

3. Currency Exchange Rates

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Joe Arata teaches courses, provides information and conducts research on commodity futures, options on futures and off exchange derivatives.

Currently he is working on an analysis of futures market price valuation and market information; analyzing profit due to underlying asset price changes as opposed to profit due to option mispricing; and decomposing option mispricing into volatility and formula error.

Abstract/Summary

This presentation will look at how currencies are traded and quoted in world financial markets. Changes in global growth and foreign economic activity are becoming increasingly more important in determining the level of U.S. agricultural exports. Currency exchange rates can reflect foreign countries structural shifts and influence the demand for US agricultural commodities and aid in the price discovery process.

Currencies

Exchange Rates and Commodities

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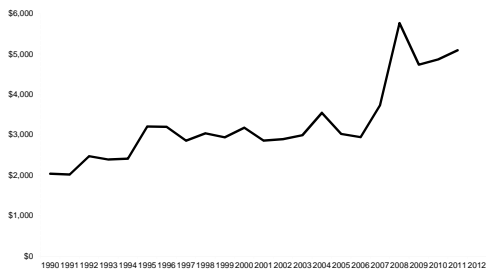
Exchange Rates and Kansas Commodities

- Why are Currency Exchange Rates important for agriculture?
- What are they?
- How do they work?

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Kansas Agricultural Exports

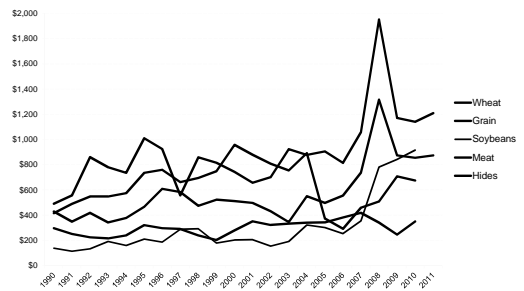
Million US Dollars



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Kansas Agricultural Exports

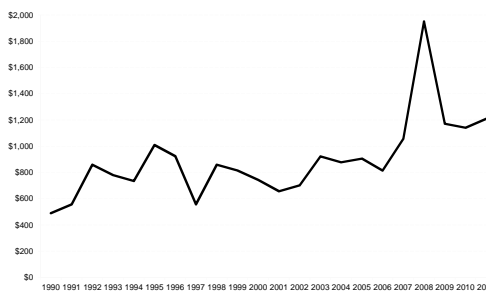
Million US Dollars



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Kansas Wheat Exports

Million US Dollars



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US Wheat Exports

1,000 Metric Tons

	2011	2010	2009	2008
Japan	3,512	3,273	3,148	3,103
Mexico	3,496	2,601	1,975	2,423
Nigeria	3,248	3,645	3,233	2,660
Philippines	2,039	1,806	1,518	1,480
South Korea	1,983	1,640	1,111	1,127
Egypt	950	4,021	456	1,928
Taiwan	888	913	843	714
Indonesia	830	781	528	710
Spain	639	304	135	364

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US Corn Exports

1,000 Metric Tons

	2011	2010	2009	2008
Japan	14,279	14,343	15,909	15,801
Mexico	7,019	7,999	7,454	8,739
South Korea	6,104	7,561	5,129	8,639
Egypt	3,302	2,935	2,233	3,309
Taiwan	2,393	2,949	3,198	3,478
Syria	1,035	755	501	1,336
China	977	1,158	0	0
Venezuela	894	1,076	1,159	1,001
Israel	801	158	166	1,100

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US Soybean Exports

1,000 Metric Tons

	2011	2010	2009
• China	24,445	22,454	18,681
• Mexico	3,215	3,215	3,098
• Japan	1,887	2,346	2,410
• Indonesia	1,680	1,462	1,340
• Taiwan	1,397	1,556	1,592
• Netherlands	970	804	885
• Egypt	897	945	1,117
• Spain	856	627	338
• South Korea	691	683	346

