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Modeling the Impact of Macroeconomic Policies for Development and Growth: The Case of Pakistan, Iran, and Turkey

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1. Introduction

A stable macroeconomic environment is a pre-requisite for sustainable growth and economic development. Efficient economic management not only promotes macroeconomic stability but also provides a conducive environment for public and private investments that underpin the productivity capacity of an economy. Macro-econometric models are important tools that can facilitate macroeconomic management based on a consistent framework that encompasses the key relationships in the economy. Such models are widely used to evaluate the impact of macroeconomic policies and to assess the response of the economy to various internal and external economic shocks.

The key objective of this study is to develop a macro-econometric model for Pakistan, Iran, and Turkey to provide a consistent framework that can serve as the basis for evaluating macroeconomic policies. The estimation of economy-wide macro-econometric models can help policymakers to better pursue their macroeconomic goals including job creation, economic growth, and external stability. The model can also form the basis of economic policies that are based on a complete understanding of the underlying macroeconomic structures and dynamic properties of the relevant macroeconomic variables. Macroeconomic stabilization efforts

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based on a sound macro-econometric model are expected to be more effective in promoting a macroeconomic environment that is conducive to private investment, job growth, and prosperity.

This paper develops a macro-econometric model for Pakistan, Iran, and Turkey with a view of providing a framework for effective macroeconomic management based on rigorous quantitative techniques. The model is specified based on the latest research while widely used time series techniques are employed for estimations and forecasting. The model covers all the major building blocks including production, aggregate demand, fiscal and monetary framework, and foreign trade and capital inflows. The medium-term forecasts are developed to identify key vulnerabilities and assess the efficacy of macroeconomic policies for growth and development outcomes. The country-specific estimations provide a better understanding of the economic structures of Pakistan, Iran, and Turkey to identify areas of mutual economic cooperation based on the diversity of underlying economic structures and macroeconomic frameworks.

The paper is organized as follows: Section 2 elaborates on the specification of the structural model. Section 3 describes data and methodology while section 4 reports the estimation results of modeling exercise for Pakistan, Iran, and Turkey. Section 5 lays out the results of model simulations and policy forecasts, whereas Section 6 concludes the paper.

2. Specification of the Structural Model

The benchmark model includes both the supply side as well as the demand side of the economy. On the supply side, production functions for the agriculture sector, the manufacturing sector, and the service sector have been specified. On the demand side, the model largely focuses on the behavior of consumption, investment, and foreign trade of goods and services respectively. The model covers five key blocks of the economy: the production block, aggregate demand block, fiscal block, foreign trade block, and monetary block.

2.1. Production Block

To model the production activities, production is disaggregated into three major sub-sectors: (1) agriculture, (2) manufacturing, and (3) services. The selection of the sectors is primarily based on the structure of the economy. However, data availability constraints

have also played a role in the selection of sectors for disaggregation of production.

2.1.1. Production Function for Agriculture Sector

Following Naqvi *et al.*; Zerfu and Iqbal, Ahmad, and Abbas, agriculture sector production is assumed to be a function of the labor force engaged in agriculture (L_t^A), disbursement of credit to agriculture sector (CD_t^A) and availability of water (W_t) proxied by area irrigated by tube wells.[1] The functional form is given by:

$$Y_t^A = f(L_t^A, CD_t^A, W_t) \tag{2.1}$$

Where:

Y_t^A	=	Agriculture value-added
L_t^A	=	Labor force engaged in agriculture
CD_t^A	=	Credit disbursement to the agriculture sector
W_t	=	Water availability (area irrigated by tube wells)

Factors other than the ones included in the above functional form that may influence agricultural output include land, fertilizer, pesticides, tractors, and biological inputs like seeds of high yield variety. These, excluding land, are typically purchased using credit. This is especially true for biological inputs.[2] Thus, the inclusion of agriculture credit disbursement accounts for the influence of these factors.

The influence of infrastructure like farm to market roads and electricity on agricultural output needs no emphasis. Parikh assumes that infrastructure and water availability influence agricultural

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1 Naqvi, S. N. H. et al. *The PIDE Macroeconometric Model of Pakistan's Economy*. Islamabad: Pakistan Institute of Development Economics, 1983;. M. Iqbal, M. Ahmad, and K. Abbas, "The Impact of Institutional Credit on Agricultural Production in Pakistan", *Pakistan Development Review* 42, no.4 (Winter: 2003): 469–485; Daniel Zerfu,. *The Macroeconomic Impact of HIV, Aids in Ethiopia*. Department of Economics, Addis Ababa Univ, 2002.

2 K. Dhansekaran, "The decomposition of agricultural output change into the sources of technological, technical efficiency and input changes using frontier production function approach", *Asian Economic Review*, 41, no.2, (1999): 200–207; M. Iqbal, M. Ahmad, and K. Abbas, "The Impact of Institutional Credit on Agricultural Production in Pakistan.

output significantly.[3] To capture the effect of infrastructure $(IFRS_t)$ the functional form incorporates road length as a proxy for infrastructure. The functional relation cited above takes the following form:

$$Y_t^A = f(L_t^A, CD_t^A, W_t, IFRS_t) \tag{2.2}$$

Where:

Y_t^A	=	Agriculture value-added
L_t^A	=	Labor force engaged in agriculture
CD_t^A	=	Credit disbursement to the agriculture sector
W_t	=	Water availability (area irrigated by tube wells)
$IFRS_t$	=	Infrastructure (road length)

It is hypothesized that all the right-hand side variables exert a positive impact on the agriculture sector value-added.

2.1.2. Production Function for Manufacturing Sector

The manufacturing sector includes small-scale and large-scale industries, construction, electricity, and gas sub-sectors. Furthermore, export-processing industries are also included in this sector. In the manufacturing sector, capital stock and labor force are important factors of production and hence these are included in the manufacturing production function. The production function for the manufacturing sector is specified as:

$$Y_t^M = f(K_t^M, L_t^M) \tag{2.3}$$

Where:

Y_t^M	=	Manufacturing value-added
K_t^M	=	Capital stock employed in manufacturing
L_t^M	=	Labor employed in manufacturing

Besides capital stock and labor that have been included in the production function for the manufacturing sector, other factors such as credit disbursed to the manufacturing sector, availability of infrastructure, import of machinery and equipment, and use of

[3] A. Parikh, "Construction of a Macroeconomic Model of the Bangladesh Economy". *The Bangladesh Development Studies* 11, no.4 (December 1983): 1-16.

raw material are likely to influence the volume of manufacturing sector production.[4] Therefore, we extend the functional form by incorporating credit disbursed to the manufacturing sector, (CD_t^M) infrastructure $(IFRS_t)$, import of machinery (IMM_t) and use of domestic raw material (DRM_t) proxied by Agriculture value-added (Y_t^A). The rationale for this proxy is that a significant part of manufacturing output is agro-based, for example, the textile and sugar industries use the output of the agriculture sector as raw material. Now the production function for the manufacturing sector takes the following form:

$$Y_{tm} = f(K_{tm}, L_{tm}, CD_{tm}, IFRS_t, IMM_t, DRM_t) \quad (2.4)$$

All the right-hand side variables are expected to influence manufacturing sector value added positively.

2.1.3. Production Function for Services Sector

The services sector value added is taken as a function of aggregate demand in real terms (domestic absorption). Real aggregate demand is defined as the sum of private consumption, government consumption, and investment divided by the consumer price index. The equation for the services sector can be specified as:

$$Y_t^S = f(RAD_t) \quad (2.5)$$

Where:

Y_t^S	=	Services sector value-added
RAD_t	=	Real aggregate demand

2.2. *Aggregate Demand Block*

$$(Y_t = A_t + (X_t - M_t) \quad (2.6)$$

The aggregate demand for goods and services is the sum of domestic absorption and the trade balance.[5]:

Where A_t is domestic absorption and refers to the sum of consumption (C), investment (I) and government expenditures (G). Also, X and M denote exports and imports of goods and services respectively. The national income now is defined as:

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4 Daniel Zerfu,.*The Macroeconomic Impact of HIV, Aids in Ethiopia*.

5 Olivier Basdevant and Ülo Kaasik. "Analyzing the Prospects of Estonia Using a Macroeconomic Model." *Eastern European Economics.* 41, no. 4 (2003): 38-71. Zerfu,.*The Macroeconomic Impact of HIV, Aids in Ethiopia.*

$$Y_t = C_t + I_t + G_t + (X_t - M_t) \tag{2.7}$$

This relationship always holds as an identity. The aggregate demand can be decomposed into consumption and investment sub-sectors. The consumption sub-sector is disaggregated into private consumption and government consumption.

2.2.1. Consumption Sub-Block

2.2.1.1. Private Consumption

The specification of real private consumption function is based on an optimizing model of life-cycle behavior. The main variables explaining the real private consumption are the real disposable income and real interest rate.[6] To capture the wealth effect, real money balances are included in the real private consumption function.[7]

$$C_t^P = f(Y_t^D, r_t^D, RM_t) \tag{2.8}$$

Where:

C_t^P	=	real private consumption
Y_t^D	=	real disposable income
r_t^D	=	real interest rate
RM_t	=	real money balances (M2 definition)

Following (Haque, Lahiri, and Montiel, 1990), real disposable income (Y_t^D) is defined as:

$$Y_{td} = \frac{(GDP_t - DTXR_t - INDTXR_t + WREM_t + CRP_t)}{CPI_t} \tag{2.9}$$

Where $DTXR$ denotes direct tax revenues and indirect $INDTXR$ tax revenues. $WREM$, CRP and CPI are worker's remittances, credit to the private sector, and consumer price index respectively. Worker's

6 T. Tjipe, H. Nielsen, and E. Uanguta, "Namibia Macroeconometric Model (NAMEX)" (paper presented at Ninth Annual Conference on Econometric Modelling for Africa, 30 June-2 July 2004).

