



Fundamental Principles of Risk Management

Module Name: Risk
Session Number: Session 3

Outline Of This Session



- Risk – Return Tradeoff
- Does it apply to farming
- Exceptions
- Diversification
- Correlation

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Risk – Return Tradeoff



- A fundamental concept of risk management is that there is a tradeoff between risk and expected return
- In most cases
 - To obtain higher profit, the farmer must bear higher risk
 - To obtain lower risk, the farmer must sacrifice profit

Profit is the reward for taking risk!!

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Risk – Return Tradeoff



- Risk management typically means making tradeoffs between risk and profit
- Examples
 - Investing in the stock market rather than CD's
 - Buying insurance
 - Using debt instead of equity

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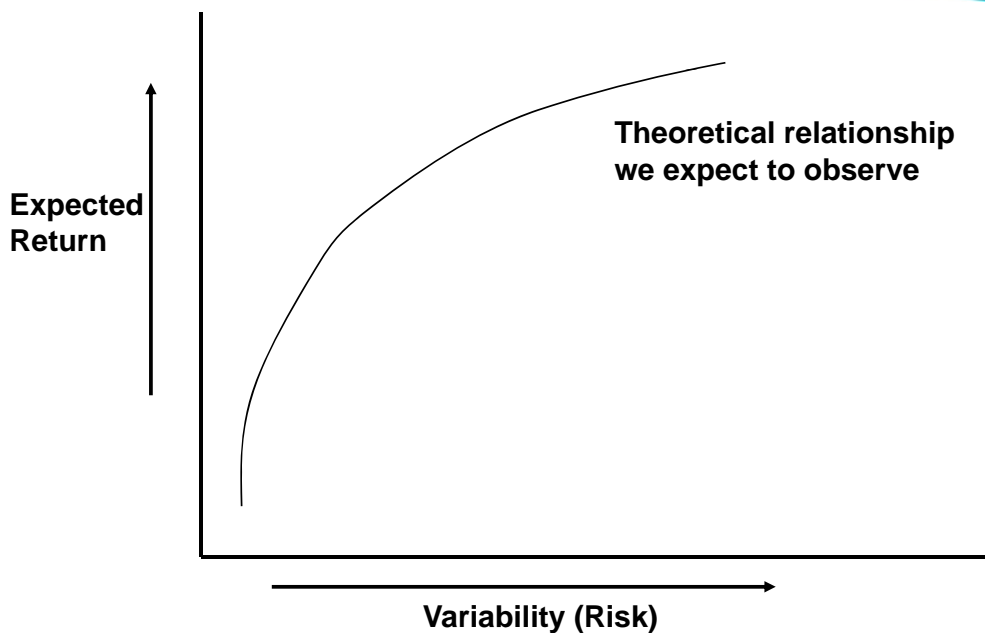
Risk – Return Tradeoff



- In reality, we rarely choose between two alternatives. We can represent a continuum of choices using a risk-return tradeoff curve
- This graph plots out the combinations of risk and expected return
- The risk management decision is not minimizing risk – but rather selecting an appropriate combination of risk and expected return for the individual situation

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Risk – Return Tradeoff Curve



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Risk – Return Tradeoff



Long-term summary of returns from alternative investments

	Average Return	Std. Dev of Return
T - Bill	3.7	3.3
Govt. Bond	5.2	8.7
Corp. Bond	5.7	8.3
Farming/Land Investment	6 --12	9 --20
Common Stock (S&P 500)	12.2	20.2
Common Stock (Small Firms)	17.4	34.3

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Does This Apply to Individual Ag Enterprises?



- KFMA dryland enterprise data
- 1993 – 2001
- Four crops: corn, grain sorghum, soybeans, and wheat

Enterprise Expected Return and Risk

Ave Std. Dev.

	Ave	Std. Dev.
Soybeans	39.33	28.2
Corn	37.56	27.5
Wheat	28.56	23.6
Sorghum	26.67	21.5

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Does This Apply to Individual Ag Enterprises?



