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Teaching Forward Contracts in Undergraduate Courses in Agribusiness Programs

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Introduction: Forward Contracts

- **Market exchange** mechanisms
- Facilitate (coordinate) **efficient movement** of **products and payments** throughout the supply chain
- **Sellers'** perspective: **Marketing** contracts
- **Buyers'** perspective: **Input procurement** (purchasing) contracts

Objective

- To develop a **set of teaching materials** to be used to explain the **mechanics of forward contracts to undergraduate students**
- The material is suitable for courses in the areas of **agribusiness management, agricultural marketing, supply chain management and agricultural commodity futures markets**
- Teaching materials include: a **teaching note** (summarized in this poster), a **forward contract check list**, a **forward contract framework** and a **problem set demonstrating its application** in the **milk supply chain**
 - Are included as the attachment to the PDF poster available on AgEcon Search

Economic Framework: Market Exchange

Market Exchange: Key Elements

- **Product** (assume a certain **quantity** is or will be available in the future)
- **Seller** originally **owns the product** -> has the **title/ownership of the product**
- **Buyer intends to purchase the product** -> will **pay the price**

Market Exchange: Process and Outcome

- **Seller** and **Buyer** reach **agreement on product Quantity and Price**
- **Product Quantity & Title** are exchanged for **Price** (i.e. payment)
- The transfer of the product title/ownership takes place
 - **Seller** receives payment and transfers the product and its title to **Buyer**
 - **Buyer** accepts the product and its title and makes payment (pays the price)

Economic Framework: Market Exchange (cont.)

P is product **price** (\$ per unit) and **Q** is product **quantity** (units)
\$ value of the market exchange (contract): P*Q (in \$)

Seller's perspective (product is output)

P is **price received/selling price/output price/price charged**
Q is product **quantity sold**; **P*Q** is **revenue** -> **positive effect on profit**
Business/economic incentive is to negotiate a higher price

Buyer's perspective (product is input)

P is **price paid/payment made**
Q is product **quantity purchased**; **P*Q** is **costs** -> **negative effect on profit**
Business/economic incentive is to negotiate a lower price

Profit formula: Profit = Revenue – Costs = P_{output}*Q_{output} – P_{input}*Q_{input}

Legal Framework: Uniform Commercial Code (UCC)

Contracts for sale/purchase of goods

<https://www.law.cornell.edu/ucc>

- If Seller and Buyer have a very simple contract
 - They do not specify all terms and conditions
- And *if there is a disagreement (dispute) later*, the UCC rules apply

UCC defines "**Contract for sale of goods**" as the one which

- "**includes both a present sale of goods and a contract to sell goods at a future time**"
- "A **"sale"** consists in the **passing of title** from the seller to the buyer **for a price**"

A **contract for sale/purchase of goods** **MUST explain/provide**

- **Description of the product** being sold/purchased
- **The product quantity** OR a procedure of the product quantity determination
- **Contract** must be in writing, if for \$500 or more

Contracts for Sale/Purchase of Goods:

Reaching Agreement vs Executing Agreement

STEP 1 (TODAY): Reaching agreement or signing a contract

- Seller and Buyer reach agreement on product quantity to be sold/purchased and product price to be paid/received

STEP 2 (FUTURE): Executing agreement (contract) or performing contract

- Seller delivers the product to Buyer
- Buyer accepts the product and makes a payment

TWO TYPES of contracts for sale (UCC classification)

PRESENT SALE: If step 1 and step 2 take place on the same day or within a few days (TODAY = FUTURE) -> **spot market contracts**
FUTURE SALE: If there is a time period between step 1 and step 2 (TODAY ≠ FUTURE) -> **Forward contracts**

- Video "Cash Markets and Forward Contracting"
<https://www.youtube.com/watch?v=L2rILKij-Gc>

Contracts for Sale/Purchase of Goods:

Spot Market Contracts (Present Sales)

Spot market transaction/sale/contract is a **present sale**
Spot market prices are referred to as **spot prices**