7 Rashid, M. A. "A Macro-Econometric Model of Bangladesh" *Bangladesh Institute of Development Studies*, 9, no.3, (1981): 21–44; Elliott, J., Kwack, S. Y. and Tavlas, G. S. "An econometric model of the Kenyan economy", *Economic Modelling* 3, no.1, (1986):2–30. Rankaduwa, W., Rao, U. L. G. and Ogwang, T. "A forecasting model of the Sri Lankan economy", *Economic Modelling* 12, no.4, (1995):343–375.

remittances are included here to capture the effect of remittances on private consumption.

According to the absolute income hypothesis, real disposable income exerts a positive effect on real private consumption.[8] The life-cycle and the permanent income hypothesis introduced real interest rate (or inflation rate) as an explanatory variable, whose impact is not clear a priori.

2.2.1.2. Government Consumption

Real government consumption depends on the development expenditure relative to GDP, government revenues, and inflation:

$$C_t^G = f(EXDEVY_t, R_t^G, \pi_t) \quad (2.10)$$

Where:

C_t^G	=	Government Consumption
$EXDEVY_t$	=	The ratio of Development Expenditure to GDP
R_t^G	=	Government Revenues
π_t	=	Inflation Rate

It is assumed that the ratio of development expenditures to GDP, government revenues, and the inflation rate is positively related to real government consumption.

2.2.2. Investment Sub-Block

Aggregate investment is disaggregated into private investment (I_t^P), government investment (I_t^G) and an increase in stocks (Δ stocks). Increases in stocks may be an important component of the business cycle. It can be thought that an increase in stocks may be heavily dependent on the fluctuations in agricultural production, which in turn is affected by exogenous factors such as climate. Hence, an increase in stocks is assumed to be exogenous.[9]

2.2.2.1. Private Investment

Private investment plays a key role in sustaining the development process by promoting economic growth. Private investment

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8 J. Odada, J. Eita, and O. Nhuleipo, *An Aggregate Consumption Function of Namibia: An Empirical Exploration* (Windhoek, 2000).

9 S. Ra, and C. Y. Rhee, "Nepal Macroeconometric Model", *Asian Development Bank.* NRP Working Paper Series, no.1 (June 2005).

decisions depend on the investment in long-lived capital assets and expectations about the future.[10] In this study we included real income, real interest rate, the ratio of private sector credit to GDP, and government investment as explanatory variables:

$$I_t^P = f(Y_t, r_t^D, CRPY_t, I_t^G) \tag{2.11}$$

Where:

I_t^P	=	Private Investment
Y_t	=	Real Income
r_t^D	=	Real Interest Rate
$CRPY_t$	=	Ratio of private sector credit to GDP
I_t^G	=	Government Investment

The accelerator theory suggests that as income increases, investment also increases. Therefore, real income is included to capture the effect of the accelerator principle. The real interest rate is another important variable determining the level of private investment. The neoclassical theory predicts a negative relationship between the interest rate and investment. However, McKinnon and Shaw argued that interest rate could exert a positive impact on the level of investment because real interest rates could increase savings thereby increase investment.[11] Furthermore, the interest rate can also be used as a measure of the cost of borrowings that may affect the cost of capital and debt-equity ratio.[12] The availability of credit to the private sector is another important determinant of private investment and influences investment behavior positively.[13] It also provides a link between the real and monetary sectors.[14]

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10 K. K. Guru-Gharana, "Macro-Economic Modeling of South Asian Economies with Intra-SAARC Trade Link", *Institute for Integrated Development Studies, Kathmandu and South Asian Network of Economic Institutes (SANEI),* (June 2000).

11 R. I. McKinnon, R. I. *Money and Capital in Economic Development*. Brookings Institution Press, 1973; E. S. Shaw, *Financial deepening in economic development*. Oxford University Press, 1973; S. Khan, and M. A. Khan, "What Determines Private Investment? The Case of Pakistan", *PIDE Working Papers,* (2007).

12 Guru-Gharana, "Macro-Economic Modeling of South Asian Economies with Intra-SAARC Trade Link".

13 J. Jongwanich, and A. Kohpaiboon, "Private Investment: Trends and Determinants in Thailand", *World Development,* 36, no.10, (2008): 1709–1724.

14 Guru-Gharana, "Macro-Economic Modeling of South Asian Economies with Intra-SAARC Trade Link".

Government investment, which concentrates mostly on infrastructure, exerts an important influence on private investment. It is often suggested that government investment complements private investment instead of crowding-out in developing countries.[15] Therefore, government investment is included in the specification to capture the 'crowding-out' or 'crowding-in' effects.[16]

2.2.2.2. Government Investment

Government investment is measured by the expenditures on capital construction such as infrastructure and innovations. Government investment serves as a fiscal policy instrument and is assumed to be exogenously determined.

2.3. Fiscal Block

The fiscal sector constitutes government revenue, government expenditure, and budgetary balance where budget deficit results when government spending exceeds government revenues. Like many other countries, in Pakistan domestic and external resources are used to finance the budget deficit. The budget deficit is defined as:

$$BD_t = EX_t^G - R_t^G \tag{2.12}$$

Where:

BD_t	=	Budget Deficit
EX_{tg}	=	Government Expenditure
R_{tg}	=	Government Revenue

Government revenue (R_t^G) originates from direct tax revenue ($DTXR_t$), indirect tax revenue ($INDTXR_t$) and non-tax government revenue ($NTXR_t$) sources, i.e.

$$R_t^G = DTXR_t + INDTXR_t + NTXR_t \tag{2.13}$$

Non-tax revenue usually consists of fees and other similar charges, which are proportional to aggregate economic activities (i.e. nominal GDP, NY). The direct and indirect tax revenues are modeled as

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15 M. I. Hossain, and A. Razzaque, "A Macroeconometric Model of Bangladesh: Specification and Estimation", (2003), MIMAP-Bangladesh technical paper; no. 06.

16 J. Jongwanich, and A. Kohpaiboon, "Private Investment: Trends and Determinants in Thailand".

endogenous variables whereas, non-tax revenue of the government is taken as an exogenous variable.[17] Two different revenue functions are modeled as they are different in nature and have different degrees of response to changes in income.

2.3.1. Direct Tax Revenues

Direct tax revenue is influenced by domestic economic activity (NY), average direct tax rate $(ADTXR)$, which is defined as the ratio of direct taxes to nominal output (NY) and inflation rate. Therefore:

$$DTXR_t = f(NY_t, ADTXR_t, INF_t) \tag{2.14}$$

An increase in NY (the tax base) is expected to raise the revenue from direct taxes. Similarly, direct tax revenue will increase as the average tax rate rises.[18] It is also assumed that there is a positive relationship between direct taxes and inflation rate because in each year public and private employee's compensations are adjusted for the cost of living and those additional compensations are taxed.

2.3.2. Indirect Tax Revenues

The indirect tax revenue can also be influenced by nominal income NY, the average indirect tax rate $(AINDTXR)$ and inflation rate (INF), i.e.:

$$INDTXR_t = f(NY_t, AINDTXR_t, INF_t) \tag{2.15}$$

A large proportion of indirect taxes is raised in the form of sales tax, customs duties, etc.; therefore, a higher price level would contribute to higher indirect tax revenue. A higher output level leads to an increase in revenue from indirect taxes due to higher spending. Similarly, a positive relationship between indirect taxes, the average tax rate, and inflation is predicted.

The elasticity of taxes with respect to income is assumed to be about unity.[19] Such a response implies that the tax system, on average, is neither progressive nor regressive.

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17 Guru-Gharana, "Macro-Economic Modeling of South Asian Economies with Intra-SAARC Trade Link", *Institute for Integrated Development Studies, Kathmandu and South Asian Network of Economic Institutes (SANEI);* T. Tjipe, H. Nielsen, and E. Uanguta, "Namibia Macroeconometric Model (NAMEX)".

18 T. Tjipe, H. Nielsen, and E. Uanguta, "Namibia Macroeconometric Model (NAMEX)".

19 Elliott, J., Kwack, S. Y. and Tavlas, G. S. "An econometric model of the Kenyan economy", *Economic Modelling* 3, no.1, (1986):2–30.

2.3.3. Government Expenditure

Government expenditure (EX_t^G) consists of current expenditure $(EXCUR)$, development expenditure $(EXDEV)$ and expenditure on capital disbursement. $(EXCD)$ The total government expenditure is therefore given by:

$$EX_t^G = EXCUR_t + EXDEV_t + EXCD_t \tag{2.16}$$

This model treats development expenditure and expenditure on capital disbursement as exogenous variables, while current expenditure on goods and services is taken as an endogenous variable. The government current expenditure is assumed to be influenced by nominal income and inflation rate. As nominal income increases, the expenditure on development projects is also expected to increase. Similarly, a rise in the inflation rate is also expected to increase the government's development expenditures. Therefore, we specify the following function for government expenditures.

$$EXCUR_t = f(NY_t, INF_t) \tag{2.17}$$

2.4. Foreign Trade Block

The trade block consists of two equations explaining the determination of exports and imports of goods and services.

