A Comparative Analysis of the Performance of Selected E&P Firms in the U.S. & Abroad

Professor Wumi Iledare, Ph.D.

Professor, Petroleum Economics & Policy Research &
Director, Energy Information Division

LSU CENTER FOR ENERGY STUDIES

Presentation Outline

- Introduction
- Research Objectives
- Overview of FRS Companies
- FRS E&P Firms' Efforts & Outcomes
- Modeling Approach & Results
- Closing Remarks

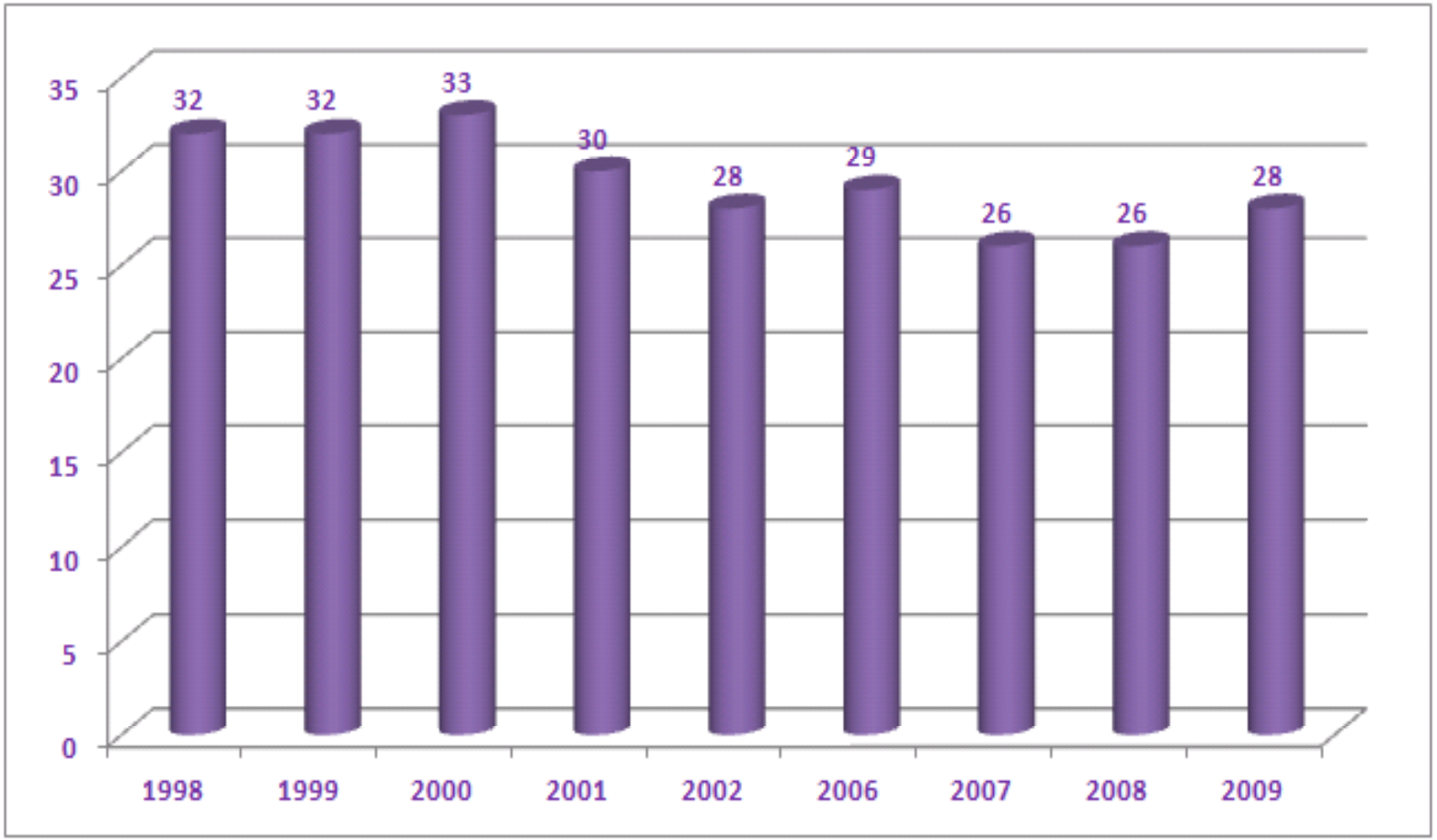
Objectives

- Paper analyses quantitatively, FRS E&P firms efforts and outcomes in the US and overseas
- The paper evaluates and compares the performance of these firms in an aggregate sense using Monte Carlo simulation process
- Determines the effect of tax regimes, prospectivity, and prices on empirical aggregate outcomes of EP efforts in the US and overseas

Companies Reporting to the FRS, 1974-2009

Alenco, Inc.	Equitable Resources, Inc.	The Coastal Corporation [28]
Alon USA, Inc.	Exxon Mobil Corporation [13]	The Williams Companies, Inc.
American Petrofina, Inc.[1]	Getty Oil[14]	Tosco Corporation [32]
Anadarko Petroleum Corporation	Gulf Oil[8]	Total Holdings, USA.[1, 26, 35]
Apache Corporation	Hess Corporation	Total Petroleum (North America) Ltd.[24]
Ashland Inc.[4]	Hovensa[41]	Ultramar Diamond Shamrock Corporation [34]
Atlantic Richfield Co. (ARCO)[29]	Kerr-McGee Corporation [15, 38]	Union Pacific Resources Group, Inc. [25, 31]
BP America, Inc.[3, 5]	Lyondell Chemical Company[16,40]	Unocal Corporation [37]
BP Amoco Corporation[2, 3, 29]	Marathon [17]	USX Corporation
Burlington Northern Inc.[6]	Mobil Corporation [13, 18]	Valero Energy Corporation [34]
Burlington Resources Inc.[6, 39]	Motiva Enterprises LLC [19]	WRB Refining LLC [43]
Chalmette Refining LLC[44]	Nerco, Inc.[20]	XTO Energy, Inc.
Chesapeake Energy Corporation	Occidental Petroleum Corporation[9]	
Chevron Corporation[7, 8, 30]	Oryx Energy Company[15, 21]	
Citgo Petroleum Corporation	Phillips Petroleum Company[32, 33]	
Cities Service[9]	Premcor Refining Group [27, 36]	
ConocoPhillips, Inc.[10, 11, 33]	Shell Oil Company[42]	
Devon Energy Corporation	Sonat Inc.	
Dominion Resources	Standard Oil Co. (Ohio) (SOHIO)[5]	
E.I. du Pont de Nemours and Co.[10, 11]	Sunoco, Inc.[21, 22]	
El Paso Energy Corporation [28]	Superior Oil[18]	
Enron Corp.	Tenneco Inc.[23]	
EOG Resources	Tesoro Petroleum Corporation	
Equilon Enterprises, LLC [12]	Texaco Inc.[14, 30]	