Representative spot market settings

- Retailers (supermarkets) sell food items to final consumers
- Wholesalers sell domestic and imported produce at terminal markets
 - Buyers are other wholesalers and retailers
- Ag producers sell ag products at shipping points located in large ag production regions
 - Buyers are wholesalers and retailers

Contracts for Sale/Purchase of Goods:

Forward Contracts (Future Sales)

- **Forward contract** is a **future sale**
- The **Seller** and **Buyer** perspectives: **forward contract**
- The **Seller's** perspective: **marketing contract**
- **Forward contract prices** are referred to as **forward prices**

Representative forward contracts settings

- Large food processors purchase large quantities of ag products (inputs) from agricultural producers using forward contracts (i.e. input procurement)

Contracts specify

- The product quantity and/or the product quantity determination procedure
- The product delivery schedule
- The price and/or the price determination procedure (for example, a price formula)

Forward Contract: Definition and Mechanics

A **forward contract** is a **legally binding agreement** between **Seller** of the **product** and **Buyer** of this product **signed Today**, according to which

- **Seller will deliver the product** to **Buyer** on a certain date **in the Future** and
- **Buyer will pay to Seller in the Future the price determined Today (forward price)**
- There is a **period of time between the moment the contract is signed (TODAY) and the moment the product delivery takes place (FUTURE)**
 - May vary from several days to several months

TODAY

- **Seller and Buyer reach agreement on product quantity and price** (contract is signed)
- The product price or the price determination procedure to be used in the future is determined
- The product quantity or the quantity determination procedure to be used in the future is determined

FUTURE

- **Seller delivers the product to Buyer**
- The actual payment is calculated; **Buyer makes the payment to Seller**
- The product title is transferred from Seller to Buyer

Why Do Firms Use Forward Contracts?

General Answer: A Proper Business Planning

Production planning: the product is an input for the firm acting as a buyer

- Input quantity affects output quantity produced
- *Input purchasing* (i.e. input procurement) -> *cost* side of the business

Marketing (sales) planning: the product is an output for the firm acting as a seller

- Securing the buyer(s) of the product -> *marketing*/distribution channels
 -> *revenue* side of the business

Risk management: managing (reducing) uncertainty related to quantity and price

- *Production risks:* uncertainty related to product quantity produced
- *Marketing risks:* uncertainty related to product quantity marketed
- *Price risks:* uncertainty related to price (input price or output price)
- Sellers and Buyers lock into prices and quantities today, while the product delivery is in the future

**Handout: Contract for Sale/Purchase of Goods
Check List: A *Generic* Version**

Contract term	Paragraph #	Brief description
SELLER		
BUYER		
PRODUCT		
Product <i>Quantity</i> and/or <i>procedure of its determination in the future</i>		
Product <i>Price</i> and/or <i>procedure of its determination in the future</i>		
Product <i>Quality</i> and/or <i>procedure of its determination in the future</i>		
The product <i>ownership (title) transfer</i> from the seller to the buyer: !!! The EXACT MOMENT!!!		
Contract <i>duration</i>		
<i>Transportation of the product:</i> PARTY responsible		
<i>Schedule of deliveries:</i> PARTY responsible		
<i>Other terms and conditions not listed above</i>		

Handout: *FORWARD CONTRACTS FRAMEWORK*
ECONOMIC EFFECTS: The SELLER and BUYER Perspectives
“Mechanics of Forward Contracts”

There is a **product** which theoretically can be sold/purchased using a forward contract or a spot market/contract.

The product is sold/purchased using a forward contract.

There is a **seller** of this product and a **buyer** of this product (contract parties).

There are two points in time: TODAY and LATER/FUTURE (assume there is a time lag of several weeks or a few months).

TODAY: Seller and Buyer sign a *forward contract* (they decided not to use a spot market)

They make an **agreement** on **product quantity and product price (Forward Price: FP)**

LATER/FUTURE: Seller delivers the product (quantity) to Buyer and receives the price Buyer pays (Forward Price)

Buyer accepts the product (quantity) from Seller and makes a payment to Seller (Forward Price)

Spot market (contract) is an alternative to a forward contract. While it is not used by Seller and Buyer, its prices for TODAY and LATER/FUTURE are used as reference prices to understand the economic effects of forward contract on Seller and Buyer.