2.4.1. Export Function

It is assumed that Pakistan is a small open economy and hence is a price taker in the world markets. Accordingly, changes in the world prices affect the domestic production level, which in turn, affects export levels. Real exports of goods and services (X_t) depend positively on the real effective exchange rate $(REER)$ as well as world income (Y_t^F). Other important determinants in the export equation are domestic real income (Y), and the price of exports relative to domestic price (RP_t^X) level.[20] The export function can thus be specified as:

$$X_t = f(Y_t, REER_t, Y_t^F, RP_t^X) \tag{2.18}$$

Domestic real income, foreign income, and the relative price of exports are expected to influence real export demand positively,

[20] A. H. Khan and M. A. Qasim "Inflation in Pakistan Revisited". *The Pakistan Development Review* 35, no.4, (1996): 747–759. D. Zerfu, "The Macroeconomic Impact of HIVG/AIDS in Ethiopia".

while real effective exchange rate exerts a negative impact on exports because of an increase in the real effective exchange rate (i.e. real depreciation) affects export demand negatively.

2.4.2. Import Function

The demand for real imports (IM_t) is assumed to be determined by domestic economic activity (i.e. real income), real effective exchange rate, foreign capital (K_t^F) and the relative price of imports (RP_t^{IM}), which is given by the ratio of the imports price index (P_t^{IM}) to the domestic price level (P). Thus, we can specify the real imports equation as:

$$IM_t = f(REER_t, Y_t, K_t^F, RP_t^{IM}) \tag{2.19}$$

Depreciation in the real effective exchange rate or an increase in the price of imports relative to domestic price level leads to a contraction in import demand. While an increase in the domestic real income and foreign direct investment results in an increase in imports.

2.4.3. Trade Balance

Finally, the trade balance (TB) is defined as:

$$TB_t = X_t - IM_t \tag{2.20}$$

2.5. Monetary and Price Block

The monetary block of the model explains the behavior of money demand, short-term interest rate, and the domestic price level.

2.5.1. Monetary Demand Function

The main objective of monetary policy is to provide adequate liquidity for economic growth while maintaining price stability. The effectiveness of monetary policy depends on the stability of money demand function. Mainstream literature suggests that the demand for real money balances $(M2)$ is positively related to the level of real income. If the level of real income increases, there is an opportunity for the agents to hold more money.

The literature also suggests that demand for real money balances is negatively related to the opportunity cost of holding money (i.e. short-term interest rate). The functional form of real money balances can be expressed as:

$$\left(\frac{M_t^D}{P_t}\right) = f(Y_t, i_t) \tag{2.21}$$

Where:

$M_t d/P_t$	=	Demand for real money balances
i	=	short term nominal interest rate
Y	=	real income $(RGDP)$
P	=	Domestic price level (CPI)
M	=	Money Supply $(M2)$

2.5.2. Interest Rate

This model treats the short-term interest rate as a monetary policy instrument. The short-term interest rate can be modeled as a function of money supply (M), domestic price level (P) and policy discount rate (DR). Therefore, the monetary policy reaction function can be expressed as:

$$i_t = f(M_t, P_t, DR_t) \tag{2.22}$$

2.5.3. General Price Equation

The general price equation is given as:

$$P_t = f(M_t, Y_t, i_t, P_t^F) \tag{2.23}$$

Where:

P_t^F	=	Foreign price proxied by the unit value of imports

The above equation is in line with the monetarist and structuralist theories of inflation which postulate that the general price level is determined by domestic monetary conditions, domestic economic activity, and foreign prices of imports in the context of an open economy.

3. Data and Estimation Methodology

Annual data for the period 1972-2015 has been collected from international sources including the World Bank and IMF. All variables except interest rates are in logarithms which are indicated by small letters instead of capital letters. The choice of estimation

methodology has to be seen in the light of data availability. Due to the short time span, the number of feasible estimation methods is limited. Therefore, we have used a single-equation based cointegration approach (Engle-Granger two-step procedure) to estimate the model. Although the multivariate cointegration technique advanced by Johansen is superior to that of the Engle-Granger method, the Johansen approach requires longer time series which makes it unsuitable for the present study in view of its relatively small sample size.[21] The performance of all estimated equations is evaluated using a battery of contemporary econometric diagnostic tests.[22]

It is well documented in the recent literature that most of the macroeconomic time series display non-stationary behavior. If two series have unit root processes then the OLS method gives spurious results even though the estimated coefficients are highly significant.[23] Engle and Granger suggest the estimation of the cointegration relationship in the first step with the static OLS method.[24] The resulting residuals are then tested for stationarity. If they are found to be stationary, then in the second step one can estimate the ECM model as a long-run equilibrium relationship.

According to the Granger representation theorem, the existence of a linear cointegration relationship can be represented as an error correction model (ECM).[25] The advantage of ECM is that the long-run and short-run properties can be estimated jointly and it makes it possible to examine the direction of long-run and short-run causality. Therefore, we use ECM to represent the dynamic behavior of the variables under consideration.

Following the methodology we start with a more general unrestricted model and come up with a relatively parsimonious

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21 S. Johansen, "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models", *Econometrica* 59, no.6, (1991).

22 To conserve space, these tests are not reported here but are available from the authors upon request.

23 C. W. J. Granger, and P. Newbold, "Spurious regressions in econometrics", *Journal of Econometrics*2, no.2, (1974): 111–120.; P. C. B. Phillips, "Understanding Spurious Regressions in Econometrics" *Journal of Econometrics* 33, no.3, (1986): 311–340.

24 R. F. Engle, and Granger, C. W. J. Granger, "Co - integration and Error Correction: Representation, Estimation and Testing", *Econometrica* 55, no.2, (1987): 251–276.

25 C. W. J. Granger, "Developments in the Study of Cointegrated Economic Variables", *Oxford Bulletin of Economics and Statistics* 48, no.3, (1986): 213–228

model.[26] By parsimonious, we do not mean a model with a limited number of regressors but rather a restricted model that captures the DGP of the underlying macroeconomic channel. At each step of G2S modeling, the restrictions are tested utilizing different econometric tests such as t-test, overall F-test, likelihood ratio test, Wald test, Lagrange Multiplier test, etc. for linear and nonlinear restrictions. While following G2S methodology one may encounter nested or non-nested models; for these two types, distinct econometric tools are available.

ARDL models are usually more general models to start with. For an ARDL(n) model one can have many economically justified models, e.g. from ARDL (1) model one can have more than ten restricted models with economic justification. Moreover, the ARDL models incorporate distinct variables in the same model with a distinct order of integration. For unknown causal relation among macro variables, the VAR technique can be utilized. Macro variables may have a long-run relationship, these long-run cointegrated variables might have built-in ECM; to capture this mechanism a simple ECM model or a Vector Error Correction Model (VECM) can be employed.

4. Estimation Results

The specified model has been estimated using the Engle-Granger two-step methodology. The results are reported below for each building block of the model.[27] The estimated models for each country may differ from the benchmark specification due to country-specific data limitations.

4.1. Pakistan

4.1.1. Production Block

4.1.1.1. Agriculture Sector

The results reported by Eq (4.1.1) suggest that infrastructure, credit disbursed to the agriculture sector and water availability play a major role in the long-run productivity of the agriculture sector,

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[26] J. E. H. Davidson, et al. "Econometric Modelling of the Aggregate Time-Series Relationship Between Consumers' Expenditure and Income in the United Kingdom", *The Economic Journal* 88, no.352, (1978): 661–692.

[27] In view of space constraints, only long-run cointegrating equations are reported here. The results of ADF test and Error Correction Models (ECM) are available from the authors upon request.

with the impact of water availability and infrastructure being greater relative to credit disbursement.

$$y_{ta} = -9.990 + 1.350IFRS_t + 0.688w_t + 0.577CD_{ta} \quad (4.1.1)$$
$$(SE)\ (2.570)\ (0.253)\ (0.208)\ (0.061)$$

4.1.1.2. Manufacturing Sector

The value-added in the manufacturing sector is significantly explained by infrastructure, import of machinery, and raw material provided by the agriculture sector to industries in the long-run. Capital stock turns out to be insignificant in the determination of output of the manufacturing sector. The long-run elasticities for infrastructure, import of machinery, and raw material are respectively 0.436, 0.166, and 0.774.

$$y_{tm} = -4.300 + 0.436IFRS_t + 0.166IMM_t + 0.744DRM_t \quad (4.1.2)$$
$$(SE)\ (0.759)\ (0.083)\ (0.034)\ (0.030)$$

4.1.1.3. Services Sector

The estimation of the services sector value added suggests that services contribution to the total production is significantly determined by real aggregate demand in the long-run. The value of the contribution of real aggregate demand in the services is 2.860 in the long -run.

