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Artificial System to Compare Energy Status in the Context of Europe and Middle East

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Abstract - Now-a-days Global economy depends on the supply of energy and proper use of it. Energy is very compelling and critical issues all over the world. But the price of energy especially oil is increasing day by day. It is an obvious duty for all government throughout the world that estimation of cost of Oil for future development. The main purpose of this research is to develop a dynamic future and instant oil price prediction model for Business organization, Ministry of Finance, Ministry of Economic, Oil Company, Think Tank of the Government, Prime-Minister, World Bank Policy Maker, International Monetary Fund (IMF) etc. In this work, we first apply chi square test to separate factors such as demand of Oil and Gas, over population, Increasing rate Industry, completion of Development and etc. We then make a automate comparison of the production and export rate of the Oil and Gas in various countries among Middle East and Europe. The main purpose of applying it is feature selection to data. Degree of freedom is used to P-value (Probability value) for best predicators of dependent variable. After being separation of factors we have had examined the desired outcome using Bayes' Networks (BN). The BN helps to determine the actual result based on our input factors. We should bear in mind that our activities for this work are dynamic and our system can inspect dynamically irrespective of any volume of dataset.

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Artificial System to Compare Energy Status in the Context of Europe and Middle East

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I. Inroduction

Oil and Gas are the important natural source of energy throughout the world. They play an important role for the development of the universe irrespective of rich and poor. An energy export oriented contract for safeguarding ensuring country's energy security is essential at any time. But there are lot of anomalies towards proper supply of oil and Gas as well as the demand is increasing day by day. Here we depict some scenario below. Crude rose in Asia Tuesday as traders monitored the crisis in Libya, with rebels claiming victory but one of Moamer Kadhafi's sons insisting his father was still in control, analysts said. Also supporting prices was expectations that it could take years before the North African country's oil output is back to pre-revolt levels. Brent North Sea crude for October delivery rose 58 cents to $108.94 a barrel from Monday's close of $108.36.New York's main contract, West Texas Intermediate (WTI) light sweet crude for October delivery rose 97 cents to $85.39.Brent in particular experienced sharp swings, with the October contract losing as much as 18 cents at one point a day after it tumbled as it emerged that Libyan rebels were on the verge of toppling Kadhafi. "You would have expected Brent (price) to be bearish now but that could be because the market is waiting for a direction," said Shailaja Nair, managing editor with energy news specialist Platts' Asia desk in Singapore."Until it reaches a conclusion one way or the other, you are going to see volatility in prices," she told AFP. Brent is more affected than WTI by the situation in Libya as oil from the North Sea as well as from Libya serves the European markets. Around 85 percent of Libyan oil output was exported to Europe until the revolt disrupted the country's production six months ago. Libya's rebels declared the "Kadhafi era" over after taking charge of most of Tripoli, but his son Seif al-Islam claimed Tuesday his father was still in control of the capital. "Tripoli is under our control. Everyone should rest assured. All is well in Tripoli," he told journalists outside Kadhafi's compound at Bab al-Azizya. Meanwhile, analysts cautioned it could take Libya two years before oil production returns to normal and that disputes over who would hold power in any post-Kadhafi regime could also delay rebuilding the economy.

Tensions between the United States and Iran these days are as high as they've ever been in years. With Iran threatening to block US ships from entering the Persian Gulf, and the United States imposing sanctions, the stage seems to be set for a protracted confrontation. Add to this, fears that Europe's new embargo on Iran, set to start in July, could spark tensions in the region; also the increased likelihood that Israel could launch an attack on Iran's underground nuclear facilities over the next few months. So how would the world cope with an Iranian oil crisis, if it came to that? The West wants to prevent Iran from developing a nuclear weapon. The plan, for now at least, is to use sanctions as pressure hoping that the resulting economic pain might induce the Iranian regime to give up any thought of a weapons programmed. The Iranians, not surprisingly, don't like being squeezed. The latest sanctions idea is to make it hard for Iran to sell its oil. In theory, that should hurt as the country depends heavily on oil revenue .What we're seeing around Iran right now is largely an economic war.

