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Energy Trading

Understanding the Strategies and Risks

Randy Wilson

Principal, Financial Risk Management

KPMG LLP

Houston, Texas

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Agenda

The Front Office:

- Value Creation or distraction?
- Roles and responsibilities
- Book structure and portfolio management
- Trading Instruments
- Trading and marketing strategies
- Special considerations:
 - Gas
 - Power

The Mid Office:

- Roles and Responsibilities
- Risk control: Daily management/risk reporting
- Risk Analytics
- Valuation – Curve and model control and validation

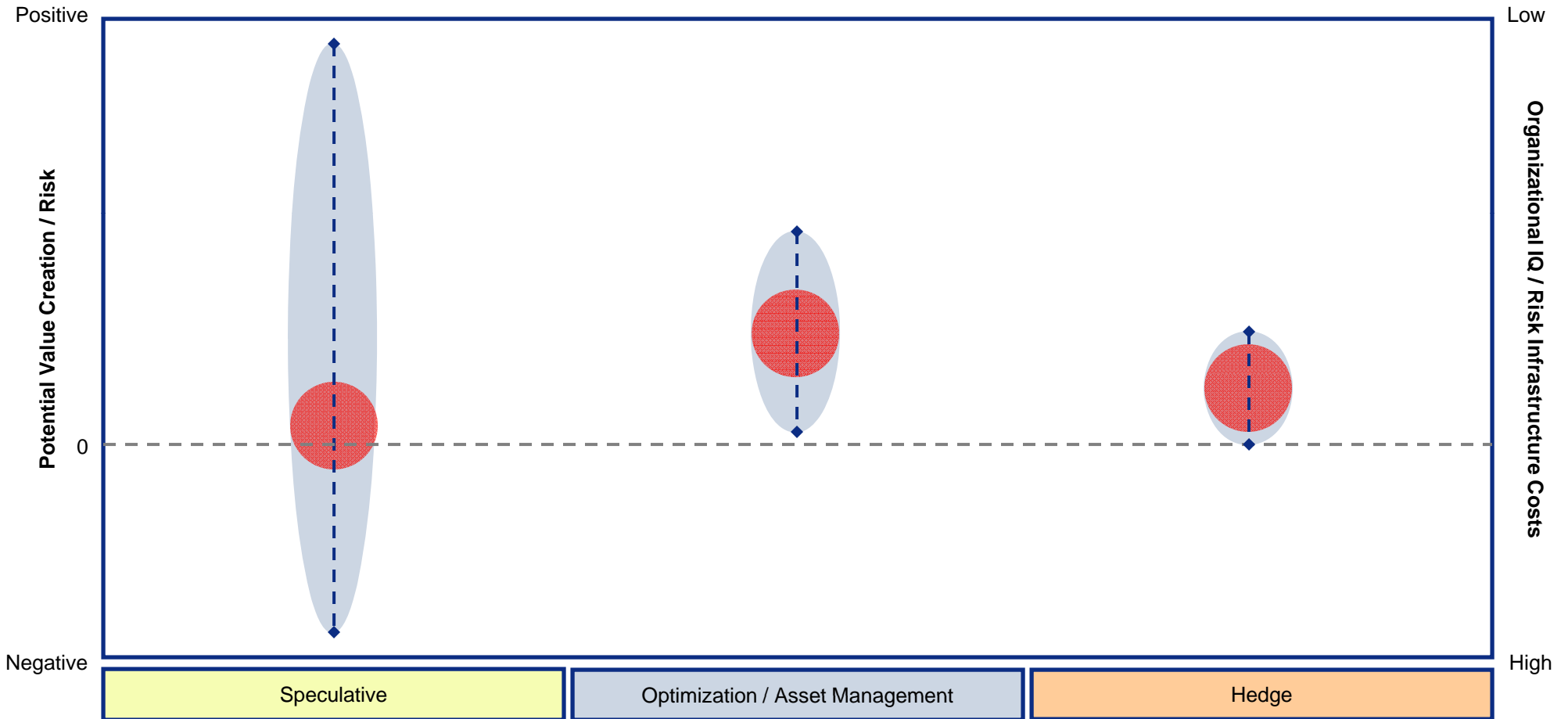


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Front Office

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Trading Strategy Potential Value and Related Cost