$$y_{st} = -17.800 + 2.860rad_t \quad (4.1.3)$$
$$(SE)\ (1.550)\ (0.142)$$

4.1.2. Aggregate Demand Block

4.1.2.1. Private Consumption

Eq (4.1.4) reports the long-run estimates of private consumption. It can be seen from the results that in the long-run real disposable income and money supply exert a positive and significant impact on real private consumption. The marginal propensity to consume (mpc) is equal to 0.36, which implies that individuals spend only 36 percent of their income on consumption in the long run. This means that the marginal propensity to save out of real disposable income is moderate $(1 - 0.36 = 0.64)$.

$$c_{pt} = 0.357y_{dt} + 0.742rm_t \quad (4.1.4)$$
$$(SE)\ (0.028)\ (0.023)$$

4.1.2.2. Government Consumption

Government consumption significantly depends on total government revenue and development expenditure relative to GDP. The relationship estimated in Eq (4.1.5) suggests that in the long-run development expenditure exerts a negative effect on government consumption, although the effect is as low as 27 percent, it is statistically significant. Government revenue is expected to exert a substantial positive influence on government consumption.

$$c_{gt} = 1.150 - 0.267exdev_t + 0.817r_{gt} \quad (4.1.5)$$

$$(SE)\ (0.238)\ (0.115)\ (0.033)$$

4.1.2.3. Private Investment

The long-run estimates of the real private investment are given by Eq (4.1.6). It is evident from the results that real private investment is significantly determined by real income, the ratio of private sector credit to GDP, and government investment. Real income is highly significant with a positive impact on real private investment. These results partially confirm the earlier findings by Guru-Gharana in the case of Pakistan The positive and significant coefficient of real income verifies the existence of the accelerator principle in the case of Pakistan.

Government investment has a crowding-out effect on real private investment. This finding of the crowding-out effect from government investment is against the majority of empirical studies.[28] The crowding-out effect of government investment on real private investment implies the lead role played by the private sector in

[28] K. Sakr, *Determinants of Private Investment in Pakistan*. 93/30. Washington D.C, 1993; R. E. Looney, "Infrastructure and Private Sector Investment in Pakistan", *Journal of Asian Economics* 8, no.3, (1997): 393–420; R. E. Looney, and P. C. Frederiken, "Government Investment and Follow-on Private Sector Investment in Pakistan, 1972-1995", *Journal of Economic Development* 22, no.1, (1997): 91–100; K. Hyder, and A. Qayyum, "Crowding-out Hypothesis in a Vector Error Correction Framework: A Case Study of Pakistan [with Comments]", *The Pakistan Development Review* 40, no.4, (Winter 2001): 633–650; N. H. Naqvi, "Crowding-in or Crowding-out? Modelling the Relationship between Public and Private Fixed Capital Formation Using Co-integration Analysis: The Case of Pakistan 1964-2000". *The Pakistan Development Review* 41, no.3 (Autumn 2002): 255–275; E. Atukeren, "Interactions Between Public and Private Investment: Evidence from Developing Countries", *Kyklos*. Wiley/Blackwell (10.1111) 58, no.3, (2005): 307–330; A. Rashid, and I. Ahmad, "Public / Private Investment Linkages: A Multivariate Cointegration Analysis", *The Pakistan Development Review* 44, no.4 (Winter 2005): 805–817

economic activities. The real interest rate exerts no significant effect on private investment in the long-run. The absence of interest rate in the investment function indicates the absence of a channel through which monetary policy shocks can be transmitted to the real sector.[29]

$$i_{pt} = -42.000 + 3.560y_t - 0.390crpy_t - 0.128i_{gt} \quad (4.1.6)$$

$$(SE)\ (1.460)\ (0.140)\ (0.160)\ (0.070)$$

4.1.3. Fiscal Block

4.1.3.1. Direct Tax Revenue

Eq (4.1.7) reports the long-run estimates for direct tax revenues $(dtxr = LNDTXR)$. The result reveals that nominal income (ny) contributes positively to the collection of direct tax revenues, supporting the theoretical view that direct taxes are positively correlated with nominal income. The average tax rate remains insignificant; therefore, it has been excluded from the analysis. The estimated long-run elasticity of direct taxes for nominal income is 1.224 showing that a one percent increase in nominal income translates into more than a unity increase in direct taxes. This result is in line with the previous findings.[30]

$$dtxr_t = -6.959 + 1.224ny_t \quad (4.1.7)$$

$$(SE)\ (0.423)\ (0.030)$$

4.1.3.2. Indirect Tax Revenue

As with direct tax revenue, the indirect tax revenue is assumed to depend on the nominal income. Equations (4.1.8) depict the long-run relationship showing that nominal income (ny_t) exerts a positive impact on indirect tax revenue in the long-run. The long-run elasticity of indirect tax revenue to nominal income is 0.918, which implies that the indirect tax system is neither regressive nor progressive.

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29 S. Ra, and C. Y. Rhee, "Nepal Macroeconometric Model", *Asian Development Bank.* NRP Working Paper Series, no.1 (June 2005).

30 F. Mukarram, "Elasticity and Buoyancy of Major Taxes in Pakistan". *Pakistan Economic and Social Review* 39, no.1 (Summer 2001): 75–86; M. A. Chaudhary, and A. Hamid. "Resource Mobilization and Tax Elasticities in Pakistan", *Pakistan Economic and Social Review* 39, no.1 (Summer 2001): 25–48.

$$indtxr_t = -1.4 + 0.918ny_t \quad (4.1.8)$$
$$(SE)\ (0.203)\ (0.014)$$

4.1.3.3. Current Expenditure

Government current expenditure is assumed to depend on nominal income which captures domestic economic activity. The results (equation 4.1.9) show that nominal income (ny_t) exerts a positive impact on the current expenditure in the long-run. The long-run elasticity of current expenditure concerning nominal income is 0.990.

$$curexp_t = -1.660 + 0.990ny_t \quad (4.1.9)$$
$$(SE)\ (0.220)\ (0.015)$$

4.1.4. Foreign Trade Block

4.1.4.1. Exports

Theoretically, exports of goods and services are determined by world income, the real effective exchange rate, and the relative price of exports. Based on the functional form specified earlier, we have estimated the following long-run equation for exports. It is evident from the results reported in Eq (4.1.10) that both the variables exhibit expected signs and are statistically significant at the conventional level of significance in the long-run. Foreign income came out to be insignificant suggesting that Pakistani exports are not much in demand in the world market, which reflects the actual trends observed. The relative price of exports is seen to influence real exports negatively.

$$x_t = -18.400 + 2.050y_t - 0.722rpx_t \quad (4.1.10)$$
$$(SE)\ (4.930)\ (0.307)\ (0.197)$$

4.1.4.2. Imports

The import of goods and services is estimated as a function of real domestic income, real effective exchange rate, the relative price of imports, and foreign capital inflows. The long-run estimates are reported in Equations (4.1.11). It can be seen that domestic real income and real effective exchange rates positively influence real imports of goods and services in the long-run.

$$IM_t = -48.200 + 3.570y_t + 1.240REER_t \quad (4.1.11)$$
$$(SE)\ (2.170)\ (0.094)\ (0.162)$$

4.1.5. Monetary and Price Block

4.1.5.1. Money Demand

The demand for broad money M/P or in logarithmic form $(m-p)$ is assumed to be influenced by real income (Y) as a scale variable and the nominal interest rate (i). It is evident from the estimates presented in Eq(4.1.12) that real income (y) and nominal interest rate (i) display expected signs and are statistically significant in the long-run. The income elasticity of money demand is 1.320. This result is in line with earlier findings.[31] The interest elasticity of money demand for -0.015 is quite low. This implies that the domestic financial market is not yet well developed, and the interest rates were not set at market rates before 1993.

$$m - p = 9.930 + 1.320Y_t - 0.015i_t \quad (4.1.12)$$
$$(SE)\ (0.302)\ (0.020)\ (0.005)$$

4.2. Iran

The modeling exercise for Iran has focused on key macroeconomic variables for which time series data of adequate duration were available. The model specifications have also been dictated by data availability and consequently, there may be some missing variable bias.

4.2.1. Production Block

4.2.1.1. Agriculture Sector

Due to the limited availability of data, a parsimonious production function for agriculture has been estimated using the lagged output and agricultural machinery as key inputs (equation 4.2.1):

$$y_t^a = 0.948y_{t-1}^a + 0.144ma_{t-1}^a \quad (4.2.1)$$
$$(SE)\ (0.014)\ (0.035)$$

The results suggest that agricultural machinery plays a major role in the productivity of the agriculture sector. The machinery used in last year has a positive impact on agricultural value-added. Also, similar

[31] Qayyum (2005) and Khan and Sajjid (2005) among others.

to the case of Pakistan (in the short run), the agriculture sector value-added lagged by one year positively influences agriculture value-added in the current year. The post-estimation residual analysis suggests no serial correlation and no heteroscedasticity problem.

4.2.1.2. Manufacturing Sector

The value-added in the manufacturing sector of Iran is significantly explained by raw material provided by the agriculture sector to industries (Eq (4.2.2)). In addition, the manufacturing value-added lagged by one year, and agriculture value-added lagged by one year are found to influence manufacturing value-added in the current year significantly.

$$y_t^m = 0.958y_{t-1}^m + 0.310drm_t^m - 0.263drm_{t-1}^m \quad (4.2.2)$$
$$(SE)\ (0.035)\ (0.147)\ (0.138)$$

The diagnostic tests do not indicate any misspecification problem. Overall, the result of the manufacturing sector is quite satisfactory.