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Despite the military overture of the stalemate, what's happening with Iran may be more of an economic confrontation than a military standoff. Even Iran's military threats have economic significance; the more the Iranians talk about closing the Strait of Hormuz, the more oil traders get unnerved. Oil prices jump. Forcing oil prices up is a way to hurt the US and European economies. So what impact will the current stalemate have on the oil price in the international market? The main driver of global oil prices so far this year has been concern about the potential disruption to supplies from the Middle East as a result of tensions with Iran. Going forward, I can think of three possible scenarios: a gradual tightening of economic sanctions on Iran, an escalation of the crisis to a military conflict, or, more positively, a reduction in tensions if Iran scales back its nuclear ambitions. The immediate focus is the tightening of economic sanctions. In principle, sanctions against Iran could result in the withdrawal of a significant amount of supply from global markets thus raising the price of crude oil in the international market. However, the impact on global prices is likely to be diluted by three main factors. First, sanctions will only be implemented gradually and with plenty of room to maneuver. Second, a gradual tightening of sanctions would allow more time for the market to adapt. Saudi Arabia has signaled that it has ample spare capacity to help meet any shortfall while Libyan production continues to come back on stream more quickly than many had anticipated. In the meantime, the threat of EU sanctions may well force Iran to accept lower bids from other buyers, notably China, thus putting downward pressure on global prices. A third factor that is not so widely discussed is that European countries, and particularly the southern economies who currently trade most with Iran, are likely to require less oil anyway as the region slides back into recession. The upshot is that we would see the first scenario (a gradual tightening of sanctions on Iran) as broadly neutral for global oil prices. But this situation is also unlikely to be sustainable because of the huge pressure that the loss of oil revenues would put on the Iranian economy, which is already fragile. The issue then becomes which way the Iranian regime would jump.

The worst case is that Iran decides it has little more to lose and attempts to disrupt supplies through the Strait of Hormuz. This could lift the price of Brent crude oil in the international market as high as $150 per barrel from the current price of about $110, although only temporarily. But neither side would want tensions to spiral this far out of control. The Iranian regime is very unlikely to seek a military conflict that ultimately it would be sure to lose, not least given the huge suffering of its people during the war with Iraq in the 1980s. The US, especially under a Democratic President, will talk tough in an election year, but will not want to risk another spike in oil prices either.

II. Collected Statistical Data

As part of the data-understanding phase we carried out the cross-tabulation for each variable and the natural resources prediction after preparing and cleaning the data. The Table 1 reports the results of oil prediction (thousands barrels in daily) and oil reservation (million barrels) in 2009 shares of the total change over the world according to BP statistical review of world energy June 2012.In table 2 represents another natural resources of Gas prediction (billion cubic meters) and Gas reservation (Trillion cubic meters).

Table 1: Descriptive statistics of natural resources (oil)

	United Arab Emirates	Iran	Saudi Arabia	USA	UK	Canada	Total
Gas production (2009 share of total percentage)	1.6	4.4	2.6	20.1	2.0	5.4	36.1
Gas proved reserved(2009 share of total percentage)	3.4	15.8	4.2	3.7	0.2	0.9	28.2
Total	5.0	20.2	6.8	23.8	2.2	6.3	64.3

Table 2 : Descriptive statistics of natural resources (Gas):

	United Arab Emirates	Iran	Saudi Arabia	USA	UK	Canada	Total
Oil production (2009 share of total percentage)	3.2	5.3	12.0	8.5	1.8	4.1	34.9
Oil proved reserved(2009 share of total percentage)	7.3	10.3	19.8	2.1	0.2	2.5	42.2
Total	10.5	15.6	31.8	10.6	2.0	6.6	77.1

Oil production and reservation is most in middle-east countries than Europe countries. For gas production and reservation Europe countries are in advanced.

III. Our Contribution

At first, we have calculated the chi square values of collected data. The procedures of chi square values are given bellow:

Step 1: First insert the observed value in each cell of observable table. Inserted value collected from record.

