Marginal Field Optimizer (MFO) Software for Economics Analysis of Marginal Field Development

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Abstract- The objective of this work is to develop a computer program called Marginal Field Optimizer (MFO) using Microsoft Visual Basic studio 2010 for evaluating the economics analysis of Marginal Field Development in Nigeria. Microsoft visual studio is a powerful IDE (Integrated development environment) that ensures quality code throughout the entire application life cycle, from design to deployment. The software has the capability to evaluate the economic returns in term of Internal Rate of Return (IRR), Net Present Value (NPV), Payback Time (PBT), Profit to Investment Ratio (PIR), Production forecast, Revenue forecast and Profit sharing. The MFO software design support input parameters under various production and economics including capital cost (CAPEX), operating cost (OPEX), production, revenue and profit sharing data. The software aids to investigate the effect of changes in economic, technical cost, and production parameters on the net present value and general accepted economics project, finance and technical data about Nigeria operating environment. The results obtained from the software was validated with Microsoft excel model. MFO software is more suitable to carry out economic analysis of marginal field development because, it has the capability to predict accurately as well as save time and cost.

Keywords- *Software Development, Microsoft Visual Basic, Marginal Field, Economic Analysis*

I.   INTRODUCTION

Economic evaluation is an essential part of the process of studying available investment opportunities and supports decision-making, by using special methodology and scientific analysis to select best options. Currently, many relevant areas have been developed such as technology, increasing number of economic and non-economic factors and new forms of fiscal terms, all of them make the modern economic evaluation more important and more complex. Petroleum projects as investment opportunities require huge funds and require a long time to construct and they are associated with a series of risks and uncertainties [1]. Therefore, the economic evaluation can be a main tool and reasonable way to find out the best petroleum investment opportunities in terms of cost, revenue and risks.

Economic analysis is an integral part of every field development process whether it is a giant or marginal fields as it is the pivot on which several other decisions revolve. Economic performance indicators of a prospective project drawn from a detailed economic analysis are oftentimes the deciding factor in determining whether or not a project will be undertaken [2]. Economic analysis of marginal fields development is of paramount importance in Nigeria. Marginal field refers to a field which due to various factors (geologic, geographic, technological or economic) may not produce enough net income to make it worth developing at a given time. However; should technical or economic conditions change, such a field may become commercially viable [3]. It is usually associated with pockets of hydrocarbons that have a plateau of a few years. Most of these are far away from existing infrastructures, located at great water depths or contain insufficient reserves distributed in multiple pays to consider development on a stand-alone basis. Concerted efforts involving complex combination and integration of human resources, advanced technologies improving scale of economics by integrated cluster development and changed economic scenario, many of these fields could be made economically feasible.

The Nigeria marginal fields' reserve has increased from 141.01million barrels (MMB) in 2004 to 302.62 MMB in 2013 with the crude oil production at 60,000 barrels per day and gas production at 15 million standard cubic feet per day [4]. The Nigeria marginal field development will continue to grow as the Niger Delta matures as an oil province; oil continues to be the fuel of choice for rapidly growing economics around the World with the attendant price levels witnessed in the last few years. The objective of this research is therefore, to develop a computer program called Marginal Field Optimizer (MFO) using Microsoft Visual Basic studio 2010 for evaluating the economics analysis of Marginal Field Development in Nigeria. The software aid to investigate the effect of changes in economic, technical cost, and production parameters on the net present value and general accepted economics project, finance and technical data about Nigeria operating environment.

II.   MICROSOFT VISUAL STUDIO

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop console and graphical user interface applications along with Windows Forms or Windows Presentation Foundation (WPF)

applications, web sites, web applications, and web services in both native code together with managed code for all platforms supported by Microsoft Windows, Windows Mobile, Windows CE, .NET Framework, .NET Compact Framework and Microsoft Silverlight. Visual Studio includes a code editor supporting IntelliSense as well as code refactoring. The integrated debugger works both as a source-level debugger and a machine-level debugger. Other built-in tools include a forms designer for building GUI applications, web designer, class designer, and database schema designer. It accepts plug-ins that enhance the functionality at almost every level—including adding support for source-control systems (like Subversion and Visual SourceSafe) and adding new toolsets like editors and visual designers for domain-specific languages or toolsets for other aspects of the software development lifecycle (like the Team Foundation Server client: Team Explorer) [5].

It supports different programming languages by means of language services, which allow the code editor and debugger to support (to varying degrees) nearly any programming language, provided a language-specific service exists. Built-in languages include C/C++ (via Visual C++), VB.NET (via Visual Basic .NET), C# (via Visual C#), and F# (as of Visual Studio 2010) [6]. Support for other languages such as M, Python, and Ruby among others is available via language services installed separately. Individual language-specific versions of Visual Studio also exist which provide more limited language services to the user: Microsoft Visual Basic, Visual J#, Visual C#, and Visual C++ [7].