Front Office – Roles & Responsibilities

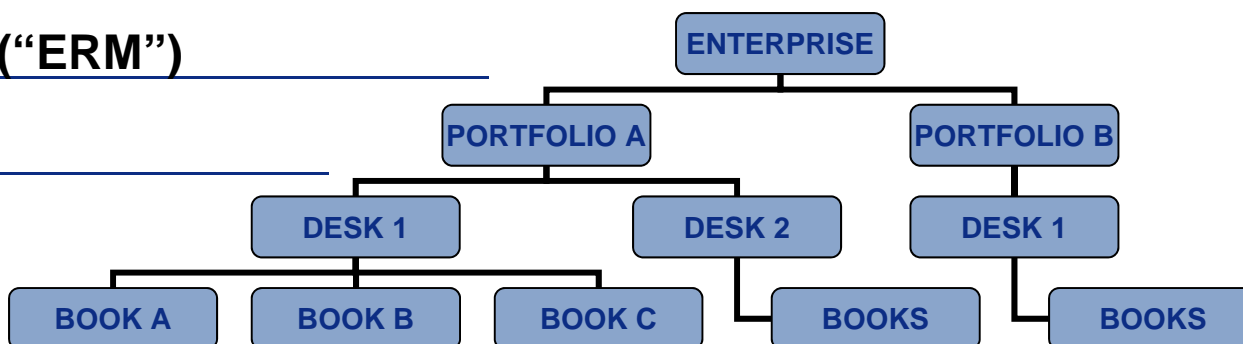
- **Trading** – Execute liquid, commodity transactions - in accordance with approved strategies
- **Marketing** – Foster customer relationships, develop structured transactions and execute structured / physical transactions – in accordance with approved strategies
- **Deal Entry** – Expedient entry of all new deals on same-day basis with proper recognition of embedded risk elements: Risk Disaggregation
- **Operations** – Manage deals and overall portfolio to meet obligations and optimize assets – Scheduling / Dispatch
- **Price Discovery & Curves Maintenance** – Understand relevant markets and maintain forward price curves for deal valuation and structuring

Front Office – Book Structure & Portfolio Management

Enterprise Risk Management (“ERM”)

Portfolio Management

Desk and Book structure



Objectives:

- Assign accountability
- Measure performance
- Disaggregate risk
- Facilitate risk monitoring & reporting
- Allow P&L analysis & reporting

Structure (based on characteristics):

- Strategies
- Commodity
- Instrument
- Time horizon
- Personnel
- Accounting Treatment

Issues:

Risk system capable of handling book, desk, portfolio roll-up - ERM

Inter-book transfers (“IB”) – Adds complexity

- Requires controls for timely deal capture and market pricing

Front Office – Common Trading Instruments and Asset Types

PRIMARY TRADING INSTRUMENTS

Physical Forwards

Derivatives

- Futures
- Fixed for float swaps
- Swing swaps
- Basis swaps
- Options

PRIMARY ASSET TYPES

Production – crude oil, natural gas, coal

Transportation / Transmission

Storage

Gas-fired power generation

Coal-fired power generation

Refinery

Gas processing

IMPORTANT CONSIDERATIONS

Instruments and asset types must be uniquely identified within risk system for proper management and settlement.

Positions reflected in risk system must be determined properly based on transaction.

Appropriate accounting treatment for each transaction must be determined, and deal must be entered accordingly into risk system.

Front Office – Trading & Marketing Strategies

SPECULATIVE TRADING

Acct Treatment	MTM
Liquidity	Deep liquid markets are key
Instruments	Financial (futures, swaps & options) - Derivatives
Strategies	Outright price, spreads & volatility (options) – market exposure / arbitrage / back-to-back

HEDGING or TRADING AROUND ASSETS

Accrual
Underlying assets less liquid
Physical with some derivatives for hedges
Asset-based – production or “conversion” Static or Dynamic or Structured

CONTROL FRAMEWORK:

- Segregate personnel, incentives, book structure, controls, reporting
- Communicate clearly and exhaustively the strategy and risk tolerances
- Support robust “ETRM” system to manage the portfolio
 - Deal capture, valuation, scheduling and settlement
 - P&L reporting & monitoring of forward portfolio value
 - Risk analytics (Greeks, VaR, Stress Testing, Scenario Analysis)
 - Limits – dynamic setting and monitoring
- Validate models for valuation and optimization
- Apply risk control tools appropriately

LEADING PRACTICES:

- Pursue well-defined and well-communicated strategies where competitive advantages exist
- Invest in ETRM systems, modeling support and appropriate training
- Secure sufficient trading capital - liquidity



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Front Office: Special Considerations

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Special Considerations: Natural Gas – Pricing & Swing

Pricing Mechanisms

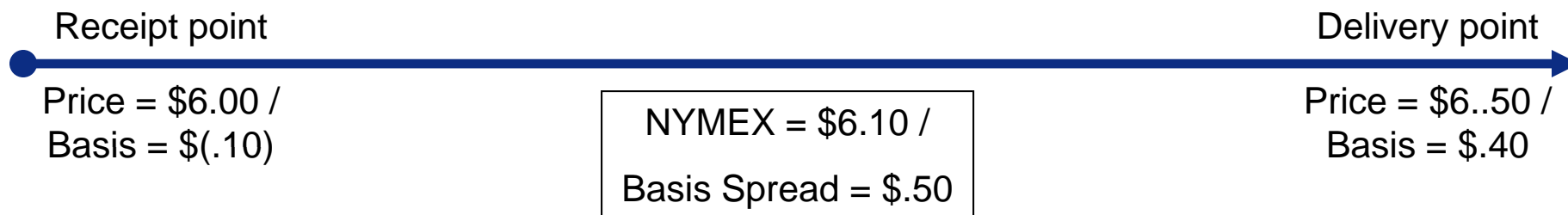
- Index
 - Monthly – IFERC
 - Daily – GDA
- Fixed Price
 - Daily – sets GDA
 - Monthly – sets monthly indices
 - Strips – Average
- Triggers – Basis + NYMEX

Swing rights (operational or economic dispatch)

- GDA
- IFERC - Fixed price

Special Considerations: Natural Gas – Transportation

- Receipt & Delivery Points
- MDQ
- Demand fees – fixed commitment
- Variable fees
 - Commodity charge - \$\$
 - Fuel charge (MMBtu's)
- Value proposition
 - Buy low / sell high
 - Segmenting
 - Backhauls
- Daily “in-the-money” dispatch
- Hedging – Basis + Index
 - Intrinsic value
 - Interruptible risk
 - Fuel risk
 - Receipt point basis left open
- Settling Imbalances – Cash outs & Volumetric
- “Shipper must have title” regulation
- Deal maintenance



Special Considerations: Natural Gas – Storage

- MDQ's
 - Injection
 - Withdrawal
- Reservoir or Salt Dome
- Ratchets
- Demand fees – Fixed component
- Variable fees
 - Commodity charge - \$\$
 - Fuel charge (MMBtu's)
- Value proposition
 - Buy low / sell high
 - “Rolling Hedges”
- Hedging: Fixed price
 - NYMEX + Basis + Index
 - Interruptible risk
 - Ratchet limits
- “Park & Loans”
- Deal maintenance

<u>September</u> \$8.05	<u>October</u> \$8.15	<u>November</u> \$8.80	<u>December</u> \$9.50	<u>January</u> \$9.80
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Case Study

Intra-state pipeline with regulated LDC and marketing affiliate

Management is openly risk averse. Statements made on analyst calls include:

- “We are not a trader”
- “We do not speculate”
- “We run a flat book – No net open positions”

Have pipelines and storage assets

Have corporate market risk policy, but wording is vague in some areas

Case Study I

Natural Gas Storage Position with resulting hedges									
		Contract Months							
		May	June	July	August	September	October	Total	
1	Phys Inventory at TxOk	500,000							500,000
2	NG Nymex Futures				(150,000)	(150,000)	(150,000)	(450,000)	
3	Basis swap TxOk - Hub				(150,000)	(150,000)	(200,000)	(500,000)	
3	Basis swap TxOk - Hub				150,000	150,000	200,000	500,000	
Total		500,000							
1- Natural gas physical inventory 2 - Natural gas nymex contracts 3 - Natural gas basis swaps									

Try to find the risk embedded in this natural gas storage position

Case Study I - Solution

Natural Gas Storage Position with resulting hedges		Contract Months							
		May	June	July	August	September	October	Total	
1	Phys Inventory at TxOk	500,000						500,000	
2	NG Nymex Futures				(150,000)	(150,000)	(150,000)	(450,000)	
3	Basis swap TxOk - Hub				(150,000)	(150,000)	(200,000)	(500,000)	
3	Basis swap TxOk - Hub				150,000	150,000	200,000	500,000	
	Total	500,000							