Domain category	Option1	Option 2	Total
Cotegory1	a	b	a + b
Category 2	c	d	c + d
Total	a + c	b +d	a + b + c + d

Step 2: Calculate expected value for every cell of the describing table.

Domain	Option 1	Option 2	Total
Cotegory1	a1=(a+b)*(a+c)/(a+b+c+d)	b1=(a+b)*(b+d)/(a+b+c+d)	a1 + b1
Category2	c1=(a+c)*(b+d)/(a+b+c+	d1=(c+d)*(b+d)/(a+b+c+d)	c1 + d1
Total	a1 + c1	b1 +d1	a1+ b1+ c1+ d1

Step 3: calculating chi value for every cell using the following formula:

$\chi^2 = (observed\ value\text{-}expected\ value)^2/expected\ value$

Step 4: calculate total chi –value for domain using the following formula

$$\chi^2 = \sum_{i=1}^{n} (observed\ value\text{-}expected\ value)^2/expected\ value$$

Step 5: calculating degree of freedom using following rule

Degree of freedom df = (No.of.rows-1)*(No.of.columns-1)

Step 6: calculate p-value (probability value) using following method in Ms Excel

P-value=CHIDIS (Chi value, df)

IV. Explanation of Chi-Square (χ^2) and P-Value

Step 1: consider the domain is oil and gas in table 1 and table 2 respectively

Step 2: calculating expected value for each cell using describing formula

Table 3: Observation value for oil production & oil Reservation

	United Arab	Iran	Saudi Arabia	USA	UK	Canada	Total
Oil production (2009 share of total percentage)	4.75	7.06	14.39	4.80	0.91	2.99	34.9
Oil proved reserved(2009 share of total percentage)	5.75	8.54	17.41	5.80	1.1	3.61	42.2
Total	10.5	15.6	31.8	10.6	2.0	6.6	77.1

Table 4: Observation value for gas production & reservation:

	United Arab Emirates	Iran	Saudi Arabia	USA	UK	Canada	Total
Gas production (2009 share of total percentage)	0.28	6.35	3.82	13.36	1.24	3.54	36.1
Gas proved reserved(2009 share of total percentage)	2.19	8.86	2.98	10.44	0.96	2.76	28.2
Total	5.0	20.2	6.8	23.8	2.2	6.3	64.3

Step 3: calculating chi value for every cell using the describing formula:

Table 5: Chi- value for gas and oil domain

	United Arab Emirates	Iran	Saudi Arabia	USA	UK	Canada
Oil production (2009 share of total percentage)	1.72	0.44	0.40	2.85	.87	0.41
Oil proved reserved(2009 share of total percentage)	0.42	0.36	0.33	2.36	0.2	0.74
Gas production (2009 share of total percentage)	0.52	4.23	0.39	3.4	0.47	0.98
Gas proved reserved(2009 share of total percentage)	0.67	5.44	0.50	4.35	0.60	1.25

Step 4: calculate total chi –value for domain oil production

$X_2 = 1.72+0.44+0.40+2.85+0.87+0.41=6.69$

Table 6: Individual Chi-value for each category

Prediction categories	Chi-value
Oil production (2009 share of total percentage)	6.69
Oil proved reserved(2009 share of total percentage)	4.41
Gas production (2009 share of total percentage)	9.99
Gas proved reserved(2009 share of total percentage	12.81

Step 5: calculating degree of freedom using following the rule

Degree of freedom df = (6-1)*(2-1)
= 5

Step 6: calculate p-value (probability value) using in Ms Excels

P-value =CHIDIS (11.1, 5)
= 0.05

V. Factors Selection

Factors selection is an important process to assess the prediction of countries and natural resources. The prediction has related the variable that determines the much oil or gas production or reservation countries. The number of predictor variables is not so large and we don't have to select the subset of variables for further analysis which is the main purpose of applying feature selection to data. However, feature selection could be also used as a pre-processor for predictive data mining to rank predictors according to the strength of their relationship with dependent or outcome variable. During the factors selection process no specific form of relationship, neither linear nor nonlinear, is assumed. The outcome of the factors selection would be a rank list of predictors according to their importance for further analysis of the dependent variable with the other methods for regression and classification. Here the figure below shows the relative outcome of the predictor's value.