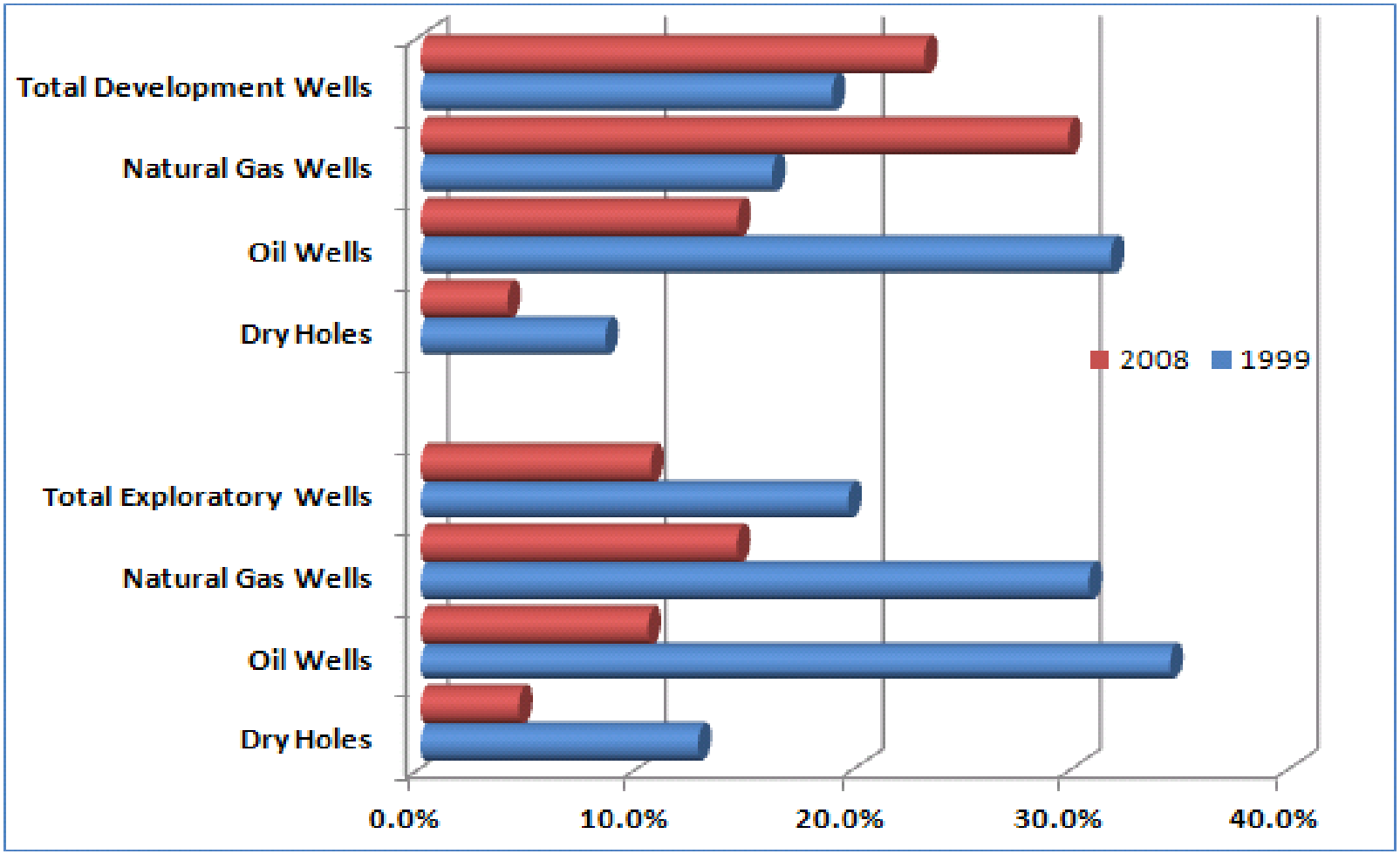
Companies Reporting to the FRS, 1998-2009



Firms Reporting to the FR System

- Original criteria was at least 1% of oil and gas production or reserves in the U.S. or 1% of either refining capacity or petroleum product sales in the United States.
- In 1976 there were 27 FRS firms reporting domestic and foreign activities using Form EIA 28
- A simplified EIA requirement was introduced in 1998 to make the survey more pragmatic because of the changing structure of the industry in the U.S.

Role of FRS Firms in U.S. E&P



Role of FRS Firms in U.S. E&P

	EOY 2008	Share	EOY 1998	Share	RRR 2008	RRR 1998
Crude Oil and Natural Gas Liquids (Million Barrels)					%	%
U.S. Onshore2						
Total Industry	23,945		24,080		-10	25
FRS Companies	9,842	41%	12,062	50%	-36	49
All Other	14,103	59%	12,018	50%	5	5
U.S. Offshore2						
Total Industry	4,451		4,478		85	53
FRS Companies	2,972	67%	3,333	74%	76	89
All Other	1,479	33%	1,145	26%	97	-17
Dry Natural Gas (Billion Cubic Feet)						
U.S. Onshore2						
Total Industry	231,110		136,196		137	89
FRS Companies	103,310	45%	55,111	40%	104	106
All Other	127,800	55%	81,085	60%	162	78
U.S. Offshore2						
Total Industry	13,546		27,845		64	67
FRS Companies	7,603	56%	20,401	73%	29	89
All Other	5,943	44%	7,444	27%	96	37

