
  Factors affecting price discovery

  – **市场结构**
    Market structure
    数量、尺寸、位置和买卖双方的竞争
    Number, size, location, and competitiveness of buyers and sellers

  – **市场信息和价格报告**
    Market information and price reporting
    数量、及时性和信息的可靠性
    Amount, timeliness, and reliability of information

  – **价格市场行为**
    Price Market behavior
    卖家采购和定价方法Buyer procurement and pricing methods

  – **风险管理替代**
    Risk management alternatives

生猪 – 不同生产者类型的农场和销售
HOGS AND PIGS – FARMS AND SALES BY TYPE OF PRODUCER: 2002, 2007, 2012

	2002		2007		2012	
	农场 Farms	销售 Sales	农场 Farms	销售 Sales	农场 Farms	销售 Sales
独立养殖户 Independent grower	86%	41%	87%	41%	85%	46%
订约人或一条龙养殖户 Contractor or integrator	1%	16%	1%	15%	1%	10%
合同养殖户 Contract grower (contractee)	12%	42%	12%	44%	14%	44%

生猪 – 不同机构类型的农场和销售
HOGS AND PIGS – FARMS AND SALES BY TYPE OF ORGANIZATION: 2002, 2007, 2012

	2002		2007		2012	
	农场 Farms	销售 Sales	农场 Farms	销售 Sales	农场 Farms	销售 Sales
个人或家庭 Individual or family	86%	47%	85%	44%	83%	41%
合伙制 Partnership	8%	17%	8%	22%	7%	23%
公司 Corporation	6%	34%	6%	33%	8%	34%
其他 Other	1%	1%	1%	1%	2%	2%

Data Source: USDA-NASS

美国养猪农场和每家农场的猪只数量

U.S. Farms with Hogs and Hogs per Farm

Data Source: USDA-NASS
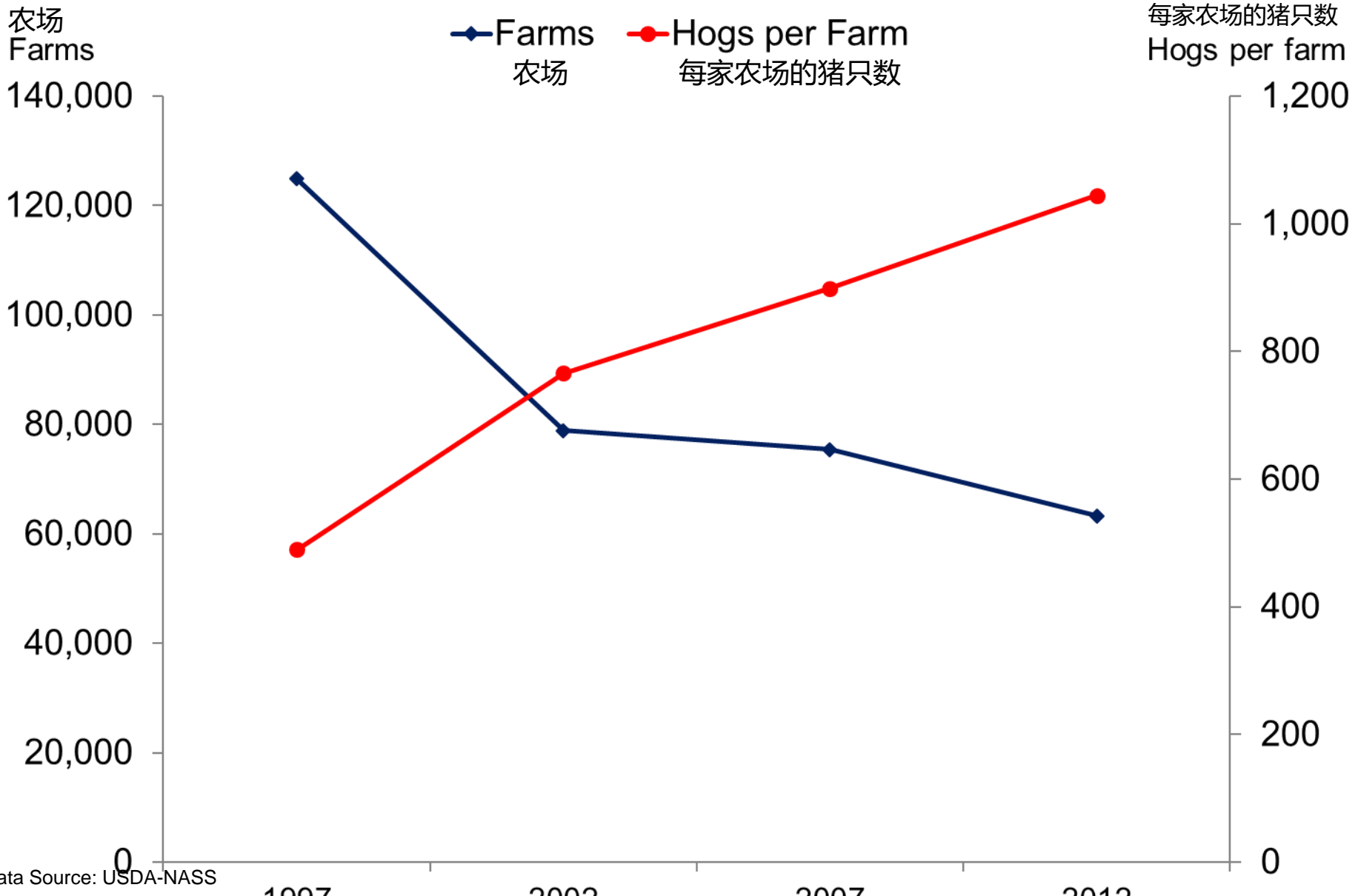
美国猪和猪肉的结构变化
STRUCTURAL SHIFTS IN THE U.S. HOG AND PORK

✓ 在过去20年里，生猪生产增加了约20%
Hog production increased some 20% during the past 20 years.

✓ 过去20年的猪肉生产增加了40%多，生猪产量和胴体重量同时提高
Pork production increased more than 40% during the past 20 years through both increased hog production and increased carcass weights.

✓ 包装企业扩大规模，很多企业提高集中度和垂直管理，主要的投资和变化都在于改善物流链的管理
Packing firms have increased size, in many instances increased concentration, vertically integrated, and made major investments and changes in processing to improve supply chain management.

✓ 协议贸易被公式定价、远期市场及更长期的市场合约快速取代，还有一个变化是趋向用猪肉价格来定猪价
Negotiated trade has been rapidly replaced by formula pricing, forward markets, longer term marketing agreements, and there is an ongoing shift towards pricing hogs using pork values.

定义- 协商贸易
Definitions – Negotiated
USDA-AMS

协议现货 – 现货或者现货市场采购是基于买卖双方沟通的底价以及约定的交货日期且计划交货不超过约定当天后的14天

NEGOTIATED CASH - Cash or spot market purchase under which the base price is determined by seller-buyer interaction and agreement on a delivery day and are scheduled for delivery no more than 14 days after the date committed.

协议公式 – 生猪或者猪肉市场的公式由按批次协商计划交货不超过约定当天和保证的猪只数量后的14天

NEGOTIATED FORMULA - Swine or pork market formula determined by negotiation on a lot-by-lot basis and scheduled for delivery not later than 14 days after the date on which the formula is negotiated and swine are committed.

定义 – 公式
Definitions – Formula
USDA-AMS

其他市场公式
OTHER MARKET FORMULA

基于一个或多个期货或期权的定价机制 Pricing mechanism is a formula price based on one or more futures or options contracts.