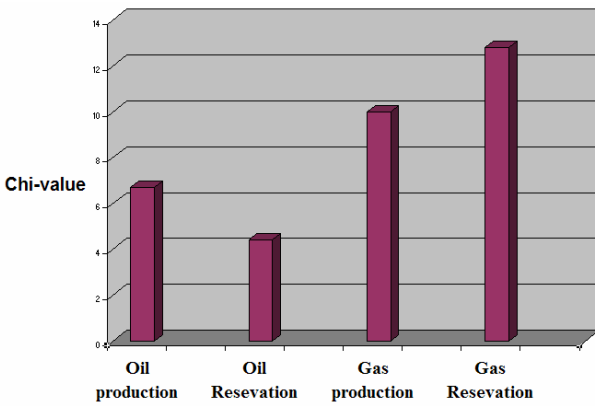

Fig 1: Importance plot for predictors

Results of factors selection has presented in Figure 1. The top four predictors are oil prediction, oil reservation, gas production and gas reservation.

In all three cases, i.e. for all three definitions of the dependent variable, if the top 4 variables are selected, we get the same list of predictors. Therefore we can conclude that the list of important predictors is quite robust to changes in the outcome definition. We may proceed into the next step using the top 4 variables:

1. Gas reservation
2. Gas production
3. Oil production
4. Oil reservation

We follow an advice given in Luan & Zhao (2006) who suggested that even though some variables may have little significance to the overall prediction outcome, they can be essential to a specific record.

VI. Knowledge Base For Collected Data

A knowledge base in artificial intelligence is a place where information are stored or designed for machine or device by which it will work. In general, a knowledge base is a consolidate stock for information: a library, a database of related information about a particular subject could all be considered to be examples of knowledge bases. The process of building knowledge base is called knowledge engineering. A knowledge base is integrated collection of choosing logic, building a knowledge base, implementing [31] the proof theory, inferring new facts. The main advantage of engineering is that it requires less commitment and thus less work. To help the focus the development of knowledge base and to integrate the designer's thinking the following five step methodology can be used:

1. Decide what to talk about
2. Decide on a vocabulary of predicates, function, and constant.
3. Encode general knowledge about the domain.
4. Encode a description of the specific problem instance.
5. Pose queries to the inference procedure and answers.

In our work we have described a simple method of probabilistic inference that is, the computation from observed evidence of posterior probabilities for query propositions. We have used the joint probability as the knowledge base from which answer to all question may be derived. We have had built the knowledge base by considering two Boolean variables. The table 7 is an example of two valued propositional logic which is the bases of knowledge base representation:

Table 7: Concepts of propositional logic to design a Knowledge Base using the proposition of Boolean events A, B and C

	B		⌐B	
	C	⌐C	C	⌐C
A	111	110	101	100
⌐A	011	010	001	000

Based on table 7, we have designed the knowledge base (Joint probability distribution) for our research activity. Here we have considered those events

which have true (one or 1) Boolean values. Table 8 is an example of knowledge base for events A, B and C:

Table 8: Fully Joint probability distribution

	B		⌐	
	C	⌐C	C	⌐C
A	P(A)*P(B)*P(C)	P(A)*P(B)*P(⌐C)	P(A)*P(⌐B)*P(C)	P(A)*P(⌐B)*P(C)
⌐A	P(⌐A)*P(B)*P(C)	P(⌐A)*P(B)*P(⌐C)	P(A)*P(⌐B)*P(C)	P(A)*P(⌐B)*P(C)

By keeping the similarities s with the table 8, we compared our factors as oil production and oil reservation so on. The designing of knowledge base for the factors which we are considered as Gas preservation and gas production