The spot (cash) price typically changes between TODAY and LATER (increases or decreases).

TODAY we do not know whether spot (cash) price will increase or decrease between TODAY and LATER

This is one of the reasons why forward contracts are used as a risk management mechanism.

Recall: Profit = Revenue – Costs = P output * Q output – P input * Q input

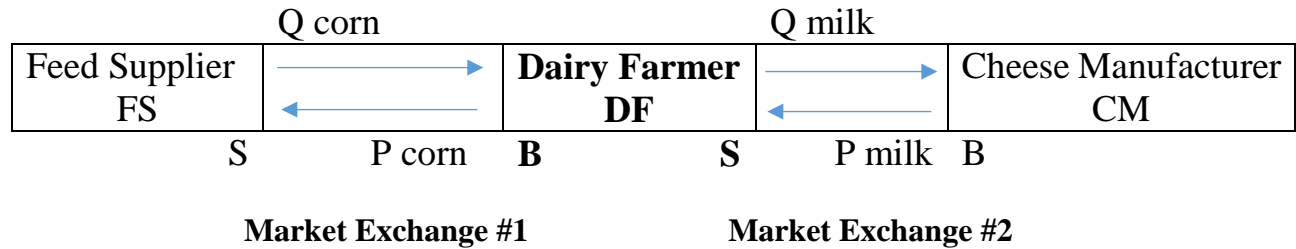
Handout: Forward Contract Framework

SPOT (CASH) MARKET Product is sold/purchased on the spot. Price (cash payment) is paid on the spot	FORWARD CONTRACT (FC): Between Seller and Buyer	
	Seller <i>Sells the product: Output for seller</i> <i>Output Price Received affects Revenue</i>	Buyer <i>Buys the product: Input for buyer</i> <i>Input Price Paid affects Cost</i>
TODAY Cash Price = \$XX/unit	Seller and Buyer sign a forward contract TODAY: Agree on product quantity (Q) and product price -> “Forward Price” (in \$/unit) “FP”	
LATER/FUTURE Cash Price = \$YY/unit “CPL”	Seller delivers the product to Buyer and receives price (FP) Buyer accepts the product from Seller and pays price (FP)	
	To evaluate the economic effects (gain or loss) of forward contract on Seller and Buyer: Compare Forward Price (FP) and Cash Price LATER (CPL)	
	Scenario 1: $FP > CPL \rightarrow FP - CPL > 0$	
	Seller Gains $FP > CPL \rightarrow FP - CPL > 0$ Seller has <i>increased the output (selling) price</i> by using FC Seller’s <i>revenue increases</i> -> Seller’s <i>profit increases</i>	Buyer Loses $FP > CPL \rightarrow FP - CPL > 0$ Buyer has <i>increased the input (purchasing) price</i> by using FC Buyer’s <i>cost increases</i> -> Buyer’s <i>profit decreases</i>
	Scenario 2: $FP < CPL \rightarrow FP - CPL < 0$	
Seller Loses $FP < CPL \rightarrow FP - CPL < 0$ Seller has <i>decreased the output (selling) price</i> by using FC Seller’s <i>revenue decreases</i> -> Seller’s <i>profit decreases</i>	Buyer Gains $FP < CPL \rightarrow FP - CPL < 0$ Buyer has <i>decreased the input (purchasing) price</i> by using FC Buyer’s <i>cost decreases</i> -> Buyer’s <i>profit increases</i>	

Seller: Total Gain/Loss (\$) = Price difference (\$/unit) * Quantity (units)
 Buyer: Total Gain/Loss (\$) = Price difference (\$/unit) * Quantity (units)
 Price difference (\$/unit) = Forward Price (\$/unit) – Cash Price Later (\$/unit)
 Forward contract \$ value = Forward price (\$ per unit) * Quantity (units)

Problem Set: Forward Contracts in the Milk Supply Chain
Evaluating Economic Effects of Forward Contracting
“Mechanics of Forward Contracts”