4.2.1.3. Services Sector

The estimation of the services sector value added suggests that the contribution of services to the total production is not significantly determined by real aggregate demand, it merely depends on its first two lags. There is no value of the contribution of real aggregate demand in the services added in the time period under study. Diagnostic tests suggest the model does not have any problem of serial correlation, functional form, or heteroscedasticity.

$$y_t^s = 1.520y_{t-1}^s - 0.522y_{t-2}^s + 0.0005rad_t^s \quad (4.2.3)$$
$$(SE)\ (0.118)\ (0.119)\ (0.002)$$

Overall no relation was observed between real aggregate demand and services sector value addition during the whole data span i.e. 1960 - 2014. However, the relation between services sector value addition and real aggregate demand was found to be distinct before and after 1979 indicating a structural break. In particular, the relationship is positive (as expected from theory) before 1979 and negative afterward.

4.2.2. Aggregate Demand Block

4.2.2.1. Private Consumption

It can be seen from Eq. 4.2.4 that in the long-run, real disposable income exerts a positive and significant impact on real private

consumption, while the money supply is found to be insignificant. The marginal propensity to consume (MPC) in this case is 0.522, which implies that individuals spend only 52 percent of their income on consumption in the long run. This means that the marginal propensity to save out of real disposable income in Iran over the time-period considered is moderate (1-0.52 =0.48).

$$c_t^p = 17.300 + +0.522 y_t^d + 0.014 rm_t \quad (4.2.4)$$
$$(SE)\ (2.620)\ (0.125)\ (0.0414)$$

4.2.2.2. Government Consumption

In Iran, government consumption solely depends on total government revenues in the time period under study (Eq (4.2.5)). The estimated result suggests that in the long-run the government revenues exert a positive influence on government consumption.

$$c_t^g = 31.600 + 0.037 r_t^g \quad (4.2.5)$$
$$(SE)\ (0.385)\ (0.013)$$

4.2.2.3. Private Investment

The long-run estimates of real private investment are given by Eq (4.2.6). It is evident from the results that real private investment is significantly determined by real income, the ratio of private sector credit to GDP, credit to the private sector, and government investment. The real income is highly significant with a positive impact on real private investment showing that real private investment responds positively to a pick-up in overall economic activity. These results are partially in line with the earlier findings in the case of Pakistan.[32] The positive and significant coefficient of real income verifies the famous accelerator principle. In the case of Iran, government investment does not have a crowding-out effect on real private investment. These findings conform to the majority of empirical studies in this area.[33]

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[32] K. K. Guru-Gharana, "Macro-Economic Modeling of South Asian Economies with Intra-SAARC Trade Link", *Institute for Integrated Development Studies, Kathmandu and South Asian Network of Economic Institutes (SANEI),* (June 2000).

[33] K. Sakr, "Summary of WP/93/30: "Determinants of Private Investment in Pakistan"", IMF Working Papers 1993, 063 (1993), A029; R. E. Looney, "Infrastructure and Private Sector Investment in Pakistan", *Journal of Asian Economics* 8, no.3, (1997): 393–420; R. E. Looney, and P. C. Frederiken "Government Investment and Follow-on Private Sector Investment in Pakistan, 1972-1995", *Journal of Economic Development* 22, no.1, (1997): 91–100; K. Hyder, and A. Qayyum, "Crowding-out Hypothesis in a Vector Error

$$i_t^p = -11.1100 - 0.175crpy_t + 0.248y_t + 0.750i_t^g + 0.054psc_t \quad (4.2.6)$$
$$(SE)\ (1.610)\ (0.055)\ (0.086)\ (0.049)\ (0.009)$$

4.2.3. Fiscal Block

The fiscal block includes separate estimates for direct tax revenues, and indirect tax revenues, as described in the sections below.

4.2.3.1. Direct Tax Revenue

Eq (4.2.7) reports the long-run estimates for direct tax revenues $(dtxr = LNDTXR)$. The result reveals that nominal income (ny) contributes positively to the collection of direct tax revenues. This result supports the theoretical view that direct taxes are positively correlated with nominal income. The variables' average tax rate and inflation turn out to be insignificant; therefore, these variables have been left out from the analysis. The estimated long-run elasticity of direct taxes to nominal income is 1.070 representing that a one percent increase in nominal income translates into more than a unity increase in direct taxes. This result is in line with the previous findings.[34]

$$dtxr_t = -6.050 + 1.070ny_t \quad (4.2.7)$$
$$(SE)\ (0.645)\ (0.020)$$

The long-run direct tax elasticity concerning nominal income (NY) is 1.070, whereas the short-run direct tax elasticity is 0.929. These results have very important implications in the context of Iran's fiscal policy which aims to attain fiscal discipline through prudent taxation and expenditure policies.

4.2.3.2. Indirect Tax Revenue

As in the case of direct tax revenue, indirect tax revenue is also assumed to depend on nominal income. The long-run results are

Correction Framework: A Case Study of Pakistan [with Comments]", *The Pakistan Development Review*. 40, no.4, (Winter 2001): 633–650; N. H. Naqvi, "Crowding-in or Crowding-out? Modelling the Relationship between Public and Private Fixed Capital Formation Using Co-integration Analysis: The Case of Pakistan 1964-2000". E. Atukeren, "Interactions Between Public and Private Investment: Evidence from Developing Countries", A. Rashid, and I. Ahmad, "Public / Private Investment Linkages: A Multivariate Cointegration Analysis", *The Pakistan Development Review* 44, no.4 (Winter 2005): 805–817.

34 F. Mukarram, "Elasticity and Buoyancy of Major Taxes in Pakistan". *Pakistan Economic and Social Review*, 39, no.1 (Summer 2001): 75–86; M. A. Chaudhary, and A. Hamid. "Resource Mobilization and Tax Elasticities in Pakistan", *Pakistan Economic and Social Review* 39, no.1 (Summer 2001): 25–48.

reported by Eq(4.2.8). It is found that nominal income (ny) exerts a positive impact on indirect tax revenues in the long-run. The long-run elasticity of indirect tax revenue for nominal income is 0.395, which implies that the indirect tax system is neither regressive nor progressive.

$$indtxr_t = 13.200 + 0.395ny_t \quad (4.2.8)$$

$$(SE)\ (1.030)\ (0.032)$$

4.2.4. Foreign Trade Block

The foreign trade block comprises separate models estimated for exports and imports, respectively, as detailed below.

4.2.4.1. Exports

Theoretically speaking, exports of goods and services are determined by world income, the real effective exchange rate, and the relative price of exports. Based on the functional form specified earlier, the long-run equation for exports given in Eq(4.2.9) has been estimated.

$$x_t = -156.000 + 5.490y_t + 0.341REER_t - 0.611rp_t^x \quad (4.2.9)$$

$$(SE)\ (13.800)\ (0.386)\ (0.179)\ (0.111)$$

It is evident that both the variables' real income and real effective exchange rate possess the expected signs and are statistically significant at conventional levels of significance in the long-run. The statistical insignificance of foreign income suggests that Iranian exports were not much in demand during the period due perhaps to international sanctions. The relative price of exports influences real exports negatively.

4.2.4.2. Imports

The import of goods and services is estimated as a function of real domestic income, real effective exchange rate, the relative price of imports, and foreign capital inflows. It can be seen from equation 4.2.10 that domestic real income exerts a positive impact on imports of goods and services, while the relative price of imports is negative and significant in the long-run.

$$im_t = -135.000 + 4.820y_t - 0.559rp_t^{im} \quad (4.2.10)$$

$$(SE)\ (12.600)\ (0.356)\ (0.090)$$

4.2.5. Monetary and Price Block

4.2.5.1. Money Demand

Theory suggests that the demand for broad money M/P or in logarithms $(m-p)$ is influenced by real income (Y) as a scale variable. It is evident from the estimates presented in equation 4.2.11 that real income (y) possesses the expected sign and is statistically significant in the long-run, while the income elasticity of money demand is 2.060.

$$(m-p)_t = -41.600 + 2.060 y_t \qquad (4.2.11)$$
$$(SE)\ (3.470)\ (0.100)$$

4.2.5.2. Prices

The domestic price level, proxied by the consumer price index (CPI), is determined by real income and nominal money balances (Eq (4.2.12)). The results show that money supply and real income are the main factors accelerating inflationary pressure in Iran in the long-run. The impact of the money supply is on the order of 0.837 on the domestic price level. On the other hand, the coefficient of real output of -1.100 implies that an increase in real GDP would significantly depress inflationary pressures in the economy in the long-run. In overall terms, the result supports the view that monetarist and structuralist factors are responsible for determining inflationary pressure in the long-run.

$$p_t = 13.500 + 0.837 m_t - 1.100 y_t \qquad (4.2.12)$$
$$(SE)\ (5.000)\ (0.025)\ (0.164)$$

4.3. Turkey

4.3.1. Production Block

4.3.1.1. Agriculture Sector

Due to data constraints, a parsimonious production function for agriculture has been estimated using labor as the only input (Eq. 4.3.1). The result suggests that in the absence of important variables like infrastructure, credit disbursed to the agriculture sector and water availability the impact of labor involved in agriculture has a negative significant effect. While this result seems quite unusual, it may be indicative of more intensive use of labor-saving technology in the agriculture sector.