Table 9: Fully joint distribution for consideration oil Production

	Oil production(>3 thousand million barrel)					
	United Arab Emirates	Iran	Saudi Arabia	USA	UK	Canada
Gas proved reserved(>3 trillion cubic	0.83*0.67*0.17=0.09	0.83*0.67*0.17=0.09	0.83*0.67*0.17=0.09	0.83*0.67*0.17=0.09	0.83*0.67*0.17=0.09	0.83*0.67*0.17=0.09
Gas proved reserved(<3 trillion cubic meters)	0.83*0.33*0.17=0.05	0.83*0.33*0.17=0.05	0.83*0.33*0.17=0.05	0.83*0.33*0.17=0.05	0.83*0.33*0.17=0.05	0.83*0.33*0.17=0.05

Table 10: Fully joint distribution for consideration oil Reservation

	Oil production(<3 thousand million barrel))					
	United Arab Emirate	Iran	Saudi Arabia	USA	UK	Canada
Gas proved reserved(>3 trillion cubic meters)	0.17*0.67*0.17=.02	0.17*0.67*0.17=.02	0.17*0.67*0.17=.02	0.17*0.67*0.17=.02	0.17*0.67*0.17=.02	0.17*0.67*0.17=.02
Gas proved reserved(<3 trillion cubic meters)	0.17*0.33*0.17=0.01	0.17*0.33*0.17=0.01	0.17*0.33*0.17=0.01	0.17*0.33*0.17=0.01	0.17*0.33*0.17=0.01	0.17*0.33*0.17=0.01

VII. Bayes'Theorem and Conditional Probability

Bayes' theorem and conditional probability are opposite to each other. Given two dependent events A and B. The conditional probability of P (A and B) or P (B/A) will be P (A and B)/P (A). Related to this formula a rule is developed by the English Presbyterian minister Thomas Bayes (1702-61).According to the Bayes rule it is possible to determine the various probabilities of the first event given the outcome of the second event in a sequence of two events.

The conditional probability:

$$P(B/A) = \frac{P(AandB)}{P(A)} \quad (1)$$

The equation (1) will help to find out the probabilities of B after being occurrences of the A. we get the Bayes' theorem for these two events as follows:

$$P(A/B) = \frac{P(A).P(B/A)}{P(B)} \quad (2)$$

If there are more events like A1, A2, and B1, B2.In this case the Bayes theorem to determine the probability of A1 based on B1will be as follows:

$$P(A1/B1) = \frac{P(A1).P(B1/A1)}{P(A1).P(B1/A1) + P(A2).P(B2/A2)}$$

Now applying the Bayes theorem on table 5 we have got the following outcomes:

If one Gas proved reserved (>3 trillion cubic meters) based on Iran and Oil production (>3 thousand million barrel)) then

P (Gas proved reserved (>3 trillion cubic meters) | Iran ^ Oil production (>3 thousand million barrel)) =

P (Gas proved reserved (>3 trillion cubic meters) Iran ^ Oil production (>3 thousand million barrel))

P (Iran ^ Oil production (>3 thousand million barrel))
P (Gas proved reserved (>3 trillion cubic meters) Iran ^ Oil production (>3 thousand million barrel)) =0.09

P (Iran ^ Oil production (>3 thousand million barrel)) =0.14

P (Gas proved reserved (>3 trillion cubic meters)| Iran ^ Oil production (>3 thousand million barrel))
= 0.09/0.14
=0.64

The total resultant of Bayes Theorem of all data considering financial condition we have got the following table 11:

Rule	Outcome
P(Gas proved reserved (>3 trillion cubic meters) | Iran^ Oil production (>3 thousand million barrel))	64.2%
P(Gas proved reserved (>3 trillion cubic meters) | Saudi Arabia^ Oil production (>3 thousand million barrel))	64.2%
P(Gas proved reserved (>3 trillion cubic meters) | UK^ Oil production (>3 thousand million barrel))	64.2%
P(Gas proved reserved (<3 trillion cubic meters) |United Arab Emirates^ Oil production (>3 thousand million barrel))	35.7%
P(Gas proved reserved (<3 trillion cubic meters) | Iran^ Oil production (>3 thousand million barrel))	35.7%
P(Gas proved reserved (<3 trillion cubic meters) | USA^ Oil production (>3 thousand million barrel))	35.7%
P(Gas proved reserved (>3 trillion cubic meters) | Iran^ Oil production (<3 thousand million barrel))	66.67%
P(Gas proved reserved (<3 trillion cubic meters) | USA^ Oil production (<3 thousand million barrel))	33.33%