1- Natural gas physical inventory 2 - Natural gas nymex contracts 3 - Natural gas basis swaps

Natural Gas Storage Position with resulting hedges		Contract Months							
		May	June	July	August	September	October	Total	
1	Phys Inventory at TxOk	500,000						500,000	
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3	Basis swap TxOk - Hub				(150,000)	(150,000)	(200,000)	(500,000)	
3	Basis swap TxOk - Hub				150,000	150,000	200,000	500,000	
	Total	500,000							

Flat price risk - Volume of physical inventory and financial futures should be the same

- 1. Flat price risk – Sell an additional 50,000 of Natural gas futures in Oct to match the 500,000 total of inventory**

Case Study II

Natural Gas Storage Position with resulting hedges									
Contract Months									
			Aug	Sept	Oct	Nov	Dec	Jan	Total
1	Phys Inventory at TxOk		850,000						850,000
2	NG Nymex Futures					(300,000)	(300,000)	(250,000)	(850,000)
3	Basis swap TxOk - Hub						(425,000)	(425,000)	(850,000)
3	Basis swap TxOk - Hub						425,000	425,000	850,000
	Total		850,000						

1- Natural gas physical inventory 2 - Natural gas nymex contracts 3 - Natural gas basis swaps

Try to find the risk associated with this Natural gas storage position

Case Study II - Solution

Natural Gas Storage Position with resulting hedges									
Contract Months									
		Aug	Sept	Oct	Nov	Dec	Jan		Total
1	Phys Inventory at TxOk	850,000							850,000
2	NG Nymex Futures				(300,000)	(300,000)	(250,000)		(850,000)
3	Basis swap TxOk - Hub					(425,000)	(425,000)		(850,000)
3	Basis swap TxOk - Hub					425,000	425,000		850,000
	Total	850,000							

1- Natural gas physical inventory 2 - Natural gas nymex contracts 3 - Natural gas basis swaps									
Contract Months									
		Aug	Sept	Oct	Nov	Dec	Jan		Total
1	Phys Inventory at TxOk	850,000							850,000
2	NG Nymex Futures				(300,000)	(300,000)	(250,000)		(850,000)
3	Basis swap TxOk - Hub				(300,000)	(300,000)	(250,000)		(850,000)
3	Basis swap TxOk - Hub				300,000	300,000	250,000		850,000
	Total	850,000							

Basis Risk – Basis swaps are in the correct volumes but not in the correct settlement month. Basis swaps should be matched to the same volume and same months as the nymex future hedges

Case Study III

Outright Price Position	
Delivery	Contracts
May '07	25
Jun '07	20
Jul '07	20
Aug '07	20
Sep '07	15
Oct '07	20
Nov '07	(20)
Dec '07	(25)
Jan '08	(25)
Feb '08	(20)
Mar '08	(30)
Net Open	0

Can you identify the risks inherent with this example fixed price book?

Case Study III - Solution

Outright Price Position	
Delivery	Contracts
May '07	25
Jun '07	20
Jul '07	20
Aug '07	20
Sep '07	15
Oct '07	20
Nov '07	(20)
Dec '07	(25)
Jan '08	(25)
Feb '08	(20)
Mar '08	(30)
Net Open	<u><u>0</u></u>

"Summer Strip"
 120 contracts =
 1,200,000 MMBTu's

"Winter Strip"
 (120) contracts =
 (1,200,000) MMBTu's

This book contains time spread risk. The "Summer / Winter" spread is designed to gain from changes in the structure of the market.

The net open position is flat which is within the policy - the detail provides a different risk profile.

A \$.10 change in the value of this spread would result in an overall change in value of \$120,000

Questions to Ask

How do you define market risk?

Do you take fixed price positions?

Are you exclusively a hedger or do you “optimize” your assets?

Do you have a risk policy?

How do you monitor trading/hedging limits?