- In this case, yes!
- The four enterprises are ranked according to theory based on expected return and risk
 - Soybeans are the high-risk, high return enterprise
 - Sorghum has the lowest expected return and risk

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Exceptions to Theory



- On individual farms, risk management can mean *reducing* risk while *increasing* total return!!
- Examples:
 - Better management (attention to detail)
 - Off farm employment
 - Federal crop insurance (highly subsidized)
 - Technology adoption (maybe)

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Diversification



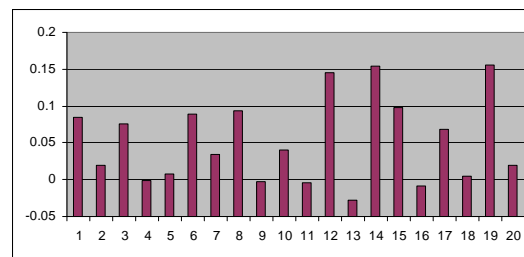
- Often misunderstood strategy for managing risk
- In the stock market, diversification works because the prices of different stocks do not move exactly together
- Thus, by dividing one's portfolio among several stocks, the total variability (risk) an investor faces can be reduced

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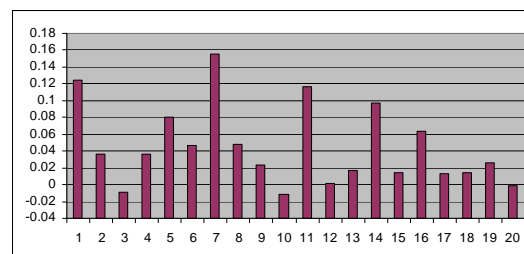
Diversification



- Consider two investments with these annual rates of return over a 20 year period
- A 50/50 mix would have avg. expected returns of .048, SD = .036



Ave = .052 SD = .057



Ave = .045 SD = .047

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Diversification; Why It Works When It Does



- The expected return of the two investment portfolio is simply the weighted average expected return (percent of overall portfolio in each investment multiplied by the expected return from that investment)

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Diversification; Why It Works When It Does



- The standard deviation (risk) of the two investment portfolio contains three components
 - Variability of investment 1
 - Variability of investment 2
 - An interaction term which contains the amount of each investment, the variability of each investment, and the *correlation* between the returns of the two investments
- It is this last term that determines the effectiveness of diversification!!!

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Correlation Is The Key



- The correlation coefficient (r_{12}) ranges between -1 and +1 and measures how closely two return series move together
 - If they move perfectly in sync (r_{12}) takes on a value of +1
 - If they move exactly opposite (one goes up every time the other goes down), (r_{12}) takes on a value of -1
 - If the two return series have no relationship, (r_{12}) takes on a value of 0

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When Diversification Works



- The key to reducing risk through diversification is to find return series that tend not to move together
 - As (r_{12}) gets smaller (or negative) there are more gains from diversification
- The less returns from two crops move together, the greater the risk reduction from diversifying between the two crops

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Crop Diversification Opportunities in Kansas