Role of FRS Firms in U.S. E&P

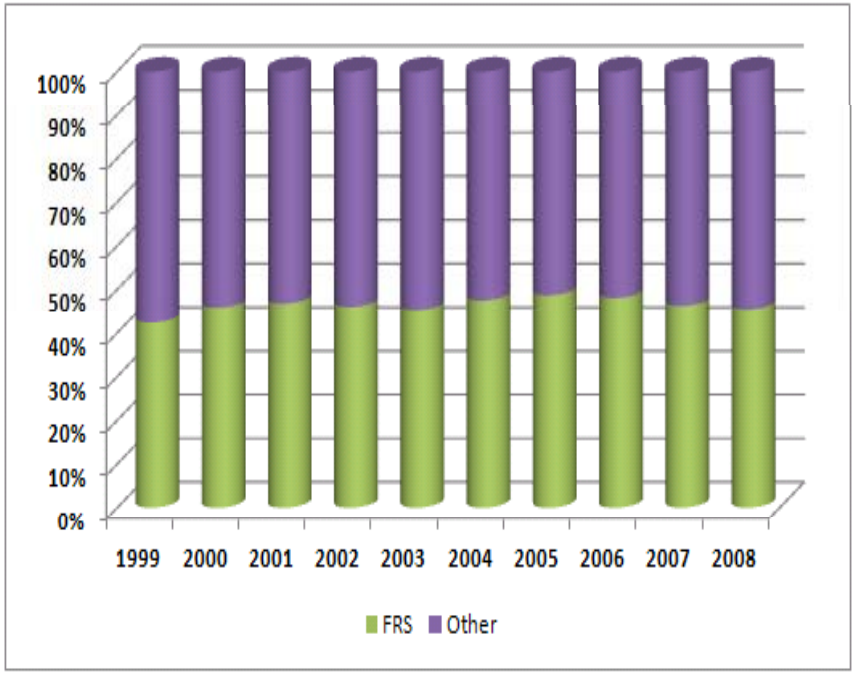
Liquid Production

Dry Gas Production

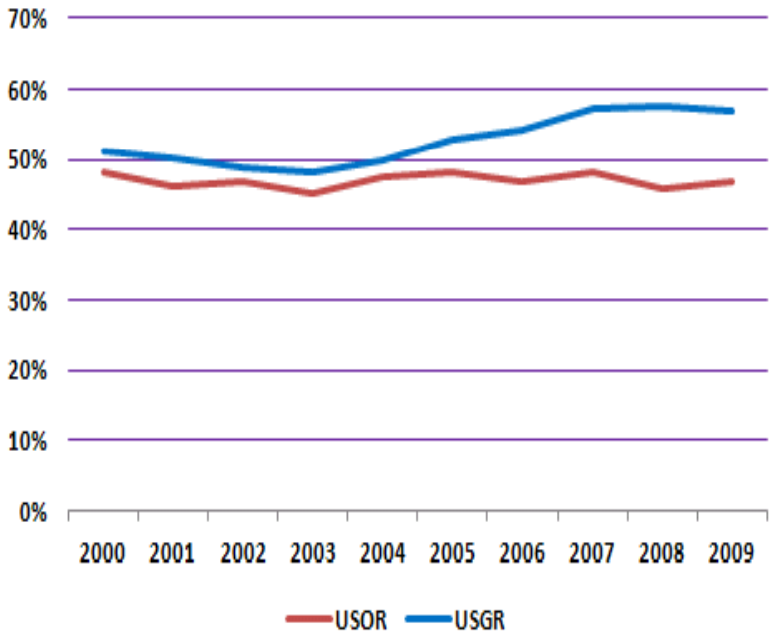
Role of FRS Firms in the U.S. E&P

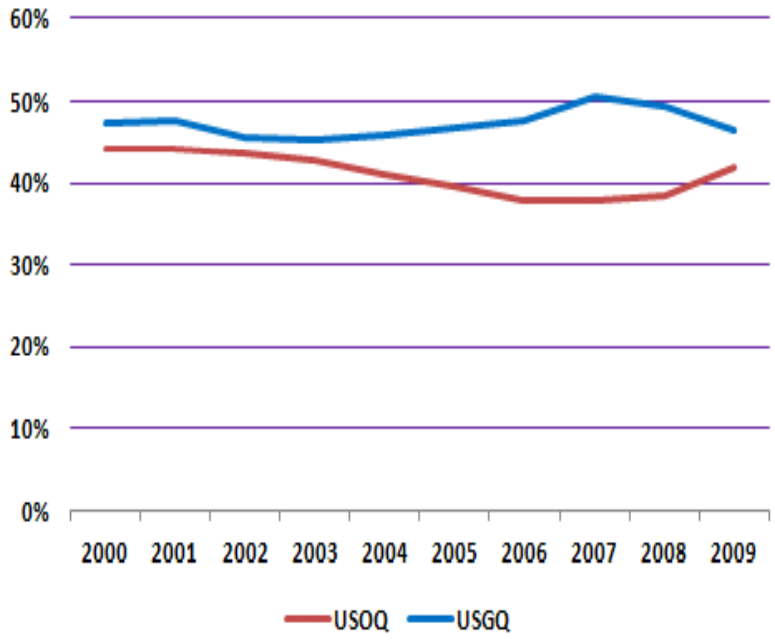
Liquids Reserves

Gas Reserves

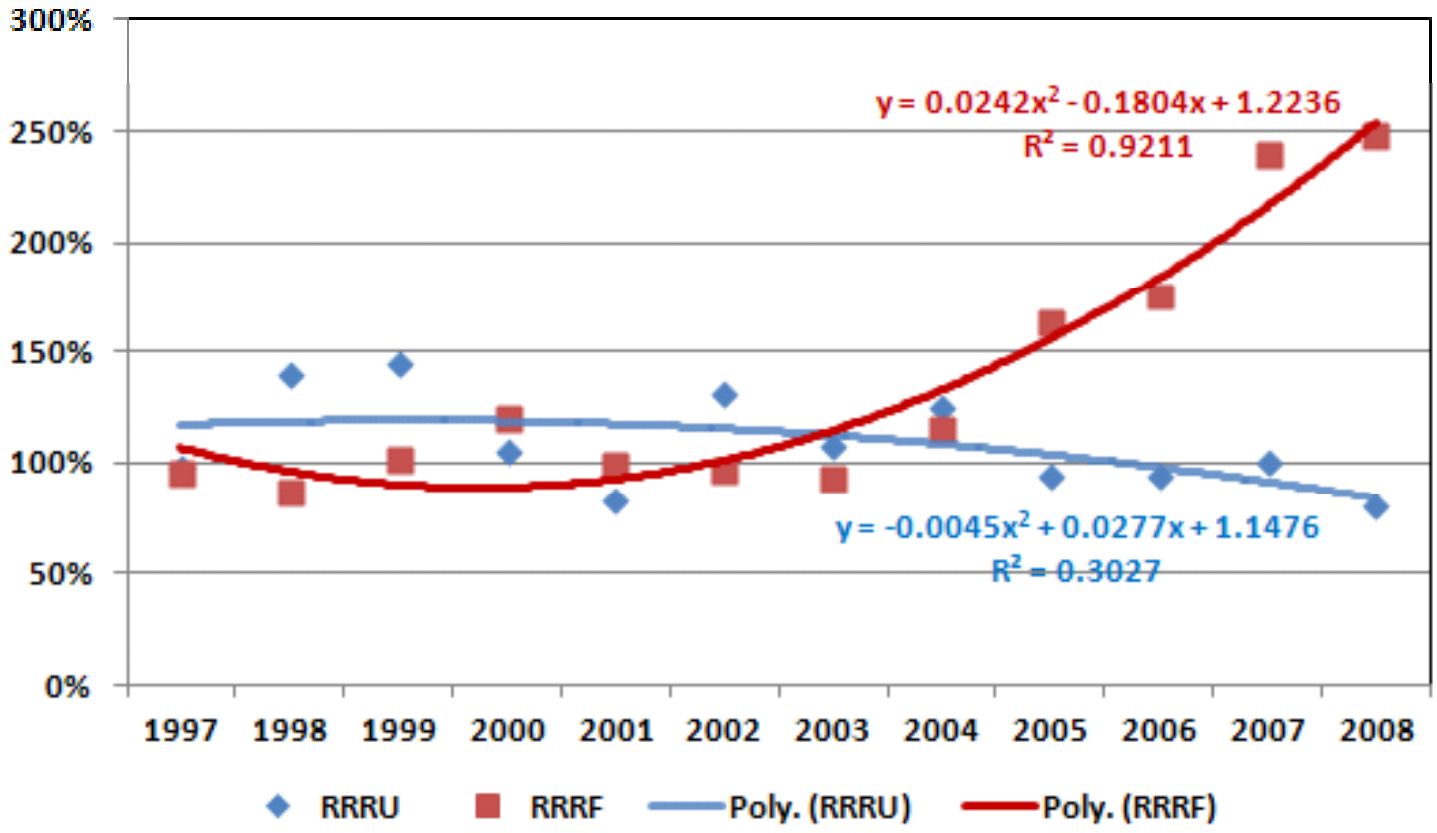


FRS Firms' Relative Reserves and Production in the US & Overseas

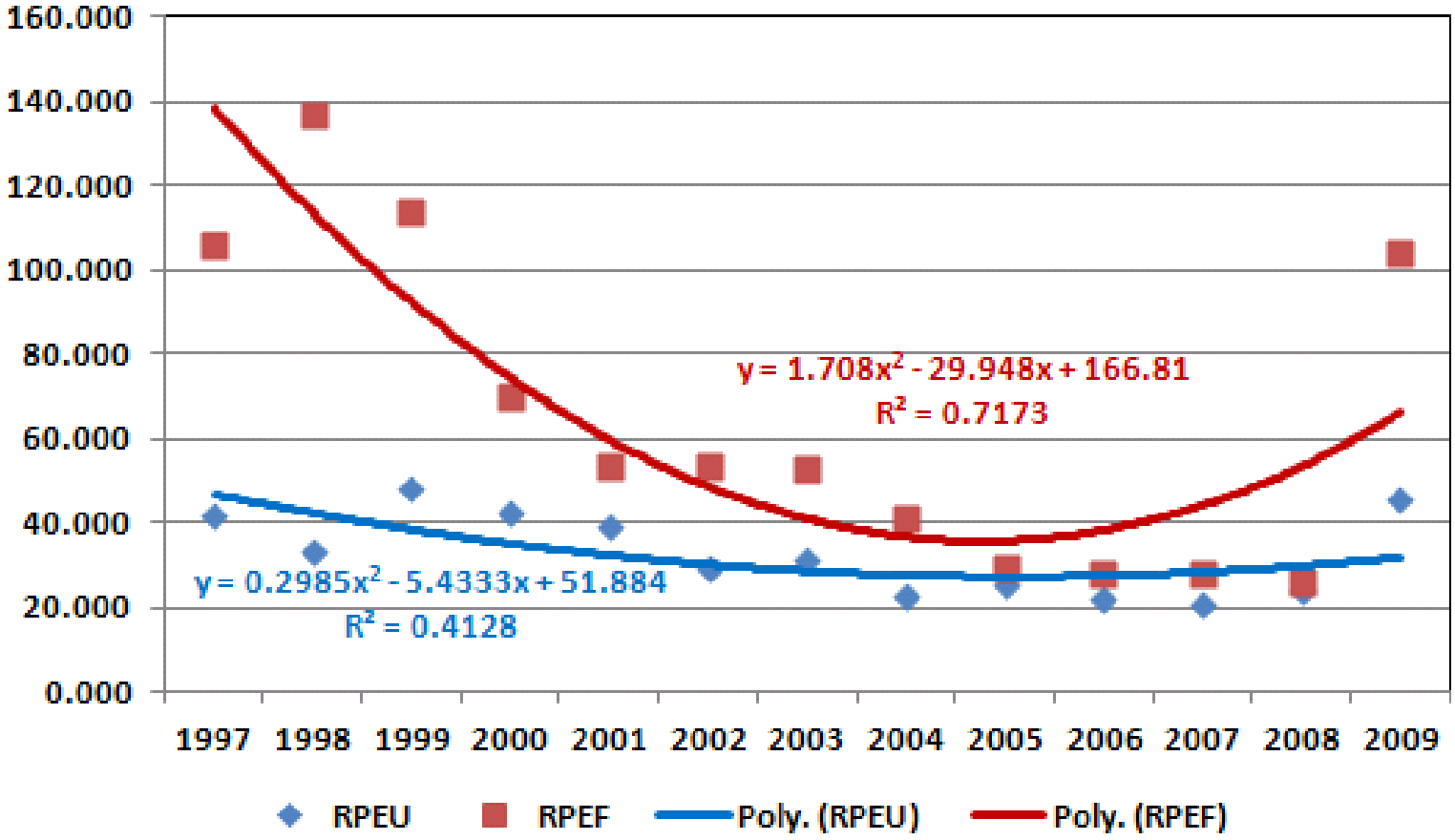




FRS Firms' Relative Performance in the US & Abroad –BOE Reserves Replacement



BOE Reserves per Effort in the US and Abroad



Model Specification

Annual net cash flow for a typical E&P venture :

NCF = Gross Revenue
- Royalty
- State & Local Taxes
- Operating Expenses
- Overheads (business & investment)
- Capital Investments
- Bonus & Rentals
- Net Taxes
+ Property Sales Price

Model Specification

- Annual Taxable Income = Revenues – Royalties - Fiscal Costs
  - Fiscal allowable cost deductions include:
  - OPEX, Royalty, Depreciation, Depletion Allowance, Expensed Investments
  - Revenue (R) = Price (P) * Marketed Production (Q)

- $NCF_{ATAX} = NCF_{BTAX} - T_C(NCF_{BTAX} - DD\&A - I)$
- $PIR = 1 + [NCF_{ATAX} / (DD\&A + I)]$
- $NRE = (NCF_{ATAX} * SUCR)/CWELL$

Model Specification

- $NCF_{BTAX} = (1-\beta_1-\beta_2-\beta_3)^* R$
- SUCR = successful completion rate
- I = interest payment on debt (loan) if allowed
- T_C = the corporate tax rate, fraction
- B_i: (i=1,2,3) fraction of revenue for CAPEX, OPEX, other Cost
- R = annual Operating Revenue
- P= price of Output and Q=Output