生猪或猪肉市场定价公式
SWINE OR PORK MARKET FORMULA –
价格基于生猪或猪肉市场价格，而不是基于生猪相关的期货或期权
Pricing mechanism is a formula price based on a market for swine, pork, or a pork product, other than a future or option for swine, pork, or a pork product.
- **适用于97%的美国猪肉产值**
  E.g., 97% of national pork cutout value.

其他购买合同
OTHER PURCHASE AGREEMENT Not a negotiated purchase, swine or pork market formula purchase, negotiated formula purchase, or other market formula purchase; and does not involve packer-owned swine.

- E.g., Floor Price (FP) set by COP; Floor published at the end of each month; Ceiling Price (CP) = FP + $5, If Market Price (MP) < FP, then Base Price = FP; If MP > CP, then Base Price = 93% MP.

定义 – 公式
Definitions – Formula
USDA-AMS

基准价格 - 无折扣，无溢价
BASE PRICE – Price from which no discounts are subtracted and no premiums are added.

净价格 - 包含溢价和折扣的送至猪肉加工厂的每100磅酮体猪肉的价格 （主要基于猪肉品质）
NET PRICE – Total amount paid (including all premiums, less all discounts) per hundred pounds of carcass weight of swine delivered at the packing plant.
E.g., Sort loss, backfat, loin area/depth, carcass weight differentials.

非酮体特质溢价 -基于其他因素而非酮体的品质而产生的溢价 （比如无抗生素，送货及时，动物福利， 饲料配比，猪舍环境等）
NONCARCASS MERIT PREMIUM – Increase in base price based on any factor other than the characteristics of the carcass, if the actual amount of the premium is known before the sale and delivery of the swine.

- E.g., Transportation, delivery time, beta agonist free, animal welfare, antibiotic free, diet/feed, genetics, meat quality, process verified program, sow housing.
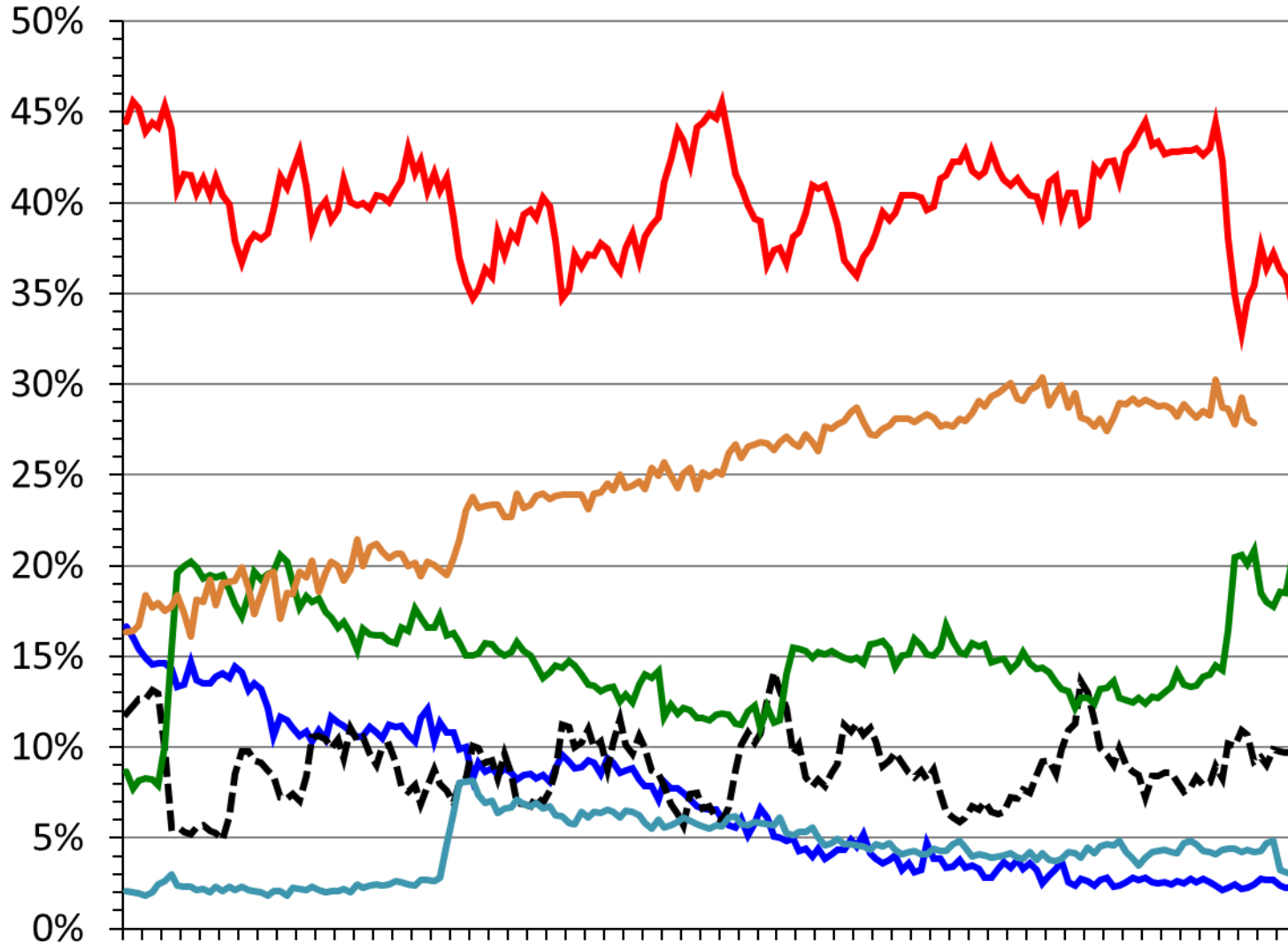
通过交易卖出的猪只
全国，每月
HOGS SOLD BY TRANSACTION
National, Monthly

Percent

Legend:
- Negotiated Purchases
- Other Market Formula
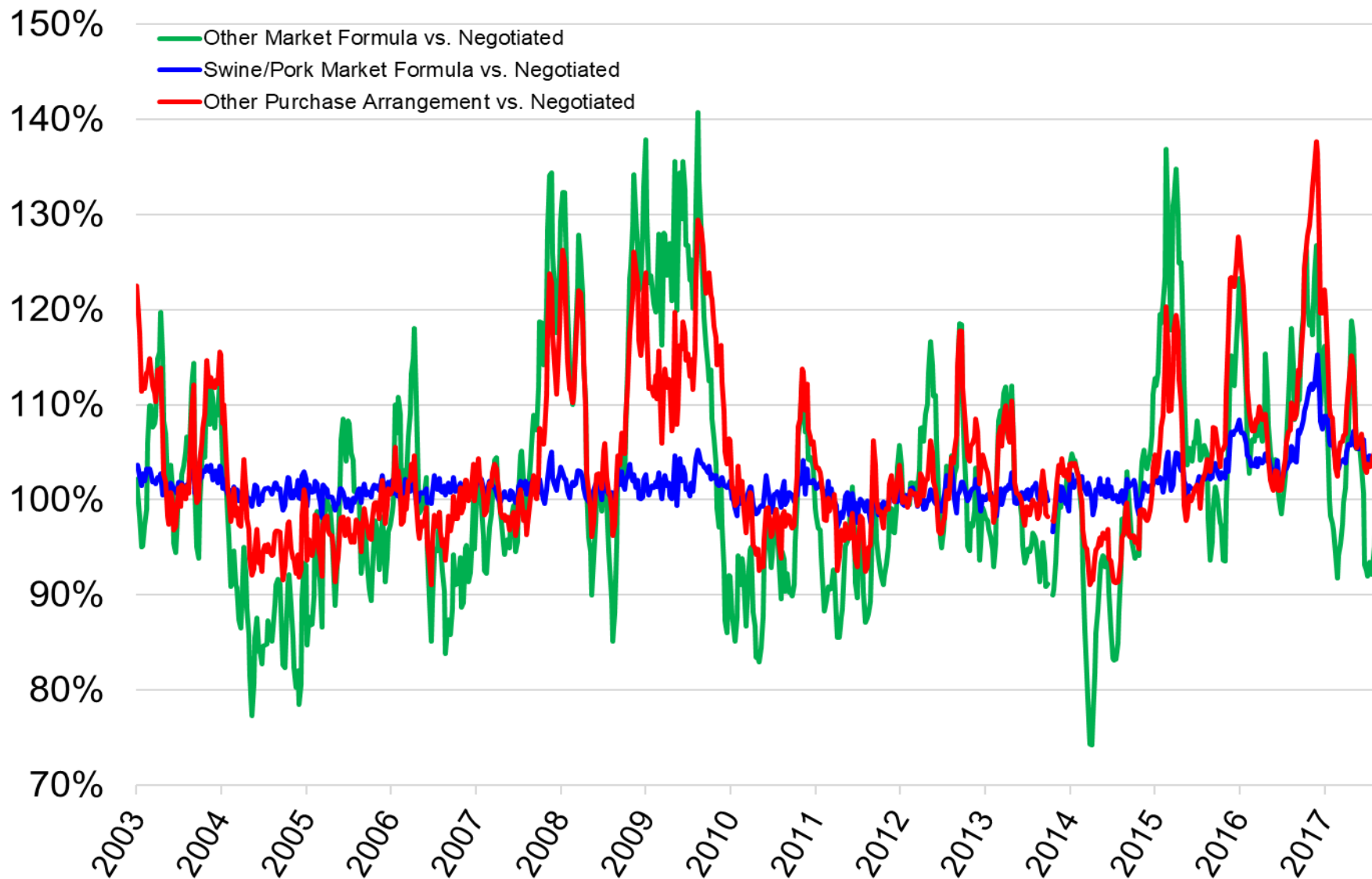- Swine or Pork Mkt Formula
- Other Purchase
- Packer Sold
- Packer Owned