$$y_t^a = 31.600 - 0.547 l_t^a \quad (4.3.1)$$

$$(SE)\ (1.330)\ (0.084)$$

4.3.1.2. Manufacturing Sector

The value-added in the manufacturing sector is significantly explained by labor engaged in the manufacturing sector, import of machinery, and raw material provided by the agriculture sector to industries in the long-run. Capital stock plays a significant role in the determination of output of the manufacturing sector in Turkey. The long-run elasticities of the labor force, raw material, capital inflows, and import of machinery, are respectively 0.697, 0.532, 0.018, and 0.086 in Eq (4.3.2).

$$y_t^m = 0.697 l_t^m + 0.532 drm_t^m + 0.018 k_t^m + 0.086 im_t^m \quad (4.3.2)$$

$$(SE)\ (0.157)\ (0.103)\ (0.008)\ (0.042)$$

4.3.1.3. Services Sector

The estimation of the services sector value-added model in Eq (4.3.3) suggests that services' contribution to the total production is significantly determined by the labor involved in the services sector in the long-run. The added value of the contribution of labor in the services is 1.230 in the long -run.

$$y_t^s = 4.680 + 1.230 l_t^s \quad (4.3.3)$$

$$(SE)\ (0.547)\ (0.034)$$

4.3.2. Aggregate Demand Block

4.3.2.1. Private Consumption

Equation (4.3.4) reports the long-run estimates of the private consumption model. It can be seen from the results that in the long-run money supply exerts a positive and significant impact on real private consumption.

$$c_t^p = 12.400 + 0.562 rm_t \quad (4.3.4)$$

$$(SE)\ (0.509)\ (0.023)$$

4.3.2.2. Government Consumption

Government consumption depends on the total government revenues as reflected in the long-run relation in Eq (4.3.5).

Government revenue exerts a significant positive influence on government consumption, and although inflation turned out to be insignificant, it is retained in the long-run equation as the Exclusion Restriction Test does not allow us to drop it.

$$c_t^g = 0.536 + 0.002INF_t + 0.913r_t^g \quad (4.3.5)$$

$$(SE)\ (0.136)\ (0.002)\ (0.001)$$

4.3.2.3. Private Investment

The long-run estimates of the real private investment are given by Eq (4.3.6). It is evident from the results that real private investment is significantly determined by real income. The coefficient for real income is highly significant with a positive impact on real private investment. These results partially confirm the earlier findings by Guru-Gharana as well as the earlier estimations for Pakistan.[35] The positive and significant coefficient of real income verifies the accelerator principle from standard economic theory.

$$i_t^p = -7.250 + 1.230y_t \quad (4.3.6)$$

$$(SE)\ (1.360)\ (0.054)$$

4.3.3. Fiscal Block

4.3.3.1. Direct Tax Revenue

Equation (4.3.7) reports the long-run estimates for direct tax revenues $(dtxr = LNDTXR)$. The results reveal that nominal income (ny) contributes positively to the collection of direct tax revenues. Inflation is insignificant, but it cannot be dropped from the model because the Exclusion Restriction test allows keeping inflation in the long-run equation even though it is insignificant. This result supports the theoretical view that direct taxes are positively correlated with nominal income. The estimated long-run elasticity of direct taxes with respect to nominal income is 0.986 indicating that a one percent increase in nominal income translates into almost a unit increase in direct taxes. This result is in line with the previous findings of Mukarram as well as Chaudhary and Hamid.[36]

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35 K. K. Guru-Gharana, "Macro-Economic Modeling of South Asian Economies with Intra-SAARC Trade Link", *Institute for Integrated Development Studies, Kathmandu and South Asian Network of Economic Institutes (SANEI),* (June 2000).

36 F. Mukarram, "Elasticity and Buoyancy of Major Taxes in Pakistan". *Pakistan Economic and Social Review* 39, no.1 (Summer 2001): 75–86; M. A. Chaudhary, and A. Hamid.

$$dtxr_t = -2.310 + 0.968ny_t + 0.003INF_t \quad (4.3.7)$$

$$(SE)\ (0.209)\ (0.016)\ (0.002)$$

4.3.3.2. Indirect Tax Revenue

Similar to direct tax revenue, indirect tax revenue is assumed to depend on the nominal income. It is found that nominal income (ny_t) exerts a positive impact on indirect tax revenues in the long-run (equation 4.3.8). The long-run elasticity of indirect tax revenue concerning nominal income is 1.040, which implies that the indirect tax system is neither regressive nor progressive.

$$indtxr_t = -3.820 + 1.040ny_t \quad (4.3.8)$$

$$(SE)\ (0.235)\ (0.0132)$$

4.3.4. Foreign Trade Block

4.3.4.1. Exports

As discussed in section 2, exports of goods and services are determined by world income, the real effective exchange rate, and the relative price of exports. Based on the functional form specified earlier, the long-run equation for exports given in Eq (4.3.9) has been estimated. It is evident that both the income variables have the expected sign and are statistically significant at the conventional level of significance in the long-run. The significance of foreign income suggests that Turkey's exports have been very much in demand during the period. The relative price of exports influences real exports negatively.

$$x_t = -67.100 + 2.950y_t + 0.874y_t^f - 1.030rp_t^x \quad (4.3.9)$$

$$(SE)\ (7.540)\ (0.540)\ (0.397)\ (0.042)$$

4.3.4.2. Imports

The import of goods and services is estimated as a function of real domestic income, real effective exchange rate, the relative price of imports, and foreign capital inflows (Eq. 4.3.10). It can be seen that domestic real income and real effective exchange rates exert a positive impact on real imports of goods and services, while the relative price of imports has a negative impact in the long-run.

"Resource Mobilization and Tax Elasticities in Pakistan", *Pakistan Economic and Social Review*. 39, no.1 (Summer 2001): 25–48.

$$im_t = -66.000 + 3.610y_t + 0.057k_t^f - 0.964rp_t^{im} + 0.744REER_t \quad (4.3.10)$$
$$(SE)\ (8.330)\ (0.372)\ (0.053)\ (0.060)\ (0.265)$$

4.3.5. Monetary and Price Block

4.3.5.1. Money Demand

The demand for broad money M/P or in logarithms $(m-p)$ is influenced by real income (Y) as the scale variable and nominal interest rate (i). Equation (4.3.11) reports the estimated long-run results where the interest rate (i) is found to be insignificant. It is evident from the estimates presented that real income (y) has the expected sign and is statistically significant in the long-run. The income elasticity of money demand is 1.620. This result is in the line with earlier findings of researchers in this area. The insignificant interest rate may imply that the domestic financial market is not yet as well developed as those of developed countries, and the interest rates were not set at market rates.

$$(m-p)_t = -18.600 + 1.620y_t \quad (4.3.11)$$
$$(SE)\ (0.868)\ (0.035)$$

4.3.5.2. Interest Rate

The estimated results (Eq. 4.3.12) suggest that nominal money balances, real income, and policy discount rate determine the short-term nominal interest rate. Nominal money balances exert a positive impact, while the price level has no impact on the short-term nominal interest rate in the long-run. The policy discount rate influences the short-term nominal interest rate positively in the long-run. The pass-through effect of the discount rate is substantial (i.e. 0.820 percent) on short-term nominal interest rates in the long-run.

$$i_t = -357.000 + 14.012y_t + 0.824DR_t + 49.025\Delta m_t \quad (4.3.12)$$
$$(SE)\ (73.200)\ (2.930)\ (0.109)\ (10.600)$$

4.3.5.3. Prices

The domestic price level, proxied by the consumer price index, (CPI) is significantly determined by real income and nominal money balances (Eq. 4.3.13). Money supply and real income are the main factors contributing to inflationary pressure in Turkey in the long-run. The impact of the money supply is 0.979 percent

on the domestic price level. On the other hand, the coefficient of real output is -1.430, implying that an increase in real GDP would significantly depress inflationary pressures in the long-run. Overall, the result supports the view that monetarist and structuralist factors are responsible for inflationary pressure in Turkey in the long-run.

$$p_t = 14.500 + 0.979m_t - 1.430y_t \qquad (4.3.13)$$
$$(SE)\ (4.390)\ (0.017)\ (0.191)$$

5. Simulations and Forecasts

Well-specified individual behavioral equations are a prerequisite for a good macro-econometric model. From a statistical perspective, individual equation estimation should exhibit high goodness of fit, and the coefficient estimates should be statistically significant. However, good statistical properties in individual equations do not necessarily imply a good performance of the model as a whole. Rather, the good forecasting performance of the model depends on how well the relations between behavioral equations are linked and if the coefficient estimates are economically reasonable. Tests need to be carried out to determine whether the predicted values from the system trace the actual history of the variables reasonably well to evaluate the forecasting performance of the model. What follows is the results of model simulation and forecasting for each country.