Visual Studio 2010 features a new User Interface (UI) developed using Windows Presentation Foundation (WPF). Visual Studio 2010 IDE has been redesigned which, according to Microsoft, clears the UI organization and "reduces clutter and complexity [7] The new IDE better supports multiple document windows and floating tool windows, while offering better multi-monitor support. The IDE shell has been rewritten using the Windows Foundation (WPF), whereas the internals have been redesigned using Managed Extensibility Framework (MEF) that offers more extensibility points than previous versions of the IDE that enabled add-ins to modify the behavior of the IDE. Visual Studio 2010 comes with .NET Framework 4 and supports developing applications targeting Windows 7. It supports and Oracle databases, in addition to MicrosofIBM DB2t SQL Server. It has integrated support for developing Microsoft Silverlight applications, including an interactive designer. It also, offers several tools to make parallel programming simpler: in addition to the Parallel Extensions for the .NET Framework and the Parallel Patterns Library for native code, Visual Studio 2010 includes tools for debugging parallel applications. The new tools allow the visualization of parallel Tasks and their runtime stacks. Tools for profiling parallel applications can be used for visualization of thread wait-times and thread migrations across processor cores [7, 8].

III. ECONOMIC YARDSTICK MODEL EQUATIONS

The decision maker uses some parameters as measures of profitability of an investment project to order, accept, reject or compare investments proposals. These parameters are also frequently called profit indicators, decision criteria, economic yardsticks or measures of investment worth. There is probably no single measure of profitability that considers all of the factors that are pertinent to the decision maker. A company, therefore, must select the profitability parameters which most nearly represents the financial aspects of its treasury. The following equations were adopted in the development of the software [9].

A. Payback Period

The Payback Period also referred to as the breakeven point is defined as the expected number of years required for recovering the original investment. Payback period incorporates the idea of recovering one's investment. In its simplest form, it is the point at which the cumulative NCF is zero that is the time taken, from the start of the project, to reach this position. Mathematically,

Payback Period=

$$\text{Cum.} -ve \text{ NCF Years} + \frac{1}{(+ve \text{ NCF} - (-ve \text{ NCF})) \times -(-ve \text{ NCF})} \quad (1)$$

Where

Cum. −ve NCF Years	*= Last year with negative cash flow*
+ve NCF	*= Positive Net Cash flow*
-ve NCF	*= Negative Net Cash flow*

B. Net Present Value

Net Present Value [NPV] is the sum of all project cash flows, discounted back to a common point in time. Mathematically;

$$\text{NPV} = \sum_{i=1}^{n} \frac{NCF}{(1+i_d)^t} \quad (2)$$

Where

NCF	=	*Net Cash flow*
i_d	=	*Time (years)*
t	=	*Time (years)*

C. Internal Rate of Return

The Internal Rate of Return [IRR] is the discount rate, which reduces the project NPV to zero. It is, therefore, the solution to the following equation:-

$$\text{IRR} = \sum_{i=1}^{n} \frac{NCF_t}{(1+IRR)^t} = 0 \quad (3)$$

Where

NCF_t = Net Cash flow over a period of time at iterative rate

D. Profitability Index

Profitability Index (PI) is a dimensionless ratio obtained by dividing the present value of future operating cash flows by present value of the investment. Mathematically written as,

$$\text{PI} = \frac{(\text{Present Value of Future Operating Cash Flow})}{(\text{Present Value of Capital Investment})} \quad (4)$$

E. Present Value Rate

Present Value Rate is the ratio of the NPV to the present value of capital investment.

$$PVR = \frac{NPV}{PV \text{ of Capital Investment}} \qquad (5)$$

F. Profit to Investment Ratio

The Profit to Investment Ratio is a measure of investment efficiency, incorporating the idea of optimizing profit earned for every dollar invested. This is likely to be important in a situation, where resources for investment are limited.

$$\text{Profit to Investment Ratio} = \frac{\text{Undiscounted Profit}}{\text{Investment}} \qquad (6)$$

IV. METHODOLOGY

A. Development of Marginal Field Optimizer Software (MFO)

Microsoft visual studio 2010 is the most versatile tool used for software programs in recent times because it has been redesigned to clear the UI organization and reduce clutter and complexity in software development [7]. Microsoft Visual Studio 2010 was used to develop the marginal field Optimizer software. The base case for the economics analysis considered an offshore field in the Niger-Delta. The software development is based on the principle of data manipulation. The field is located in approximately 88ft of water, 15miles offshore in Niger Delta, Nigeria. The field has a reserve of 77.4MMBbls and production schedules were 10 years. The input data being the base case for computation of the economic, cost and general data set is shown on Table 1.

TABLE I.   THE INPUT DATA SET

Production Parameters		Base Case		Tax Input	
No. of Producing Days	365	Reserve Capacity (MMbbl)	77.4	Tax Rate (%)	50.0
No. of Producing Wells	5.0	Minimum rate of Return (%)	15.0	Royalty (%)	18.2
Field Production rate (bbl/d)	5000	Exponential Field Decline Rate(%/Yr)	7.0	Depreciation (%)	20.0
Production Year	10.0	Initial Field BS & W (%)	3.0	Depreciation last	5.0
		BS & W Incremental Rate (%/Yr)	7.0	ETF Rate (%)	25.0
		Inflation Rate	7.0	NDDC Rate (%)	3.0

B. Software Validation

The software testing, debugging and validation was done using excel spreadsheet model for comparison with the developed software. The evaluation was done based on the following economic indicators such as Internal Rate of Return (IRR), Net Present Value (NPV), Payback Time (PBT), Profit to Investment Ratio. The modulus of relative deviation was used to evaluate the performance of the two software. The modulus of relative deviation analysis is given by:

$$\text{Modulus of relative deviation} = \frac{\text{Ms Excel} - \text{Software}}{\text{Ms excel}}$$