The Carbon Markets

- Definition – buying and selling of emissions permits that have either been distributed by a regulatory body or generated by green house gas (GHG) reduction projects
- Six main GHGs – carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, hydro fluorocarbons, per-fluorocarbons
- Traded based on carbon credits – based on reduction of one metric ton of CO₂
- Credits generated through specific project or as allowances (cap and trade type programs)
- Two distinct markets:
 - Compliance (example EU ETS)
 - Voluntary
 - All project based with one notable exception
 - CCX

Special Considerations: Carbon

CER Example: 1 ton per year, 85% probability of exercise, declining by 10% per year. Assume a 5% discount rate starting on 12/31/2007

Year	ER	P	Forward	DCF	Value
2009	1	0.85	21.55	0.951	17.42
2010	1	0.75	22.35	0.904	15.15
2011	1	0.65	22.95	0.861	12.84
2012	1	0.55	23.9	0.819	10.77

Net price of contract is \$14.05.



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Middle Office

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Middle Office – Roles & Responsibilities*

Risk Control

- Monitor compliance with policies, guidelines, and limits; report violations
- Confirm all appropriate transactions within established industry standards
- Validate and maintain all transaction details in the risk management systems
- Approve and manage the trading book structure to accomplish front and back office guidelines

Risk Analytics

- Provide daily report of risk exposure (P&L)
- Perform periodic back testing and stress testing
- Calculate MTM and risk metrics (VaR, EaR, CFaR, etc) of portfolios on a daily basis
- Analyze and explain changes in the portfolio

Valuation

- Validate and model forward curves for all commodity exposures
- Access market quotes for MTM assessment

** Obtained from the Governance and Controls Whitepaper written by the Committee of Chief Risk Officers (CCRO)*

Risk Control: Daily Management and Risk Reporting

PROCESS OVERVIEW

- Past, present and future metrics are reported to management on a timely basis to facilitate decisions.

Methods

- Past = performance
- Present = positions
- Future = risk
- Limits / reporting thresholds for all

CONTROL FRAMEWORK

- Ensure all deals are in calculations of P&L, positions, and risk.
- The P&L included in backtest analysis of risk measures should be reconciled to P&L reported in management reports.
- P&L and or risk measures should be available on a timely basis for management.

LEADING PRACTICES

- Real time calculation of performance, positions, and risk.
- Risk adjusted historical performance.

Risk Analytics

PROCESS OVERVIEW

- Analysis of existing position against significant market movements to quantify risk.
- Risk normalization of historical performance.

CONTROL FRAMEWORK

- The performance of predictive risk models can be analyzed over time to compare actual rate of accuracy to the confidence interval election in the model (i.e. backtesting).
- This analysis must be continuous.
- Correlations and volatilities are often not updated consistently.
- For credit value at risk, netting assumptions in calculations should be matched to netting agreements.
- Risk of replacement for physical delivery should be considered.

Methods

- Value at Risk
 - Calculation (what's my economic risk?)
 - Decomposition (what is driving my risk?)
- Earnings at Risk (what's my accounting risk?)
- Credit Value at Risk (what's my counterparty exposure risk?)
- Stress Test (how bad could things reasonably get?)

LEADING PRACTICES

- Risk is calculated and backtest is updated daily.
- Adjustments are made as needed to fine tune models.
- Risk is used as an input to commercial decisions.
- Stress testing is based on several standard scenarios **plus** ad hoc scenarios based on market conditions.

Valuation: Curve Validation

PROCESS OVERVIEW

- Review forward curves to ensure that MTM and decision models are based on objective market prices.
- 2 general practices – daily and periodic (semi-monthly, monthly, or quarterly).

CONTROL FRAMEWORK

- Curve validators should be independent of curve creators (especially true for monthly/quarterly validators).
- For some markets, it can be a challenge to obtain **objective** broker quotes. Validators should be aware of broker-front office relationships.
- Validators should not over-rely on broker quotes and should consider using a few of the other methods listed above to corroborate broker quotes. Illiquid curves or portions of curves are often omitted from the validation process because broker quotes are not easily available.

Methods

- Broker Quotes
- Last trade (if reasonably recent)
- Graph and review for kinks
- Compare to geographic or other bucket
- Review curve movement since last validation (kick out movements greater than X% for review in any time period)
- Counterparty quotes
- Curve regeneration (if model based)

LEADING PRACTICES

- Compare entire portfolio to mid price of independent curve to determine whether sum of insignificant individual variations is significant.
- Systematic process using a database to automatically kick out exceptions for review.
- Curve validation individual or group dedicated to this process will be almost as familiar with markets as front office.
- For very illiquid markets, validators should raise red flags for curve movements without transactions (unless curve generation is based on an objective model using validated inputs).
- Model risk management – risk assessment and validation



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Q & A

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