通过交易卖出的猪只
全国，平均净价

Premium of Lean Hog Marketing Arrangements vs. Negotiated Market
National, Average Net Price, LM_HG201

Legend:
- Other Market Formula vs. Negotiated
- Swine/Pork Market Formula vs. Negotiated
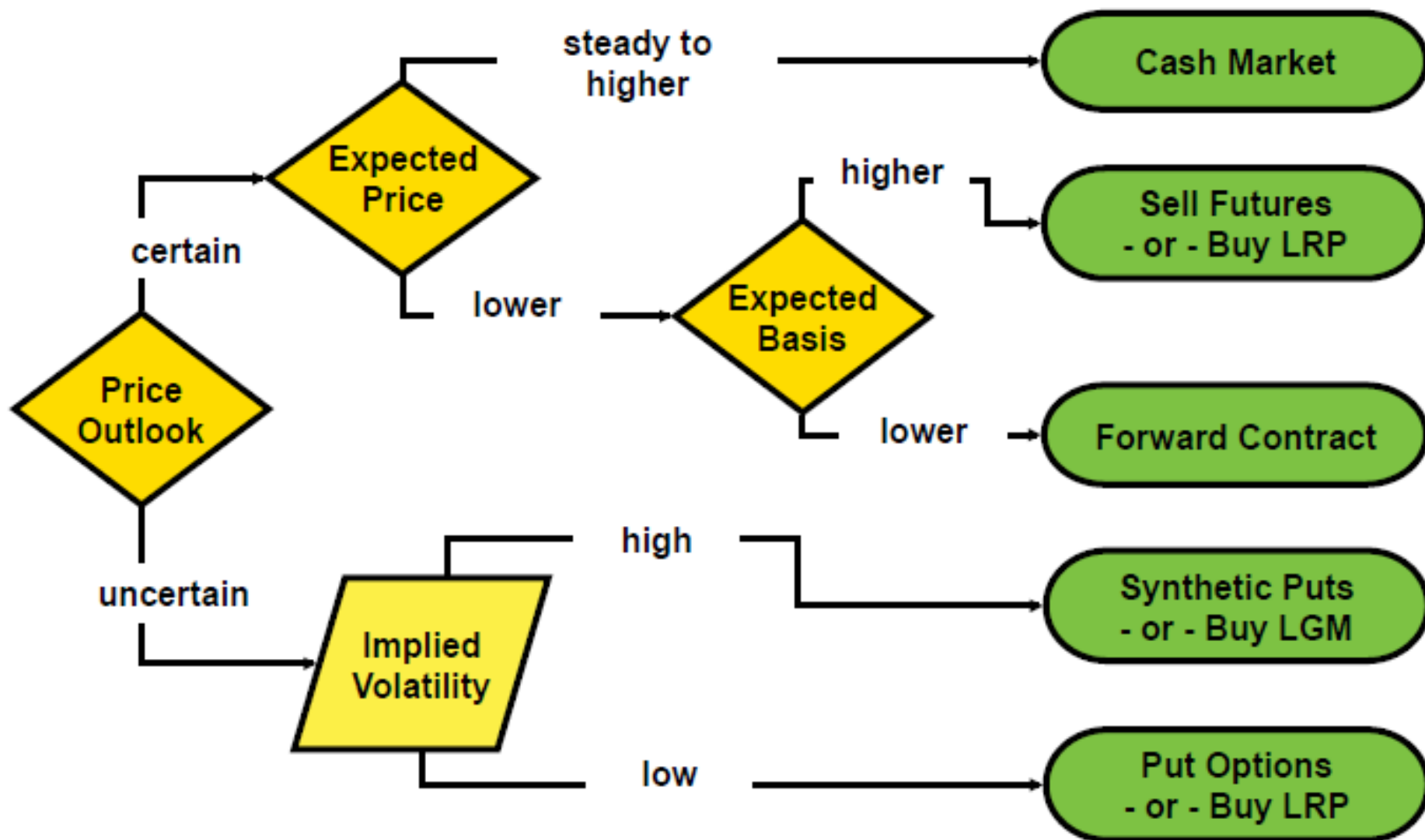- Other Purchase Arrangement vs. Negotiated

Data Source: USDA-AMS

价格风险管理的经济学
ECONOMICS OF PRICE RISK MANAGEMENT

✓ 价格风险管理定义 – 协调和策略在经济上的应用来最小化、监控和控制价格反向移动的可能性
  Price risk management defined → Coordinated and economical application of strategies to minimize, monitor, and control the probability of adverse price movements.

✓ 管理同期价格风险很困难（如：风险容忍、随机、动态）
  Managing year-to-year price risk is difficult
  (e.g., risk tolerance, stochastic, dynamic).

✓ 关于价格风险管理，用分析来建构模型和评估可替代的策略（基于实际或者准确的生产成本预测）
  Analyses used to construct models and evaluate alternative strategies regarding price risk management.
  (based on actual or accurately estimated production costs)

✓ 任何策略都不会一直是最好的策略
  No one strategy is best all the time.

✓ 检验策略表现是否和市场目标相关
  Check performance relative to marketing goals.