V. SOFTWARE APPROACH

The following describe some of the major interface of the developed Marginal Field Optimizer software;

A. Input Data Interface

Input Data are first entered into the text box. Figure 1 shows the snapshot of input data interface which include the following parameters: Recent reserve Capacity(MMbbl), Minimum Rate of Return (%), Field Decline Rate (%/yr), Initial field (BS&W), Inflation Rate, Number of Production Days, Number of Production Wells, Field Production Rate (bbl/d), Production Years, Tax Rate (%), Royalty (%), Depreciation (%), ETF Rate (%), NDDC Rate (%), Farmee Rate (%), Farmor Rate (%) and Government rate (%).
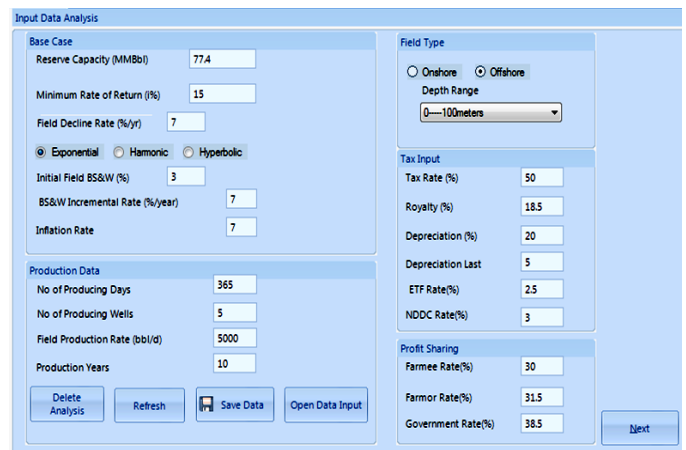

Figure 1.   Snapshot of Input Data Analysis Interface

B. Capital Cost Data Interface

Capital Cost Data analysis interface which comprises Equipment list, Unit price, Quantity of the equipment and Total Cost of the equipment is shown in Figure 2. The capital cost data can be uploaded from the excel spreadsheet or can as well be entered manually.
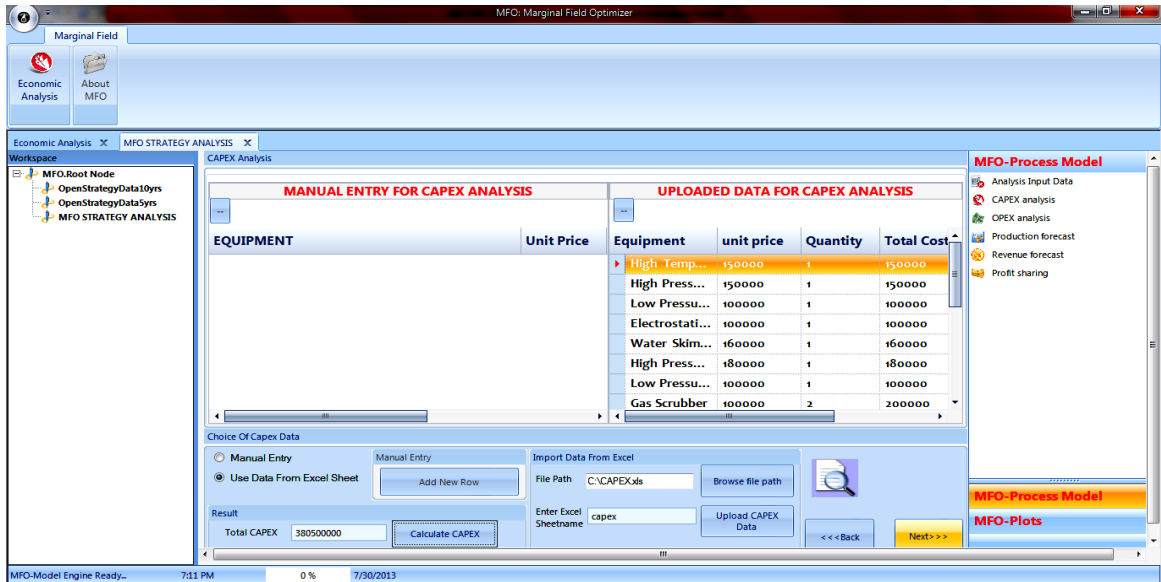
Figure 2.   Snapshot of Capital Cost Analysis Interface

C. Operating Cost Data Interface

Operating cost Data is imported from excel Sheet with the corresponding number of production years. For instance, for this case study, the number of production year is 10 years.

