PRE-PROPOSAL

(The pre-proposal should be brief and should not be more than three pages, including this cover page)

Program	ADVANCED AND STRATEGIC TECHNOLOGIES			
Sub-Program/ Technology Area	1) Mathematics and Physics 2) Information Technology			
Track	1) a) Applied Mathematics; b) Numerical Analysis and Optimization 2) Scientific Computing			
Sub-Track	1) a) Econometrics; b) Statistics 2) a) Computer Simulation; b) Computer Modeling			
Project Title	The Macroeconomic Effect of Oil Revenue on the Public and Private Sectors of Saudi Arabia: Linking Theory with Data			
Project Type	Theoretical and Applied			
Research Team	Senior Personnel			
	No.	Name	Rank	Role	Area of Specialization
	1	Dr. Zohair A. Yamani	Assistant Professor	P I	Macroeconomics, Development Economics, Applied Econometrics
	2	Dr. Muhammad Saifur Rahman	Assistant Professor	CO- I	Macroeconomics, Energy Economics, Applied Econometrics
	3			CO- I	
	4			CO- I	
	5				

1. INTRODUCTION

Saudi Arabia is one of the largest oil exporters of crude oil with at least one quarter of world's known reserves. Oil export constitutes more than 85% of country's over all export. The heavy dependence on oil exports has prompted the government to take decisive measures in the form of 'Development Plans' to diversify the economy through increased participation from the private sector in the last 30 years. The key objective was to make efficient utilization of the oil export revenue on the economic development both directly through increased public investment and indirectly through private sector involvement. But the success of these development plans depends heavily on the effectiveness of oil revenue to stimulate macroeconomic activity for Saudi Arabia.

This study examines the role of oil revenue in the economic development of Saudi Arabia through its effect on the public and private sectors from both theoretical and empirical perspectives. It also explores the extent to which high levels of government domestic spending has brought about structural changes in the key sectors of the economy. It particularly concentrates on the government's efforts to enhance the capital absorptive capacity of the Saudi Arabian economy and diversify its production and employment structure. The study is broadly divided into two parts. First, theoretical work will be carried out on understanding the role oil sector based on the 'Staple Theory of Economic Growth' which argues that the staple export sector can become the leading sector of the economy to set the direction and pace of economic development. The staple export sector can contribute to economic growth directly through its contribution to GDP or indirectly via 'Spread Effects' throughout the economy. In Saudi Arabia, the staple export sector is the oil sector. In this regard, three models will be proposed and developed to understand the effect of oil revenue on the Saudi Arabian economy; two partial economy models while the other a newly developed full-fledged dynamic open economy multi-sector macroeconomic model. Second, theoretical results will be tested by employing several empirical techniques to estimate the effect of oil revenue on the public and private sectors of Saudi Arabia. The empirical exercises would be carried out in two dimensions. First, efforts will be made to structurally estimate the small open economy macroeconomic model. Second, reduced form econometric models would be specified based on the partial economy models and will be estimated by using standard time series techniques. The empirical analysis will show the estimated long run and short run multiplier impact of oil revenue on government expenditure and its various components, and on non-oil GDP of Saudi Arabia and its various components.

The outcome of the study has several implications for Saudi Arabia and the strategic areas specified under the NSTIP program. First, it would contribute to the strategic area of mathematics and physics by developing a new open economy macroeconomic model based on applied mathematical principles. The proposed research would carry out both structural and reduced econometric estimation of the proposed macroeconomic models which would contribute to the econometric and statistical sub-tracks under the applied mathematics track. The present study offers innovative research by utilizing many of the recently developed macroeconomic modeling and time series econometric techniques in the development and estimation of three macroeconomic models for Saudi Arabia which would enable us to analyze and forecast the effect of oil revenue on the Saudi Arabian macro economy in a more accurate, scientific and useful way. Finally, the accumulation and compilation of data from various sources required for the research for Saudi Arabia would also result in a large database which could be transferrable for future development of more sophisticated mathematical and statistical models pertaining to the macroeconomic analysis of Saudi Arabia. Second, it would contribute to the strategic area of information technology by undertaking sophisticated computer based econometric estimation of the conceptualized models and by generating advanced econometric estimates and forecasts based on computer-based simulations.

2. PROJECT OBJECTIVES

The objective of the present study is two-fold:

1) To develop macroeconomic models that can accurately describe the critical structural feature of Saudi Arabia to understand the role of oil sector on the macro economy.
2) To estimate the short run and long run effect of the oil revenue on the public and private sector activity of Saudi Arabia.