选择风险管理策略
CHOOSING FROM RISK MANAGEMENT STRATEGIES

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Department of Economics

Estimated Livestock Returns   http://www2.econ.iastate.edu/estimated-returns/

A monthly barometer of livestock profitability

For questions or comments contact
Lee Schulz
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Phone: 515-294-3356

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Estimated Returns - Swine

- Farrow to Finish (chart | MS Excel)
- Farrow to Wean (chart | MS Excel)
- Wean to Feeder (chart | MS Excel)
- Wean to Finish (chart | MS Excel)
- Feeder to Finish (chart | MS Excel)

Estimated Returns - Cattle

- Finishing Steer Calves (chart | MS Excel)
- Finishing Yearling Steers (chart | MS Excel)

Comparison of Estimated Returns - Current vs. Previous Procedures

- Farrow to Finish
- Wean to Finish
- Finishing Steer Calves
- Finishing Yearling Steers

Procedures for Estimating Returns

- Farrow to Finish
- Farrow to Wean
- Wean to Feeder
- Wean to Finish
- Feeder to Finish
- Finishing Steer Calves
- Finishing Yearling Steers

Historical Estimated Results

- Historical Estimated Results (1991-2015)

Links

Basis - Feeder Cattle

Feeder Steer-Heifer Price Spread

Basis - Live Cattle

Basis - Lean Hog

从产仔到育肥的回报预测，艾奥瓦州

Estimated Returns to Farrow to Finish, Iowa
Past and Projected with Basis Adjusted Futures

2013 = +$6.21   [-$25.60 to +$24.57]
2014 = +$61.85   [+$13.15 to +$107.25]
2015 = +$7.93   [-$18.40 to +$26.25]
2016 = -$1.26   [-$35.52 to +$32.92]
2017[f] = +$12.55 [-$9.51 to +$47.62]
2018[f] = +$3.55   [-$16.32 to +$22.87]

Projected 9/6/17

$ per head

Month

Source: Lee Schulz, Iowa State University
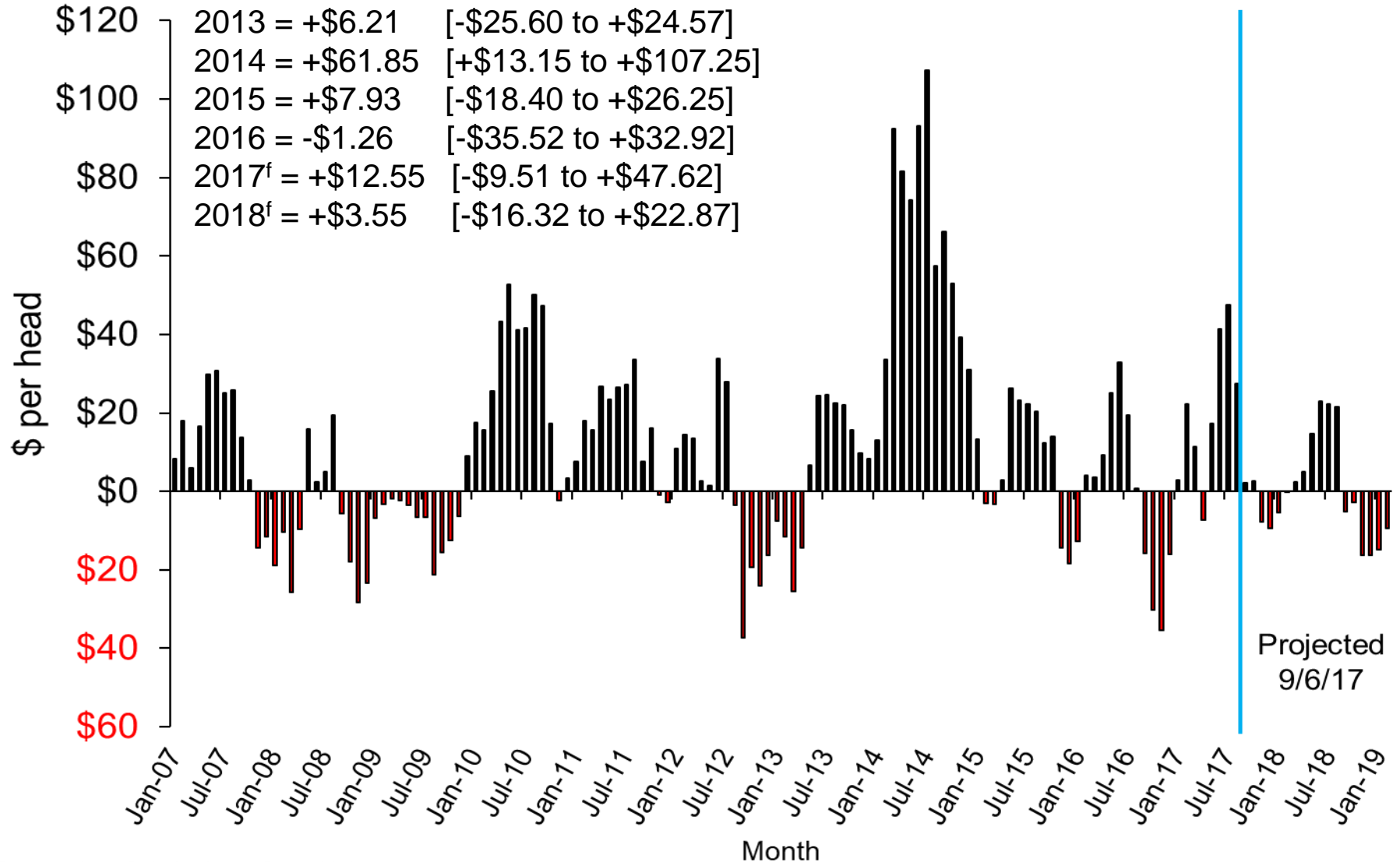
从产仔到育肥的回报预测，艾奥瓦州
2007年1月-2016年12月
ESTIMATED RETURNS TO FARROW TO FINISH, IOWA
JANUARY 2007 – DECEMBER 2016, MONTHLY

	Months of				Profit/Loss		Months
Month sold	Profit	Loss	Sum		Over $50.00	=	8.3%
January	60%	40%	100%		$25.01 to $50.00	=	17.5%
February	60%	40%	100%		$20.01 to $25.00	=	6.7%
March	60%	40%	100%		$15.01 to $20.00	=	10.0%
April	70%	30%	100%		$10.01 to $15.00	=	6.7%
May	90%	10%	100%		$5.01 to $10.00	=	7.5%
June	90%	10%	100%		$0.01 to $5.00	=	8.3%
July	90%	10%	100%		-$0.01 to -$5.00	=	8.3%
August	80%	20%	100%		-$5.01 to $10.00	=	5.8%
September	60%	40%	100%		-$10.01 to $15.00	=	6.7%
October	60%	40%	100%		-$15.01 to -$20.00	=	6.7%
November	20%	80%	100%		-$20.01 to $25.00	=	2.5%
December	40%	60%	100%		Over -$25.00	=	5.0%

During the 2007-2016 period the range in profits was
-$37.37 to $107.25

During the 2007-2016 period
65.0% of the months were profitable and
35.0% of the months were unprofitable

Cash Market
## 2007 – 2016 profit = $11.91 per head

2007-2016年瘦肉猪获利机会频次
FREQUENCY OF PROFITABLE HEDGING OPPORTUNITIES FOR LEAN HOGS, 2007-2016

✓ 瘦肉生猪期货在生猪卖出前提供了锁定卖出的价格
  Lean hog futures offer an opportunity to lock-in a selling price prior to when hogs are sold.
  - 期货提前18个月交易
    Traded approximately 18 months into the future.
  - 不仅仅依赖于出售当天的现货市场
    Not relying solely on cash market the day of sale.

✓ 分析比较了10个月期间的产仔到育肥的预测生产成本和销售前的对应每日期货的基差来确定获利套保日期的频次
  Analysis compares estimated cost of production for farrow to finish to basis adjusted daily futures prices over a 10-month period prior to sale to determine the frequency of days that a profit could have been hedged.