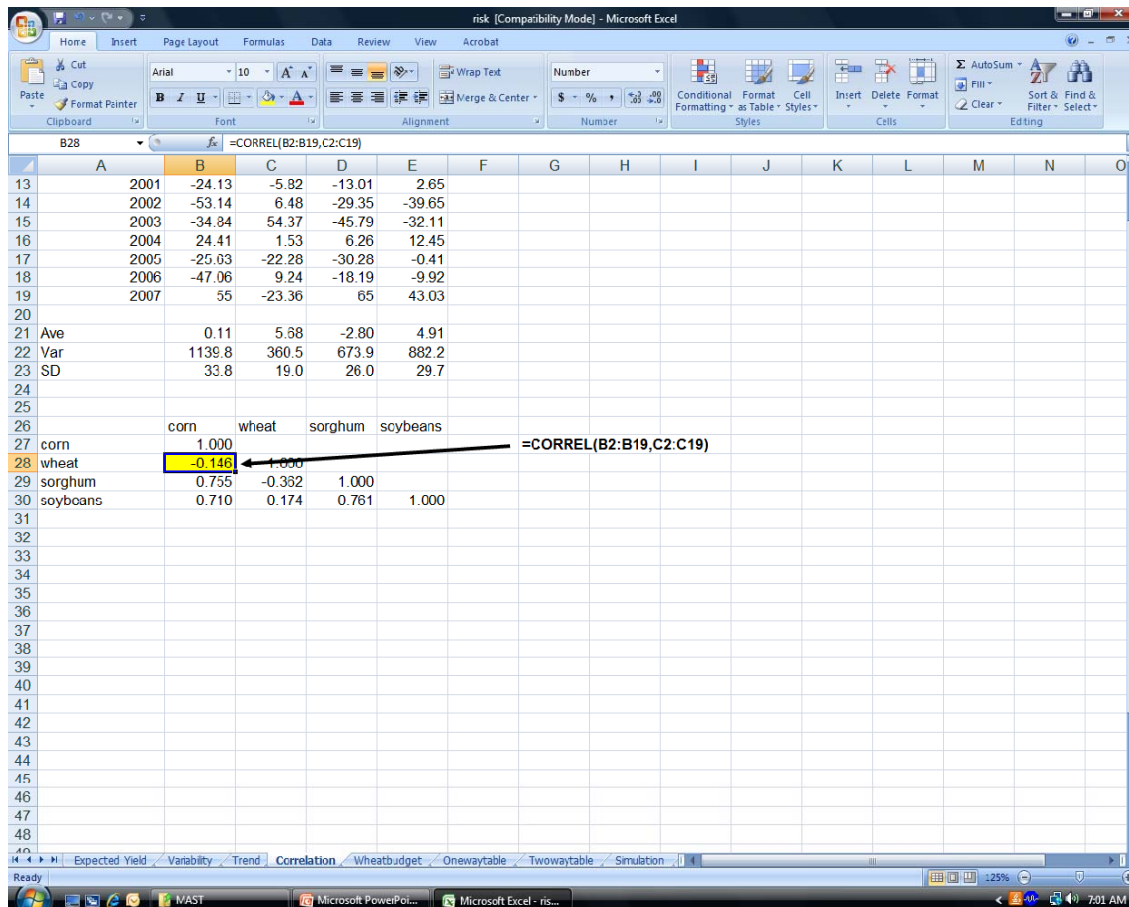


Net Return Correlations, NC Kansas

	Corn	Wheat	Sorghum	Soybeans
Corn	1.000			
Wheat	-0.146	1.000		
Sorghum	0.755	-0.362	1.000	
Soybeans	0.710	-0.174	0.761	1.000

Based on these correlations, combining a wheat enterprise with a fall crop enterprise provides more risk reduction that simply mixing two fall crops

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Types of Diversification



- Different mix of enterprises
- Differentiated products
- Value added products
- Non-farm investments
- Different varieties
- Different mix of land ownership/lease arrangements

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What About Price – Yield Correlations



“When prices are high, I never have much to sell, and when they are low, I’ve got a bumper crop”

- Commodity prices at the national or world level tend to be high when yields are low, and vice versa (negatively correlated).
- This phenomenon provides a “natural hedge” that stabilizes income

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Price – Yield Correlations



- Does this inverse relationship between price and yield exist at the local level?
 - In corn, the negative price-yield correlation is stronger (more negative) in the Corn Belt
 - In areas outside the major producing regions for any particular crop, the “natural hedge” is much weaker.

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Price – Yield Correlations



- Price – Yield correlation in Kansas

	Price-Yield correlation
– Wheat	-.32
– Corn	-.13
– Sorghum	-.37
– Soybeans	-.11
- Producers seeking income stabilization would produce Wheat and / or Sorghum
- Producers not concerned about income stability (risk takers) would raise Corn and / or Soybeans

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Summary



- Risk – Return Tradeoff
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