In terms of the first objective, three models will be proposed to understand the effect of oil revenue on the Saudi Arabian economy. In terms of the second objective, modern econometric estimation techniques, both structural and reduced form will be used to estimate long run and short run impact of oil revenue on government expenditure and its various components, on non-oil GDP of Saudi Arabia and its various components.

3. BRIEF DESCRIPTION OF THE PROPOSED WORK AND EXPECTED OUTCOMES

The objective of this study is to understand, estimate the short run and long run multiplier of the oil revenue and forecast the effect of oil revenue on the Saudi Arabian economy. The theoretical and empirical questions in this project would be investigated by carrying out nine tasks. They are as follows:

Task I: Structural Analysis of Saudi Arabia

In this task, we will analyze the macroeconomic structure of Saudi Arabia based on historical data, government

and other policy related documents. We will also conduct a thorough research on the possible linkages between oil price, oil revenue and other macroeconomic activities of the country.

Task II: Literature Review

Extensive review of the existing literature would be carried out to analyze the existing work on the relationship between oil revenue and macroeconomic activity conducted in case of other countries, identify suitable macroeconomic models for Saudi Arabia, and analyze their merits and demerits.

Task III: Macroeconomic Model Selection

A short list of macroeconomic models would be identified from task II which will then be analyzed more thoroughly to see whether they would suffice to meet our research objectives. In this phase, we will specify our new macroeconomic model. At present, we have three models in mind to carry out our research; a simple Keynesian static model to explore the short run static effect of oil revenue, a modified version of the Samuelson's accelerator model to understand the short run and long run dynamic effect of oil revenue and finally, a new dynamic fully optimized open economy macroeconomic model that incorporates the critical features of an oil dependent economy such as Saudi Arabia to measure theoretical short run and long run oil revenue multipliers.

Task IV: Model Construction, Optimization and Computer Coding

This lengthy task will involve formally setting up each of the models, solve them and put them up in computers by writing extensive codes so that the models could be used for simulation.

Task V: Model Calibration and Simulation

This task will calibrate each parameter of the models to Saudi Arabian data and will run simulations based on historical phenomena and anticipated policy changes and analyze whether dynamics of the models can generate results similar to real or expected outcomes.

Task VI: Construction of the Dataset

This task will collect, compile and clean the dataset needed for the estimation of each of the models.

Task VII: Estimation of Macroeconomic Models

This task will be done under two broad subtasks. First, the new open economy macroeconomic model would be estimated using Bayesian method. Second, the partial models would be represented by reduced form econometric models and will be estimated using standard classical estimation methods. This will carried out in several stages. First, we will employ three broad alternative econometric specifications to investigate and establish the theoretical results in empirical setup; distributed lag model, autoregressive distributed lag model and finally, co integration regression model. Second, we will carry out standard diagnostic tests for the data that commensurate with each modelling specifications. Third, we will employ several estimation techniques; ordinary least squares (OLS) for the first two models and dynamic OLS and Fully modified OLS method for the co integration regression. Fourth, we will conduct several data transformations for the estimation; data in nominal terms, data in absolute terms and data in percentage changes. We will use each of these transformations to estimate our desired long run and short elasticity of various components of government spending and non-oil GDP with respect to oil revenue. Finally, robustness checks of our results will be carried out in several ways. First, we will employ dummy variables to detect any structural changes in the relationship between the variables of interest and how it affects the short run and long elasticity estimates. Finally, we will experiment with the lag lengths of our empirical specifications to detect changes in results.

Task VIII: Simulation and Forecasts

This task will use simulation and forecasting technique to predict the effect of changes in oil revenue on the Saudi Arabian macro economy.

Task IX: Report Writing and Presentation

The two interim progress reports and one draft of the final report are considered as key components of this task.

4. VALUE TO THE KINGDOM

The outcome of the project should clearly help the governments of Saudi Arabia to identify strategic sectors in their development plans that might play key roles in Saudi Arabia's economic development in the long run. Second, the proposed proposal is the first in its kind to analyze and estimate the impact of oil revenue on the Saudi Arabian economy by looking at both static and dynamic effects and by considering both short run and long run responses to changes in oil revenue. As a result, everyone from the policy makers, private sectors, concerned citizens, students and most importantly, applied researchers in the field of statistics, economics and other business discipline should benefit from this research. Third, the private sector might also benefit from this research because it might identify key areas where private sector investment might be warranted and efficient. Finally, the project will apply and utilize several recently developed statistical tools and modelling techniques. Therefore, this research is also expected to benefit researchers not only in economics and business but also students and researchers in other fields of applied mathematics and statistics. This should also provide general help to students in studying applied mathematics and statistics in college and beyond.

*(Please do not exceed: The pre-proposal should not be more than **three pages**, including the cover page)*