✓ 更多信息请登录：
  More information available at:
  https://www.extension.iastate.edu/agdm/livestock/html/b2-53.html

2007-2016年盈亏平衡和套保较好的天数百分比
Percent of Trading Days Breakeven or Better Hedge, 2007-2016

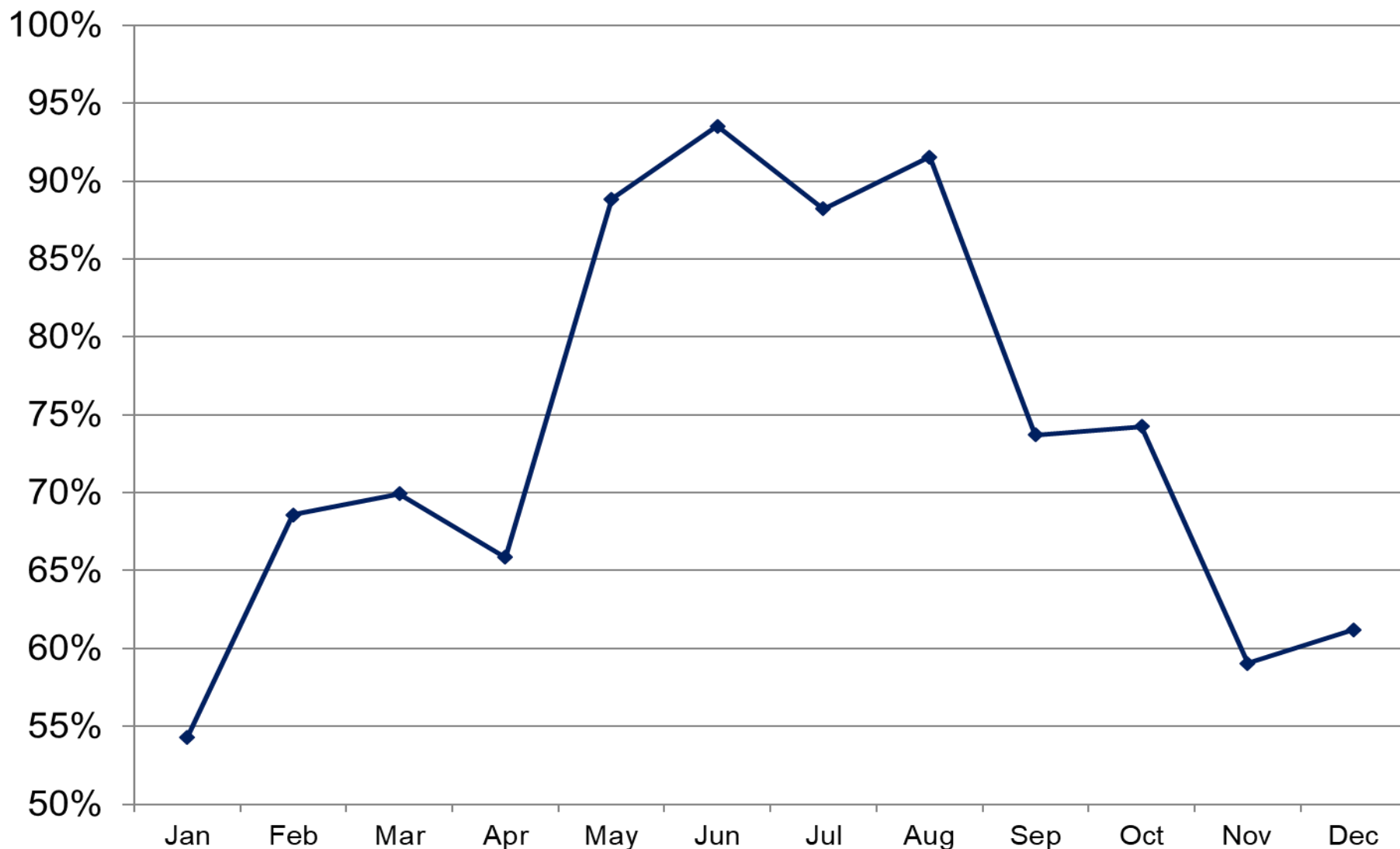▬ Breakeven or Better Hedge　　──Cash Price　　──Breakeven Price

% of trading days

平均Average = 74% of days prior to sale

Price, $/cwt
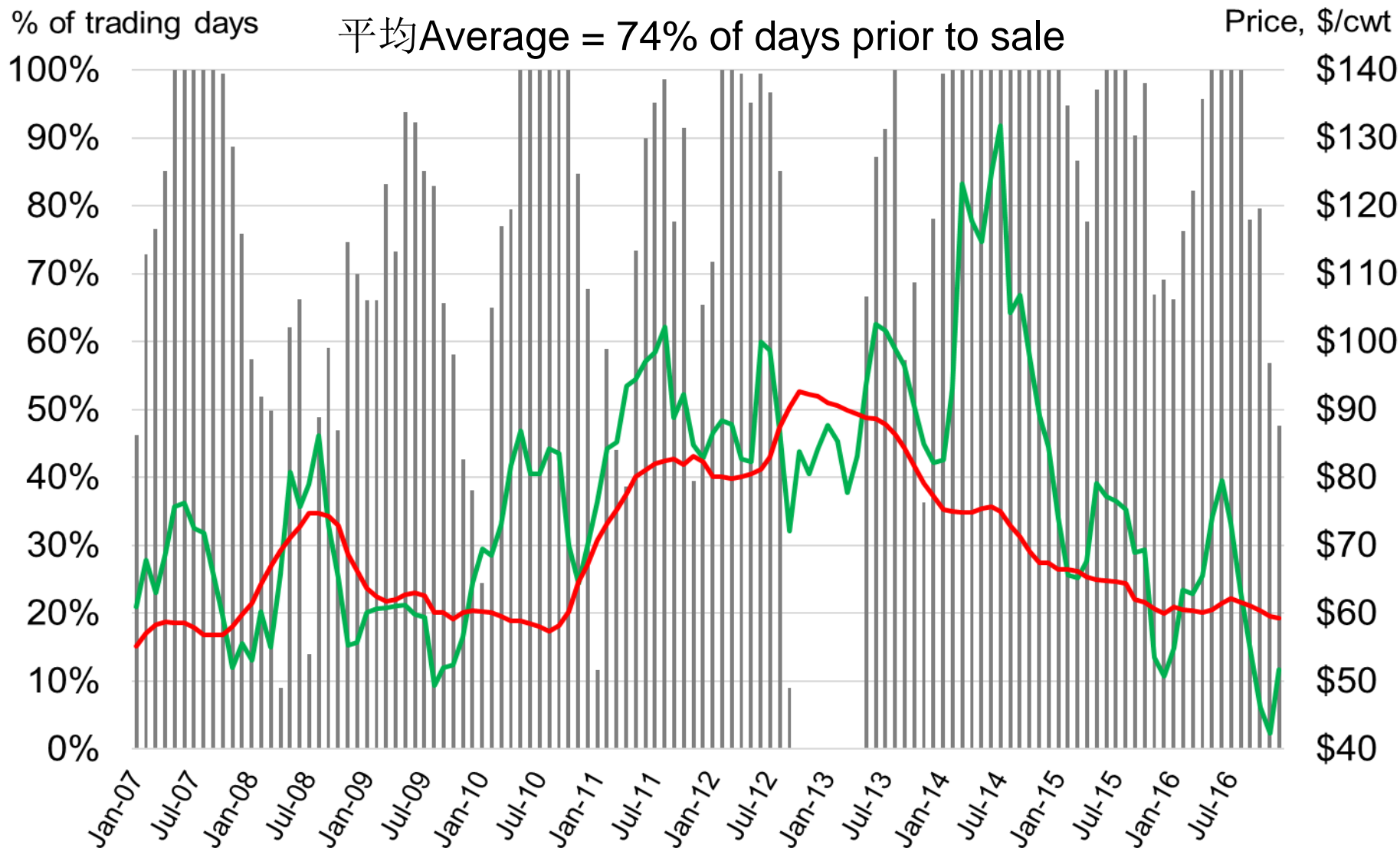
2007-2016分月份盈亏平衡和套保较好的天数百分比