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US Beef and Veal Exports

Million Pounds, Carcass Weight

	2011	2010	2009	2008
Canada	500.6	390.5	363.2	389.3
Mexico	487.9	500.5	628.4	758.5
Japan	456.1	351.0	274.3	231.1
South Korea	379.7	277.1	140.7	152.1
Vietnam	121.4	114.3	148.3	121.9
Taiwan	110.6	122.9	84.4	85.4
Hong Kong	162.9	133.4	82.2	32.3
Russia	148.0	80.0	13.4	0.1

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World Wheat Exporters

1,000 Metric Tons

	2011
• United States	31,298
• Australia	20,500
• Canada	18,500
• Russia	16,000
• EU – 27	14,500
• Kazakhstan	8,500
• Argentina	6,200
• Ukraine	4,000

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World Corn Exporters

1,000 Metric Tons

	2011
• United States	48,262
• Argentina	16,000
• Ukraine	14,000
• Brazil	12,000
• India	2,200
• EU-27	2,000
• South Africa	2,000
• Serbia	1,800
• Paraguay	1,700

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World Soy Exporters

1,000 Metric Tons

	2011
• Argentina	29,775
• Brazil	13,855
• United States	7,621
• India	4,227
• Paraguay	1,840
• Bolivia	1,550
• China	500
• EU-27	450
• Canada	185

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Foreign Exchange - FX

A **foreign currency** trade is the simultaneous buying of one currency and selling of another one. The currency combination used in the trade is called a cross (for example, the Euro/US Dollar, or the British Pound/Japanese Yen.).

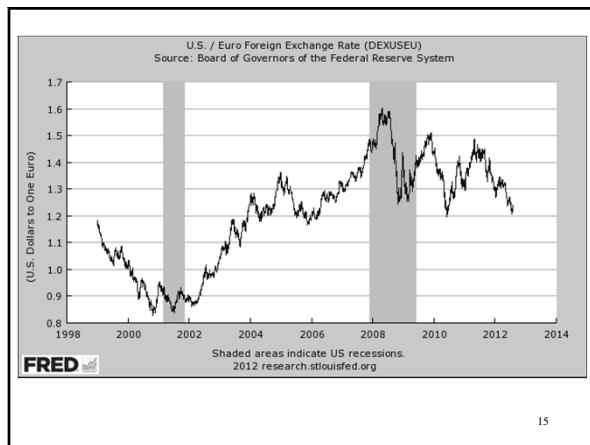
Foreign Exchange - FX

A currency exchange rate

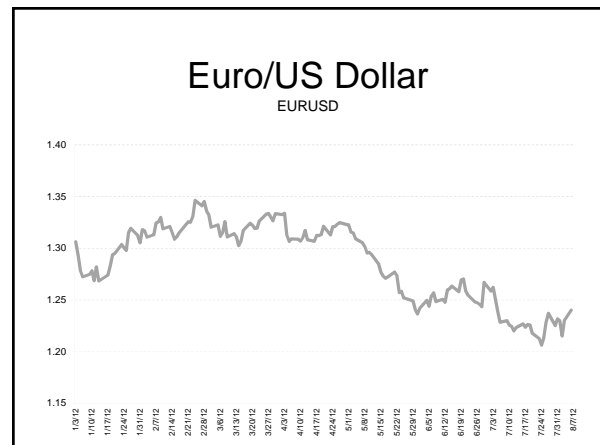
– Is the ratio of a unit of currency of one country (EUR) to a unit of the currency of another country (USD) at the time of the buy or sell transaction

Euro/US Dollar = 1.229

One Euro buys 1.229 US Dollars



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FX Market Convention

Base Currency (Primary Currency)

The base currency is the *first* currency in a currency pair; the exchange rate is always quoted per unit of the base currency

for EUR/USD, (\$/€) the Euro is the base currency... if the pair is trading at 1.229, one Euro buys 1.229 US Dollars