Descriptive Statistics of Data, 1974-2009

Domestic Efforts/Rewards	Mean	STD	Max	Min	Median
Operating Revenue, MM$2009	87,587	24,567	160,171	59,402	79,903
Corparate Tax, MM$2009	9,348	8,320	25,272	(355)	6,361
CAPEX, $MM	17,868	8,804	44,471	9,059	15,455
Royalty + Other Taxes, MM$2009	3,856	2,345	12,589	1,507	3,053
OPEX, MM$2009	17,003	4,744	25,312	10,408	15,243
Gross Reserves Added, MMBPE	2,676	563	3,736	1,883	2,608
Wells Completed, #	8,391	2,802	13,217	3,508	8,065
Success Rate, %	94.8	2.9	98.1	90.3	95.3
Reserves Added per Effort, MMBPE	32.7	9.7	48.5	20.9	31.0
Production, MMBPE	2,723	163	2,937	2,489	2,740
Reserves Replacement, %	1.06	0.23	1.45	0.73	1.00
BOE Price, $BPE	36.88	11.82	62.31	20.60	36.61

Descriptive Statistics of Data, 1974-2009

Foreign Efforts/Rewards	Mean	STD	Max	Min	Median	COV
Operating Revenue, MM$2009	83,526.35	45,212	207,952	44,250	60,625	54.1%
Corparate Tax, MM$2009	19,793.43	16,379	62,431	3,134	13,075	82.8%
CAPEX, $MM	35,116.00	19,468	86,322	16,570	29,297	55.4%
Royalty + Other Taxes, MM$2009	3,544.15	2,060	9,663	1,814	2,767	58.1%
OPEX, MM$2009	13,164.48	3,873	23,522	9,885	11,868	29.4%
Gross Reserves Added, MMBPE	2,428.11	722	3,225	1,161	2,649	29.7%
Wells Completed, #	4,187.77	1,625	6,092	1,962	4,240	38.8%
Success Rate, %	92.20	3.3	95.9	86.1	92.7	3.6%
Reserves Added per Effort, MMBPE	64.78	38.1	137.1	26.2	53.3	58.8%
Production, MMBPE	2,870.00	194	3,073	2,376	2,931	6.8%
Reserves Replacement, %	1.33	0.56	2.48	0.87	1.02	42.2%
BOE Price, $BPE	36.89	15.87	72.23	17.66	32.16	43.0%