5.1. Pakistan

5.1.1. In-Sample Forecasts

The model estimated for Pakistan in section 4 is evaluated for in-sample predictive performance. The evaluation of in-sample performance is mainly done via conventional statistics such as Mean Absolute Percentage Error (MAPE) and Theil's Inequality Coefficient (U). Theil's inequality coefficient compares the forecast with the random walk and always lies between zero (perfect fit) and one (i.e., forecast is not better than that of random walk). The MAPE is not normalized but it should be as small as possible. If MAPE is zero, it means no error in forecasting. Table 7.1. summarizes the forecast evaluation for key endogenous variables.

Table 7.1. Model Validation Statistics - Pakistan

	MAPE	Theil's Inequality (U)
Agriculture Value Added	1.68	0.01
Manufacturing Value Added	0.52	0.003
Services Value Added	0.84	0.01
Real Private Consumption	0.75	0.005
Real Government Consumption	1.24	0.007
Real Private Investment	2.76	0.01
Money Demand	1.1	0.01
Direct Tax Revenues	2.68	0.02
Indirect Tax Revenues	1.33	0.007
Current Expenditures	1.02	0.006
Export Demand	0.82	0.005
Import Demand	2.37	0.01

The results in Table 7.1. show that the model is able to track the historical development of the economy reasonably well. The MAPE is reasonable and lies within the range of 0.52 to 2.76 percent for all endogenous variables. Similarly, the Theil's inequality coefficient (U) is less than unity and close to zero for all the endogenous variables. In other words, the overall forecasting ability of estimated equations is satisfactory.

Next, the model for the period 1980 to 2014 is solved to assess the in-sample forecasting ability of the model and compare the actual values for all the endogenous variables (estimated) with the in-sample simulated values. A graphical comparison of the paths of the ex-post simulation along with the actual values of the endogenous variables reveals that the simulated values of each variable track the actual trajectories quite reasonably for almost all the estimated variables.

5.1.2. Out-of-Sample Forecasts

The primary purpose of developing the macro-econometric model is to provide guidelines for macroeconomic planning and management by forecasting the future path of the economy.

However, forecasting performance usually declines with the length of the forecasting horizon. Consequently, the forecasting horizon is set at 5 years. To generate forecasts of endogenous variables, a set of assumptions are needed on the future values of exogenous variables including government policy variables. In particular, since policy variables have a great influence on the course of the economy, it is important to set the future values of policy variables in a consistent way. No doubt, policy variables can be affected by the socioeconomic environment and political change, but in this case, it is not possible to go into these details due to limited information in certain cases. The projection of world output (foreign income) is taken from Global Economic Outlook; while for the rest of the exogenous variables (including policy variables) we have employed ARIMA models to project the future values of a series based entirely on its own dynamics. Based on this information we have solved the model for 2016 to 2020. Table 7.2. reports the out-of-sample forecasts for various macroeconomic variables.

Table 7.2. Out-of-Sample Forecasts - Pakistan

	2016	2017	2018	2019	2020
Real GDP	5.4	7.4	6.6	8.6	9.3
Inflation	6.7	8.4	6.3	9.0	9.7
Real Value Added in Agriculture	1.1	-0.4	-1.4	-2.2	-2.4
Real Value Added in Manufacturing	5.6	3.9	5.7	3.6	3.2
Real Value Added in Services	4.7	3.4	8.9	7.4	6.8
Exports	5.5	7.1	5.7	7.4	7.8
Imports	23.3	17.5	44.9	38.9	23.7
Direct Taxes	14.0	14.1	15.9	17.7	18.1
Indirect Taxes	10.2	10.4	11.7	13.0	13.3
Current Expenditures	11.1	11.2	12.7	14.1	14.4
Private Investment	8.2	2.8	17.4	12.6	12.7
Fiscal Deficit in terms of GDP	5.7	3.8	4.5	4.2	5.5
External Deficit in terms of GDP	2.7	4.0	9.2	15.4	18.5

Real GDP is expected to grow by almost 8 percent from 2016 to 2020, supported mainly by manufacturing and services at constant prices of 2010 on the supply side. Assuming infrastructure growth (by almost 3 percent) and rising imports of machinery (by almost 5 percent) accompanied by strong domestic support would help the manufacturing to grow by almost 4 percent at constant prices of 2010 (from 2016 to 2020). Similarly, the services sector will grow by 6.6 at constant prices of 2010 (from 2016 to 2020). Value added in agriculture will grow by almost 7 percent in nominal terms but in real terms, it will grow negatively. On the supply side, services are expected to contribute about 63 percent to GDP by 2020. The improvement in ease of doing business accompanied by an increased supply of energy would help in raising the contribution of manufacturing to about 22 percent of GDP.[37] The contribution of agriculture to GDP will decline to about 15 percent of GDP by 2020.[38]

Credit to the private sector (in terms of GDP) has witnessed a noticeable decline since 2008 plunging from 29 percent in 2008 to merely 14 percent in 2014. But since 2015, to support economic growth, the State Bank of Pakistan is maintaining a low policy rate (expansionary monetary policy) allowing domestic credit to expand. Assuming the same policy, credit to the private sector is expected to reach almost 24 percent of GDP by 2020; helping private investment to grow by about 11 percent. While private investment is expected to reach about 29 percent of GDP, the contribution of private household consumption as well as government consumption to GDP would remain almost the same. On the expenditure side, final consumption expenditure will continue to be the largest expenditure item in Pakistan accounting for about 93 percent of GDP in 2020.

The impetus to economic activity is expected to come mainly from an accommodative monetary policy and the consequent increase in private sector credit, especially for investment. Further,

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37 The expansion of the digital economy, the convergence of fixed, mobile and broadcast networks, the increasing connectivity of devices and objects, and the changes in social interactions and personal relationships that these developments bring about, is reshaping the manufacturing and services sectors in emerging Asian economies, including Pakistan.

38 These estimates may slightly differ from actual data, given data limitations in the estimation of model. However, major trends are more or less similar.

a steady increase in development spending and continuing work on infrastructure and energy projects under CPEC, and persistent growth in private consumption would also play an important role in the overall growth prospects of the economy.

On the fiscal side, the policy of fiscal consolidation is expected to continue, with a slight improvement in the pace of revenue collection. The projections of direct and indirect taxes reveal an increasing trend. In terms of GDP, direct taxes will improve their share by almost one percentage point as a consequence of a comprehensive reform program (currently underway)[39]; while the share of indirect taxes would remain the same. Similarly, current expenditure in terms of GDP is expected to decline to 15 percent by 2020 as a result of fiscal consolidation efforts by the government but without compromising the development projects. The adjustment will come initially on the back of scaling down in investment spending both at the federal and provincial levels. With an exogenous growth of about 12.7 percent (generated using an ARIMA model) for development expenditures (about 3.9 percent of GDP); fiscal deficit will remain about 4 percent of GDP (from 2016 to 2020).

Net exports as a percentage of GDP (reflecting widening of the trade deficit) has decreased over the years (from 2010 to 2016) despite the fall in commodity and fuel prices (major import item) since 2015. Pakistan's export earnings are declining since 2014. While the recent decline in exports has been attributed to global developments; as the price impact of global economic conditions is negative for many of Pakistan's textile export items.[40] Both exports of goods and services and imports of goods and services are projected to rise from 2016 to 2020 only in nominal terms.[41] However, imports are expected to increase much faster than exports. Under CPEC, import of machinery plus duty exemptions on other imported items for CPEC related projects is expected to continue. Additionally, crude oil prices (a major item in Pakistan's import basket) are expected

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39 Broadening of tax base and other administrative measures.

40 In 2016, Pakistan witnessed a further fall in exports despite government's support package to boost exports because of the decline in textile exports. For details see State Bank Annual Report, 2016.

41 In real terms exports will grow negatively from 2016 to 2020 (-0.5 percent); while imports will grow by about 21 percent.

to rise, thus increasing the value of our imports. Consequently, the trade deficit will rise significantly by 2020.

Prices are estimated exogenously due to data limitations using ARIMA. Inflation in Pakistan will rise again from 3 percent in 2015 to almost 10 percent in 2020; rising oil prices and prices of other commodities[42] in the international market along with stronger domestic demand will have a positive impact on inflation in the future. Additionally, the increase in prices will also be driven by the exchange rate pass-through to domestic prices.

Overall, the economy is expected to benefit from higher development spending by the Government, accommodative monetary policy, and progress on CPEC-related projects. Additionally, an added impetus to growth would come from the consolidation in global economic recovery. While the real sector of the economy presents an encouraging picture for the medium term, the external account will remain a cause of concern from the perspective of macroeconomic stability. Despite the recovery in exports, Pakistan's balance of payments will continue to remain under pressure on account of surging imports. The balance of payments position is particularly vulnerable for Pakistan at the current level of reserves.

For Pakistan, foreign direct investment (FDI), multilateral, bilateral, and private debt-creating flows are expected to be the main financing sources in the medium-term. To meet external financing needs, the government will continue to access international markets. Remittances will play an important role to finance the current account deficit. However, slower growth in the Gulf Cooperation Council (GCC) countries will affect migrants' employment options and growth in remittances.[43]

5.2. Iran

5.2.1. In-Sample Forecasts

The model estimated for Iran is evaluated for in-sample predictive performance. Table 7.3. summarizes the forecast evaluation for key

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42 As per the World Bank's commodity forecast, energy and non-energy commodity prices will continue to rise by 2030. (available at: http://pubdocs.worldbank.org/en/678421508960789762/CMO-October-2017-Forecasts.pdf). International fuel prices as well as other commodity prices have a crucial role behind inflation rates in Pakistan.