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FX Market Convention

$s_{€\$}$: spot rate of exchange

“Direct quote”:

$$s_{\$/€} = 1.229 \Rightarrow 1 \text{ € buys } \$1.229$$

Indirect quote”:

$$s_{€\$} = 0.814 \Rightarrow 1 \text{ \$ buys } 0.814\text{€}$$

$f_{€\$}$: forward rate of exchange

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	In USD	Per USD
Argentina	0.2176	4.5956
Brazil	0.4945	2.0222
Canada	1.0058	0.9942
Chile	0.002101	475.9638
Colombia	0.0005591	1788.5888
Mexico	0.0761	13.1406
Peru	0.3821	2.6171
Venezuelan	0.229885	4.3500
Australia	1.0573	0.9458
China	0.1572	6.3613
Hong Kong	0.1289	7.7580
India	0.01809	55.2792
Indonesia	0.0001056	9469.6970
Japan	0.012749	78.4375
Malaysia	0.3218	3.1075

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	In USD	Per USD
New Zealand	0.8158	1.2258
Pakistan	0.01061	94.2507
Philippines	0.024	41.6667
Singapore	0.803	1.2453
South Korea	0.0008846	1130.4544
Taiwan	0.03337	29.9670
Thailand	0.03177	31.4762
Viet	0.00004795	20855.0574
Czech Rep	0.0492	20.3252
Denmark	0.1661	6.0205
Euro Area	0.12365	8.0873
Hungary	0.004465	223.9642
Poland	0.1701	5.8789
Russia	0.03172	31.5259
Sweden	0.1495	6.6890

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	In USD	Per USD
Switzerland	1.0294	0.9714
Turkey	0.5618	1.7800
UK	1.5659	0.6386
Bahrain	2.6531	0.3769
Egypt	0.1645	6.0790
Israel	0.2506	3.9904
South Africa	0.1237	8.0841

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FX Market Convention

- Currency Hierarchy:
 - Euro
 - British Pound (Sterling)
 - Australian Dollar
 - New Zealand Dollar
 - United States Dollar
 - Canadian Dollar
 - Swiss Franc
 - Japanese Yen

Note: Euro is the world's dominant base currency, all currency pairs traded against the Euro are quote per EUR

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FX Market Convention

- Historically, this was established by a ranking according to the relative values of the currencies with respect to each other, but the introduction of the euro and other market factors have broken the original price rankings.

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FX Market Convention

Some currency rates as of August 10, 2012:

In U.S. dollar:

Japan YEN (Yen)	0.0126
Mexico MXN (Peso)	0.0743
South Korea (Won)	0.0008661
Taiwan TWD (TDollar)	0.03336
Canada CAD (CDollar)	0.9700
China CNY (Yuan)	0.1575

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FX Market Convention

Every currency has a three letter code
Typically, the first two letters refer to the country,
the final letter to the currency

USD	US Dollar	CNY	Chinese Yuan
EUR	Euro	HKD	Hong Kong Dollar
GBP	British Pound	INR	Indian Rupees
AUD	Australian Dollar	MYR	Malaysian Ringgit
JPY	Japanese Yen	SGD	Singapore Dollar
CHF	Swiss Franc	BRL	Brazilian Real
CAD	Canadian Dollar	MXN	Mexican Peso

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FX Market Convention

Currency	% of Trades
• US Dollar	84.9%
• Euro	39.1%
• Japanese Yen	19.0%
• Pound Sterling	12.9%
• Australian Dollar	7.6%
• Swiss Franc	6.4%
• Canadian Dollar	5.3%

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FX Market Basics

FX is largest financial market on Earth.

Average daily trading volume

FX GT	\$4,100,000,000,000 (trillion)
NYSE	\$54,000,000,000 (billion)
World Equity	\$900,000,000,000 (billion)

Source: BIS 2012

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FX Market Basics

Foreign exchange market is unique due to:

- Variety of Traders in the Market
- Estimated that 90% of all FX trades are speculative

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FX Market Convention

$r_{\$}$: dollar rate of interest ($r_{¥}$, $r_{HK\$}$, ...)