Milk supply chain



Market Exchange #1: Decision Situation #1 for Dairy Farmer (Q1 and Q2)

- Animal feed supplier (Seller) -> Dairy farmer (Buyer)
- Product: corn
- *2 scenarios in our analysis: differ due to the pattern of price changes (cash and forward)*

Market Exchange #2: Decision Situation #2 for Dairy Farmer (Q3 and Q4)

- Dairy farmer (Seller) -> Cheese manufacturer (Buyer)
- Product: milk
- *2 scenarios in our analysis: differ due to the pattern of price changes (cash and forward)*

Question 1: Dairy Farmer: Decision Situation #1

Dairy farmer purchases corn from animal feed supplier

An input (feed) forward contract: Scenario #1

TODAY: Corn Cash Price = \$3.75 per bushel

LATER: Corn Cash Price = \$3.50 per bushel

Forward Price = \$3.25 per bushel

Quantity = 1,000 bushels

SPOT (CASH) MARKET Product: Feed Corn	A FORWARD CONTRACT: Between Feed Supplier and Dairy Farmer	
	SELLER: Feed Supplier Sells the product: CORN Output -> Output Price -> Revenue	BUYER: Dairy Farmer Buys the product: CORN Input -> Input Price -> Cost
TODAY Corn Cash Price = \$3.75 per bushel	Seller and Buyer sign a forward contract TODAY: Agree on corn quantity to be delivered later: Q = 1,000 bushels and corn price to be paid later: "Forward Price": FP = \$3.25 per bushel	
LATER/FUTURE Corn Cash Price = \$3.50 per bushel "CPL"	Seller delivers corn and receives FP	Buyer accepts corn and pays FP
	Compare Forward Price (FP) and Cash Price LATER (CPL) to evaluate the economic effects (gain or loss) of the forward contract on Seller and Buyer	
	Compare prices: FP = \$3.25 per bushel < CPL = \$3.50 per bushel Calculate price difference: FP - CPL = \$3.25 - \$3.50 = -\$0.25 per bushel	
	SELLER: Feed Supplier Economic effects <i>FP is output price: decreases</i> <i>Revenue decreases</i> <i>Profit decreases</i> <i>Loses -> Worse off</i>	BUYER: Dairy Farmer Economic effects <i>FP is input price: decreases</i> <i>Costs decrease</i> <i>Profit increases</i> <i>Gains -> Better off</i>

FS Seller: Total Gain/Loss (\$) = Price difference (\$/bu) * Quantity (bu) = -\$0.25/bu * 1,000 bu = -\$250
FS is worse off with forward contract (would have been better off by using spot market)

DF Buyer: Total Gain/Loss (\$) = Price difference (\$/bu) * Quantity (bu) = -\$0.25/bu * 1,000 bu = -\$250
DF is better off with forward contract

Forward contract \$ value = \$3.25 per bushel * 1,000 bushels = \$3,250

Question 2: Dairy Farmer: Decision Situation #1
Dairy farmer purchases corn from animal feed supplier
 An *input (feed)* forward contract: *Scenario #2*

TODAY: Corn Cash Price = \$3.75 per bushel

LATER: Corn Cash Price = \$3.20 per bushel

Forward Price = \$3.50 per bushel

Quantity = 1,000 bushels

SPOT (CASH) MARKET Product: Feed Corn	A FORWARD CONTRACT: Between Feed Supplier and Dairy Farmer	
	SELLER: Feed Supplier Sells the product: CORN Output -> Output Price -> Revenue	BUYER: Dairy Farmer Buys the product: CORN Input -> Input Price -> Cost
TODAY Corn Cash Price = \$ _____ per bushel	Seller and Buyer sign a forward contract TODAY: Agree on corn quantity to be delivered later: Q = 1,000 bushels and corn price to be paid later: “Forward Price”: FP = _____ per bushel	
LATER/FUTURE Corn Cash Price = \$ _____ per bushel “CPL”	Seller delivers corn and receives FP	Buyer accepts corn and pays FP
	Compare Forward Price (FP) and Cash Price LATER (CPL) to evaluate the economic effects (gain or loss) of the forward contract on Seller and Buyer	
	Compare prices: Calculate price difference: $FP - CPL =$	
	SELLER: Feed Supplier Economic effects	BUYER: Dairy Farmer Economic effects