VIII. Conclusion

This study examines the background information from BP statistical review of world energy June 2012 that impacts upon the energy status of Europe and Middle East countries. Based on results from table 11 by implementing the knowledge of propositional knowledge base and Bayes theorem based on knowledge base to predict the energy status it was found that the most important factors that help to comparison oil and gas production and reservation in context of Europe and Middle East. Demographic data such as gas production and reservation are related to comparison outcome.

This study is limited in three main ways that future research can perhaps address. Firstly, this research is based on background information only. Secondly, we used a dichotomous variable for the comparison with only two categories: oil and gas. Thirdly, from a methodological point of view an alternative to a classification tree should be considered. The prime candidates to be used with this data set are logistic regression and neural networks.

References références referencias

1. Al-Radaideh, Q. A., Al-Shawakfa, E. M., & Al-Najjar, M. I. (2006). Mining student data using decision trees. In the Proceedings of the 2006 International Arab Conference on Information Technology (ACIT'2006*)*.
2. Baker, R. S. J. D., & Yacef, K. (2009). The state of educational data mining in 2009: A review and future visions. Journal of Educational Data Mining, 1, 3-17.
3. Bean, J. P., & Metzner, B. S. (1985). A conceptual model of nontraditional undergraduate student attrition. *Review of Educational Research, 55, 485-540.*
4. Boero, G., Laureti, T., & Naylor, R. (2005). An econometric analysis of student withdrawal and progres- sion in post-reform Italian universities. Centro Ricerche Economiche Nord Sud - CRENoS Working Paper 2005/04.
5. Cortez, P., & Silva, A. (2008). Using data mining to predict secondary school student performance.
6. Proceedings of 5th Annual Future Business Technology Conference, Porto, Portugal, 5-12. Dekker, G. W., Pechenizkiy, M., & Vleeshouwers, J. M. (2009). Predicting student drop out: A case study.
7. Proceedings of the 2nd International Conference on Educational Data Mining (EDM'09). July 1-3, Cordoba, Spain, 41-50.
8. Hastie, T., Tibshirani, R., & Friedman, J. (2009). *The elements of statistical learning: Data* mining, inference and prediction (2nd ed.). New York: Springer.
9. Han, J., & Kamber, M. (2006). Data mining: Concepts and techniques (2nd ed.). Amsterdam: Elsevier. Herrera, O. L. (2006). Investigation of the role of pre- and post admission variables in undergraduate insti-
10. mutational persistence, using a Markov student flow model. PhD Dissertation, North Carolina State University, USA.
11. Horstmanshof, L., & Zimitat, C. (2007). Future time orientation predicts academic engagement among first-year university students. British Journal of Educational Psychology, *77*(3): 703-718.
12. Ishitani, T. T. (2003). A longitudinal approach to assessing attrition behavior among first-generation stu- dents: Time-varying effects of precollege characteristics. *Research in Higher Education, 44(4), 433-449.*
13. Ishitani, T. T. (2006). Studying attrition and degree completion behavior among first-generation college students in the United States. Journal of Higher Education, 77(5), 861-885.
14. Md.Nurul Moustafa, Linkon Chowdhury, Md.Sawar Kamal, "Student Dropout Prediction for Intelligent System from Tertiary Level in Developing Country, IEEE/IAPR ICIEV Conference, May, 18-19, 2012, Dhaka Bangladesh.
15. Jun, J. (2005). Understanding dropout of adult learners in e-learning. PhD Dissertation, The University of Georgia, USA.
16. Kember, D. (1995). *Open learning courses for adults: A model of student progress*. Englewood Cliffs, NJ: Education Technology.
17. Luan, J., & Zhao, C-M. (2006). Practicing data mining for enrollment management and beyond. New Di- rections for Institutional Research, 31(1), 117-122.