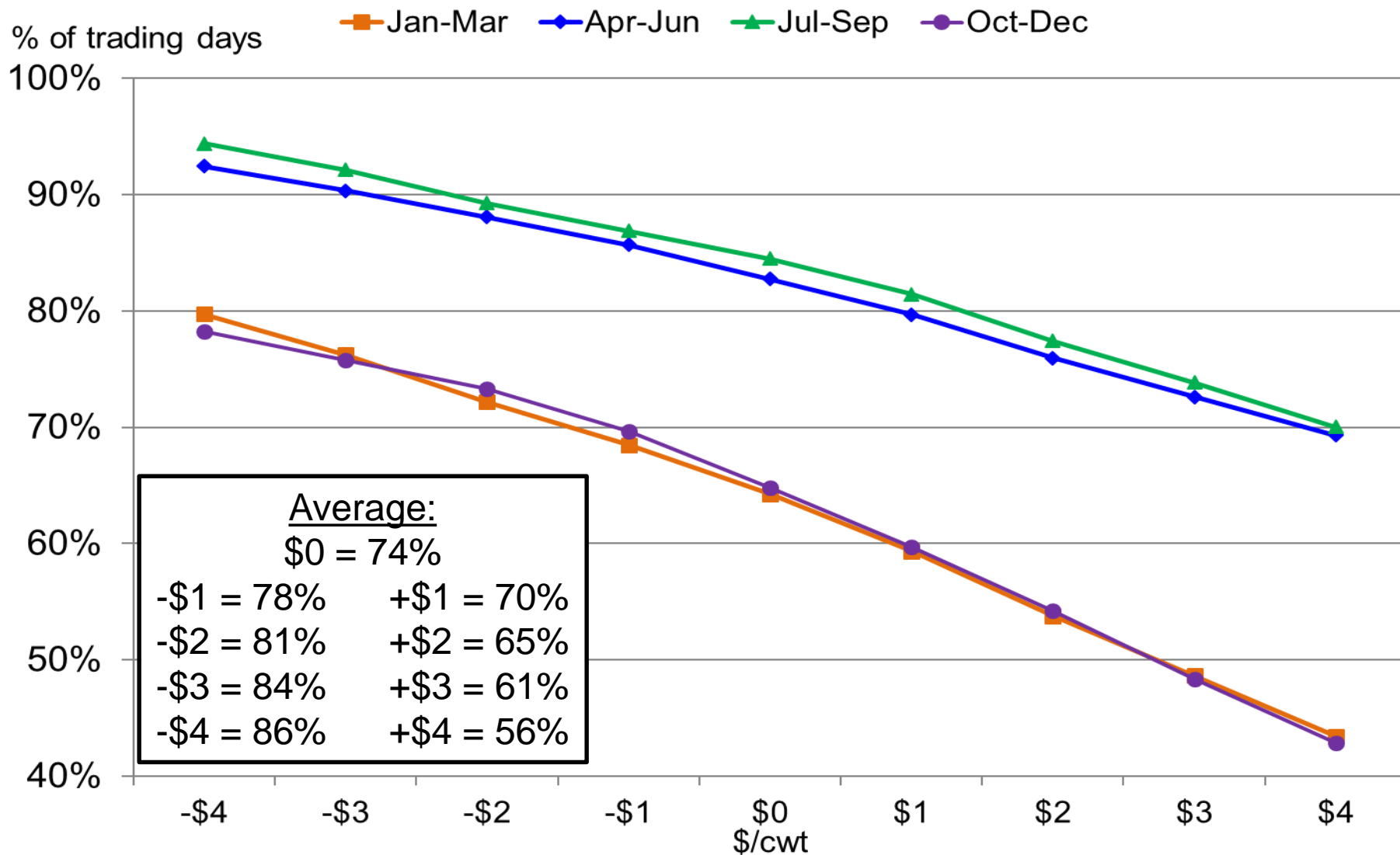## Percent of Trading Days Where Possible to Hedge Breakeven or Better
By Month, 2007-2016

## 2007-2016分季度套保价格X美元或以上的百分比
Percent of Trading Days Where $X or Better Could be Hedged
By Quarter, 2007-2016

Legend: ■ Jan-Mar ◆ Apr-Jun ▲ Jul-Sep ● Oct-Dec

% of trading days

Average:
$0 = 74%
-$1 = 78%   +$1 = 70%
-$2 = 81%   +$2 = 65%
-$3 = 84%   +$3 = 61%
-$4 = 86%   +$4 = 56%

$/cwt

2007-2016生猪养殖（断奶至育肥）利润

Crush Margin: Last Day, Average, Placement
2007-2016

$/head

—Placement　—Last Day　—Average

卖出，最后一天，平均

More information available at: http://www2.econ.iastate.edu/margins/
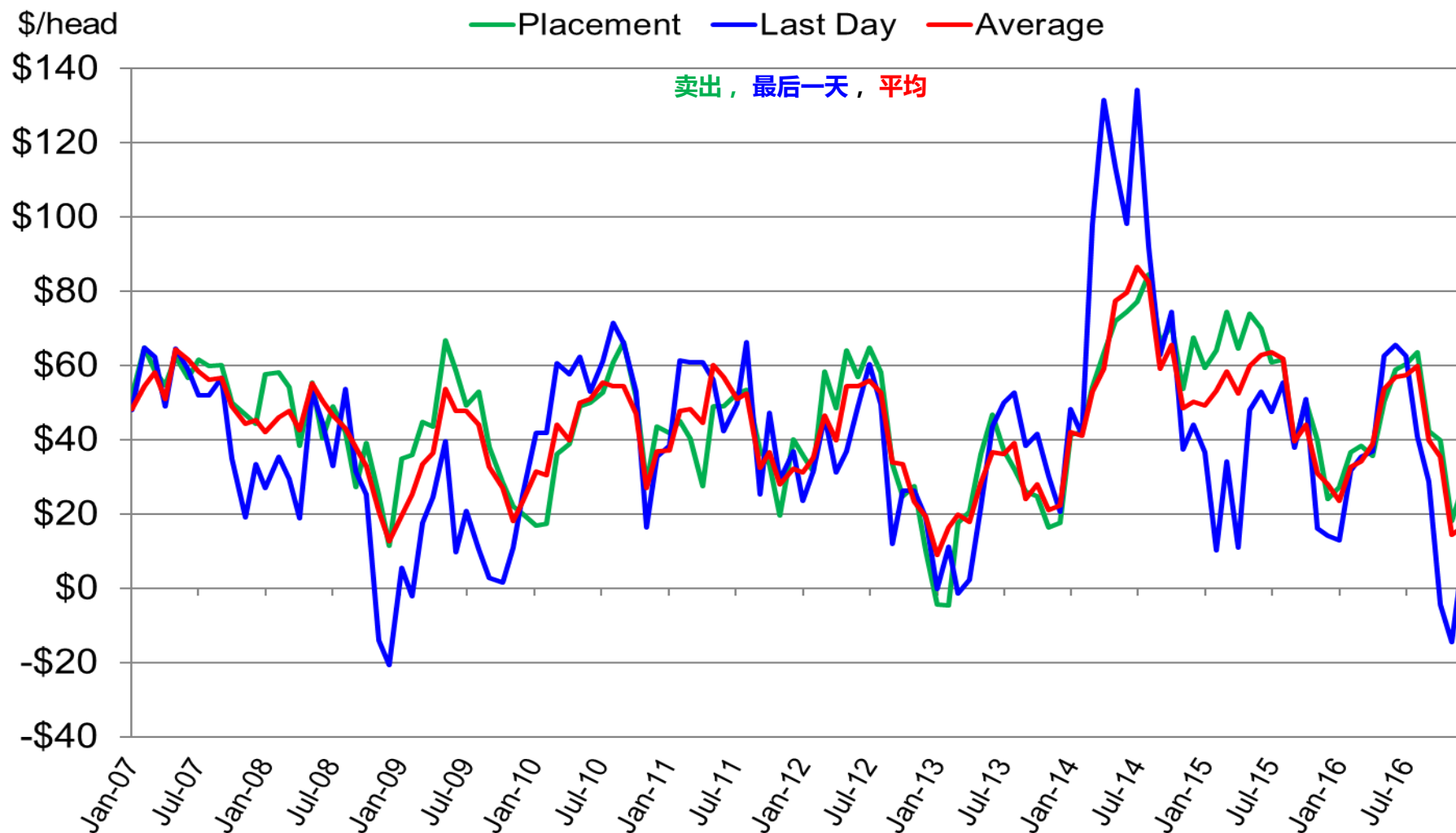
按卖出月份生猪养殖利润
Swine MARGIN BY SELLING MONTH ($/HEAD)
JANUARY 2007 — DECEMBER 2016