D. Production Forecast Interface

Production data are inputted into production forecast interface. Figure 4 shows the production data which include: Gross Oil Production data which include: Gross oil production (bbls), oil price ($) BSW (%) and Gas Production ($/MSCF).
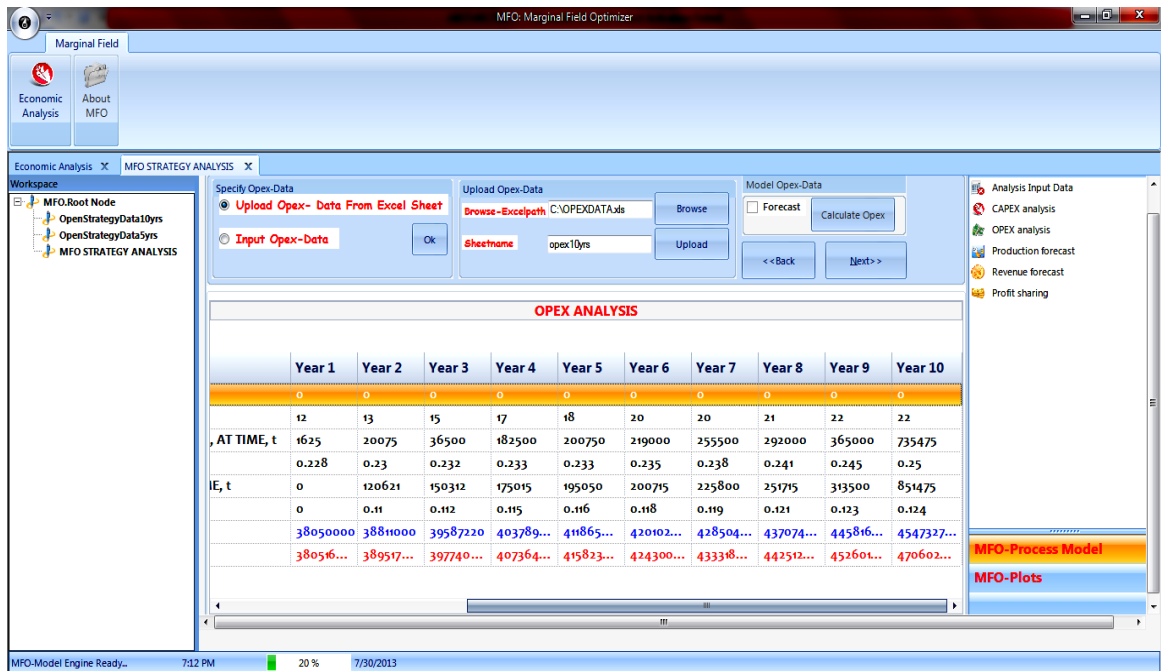

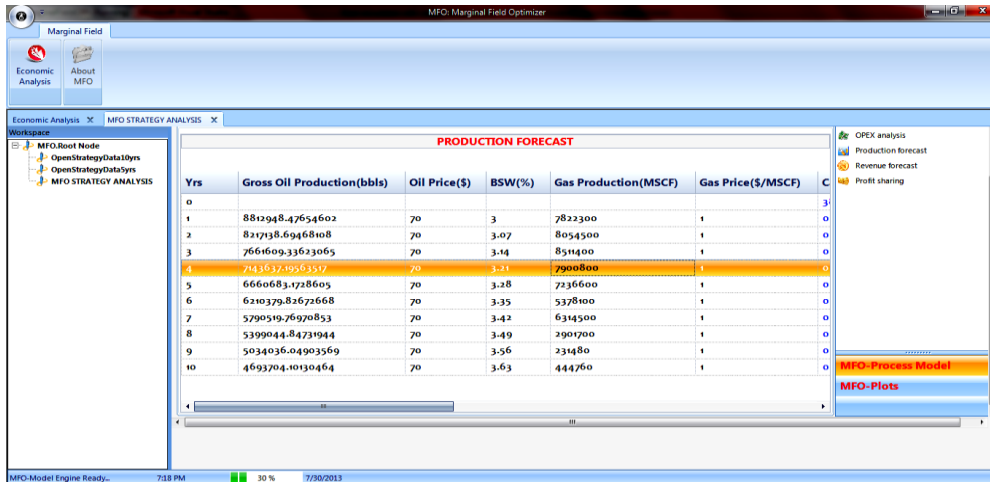Figure 3.   Snapshot of Operating Cost analysis Interface

Figure 4.   Snapshot of Production forecast interface

On entering this input data into the various interface completely, the software does some internal calculation that are invisible to the user, but would later been seen as an output in the forecast windows. The outlined above are some of the steps that can be taken to run Marginal field Optimizer software. To ensure accuracy in MOF result output, the user of the program needs to be acquainting with software approach.