$i_{\$}$: expected dollar inflation rate

$f_{\$/\$}$: forward rate of exchange

$s_{\$/\$}$: spot rate of exchange

– Indirect quote”:

$$s_{\$/\$} = 0.814 \Rightarrow 1 \$ \text{ buys } 0.814\text{€}$$

– “Direct quote”:

$$s_{\$/\text{€}} = 1.229 \Rightarrow 1 \text{€ buys } \$1.229$$

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FX Market Basics

- I. The Law of One Price
Purchasing Power Parity
- II. Theory of Interest Rate Parity

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The Law of One Price

- A commodity will have the same price in terms of common currency in every country
 - In the absence of frictions (e.g. shipping costs, tariffs,..)
 - Example
 - Price of wheat in France (per bushel): $P_{\text{€}}$
 - Price of wheat in U.S. (per bushel): $P_{\text{\$}}$
 - $S_{\text{€}\text{\$}}$ = spot exchange rate

$$P_{\text{€}} = S_{\text{€}\text{\$}} \cdot P_{\text{\$}}$$

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The Law of One Price

Example:

Price of wheat in France per bushel ($P_{\text{€}}$) = 6.94 €
 Price of wheat in U.S. per bushel ($P_{\text{\$}}$) = \$8.80
 $S_{\text{€}\text{\$}} = 0.814$ ($S_{\text{\$}\text{€}} = 1.229$)

Dollar equivalent price of wheat in France = $S_{\text{\$}\text{€}} \times P_{\text{€}}$
 = 1.229 $\text{\$/€} \times 6.94 \text{ €} = \8.50

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The Law of One Price

- Example:
 - Price of wheat in France per bushel ($P_{\text{€}}$) = 6.94 €
 - Price of wheat in U.S. per bushel ($P_{\text{\$}}$) = \$8.80
 - $S_{\text{€}\text{\$}} = 0.814$ ($S_{\text{\$}\text{€}} = 1.229$)

Dollar equivalent price of wheat in France = $S_{\text{\$}\text{€}} \times P_{\text{€}}$
 = 1.229 $\text{\$/€} \times 6.94 \text{ €} = \8.53

⇒ When law of one price does not hold, supply and demand forces help restore the equality

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The Law of One Price

- For a homogeneous mineral such as wheat or gold, international arbitrage equalizes prices quite closely