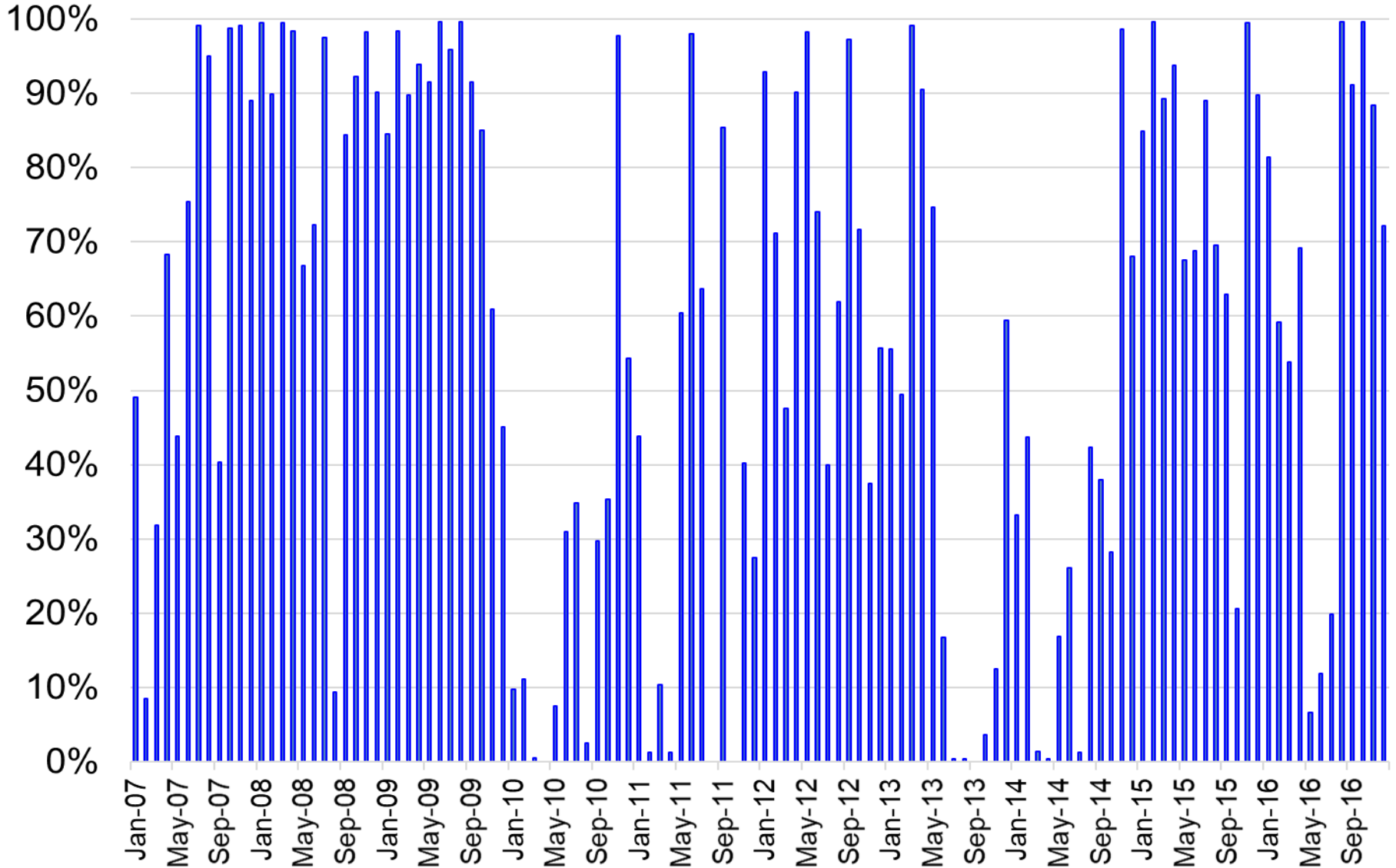|	Average	High	Low	At Placement	Last Day	Before Placement	After Placement
Jan	$33.34	$51.14	$15.52	$36.20	$28.19	$39.63	$41.51
Feb	$38.21	$57.99	$16.99	$39.10	$32.69	$46.79	$46.26
Mar	$44.33	$64.52	$23.63	$47.68	$44.29	$49.72	$53.31
Apr	$42.24	$64.56	$20.29	$43.53	$42.33	$49.61	$48.60
May	$55.68	$76.24	**$36.48**	**$57.91**	$55.87	$60.86	**$64.60**
Jun	$55.79	**$76.29**	$34.74	$56.09	$51.74	**$62.25**	$63.82
Jul	**$55.83**	$75.88	$35.62	$56.48	**$57.12**	$61.30	$64.60
Aug	$54.60	$72.44	$34.06	$56.92	$54.43	$59.78	$63.09
Sep	$41.43	$59.71	$22.85	$43.53	$36.19	$47.51	$49.26
Oct	$39.90	$58.49	$19.00	$41.32	$35.03	$47.91	$46.80
Nov	<u>$27.64</u>	<u>$45.54</u>	$5.73	<u>$29.66</u>	<u>$15.67</u>	<u>$36.61</u>	<u>$33.14</u>
Dec	$28.62	$50.36	<u>$4.70</u>	$30.54	$21.46	$38.98	$33.14

Notes: **Bold** text indicates the highest value and <u>underlined</u> indicates the lowest value