VI.   SOFTWARE APPLICATION

The software allows a general economic analysis and considers all costs involved in the life cycle of a marginal field. The objective of this economic software aimed at economic analysis and evaluation using NPV together with other economic yardsticks for accessing marginal oilfield development in Niger - Delta. Figure 5 shows a report of some economics indices that were considered: Net Present Value (NPV), Payout Period (POP), Profit to investment Ratio (PR), Discounted Profit to Investment Ratio (DPR), Productivity Index (PI) and Discounted cash flow Rate of Return (DCFROR). The NPV simply provide a way to decide whether or not to invest in a project by looking at the projected cash inflows and outflows. The decision rule is to accept all projects with positive NPV values. The discount factor is assumed to take care of inflation and some uncertainty in the time value of money. The Present Value Rate tries to evaluate the effects of inflation rate and other uncertainty in the investment. It also helps to portray or quantify the size of the investment. Its decision rule is to accept investment with positive PVR. In addition, an Internal Rate of Return is a discount rate which reduces the project NPV to zero. Internal Rate of Return takes care of factor such as high volatility of currency and exchange rate. A discount rate of 15% was used in this study because by the World Bank Standard it stands to be the hurdle rate for oil and gas investments in Nigeria [10]. Profitability index is a dimensionless ratio obtained by dividing the present value of future operating cash flows by present value of the investment. Profitability index of above 1 is desired. The Payback Period also referred to as the breakeven point is defined as the expected number of years required for recovering the original investment. Payback period incorporates the idea of recovering one's investment.
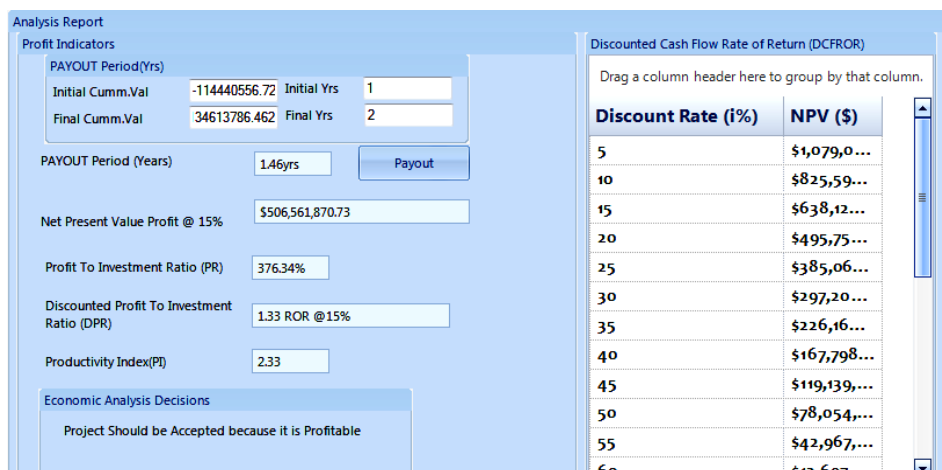

Figure 5. Snapshot of Profit Indicators Interface

Application of the Marginal field development software is very vast, as it carries out so many analyses as regards petroleum economics and profit sharing. The software package is also cable of performing the following tasks.

A. *Analysis on the production forecast*

The software has the capability to forecast Net Oil Produced (bbls), Revenue ($) & Gross Revenue ($) when the production data (Gas price, Capital cost and Operating Cost) are provided as shown in Figure 6.

PRODUCTION FORECAST

SCF)	Gas Price($/MSCF)	Capex($)	Opex($)	Net Oil Produced(bbls)	Revenue($)	Gross Revenue($)
		380500000	0	0	0	0
	1	0	3805163...	8548560.02224964	606221501.5...	494070523.769342
	1	0	3895170...	7964872.53675437	565595577.5...	460960395.721837
	1	0	3977404...	7421034.80307301	527983836.2...	430306826.515315
	1	0	4073649...	6914326.44165528	491903650.9...	400901475.496434
	1	0	4158236...	6442212.76479068	458191493.5...	373426067.231308
	1	0	4243000...	6002332.10253133	425541347.1...	346816197.949412
	1	0	4333180...	5592483.9935845	397788379.5...	324197529.333996
	1	0	4425122...	5210618.18214799	367644972.7...	299630652.791543
	1	0	4526016...	4854824.36569002	340069185.5...	277156386.262616
	1	0	4706024...	4523322.64242728	317077344.9...	258418036.150477

Figure 6: Snapshot of Production Forecast Interface

A. *The Revenue Forecast*

This forecast interface help to show the values of predicted Net Revenue after expense, depreciation and effective tax rate.

It also gives a comprehensive analysis on revenue generated such as revenue gross income, cumulative revenue , total cost, taxable income and net present value(NPV) (Figure 7a and 7b).

REVENUE FORECAST

Net Revenue day($)	Discount Factor 15%	NPV Σ	Cummulative Revenue ($)
0	1	-38050...	-380500000
728929.982	0.869565217391304	232880...	-114440556.729
682340.666	0.756143667296787	183048...	134613786.462
639222.985	0.657516232431988	138834...	367930176.048
597623.259	0.571753245593033	104994...	586062665.422
558826.993	0.49717673529829	822721...	790034518.019
416967.381	0.432327595911557	455775...	942227612.036
384747.574	0.375937039923093	360065...	1082660476.498
349834.831	0.326901773846168	272248...	1210350189.886
317666.061	0.284262412040146	203803...	1326298302.11
289531.221	0.247184706121866	158423...	1431977197.88

Figure 7a. Snapshot of Revenue Forecast Interface

REVENUE FORECAST

Year	Gross Income	Royalty	TotalCost	Depreciation	Taxable Income($)	Tax($)	Net Revenue($)
0	0	0	0	0	0	0	-380500000
1	606221501.557	1121509...	114151637....	76100000	379918886.541	18995944...	266059443.271
2	565595577.573	1046351...	115051709.34	76100000	345908686.382	172954343...	249054343.191
3	527983836.215	976770...	115874047...	76100000	314432779.171	157216389...	233316389.586
4	491903650.916	9100217...	116836496...	76100000	284064978.748	14203248...	218132489.374
5	458191493.535	847654...	117682362...	76100000	255743705.194	127871852...	203971852.597
6	425541347.177	7872514...	42430009....	0	304386188.035	152193094...	152193094.017
7	397788379.551	735908...	43331800.41	0	280865728.924	14043286...	140432864.462
8	367644972.75	6801431...	44251226....	0	255379426.775	127689713...	127689713.388
9	340069185.598	6291279...	45260161.815	0	231896224.447	115948112....	115948112.224