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The Law of One Price

Wheat Price

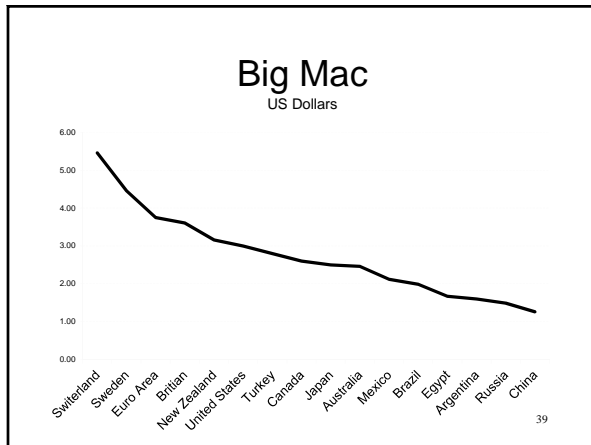
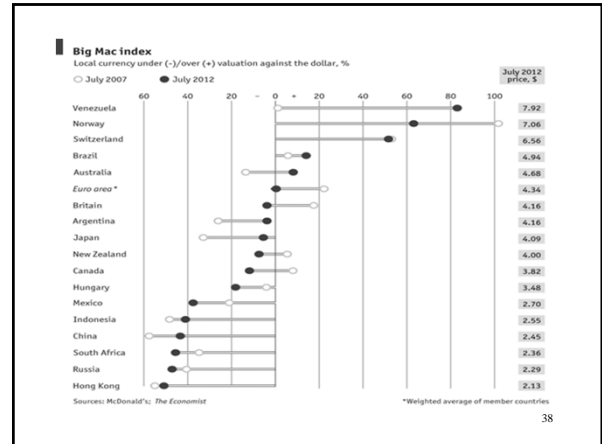
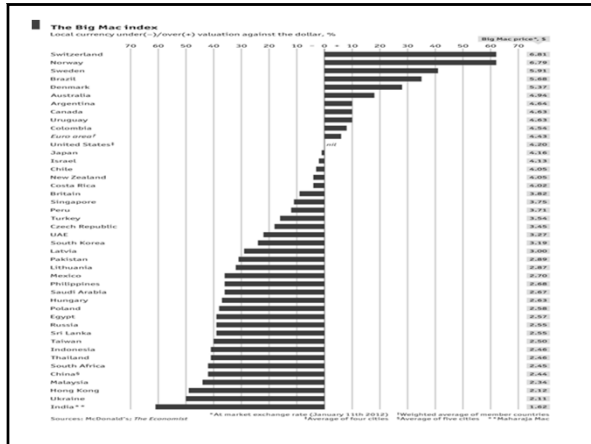
	Local	Local	USD
Country	MT	Bush	Bush
Australia-A\$	298	8.11	8.58
China-Yuan	2,050	55.8	8.79
France-Euro	255	6.94	8.53
Japan-Yen	25,999	707.6	8.90
Mexico-Peso	4,475	121.8	8.81
SKorea-Won	379942	10340	8.92
US-Dollars	323	8.79	8.79

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What is the evidence?

- The Law of One Price frequently does not hold.
- Absolute PPP does not hold, at least in the short run.
 - See *The Economist's Big McCurrencies*
- The data largely are consistent with Relative PPP, at least over longer periods.

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The Law of One Price

Big Macs are partly traded (ingredients) & partly nontraded (cooking & retail). Their price varies widely across countries. The price tends to be higher in rich countries (e.g., Europe & Japan), than in developing countries (e.g., China) and in countries with overvalued currencies (e.g., Argentina in 2011).

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FX Forward Market

What if you want to lock in an FX rate to satisfy a future obligation?

A *forward contract* in the FX market locks in the price at which an entity can buy or sell a currency on a future date:

- Both parties agree on an exchange rate for a specific date in the future
- Money does not change hands until the future maturity date
- Length of the contract can be a couple of days, months, or years

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FX Forward Market

Definition of a Forward Contract

An agreement between a bank and a customer to deliver a specified amount of currency against another currency at a specified future date and at a fixed exchange rate.

FX Forward Market

Forward currency rates as of August 13, 2012:

U.S. dollars per Japanese yen (bid prices):

- Spot rate 0.012776
- One-month forward 0.012779
- 3 months forward 0.012788
- 6 months forward 0.012807
- 12 months forward 0.012830
- 24 months forward 0.013210

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Example of a FX Forward

Suppose you will need 100,000€ in one year. Through a forward contract, you can commit to lock in the exchange rate

$f_{\$/\text{€}}$: forward rate of exchange

Currently, $f_{\$/\text{€}} = 1.229 \Rightarrow 1 \text{ € buys } \1.229

$\Rightarrow 1 \$ \text{ buys } 0.8137 \text{ €}$

- At this forward rate, you need to provide \$151,044.10 in 12 months.

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FX Forward Market

Purpose of a Forward:

Hedging the act of reducing change rate risk.

FX Forward Market

Forward Rate Quotations

Two Methods:

Outright Rate: quoted to commercial customers.

Swap Rate: quoted in the interbank market as a discount or premium.

FX Forward Market

The theory of Interest Rate Parity states:

forward rate (F) differs from the spot rate (S) at equilibrium by an amount equal to the interest differential ($r_h - r_f$) between two countries.