Seller: Total Gain/Loss (\$) = Price difference (\$/bu) * Quantity (bu) = **\$300**

Buyer: Total Gain/Loss (\$) = Price difference (\$/bu) * Quantity (bu) = **\$300**

Forward contract \$ value = \$ _____ per bushel * _____ bushels = **\$3,500**

Question 3: Dairy Farmer: Decision Situation #2
Dairy farmer sells milk to cheese manufacturer
 An *output (milk)* forward contract: **Scenario #1**

TODAY: Milk Cash Price = \$19.00 per cwt

LATER: Milk Cash Price = \$18.00 per cwt

Forward Price = \$17.00 per cwt

Quantity = 1,000 cwt

SPOT (CASH) MARKET Product: Milk	A FORWARD CONTRACT: Between Dairy Farmer and Cheese manufacturer	
	SELLER: Dairy Farmer Sells the product: Milk Output -> Output Price -> Revenue	BUYER: Cheese Manufacturer Buys the product: Milk Input -> Input Price -> Cost
TODAY Milk Cash Price = \$19.00 per cwt	Seller and Buyer sign a forward contract TODAY: Agree on milk quantity to be delivered later: Q = 1,000 cwt and milk price to be paid later: “Forward Price”: FP = \$17.00 per cwt	
LATER/FUTURE Milk Cash Price = \$18.00 per cwt “CPL”	Seller delivers milk and receives FP	Buyer accepts milk and pays FP
	<i>Compare Forward Price (FP) and Cash Price LATER (CPL) to evaluate the economic effects (gain or loss) of the forward contract on Seller and Buyer</i>	
	Compare prices: Calculate price difference: $FP - CPL =$	
	SELLER: Dairy Farmer Economic effects	BUYER: Cheese Manufacturer Economic effects

Seller: Total Gain/Loss (\$) = Price difference (\$/cwt) * Quantity (cwt) = **-\$1,000**

Buyer: Total Gain/Loss (\$) = Price difference (\$/cwt) * Quantity (cwt) = **-\$1,000**

Forward contract \$ value = \$17.00 per cwt * 1,000 cwt = \$17,000

Question 4: Dairy Farmer: Decision Situation #2
Dairy farmer sells milk to cheese manufacturer
 An *output (milk)* forward contract: *Scenario #2*

TODAY: Milk Cash Price = \$19.00 per cwt

LATER: Milk Cash Price = \$18.00 per cwt

Forward Price = \$20.00 per cwt

Quantity = 1,000 cwt

SPOT (CASH) MARKET Product: Milk	A FORWARD CONTRACT: Between Dairy Farmer and Cheese manufacturer	
	SELLER: Dairy Farmer Sells the product: Milk Output -> Output Price -> Revenue	BUYER: Cheese Manufacturer Buys the product: Milk Input -> Input Price -> Cost
TODAY Milk Cash Price = \$ _____ per cwt	Seller and Buyer sign a forward contract TODAY: Agree on milk quantity to be delivered later: Q = 1,000 cwt and milk price to be paid later: " <u>Forward Price</u> ": FP = \$ _____ per cwt	
LATER/FUTURE Milk Cash Price = \$ _____ per cwt "CPL"	Seller delivers milk and receives FP	Buyer accepts milk and pays FP
	Compare Forward Price (FP) and Cash Price LATER (CPL) to evaluate the economic effects (gain or loss) of a forward contract for Seller and Buyer	
	Compare prices: Calculate price difference: FP – CPL =	
	SELLER: Dairy Farmer Economic effects	BUYER: Cheese Manufacturer Economic effects

Seller: Total Gain/Loss (\$) = Price difference (\$/cwt) * Quantity (cwt) = **\$2,000**

Buyer: Total Gain/Loss (\$) = Price difference (\$/cwt) * Quantity (cwt) = **\$2,000**

Forward contract \$ value = \$ _____ per cwt * _____ cwt = \$20,000 cwt

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