Figure 7b. Snapshot of Revenue Forecast Interface

A. Profit Sharing Forecast

Profit sharing forecast gives the prediction of profit after tax, ETF take and NDDC take. The evaluation of profit after tax is based on gross revenue, royalty, ETF take and NDDC take. Detailed profit sharing based on the Nigerian present petroleum fiscal regime forecasted is as shown in Figure 8.

PROFIT SHARING

Year	Gross Revenue	Σ	Royalty($) 18.5%	Σ	ETF take($) 2.5%	Σ	NDDC take($) 3%	Σ	Profit After Tax ($)
0	$0.00		$0.00		$0.00		$0.00		$0.00
1	$494,070,523.77		$112,150,977.79		$6,651,486.08		$7,981,783.30		$251,426,173.89
2	$460,960,395.72		$104,635,181.85		$6,226,358.58		$7,471,630.30		$235,356,354.32
3	$430,306,826.52		$97,677,009.70		$5,832,909.74		$6,999,491.69		$220,483,988.16
4	$400,901,475.50		$91,002,175.42		$5,453,312.23		$6,543,974.68		$206,135,202.46
5	$373,426,067.23		$84,765,426.30		$5,099,296.32		$6,119,155.58		$192,753,400.70
6	$346,816,197.95		$78,725,149.23		$3,804,827.35		$4,565,792.82		$143,822,473.85
7	$324,197,529.33		$73,590,850.22		$3,510,821.61		$4,212,985.93		$132,709,056.92
8	$299,630,652.79		$68,014,319.96		$3,192,242.84		$3,830,691.40		$120,666,779.15

Figure 8. Snapshot Profit Sharing Forecast Interface

A. Profit Indicator Plot

The software also, has the ability to perform profit indicators plot. Figure 9 show the payout time, discounted cash flow rate of return (DCFROR) and profit sharing chart.
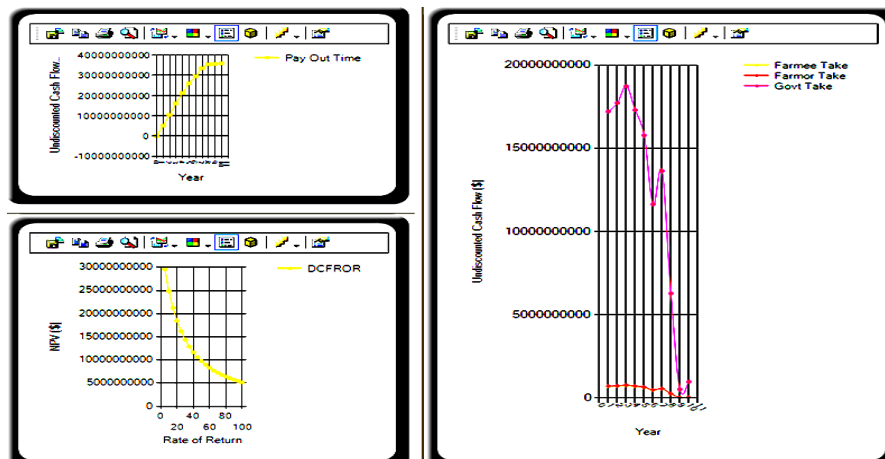

Figure 9. Snapshot of Some Economic Indicator Plots Interface

Table 2 shows Microsoft Excel Model Comparison with MFO software Values. The relative modulus analysis results obtained showed that the software predicted closely to Microsoft excel spreadsheet result. Generally, the software is a tool for carrying out petroleum economics analysis as previously reported. It is user friendly and carries out its iterative analysis in few seconds. Such software should be widely embraced as it makes report fast and easier.

TABLE II. MICROSOFT EXCEL MODEL COMPARISON WITH MFO SOFTWARE VALUES

Economic Yardstick	Ms Excel Model Result	MFO Software Result	Relative Modulus (%)
NPV	538,956,628.8690150	538,956,628.87	0.0000000
Profit to Investment Ratio (PR)	3.7634092	3.7634	0.0002443
Present Value Rate	1.4164432	1.42	0.2511095
Payment Back(yrs)	1.4595003	1.459500345	0.0000000
Productivity Index	2.4164432	2.42	0.1471925
Farmee Take($) (30% of PAT)	513,837,285.5988740	513,837,285.60	0.0000000
Farmor Take($) (45% of 70% PAT)	539,529,149.8788180	539,529,149.88	0.0000000
Government Take($)(55% of 70% PAT)	659,424,516.5185550	659,424,516.52	0.0000000

VII. CONCLUSION

A User friendly computer program was developed to facilitate the economics evaluation of marginal field development using Microsoft visual basic studio 2010 for Niger Delta region of Nigeria. The results obtained from the software predicted closely to Microsoft excel spreadsheet result. MFO software is more suitable to carry out economic analysis of marginal field development because, it involves no computation design variables and constants, computation time is reduced and the running procedures are easy to understand and less prone to human errors. Automating the design process enable Economic analysis designers save time and ensures reliability.