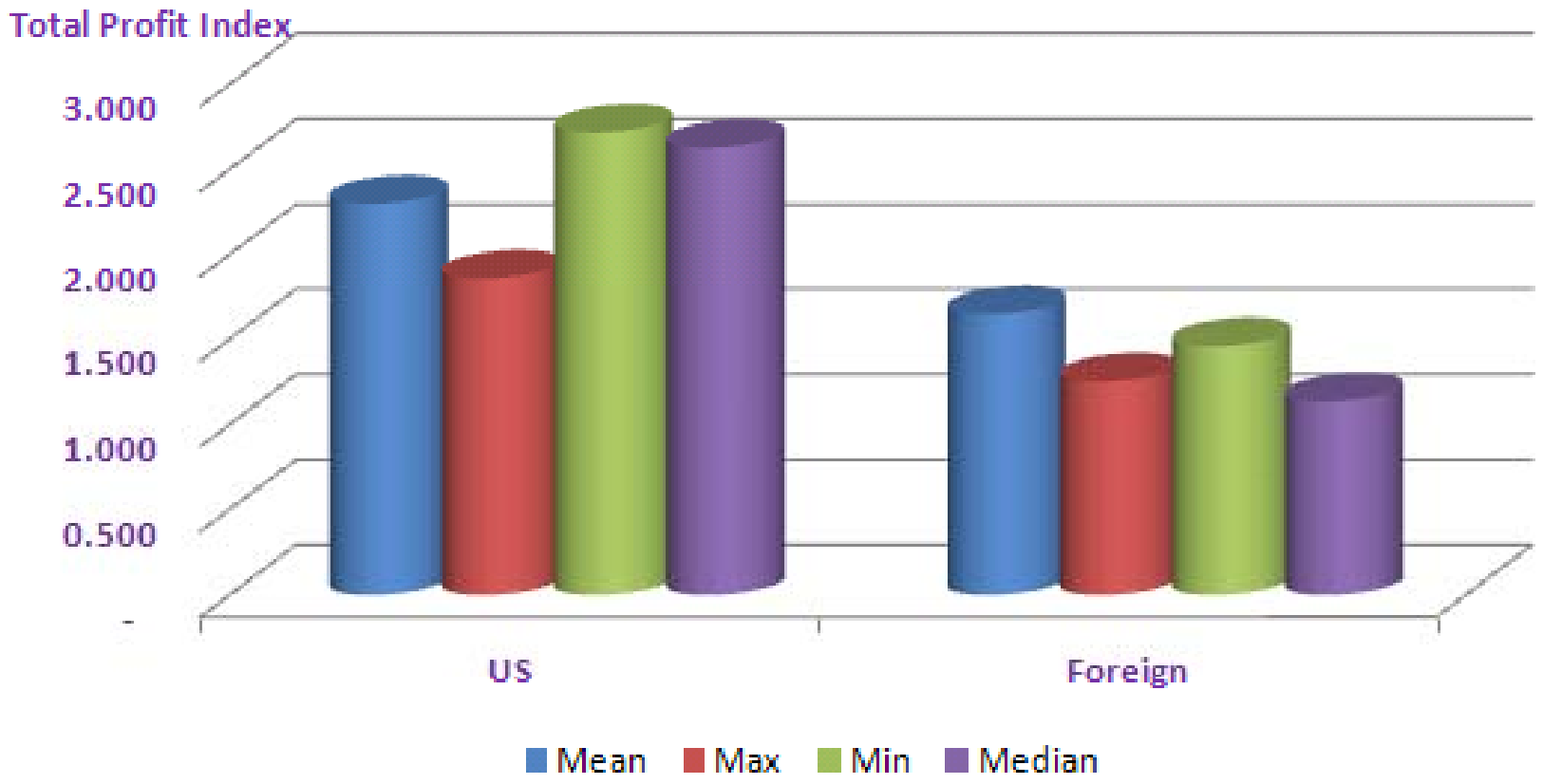
Deterministic Model Results--US

INPUT VARIABLES OF INTEREST	Mean	Max	Min	Median
Production, MMBPE	2,723	2,937	2,489	2,740
BOE Price, $BPE	36.88	62.31	20.60	36.61
Wells Completed, #	8,391	13,217	3,508	8,065
Success Rate, %	94.78	98.10	90.30	95.30
Income Tax Fraction, %	0.19	0.32	-0.01	0.14
CAPEX Fraction, %	0.20	0.28	0.15	0.19
Other Tax Fraction, %	0.04	0.08	0.03	0.04
OPEX Fration, %	0.19	0.16	0.18	0.19
OUTPUT VARIABLES OF INTEREST				
Net Operating Revenue,$MM	45,306	60,019	33,462	49,960
Net Revenue per Technical Cost	2.299	1.860	2.719	2.627
Net Revenue per Effort, $/Well	5.117	4.455	8.614	5.904