2007-2016分月份利润高于最后一天市价的交易日百分比

Average = 58% of days prior to sale , 2007-2016
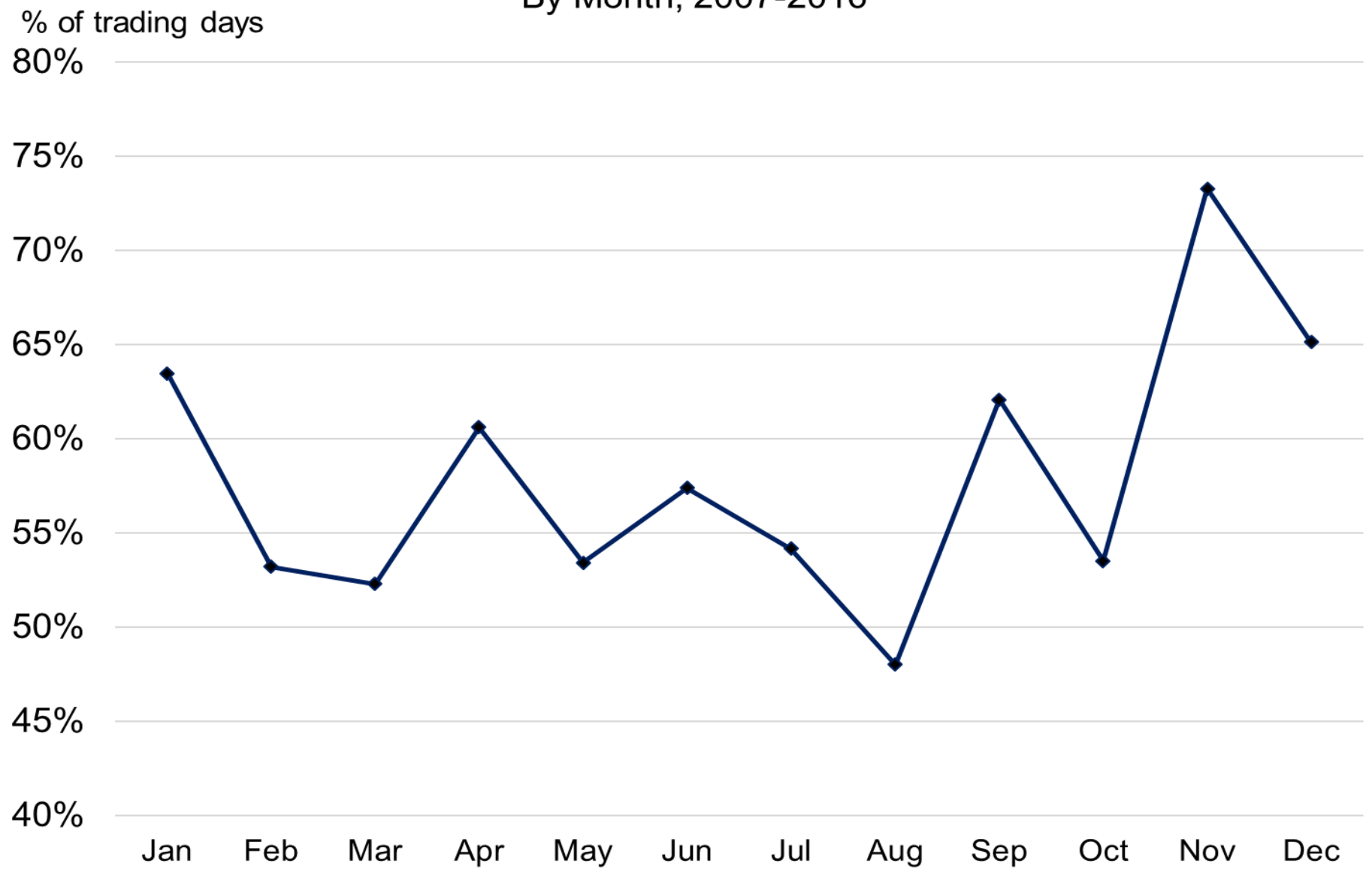
Percent of
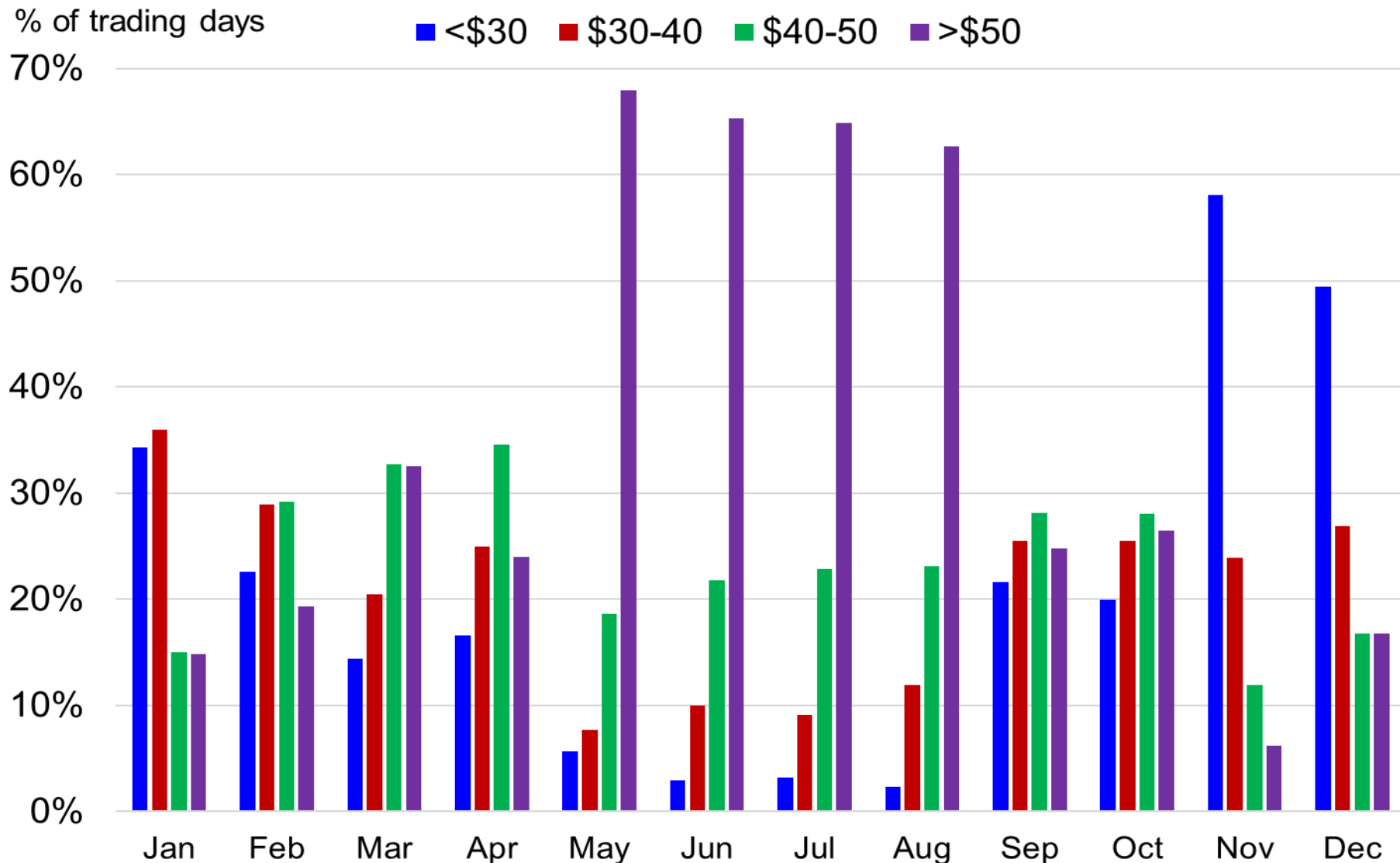
% of trading days

2007-2016平均分月份利润高于最后一天市价的交易日百分比
Percent of Trading Days Crush Margin is Higher than last Day
By Month, 2007-2016

平均分月份和利润的生猪利润高于最后一天市价的交易日百分比

Percent of Trading Days by Margin Level and Selling Month
2007-2016

% of trading days

■ <$30   ■ $30-40   ■ $40-50   ■ >$50

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

局部的基于价格的风险管理可以反映、弥补养殖户的认知偏差吗？
DOES PARTIAL RISK MANAGEMENT
(PRICE, PRODUCTION, FINANCIAL, LEGAL, ETC.)
REFLECT PRODUCER KNOWLEDGE GAP?

- ✓ Perhaps 也许可以,
  - ▪ 但是也要考虑其他经济因素
    but we must consider economic incentives
    - ➢ 有效性与实用性
      Effectiveness and practicality
    - ➢ 私人与公共的区别
      Private-public distinctions
    - ➢ 替代vs.补充Substitutes versus complements
    - ➢ 养殖户的预期
      Producer's expectations
    - ➢ 全球化风险Role of globalization
- ✓ 主要观点：缺乏正确的知识不是养殖户无法全部进行风险管理的唯一原因
  Bottom-line: Lack of knowledge is likely NOT sole reason for partial implementation of risk management.