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NOMENCLATURE
CAPEX = Capital Expenditure
OPEX = Operating Expenditure
NPV = Net Present Value
DCFROR= Discounted Cash Flow Rate of Return
PI = Profitability Index
DPIR = Profit-To-Investment Ratio
IRR = Internal Rate of Return
ETF = Educational Tax Fund
NCF = Net Cash Flow
PBP = Payback Period
MFO= Marginal Field Optimizer
GUI = Graphical User Interface
IDE = Integrated development Environment
WPF= Windows Presentation Foundation
UI = User Interface
NDDC = Niger Delta Development Commission

APPENDIX

VISUAL BASIC .NET CODE FOR MARGINAL FIELD Subroutine program

```vbnet
Dim sumloop As Double
    Dim qi, q, Dec, GasOilProduction As Double
    Dim counter, sum, sum2, counter2, cellyr1m, cellyr2m, x As Double
    Dim CummRed, Cumm, YrRed, Yr, Xyrs As Double
        Dec = Val(Me.txtfielddeclinerate.Text) / 100
        Dim xdec As Double
        xdec = Math.Exp(-Dec)
        ' MsgBox(Math.Exp(-Dec))
        qi = Val(Me.txtfieldproductionrate.Text) * Val(txtNoofWells.Text) * Val(Me.txtNoProductionDays.Text)
        ' Me.grdProdRev.Rows(1).Cells(1).Value = qi 'Me.grdProdRev.Rows(1).Cells(1).Value
        For i As Integer = 0 To Me.grdProdRev.Rows.Count - 1
          q = qi * Math.Exp(-1 * Dec * Me.grdProdRev.Rows(i).Cells(0).Value)
         GasOilProduction = (qi - q) / Dec
           Me.grdProdRev.Rows(i).Cells(11).Value = GasOilProduction
           'MsgBox(q)
        Next
        For i As Integer = 2 To Me.grdProdRev.Rows.Count - 1
           Me.grdProdRev.Rows(i).Cells(1).Value    =    (Me.grdProdRev.Rows(i).Cells(11).Value  -  Me.grdProdRev.Rows(i -
1).Cells(11).Value)
        Next
        Me.grdProdRev.Rows.Band.Columns(11).Hidden = True
        Me.grdProdRev.Rows(1).Cells(1).Value = Me.grdProdRev.Rows(1).Cells(11).Value
        Me.UltraTabControl1.SelectedTab = Me.UltraTabPageControl4.Tab
        Me.UltraStatusBar1.Panels(2).ProgressBarInfo.Value = 30
    Catch ex As Exception
    End Try
  End Sub


  Private Sub UltraButton7_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles UltraButton7.Click
    Try
        Me.UltraGridColumnChooser1.SourceGrid = Me.grdReV
        Dim sumtotal As Double
        Me.grdReV.Rows.Band.Columns(11).Header.Caption = "Cummulative Revenue ($)"
        Me.grdReV.Rows.Band.Columns(10).Header.Caption = "Discount Factor " & Me.txtROR.Text & "%"

        Dim grossincome, royalty, depreciation, totalcost, TaxableIncome, netrevenue, tax, netrevenueday, discountedRevenue,
cumRev As Double
              Me.grdReV.Rows(0).Cells(4).Value = 0
        For i As Integer = 1 To Val(Me.txtdepyears.Text)
           Me.grdReV.Rows(i).Cells(4).Value = (Val(Me.txtdepre.Text) / 100) * Val(Me.UltraTextEditor1.Text) 'Lazson
           depreciation = Me.grdReV.Rows(i).Cells(4).Value
        Next
        For i As Integer = (Val(Me.txtdepyears.Text) + 1) To Me.grdReV.Rows.Count - 1
           Me.grdReV.Rows(i).Cells(4).Value = 0
        Next

        For i As Integer = 1 To Me.grdReV.Rows.Count - 1
           royalty = (Val(Me.txtRoyalty.Text) / 100) * grossincome
           Me.grdReV.Rows(i).Cells(1).Value = grossincome
           Me.grdReV.Rows(0).Cells(1).Value = 0
           Me.grdReV.Rows(0).Cells(2).Value = 0
           Me.grdReV.Rows(i).Cells(2).Value = royalty
           totalcost = Me.grdOpex.Rows(12).Cells(i).Value + Me.grdReV.Rows(i).Cells(4)
           TaxableIncome = Val(Me.grdProdRev.Rows(i).Cells(10).Value) - totalcost  'Lazson
```

```vb
        tax = (Val(Me.txtTax.Text) / 100) * TaxableIncome
        netrevenue = (TaxableIncome - tax) + Me.grdReV.Rows(i).Cells(4).Value
        Me.grdReV.Rows(i).Cells(7).Value = Math.Round(netrevenue, 3)
        Me.grdReV.Rows(0).Cells(7).Value = -1 * Val(Me.UltraTextEditor1.Text)

        Me.grdReV.Rows(0).Cells(11).Value = -1 * Val(Me.UltraTextEditor1.Text)

        cumRev = Me.grdReV.Rows(i - 1).Cells(11).Value + netrevenue