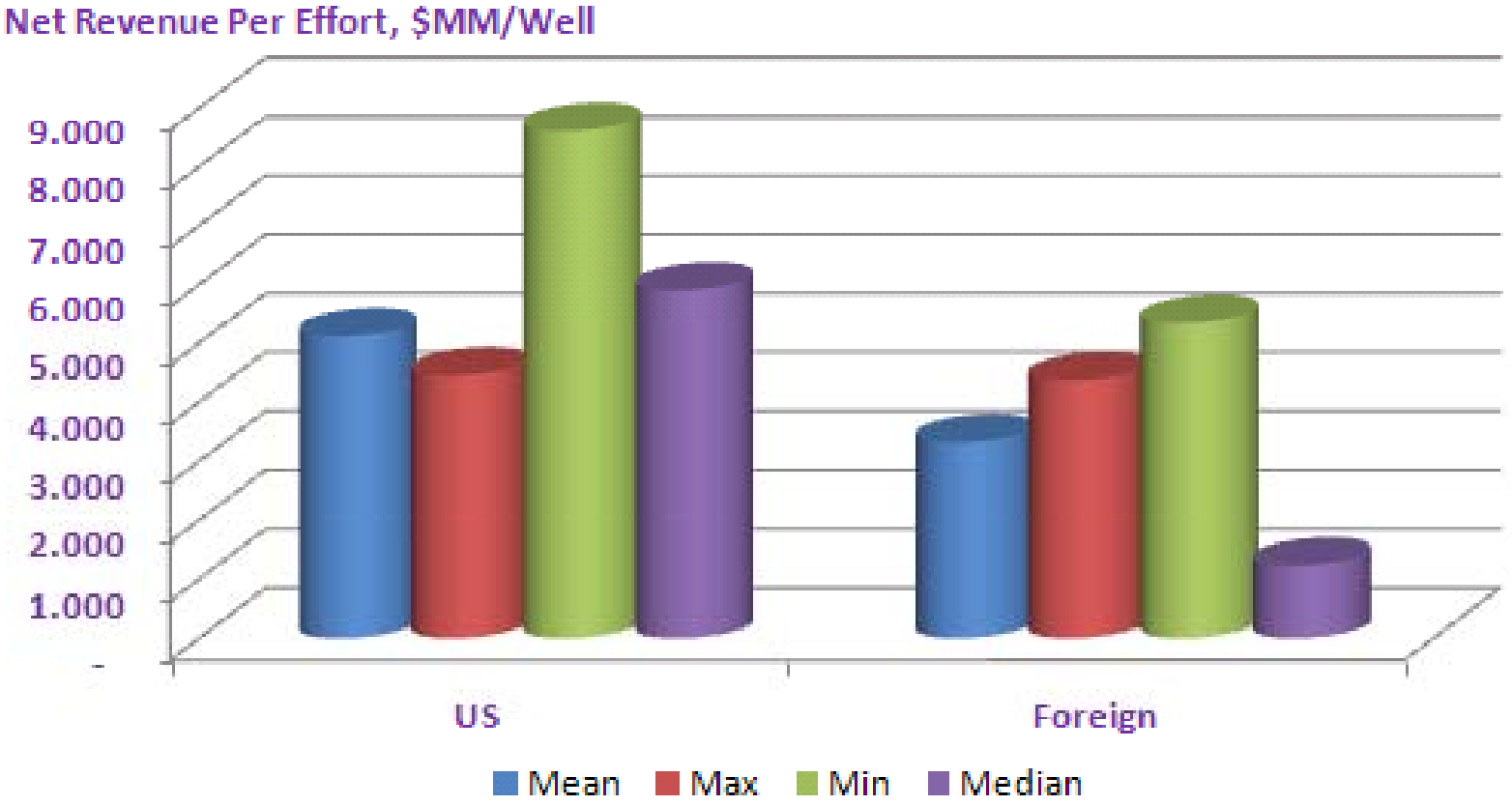
Deterministic Model Results--FOR

INPUT VARIABLES OF INTEREST	Mean	Max	Min	Median
Production, MMBPE	2,870.00	3,073.40	2,376.37	2,930.67
BOE Price, $BPE	36.89	72.23	17.66	32.16
Wells Completed, #	4187.77	6092.00	1962.00	4240.00
Success Rate, %	92.20	95.90	86.10	92.70
Income Tax Fraction, %	0.62	0.71	0.20	0.78
CAPEX Fraction, %	0.42	0.42	0.37	0.48
Other Tax Fraction, %	0.04	0.05	0.04	0.05
OPEX Fration, %	0.16	0.11	0.22	0.20
OUTPUT VARIABLES OF INTEREST				
Net Operating Revenue,$MM	15,095	27,771	12,183	5,625
Net Revenue per Technical Cost	1.647	1.253	1.461	1.137
Net Revenue per Effort, $/Well	3.323	4.372	5.346	1.230

Deterministic Model Results



Deterministic Model Results

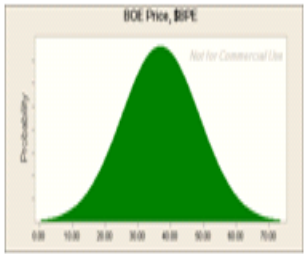


Stochastic Model Assumptions--US

Assumption: BOE Price, $BPE — **Cell: B17**

Normal distribution with parameters:

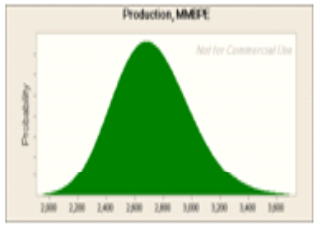
Mean	36.88
Std. Dev.	11.82



Assumption: Production, MMBPE — **Cell: B16**

Lognormal distribution with parameters:

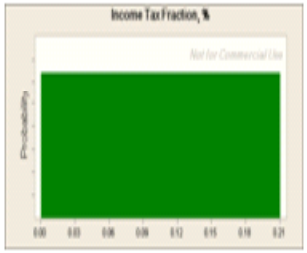
Location	0
Mean	2,723
Std. Dev.	272



Assumption: Income Tax Fraction, % — **Cell: B20**

Uniform distribution with parameters:

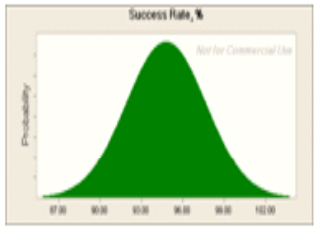
Minimum	0.00
Maximum	0.21



Assumption: Success Rate, % — **Cell: B19**

Normal distribution with parameters:

Mean	94.78
Std. Dev.	2.90



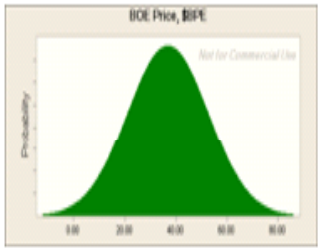
End of Assumptions

Stochastic Model Assumptions--FOR

Assumption: BOE Price, $BPE Cell: B

Normal distribution with parameters:

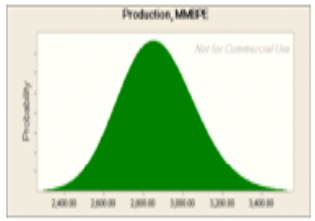
Mean	36.89
Std. Dev.	15.87



Assumption: Production, MMBPE Cell: B

Lognormal distribution with parameters:

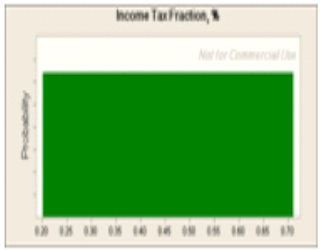
Location	0.00
Mean	2,870.00
Std. Dev.	194.00



Assumption: Income Tax Fraction, % Cell: B

Uniform distribution with parameters:

Minimum	0.20
Maximum	0.71



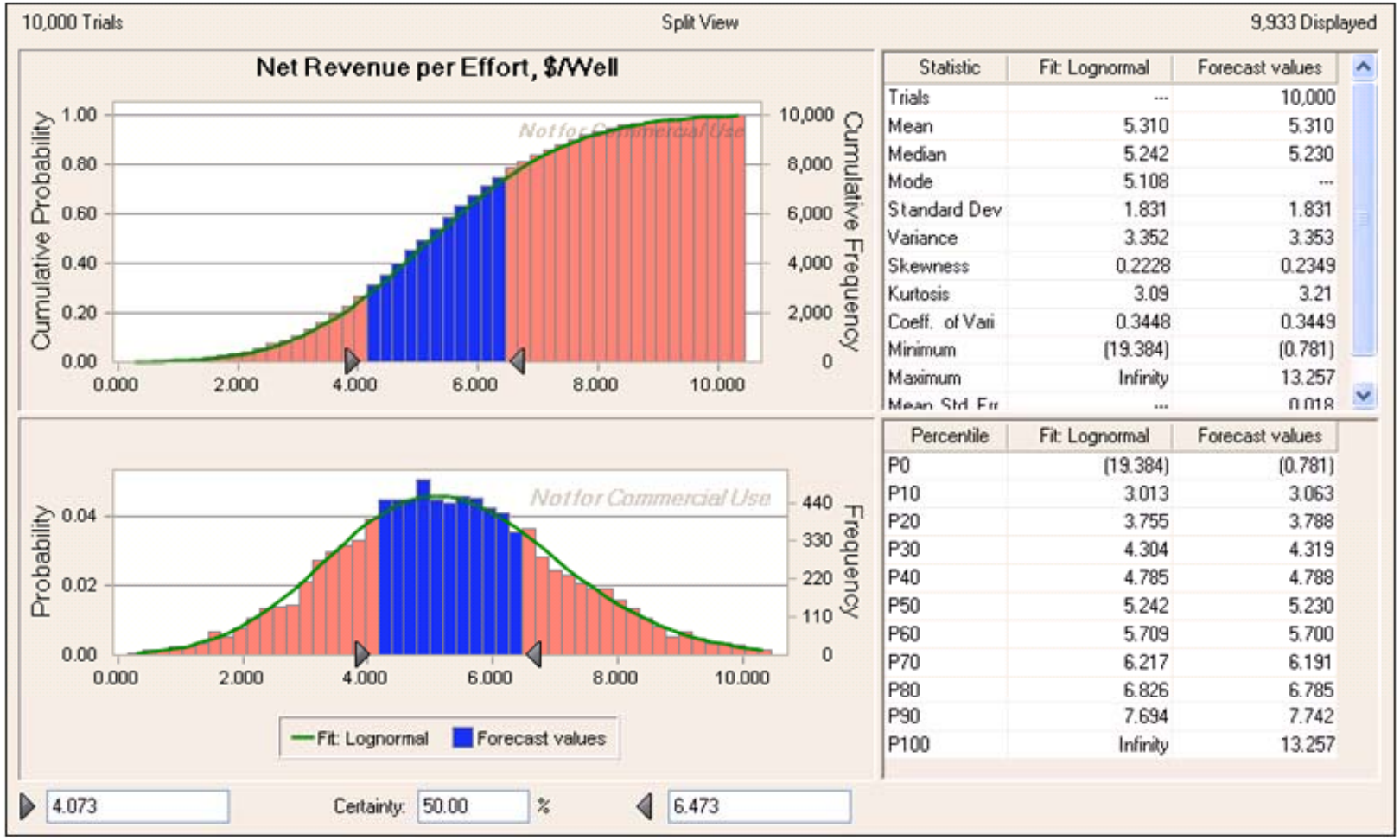
Assumption: Success Rate, % Cell: B

Normal distribution with parameters:

Mean	92.20
Std. Dev.	3.30

End of Assumptions

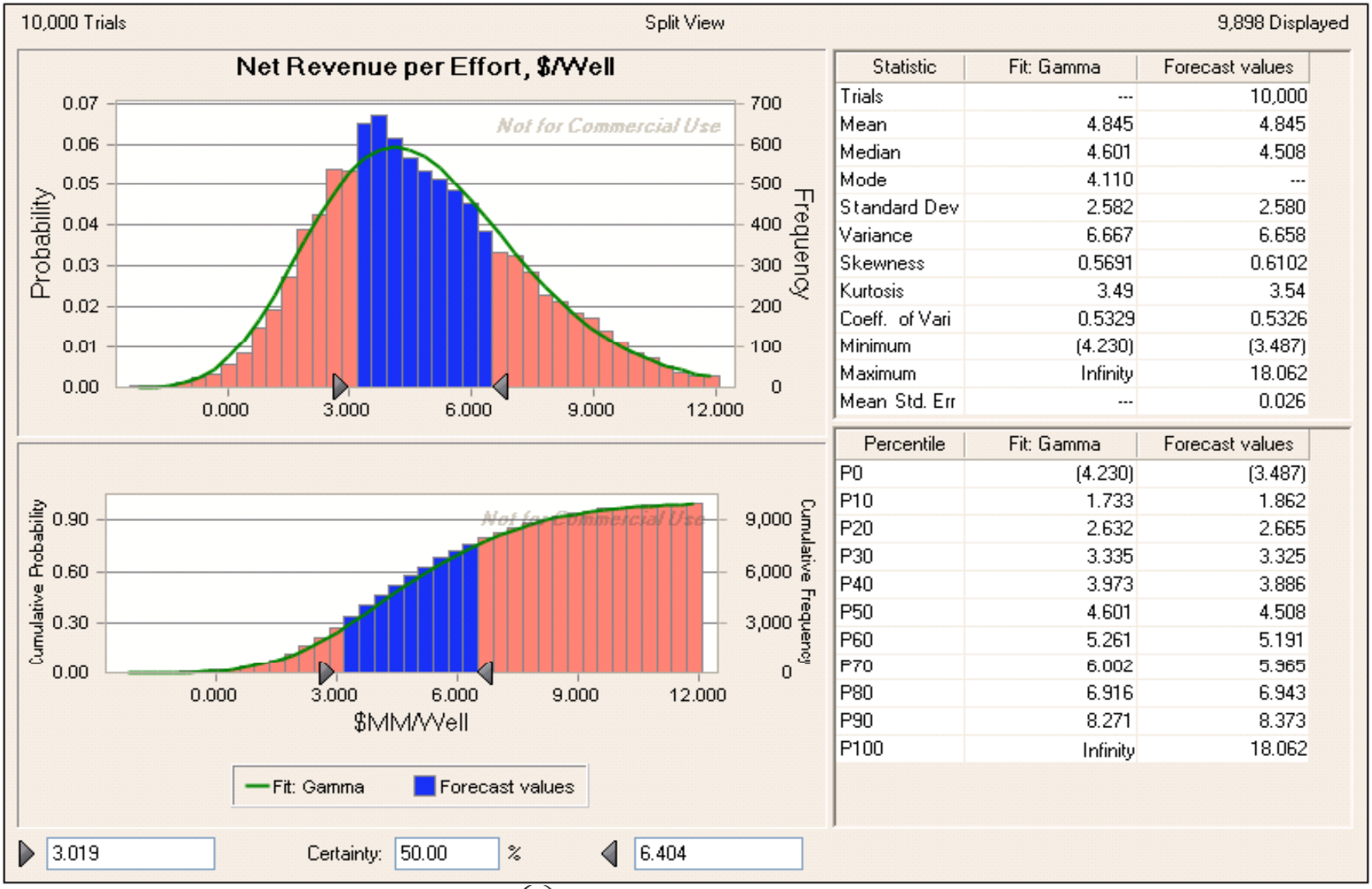
Stochastic Model Results--US



Statistic	Fit: Lognormal	Forecast values
Trials	---	10,000
Mean	5.310	5.310
Median	5.242	5.230
Mode	5.108	---
Standard Dev	1.831	1.831
Variance	3.352	3.353
Skewness	0.2228	0.2349
Kurtosis	3.09	3.21
Coeff. of Vari	0.3448	0.3449
Minimum	(19.384)	(0.781)
Maximum	Infinity	13.257
Mean Std Er	---	0.018

Percentile	Fit: Lognormal	Forecast values
P0	(19.384)	(0.781)
P10	3.013	3.063
P20	3.755	3.788
P30	4.304	4.319
P40	4.785	4.788
P50	5.242	5.230
P60	5.709	5.700
P70	6.217	6.191
P80	6.826	6.785
P90	7.694	7.742
P100	Infinity	13.257