Source: Miguel Otero-Iglesias

FX Forward Market

Calculating the Forward premium or discount

$$= \frac{F-S}{S} \times \frac{12}{n} \times 100$$

where F = the forward rate of exchange

S = the spot rate of exchange

n = the number of months in the forward contract

FX Forward Market

Forward Contract Maturities

Contract Terms

30-day

90-day

180-day

360-day

Longer-term Contracts

FX Forward Market

Forward Contracts are quoted in forward points

The amount added or subtracted to the spot rate

The number of decimals is assumed "known"

FX Forward Market

The forward premium or discount equals the interest rate differential

$$(F - S)/S = (r_h - r_f)$$

where r_h = the home rate
 r_f = the foreign rate

FX Forward Market

In equilibrium, returns on currencies will be the same

i. e. No profit will be realized and interest parity exists which can be written

$$\frac{(1 + r_h)}{(1 + r_f)} = \frac{F}{S}$$

FX Forward Market

Covered Interest Arbitrage

Conditions required: interest rate differential does not equal the forward premium or discount.

Funds will move to a country with a more attractive rate.

Evidence on interest rate parity

- Generally, it holds
- Why would interest rate parity hold better than PPP?
 - Lower transactions costs in moving currencies than real goods
 - Financial markets are more efficient than real goods markets

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Corporate Hedging

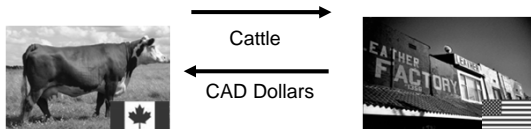
How Do Large Corporations Use FX?

Example:

A large, US Cattle Company contracts Feeders in Canadian

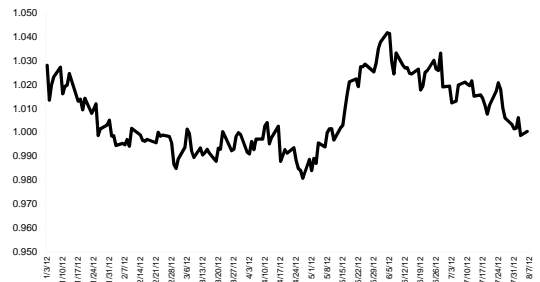
The market for Feeders in Canada is Canadian dollars

The US Company pays Canadian dollars for its cattle



Canadian/US Dollar

CADUSD



Corporate Hedging

The Problem:

The US company faces significant FX risk

If the US\$ *depreciates* significantly, the company's contracts for feeder cattle sales become worth significantly more in Canadian dollars

June 26, 2012: one US dollar = 1.0401 CAD\$

August 3, 2012: one US dollar = 0.9997 CAD\$

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Exchange Rate Determination

- Relative real interest rates
- Prospects for economic growth
- Capital market liquidity
- A country's economic and social infrastructure
- Political safety
- Corporate governance practices
- Contagion (spread of a crisis within a region)
- Speculation

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The Real Causes of the Euro Crisis

- The Appreciation Bias of the Euro = loss of competitiveness in the periphery
- Huge imbalances between surplus countries (Germany, Holland, Finland) and deficit countries (Spain, Portugal, Italy)
- Real Estate bubbles, especially in Spain and Ireland
- Lack of macroeconomic coordination
- Lack of supervision in the levels of private debt, and asset bubbles
- Lack of a centralised budget to overcome asymmetric shocks

Source: Miguel Otero-Iglesias

The Real Causes of the Euro Crisis

- Lack of a pan-European debt market (Eurobonds)
- Lack of a lender of last resort
- Lack of jurisdiction on derivative markets and credit rating agencies

Source: Miguel Otero-Iglesias

Conclusion

- Monetary Union is flawed without political union behind it
- There needs to be more macroeconomic cooperation to avoid internal imbalances
- Germany needs to stimulate internal demand
- EZ periphery needs to be more productive and competitive
- The EZ needs to create a ministry of finance
- The creation of eurobonds is also necessary
- Apart from price stability there needs to be a growth strategy, especially for the periphery
- The EZ needs to tackle the appreciation bias of the euro

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