        netrevenueday = netrevenue / 365
        Dim discountedRevenueCapex As Double
        discountedRevenueCapex = discountedRevenue - Val(Me.UltraTextEditor1.Text)
        Me.grdReV.Rows(0).Cells(3).Value = 0
        Me.grdReV.Rows(i).Cells(3).Value = totalcost

        Me.grdReV.Rows(0).Cells(5).Value = 0
        Me.grdReV.Rows(i).Cells(5).Value = TaxableIncome
        Me.grdReV.Rows(i).Cells(6).Value = tax
        Me.grdReV.Rows(0).Cells(6).Value = 0
        Me.grdReV.Rows(i).Cells(8).Value = Math.Round(netrevenueday, 3)
        Me.grdReV.Rows(0).Cells(8).Value = 0
        Me.grdReV.Rows(i).Cells(11).Value = Math.Round(cumRev, 3)
        Me.grdReV.Rows(i).Cells(12).Value          =          Math.Round(Math.Round(discountedRevenue,          3)          /
((Val(Me.grdProdRev.Rows(i).Cells(6).Value)     +     Val(Me.grdProdRev.Rows(i).Cells(7).Value))     *     Math.Round(((1     +
(Val(Me.txtROR.Text) / 100)) ^ -i + 1), 4)), 2)
        Me.grdReV.Rows.Band.Columns(12).Hidden = True
    Next
    For i As Integer = 0 To Me.grdReV.Rows.Count - 1
        Me.grdReV.Rows(i).Cells(10).Value = (1 + (Val(Me.txtROR.Text) / 100)) ^ (-i) 'Discount factor(Lazson)
        discountedRevenue = Me.grdReV.Rows(i).Cells(7).Value * Me.grdReV.Rows(i).Cells(10).Value
        Me.grdReV.Rows(i).Cells(9).Value = discountedRevenue
    Next
    Me.txtpayout.Text = Math.Round(payback(), 2)
    'MsgBox(counter)
    'MsgBox(sum)
    'MsgBox(sum2)
    Me.txtPR.Text = Math.Round(ProfitToInvestmentRatio(), 2) & "%"
    Me.txtNPV.Text = Math.Round(NPV(), 2).ToString("C")
    Me.lblNPV.Text = "Net Present Value Profit @ " & Me.txtROR.Text & "%"
    Me.txtDPR.Text = Math.Round(DPR(), 2) & " ROR @" & Me.txtROR.Text & "%"
    Me.txtindex.Text = Math.Round(PID(), 2)
    If Val(NPV) > 0 Then
        Me.lblDecision.Text = "Project Should be Accepted because it is Profitable"
    ElseIf Val(NPV) = 0 Then
        Me.lblDecision.Text = "Project is Break-Even "
    Else
        Me.lblDecision.Text = "Project Should be Rejected because it is UnProfitable"
    End If
    Dim j As Integer = 0
    If (Me.UltraGrid2.Rows.Count) > 0 Then
        For i As Integer = 1 To 19
            Me.UltraGrid2.Rows(0).Delete(False)
        Next
    End If
    For i As Integer = 5 To 100 Step 5
        j = j + 1
        Me.UltraGrid2.DisplayLayout.Bands(0).AddNew()
```

```vb
            Me.UltraGrid2.Rows(j - 1).Cells(0).Value = i
            Me.UltraGrid2.Rows(j - 1).Cells(1).Value = sumofNPVatRates(i)
        Next
        Me.UltraTabControl1.SelectedTab = Me.UltraTabPageControl5.Tab
        Me.UltraStatusBar1.Panels(2).ProgressBarInfo.Value = 40
    Catch ex As Exception
    End Try
End Sub
Function payback() As Double
    Try
    Catch
        Return x.Next(1, 10) * x.NextDouble
    End Try
End Function
Function ProfitToInvestmentRatio() As Double
    Dim sum As Double
    'For i As Integer = 0 To Me.grdReV.Rows.Count - 1
    '    sum = sum + Val(Me.grdReV.Rows(i).Cells(7).Value)
    'Next
    'Return (sum / Math.Abs(Val(Me.grdReV.Rows(0).Cells(7).Value)) * 100)
    sum = Me.grdReV.Rows(Me.grdReV.Rows.Count - 1).Cells(11).Value / Val(Me.UltraTextEditor1.Text)
    Return sum
End Function
Function PID() As Double
    Dim Piindex As Double
    Piindex = 1 + DPR()
    PID = Piindex
End Function
Function NPV() As Double
    Dim sum As Double
    For i As Integer = 0 To Me.grdReV.Rows.Count - 1
        sum = sum + Val(Me.grdReV.Rows(i).Cells(9).Value)
    Next
    NPV = Math.Round(sum, 3)
End Function
Function sumofNPVatRates(ByVal rates As Double) As Double
    Dim sum As Double
    For i As Integer = 0 To Me.grdReV.Rows.Count - 1
        sum = sum + (Val(Me.grdReV.Rows(i).Cells(7).Value) * (1 + (Val(rates) / 100)) ^ -i)
    Next
    Return (sum)
End Function
Function DPR() As Double
    DPR = NPV() / (Val(Me.UltraTextEditor1.Text))
    End Function
```