Stochastic Model Results—Foreign

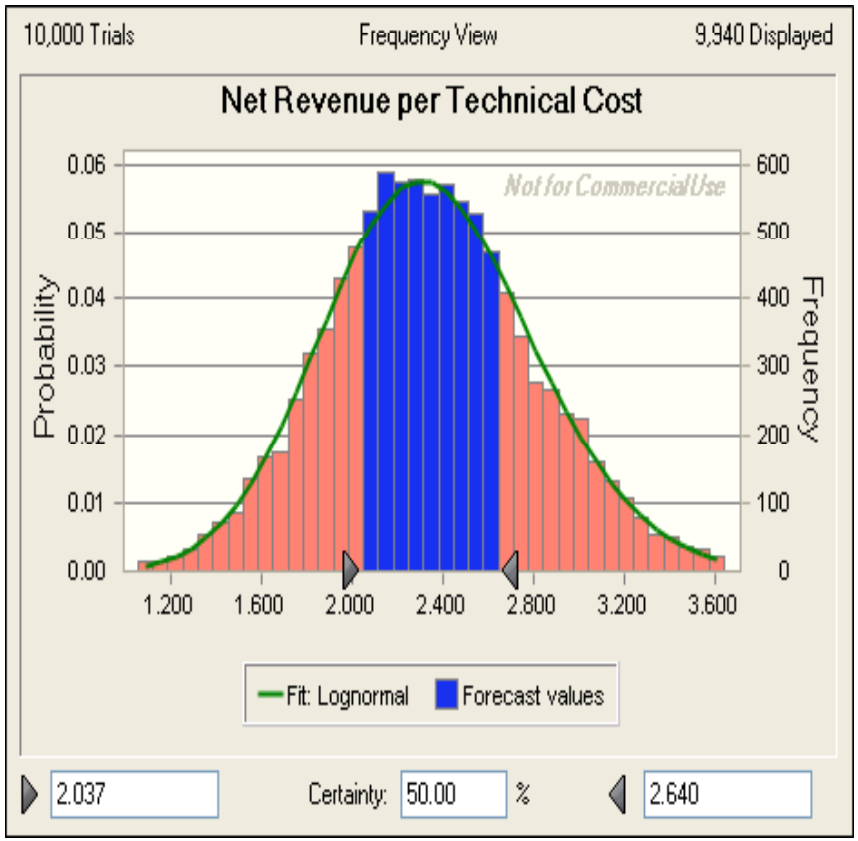


Statistic	Fit: Gamma	Forecast values
Trials	---	10,000
Mean	4.845	4.845
Median	4.601	4.508
Mode	4.110	---
Standard Dev	2.582	2.580
Variance	6.667	6.658
Skewness	0.5691	0.6102
Kurtosis	3.49	3.54
Coeff. of Vari	0.5329	0.5326
Minimum	(4.230)	(3.487)
Maximum	Infinity	18.062
Mean Std. Err	---	0.026

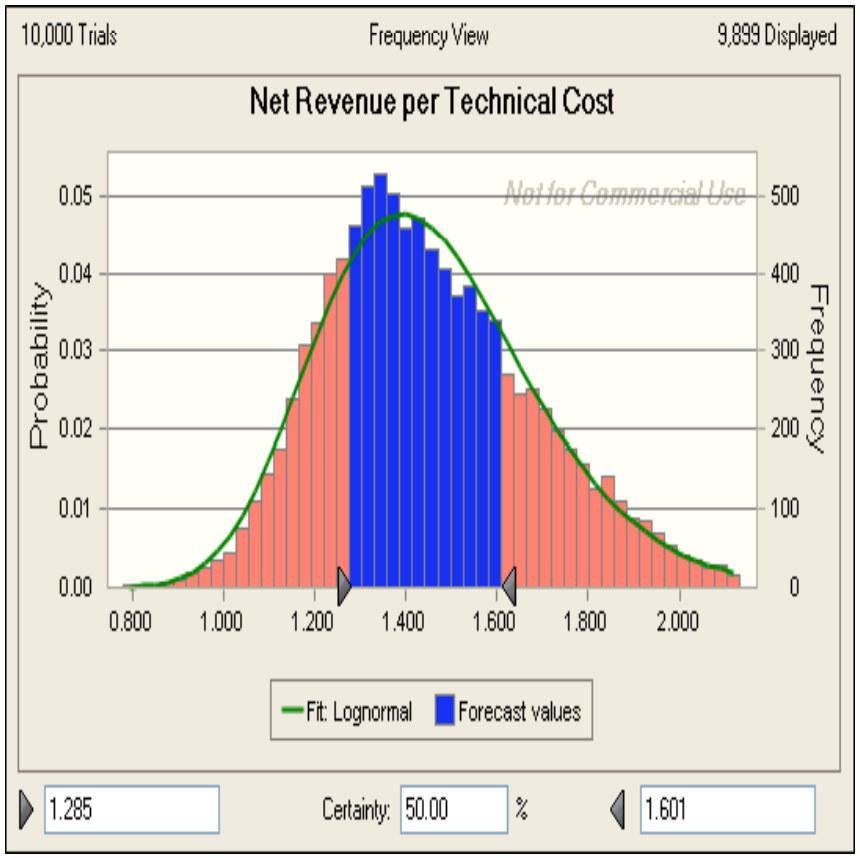
Percentile	Fit: Gamma	Forecast values
P0	(4.230)	(3.487)
P10	1.733	1.862
P20	2.632	2.665
P30	3.335	3.325
P40	3.973	3.886
P50	4.601	4.508
P60	5.261	5.191
P70	6.002	5.965
P80	6.916	6.943
P90	8.271	8.373
P100	Infinity	18.062

Comparative Stochastic Results

US



Foreign



Stochastic Sensitivity Results

Foreign Outcomes		
Sensitivity: Net Revenue per Technical Cost		
Assumptions	ContributionToVariance	RankCorrelation
BOE Price, $BPE	0.698	0.819
Income Tax Fraction, %	0.285	-0.524
Production, MMBPE	0.017	0.127
Success Rate, %	0.000	-0.007

US Outcomes		
Sensitivity: Net Revenue per Technical Cost	US	
Assumptions	ContributionToVariance	RankCorrelation
BOE Price, $BPE	0.879	0.919
Income Tax Fraction, %	0.096	-0.304
Production, MMBPE	0.024	0.152
Success Rate, %	0.001	0.022

Stochastic Sensitivity Results

Foreign Outcomes		
Sensitivity: Net Revenue per Effort, $/Well		
Assumptions	ContributionToVariance	RankCorrelation
BOE Price, $BPE	0.696	0.817
Income Tax Fraction, %	0.285	-0.523
Production, MMBPE	0.017	0.127
Success Rate, %	0.003	0.054

US Outcomes		
Sensitivity: Net Revenue per Effort, $/Well		
Assumptions	ContributionToVariance	RankCorrelation
BOE Price, $BPE	0.868	0.915
Income Tax Fraction, %	0.096	-0.304
Production, MMBPE	0.024	0.152
Success Rate, %	0.012	0.107

Summary & Conclusions

This paper evaluates the sensiitvity of selected empirical indicators of global E&P industry dynamics to changes in crude oil prices, prospectivity, and drilling success rate and taxes using Monte Carlo simulation process.

The simulation results are applied to evaluate whether investing in non-U.S. E&P ventures offers more promising rewards than investing in U.S. ventures using empirical modeling framework.

The paper shows there is enough empirical evidence to suggest that positive changes in petroleum prices do matter much more than taxes and significantly and differentially across petroleum producing regions worldwide.

There is also a statsitical evidence to suggest that the impact of tax burdens on E&P outcomes in the U.S. is significantly less than the outcomes abroad; but the impact of a higher tax burden, in a statistical sense, on the aggregate performance of E&P investments by FRS companies in the U.S. and abroad is significant.