43 World Bank. "South Asia Economic Focus", (Spring 2018): Jobless Growth, Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/29650.

endogenous variables. The Mean Absolute Percentage Error (MAPE) is reasonable and lies within the range of 0.35 to 1.01 percent for all the endogenous variables, with an exception of indirect taxes and consumer price equation. For the equation estimating indirect taxes, it is (4.52 percent); while for the price equation it is very high (47.4 percent). Similarly, the Theil's inequality coefficient (U) is less than unity and close to zero for all the endogenous variables (except for indirect taxes and price equation). In other words, the overall forecasting ability of estimated equations is satisfactory, with an exception of the above-mentioned variables. We, therefore, omitted these two equations from the model for simulations and forecasts.

Table 7.3. Model Validation Statistics - Iran

	MAPE	Theil's Inequality (U)
Agriculture Value Added	0.53	0.003
Manufacturing Value Added	0.69	0.005
Services Value Added	0.52	0.003
Real Private Consumption	0.41	0.003
Real Government Consumption	0.32	0.002
Real Private Investment	0.51	0.003
Money Demand	1.07	0.007
Consumer Prices	47.4	0.05
Direct tax Revenues	0.72	0.005
Indirect Tax Revenues	4.52	0.03
Export Demand	0.46	0.003
Import Demand	0.35	0.002

Next, we solve the model for the period 1990 to 2016 to assess the in-sample forecasting ability of the model and compare the actual values for all the endogenous variables (estimated) with the in-sample simulated values. From the graphs of the paths of the ex-post simulation along with the actual values of the endogenous variables, it is clear that the simulated values of each variable track the actual trajectories quite reasonably for almost all the estimated variables.

5.2.2. Out-of-Sample Forecasts

Iran's economic growth (in real terms at the constant prices of 2011) will slide to about 3 percent in 2017 from 8 percent in 2016 but is expected to expand to about 4 percent next year (2018). However, it will slow down again in 2019 and 2020. It is expected that besides the effect of a slowdown in its oil sector following an exceptionally high activity in 2016; growth would be affected by weak foreign investor confidence associated with geopolitical tensions (including new sanctions and hardened nuclear-deal stance by the United States).

On the supply side in real terms (at the constant prices of 2011), it is only the services sector which is expected to show moderate progress of 4 percent, but not the other two sectors. Although the government has introduced a stimulus package for the production sector[44], it will likely not be much effective as the sector is expected to grow by only about 2 percent by 2020. On the demand side, strengthening private consumption and investment are anticipated to support growth. The slowdown in private consumption and investment after 2018 will have an effect on overall economic growth and real GDP growth will also slow down accordingly.

As Iranian banks face the challenge of delays in establishing a correspondent banking relationship with large international banks (due to sanctions), foreign direct investment inflows to Iran and trade relationships with the rest of the world are restrained. As a result, exports and imports at constant prices of 2011 will grow by only 0.7 percent and 1.7 percent respectively by 2020. Consequently, a decline in trade balance by about 1 percentage point in terms of GDP is expected by 2020.

Table 7.4. Out-of-Sample Growth Forecasts – Iran (%)

	2016	2017	2018	2019	2020
GDP	8.1	2.7	3.9	2.3	2.6
Value Added in Agriculture	0.45	0.44	0.44	0.44	0.43
Value Added in Manufacturing	1.8	1.8	1.8	1.8	1.8

44 The government injected 300-trillion-rial (USD 8 billion) stimulus package into the ailing manufacturing units in early June 2017.

Value Added in Services	4.7	3.5	4.9	3.0	3.4
Inflation	8.6	13.1	17.3	10.2	8.2
Exports	0.79	0.53	1.11	0.37	0.68
Imports	0.87	1.12	1.02	1.68	2.76
Direct Taxes	5.2	4.2	13.1	17.2	19.7
Indirect Taxes	4.0	3.2	9.9	12.9	14.8
Real Private Consumption	3.3	4.0	5.1	3.2	2.9
Real Government Consumption	1.9	-0.7	-1.8	-0.3	0.06
Real Private Investment	6.7	3.8	4.7	3.6	3.8
Real Trade Balance in terms of GDP	20.5	20.0	19.5	19.0	18.5
Fiscal Deficit in terms of GDP	-2.2	-1.5	-1.3	-1.0	-0.8

Iran has adopted a comprehensive strategy involving market-based reforms as reflected in the government's 20-year vision document and the sixth five-year development plan for the 2016-2021 period. However, as per the forecasts, it seems that this reform agenda is not likely to bring the growth dividend in the medium term but may yield benefits in a longer timeframe.

The fiscal deficit is estimated at 2.2 percent of GDP in 2016, up from a deficit of 1.1 percent of GDP in 2014. Government revenue is estimated to have risen in line with the continued rise in tax revenues and the disposal of non-financial assets[45], while oil revenues remained stagnant with the rise in the export volume being offset by the oil price decline. This trend is expected to continue, as tax revenues are expected to increase by about 13 percent by 2020. With some support from the oil sector (despite the marginal growth in exports) as international oil prices are expected to rise by 2020, total government revenues are projected to increase by about 15 percent.

[45] Iran despite of its dependence on oil revenue (which reduced in 2015 because of lowering in global fuel prices) has made some progress in terms of broadening tax base, increasing the VAT rate, stepping up tax administration efforts, and enacting tax legislation that simplifies direct taxation and removes exemptions to some large non-taxpayers. This has compensated to some extent for the fall in oil revenue. For details see World Bank country page for Iran at http://www.worldbank.org/en/country/iran/overview.

On the expenditure side, government expenditure goes up roughly around 20 percent from 2014 to 2016, led by the rise in current expenditures. Income transfers through the Cash Subsidy Program[46] declined due to the exclusion of high-income households and the elimination of the earlier indexation of cash transfers to inflation. From 2016 to 2020, government expenditures are projected to rise by about 13 percent. The fiscal deficit is projected to decline by more than one percentage point by 2020 (i.e., from -2.2 percent of GDP in 2016 to -0.8 percent of GDP in 2020).

Inflationary pressures have continued to fall under a less accommodative monetary policy stance (contractionary monetary policy), with the consumer price inflation falling to 13.7 percent in 2015, from a peak of 39.3 percent in 2013.[47] In 2016, the inflation rate fell even further to 8.6 percent. This fall can further be explained by the relative stability in the foreign exchange market. However, currency depreciation, on concerns over a return of crippling sanctions, is expected to push prices up. The inflation rate is expected to rise in 2017 and even more in 2018. However, with tight monetary policy, inflationary pressures will subside by 2020.

The outlook for Iran's economy in the medium term depends to a great extent on future oil prices; the prospects for continued trade and financial sanctions; and the country's determination to pursue structural reforms needed to improve the business environment, particularly financial sector reforms, improvement in corporate governance and modernization of infrastructure.

5.3. Turkey

5.3.1. In-Sample Forecasts

The estimated model for Turkey is evaluated for within-sample predictive performance. Table 7.5. summarizes the forecast evaluation for key endogenous variables for Turkey.

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46 The Iranian government has implemented a major reform of its subsidy program on key staples such as petroleum products, water, electricity and bread, which has resulted in a moderate improvement in the efficiency of expenditures and economic activities.

47 Factors responsible for inflationary pressures in Iran's economy include economic sanctions in recent years that have resulted in disrupted supply chains and higher operating costs; withdrawal of subsidies on food staples, electricity, water, and gas, all pushed up prices.

Table 7.5. Model Validation Statistics - Turkey

	MAPE	Theil's Inequality (U)
Agriculture Value Added	0.26	0.002
Manufacturing Value Added	0.12	0.001
Services Value Added	0.16	0.001
Real Private Consumption	0.22	0.001
Real Government Consumption	0.27	0.002
Real Private Investment	0.28	0.002
Money Demand	0.41	0.003
Consumer Price index	3.78	0.01
Direct Tax Revenues	0.81	0.004
Indirect Tax Revenues	1.43	0.006
Export Demand	0.16	0.001
Import Demand	0.23	0.001

The MAPE is reasonable and lies within the range of 0.13 to 3.78 percent for all the endogenous variables. Similarly, the Theil's inequality coefficient (U) is less than unity and close to zero for all the endogenous variables. In other words, the overall forecasting ability of estimated equations for Turkey is satisfactory except for the price equation for which it is relatively high.

Next, the model for the period 1990 to 2014 is solved to assess the in-sample forecasting ability of the model and compare the actual values for all the endogenous variables (estimated) with the in-sample simulated values.[48] From the plotted paths of the ex-post simulation along with the actual values of the endogenous variables, it is seen that simulated values of each variable track the actual trajectories quite reasonably for almost all the estimated variables.

5.3.2. Out-of-Sample Forecasts

To set the future values of policy variables consistently, the projection of world output (foreign income) is taken from Global Economic Outlook; while for the rest of the exogenous variables

[48] Some equations are omitted from model due to data limitations as well as their inability to forecast properly.

(including policy variables) we have employed ARIMA models to project the future values of a series based entirely on its own inertia. Based on this information we have solved the model for Turkey from 2016 to 2020. Table 7.6. reports the out-of-sample forecasts for key macroeconomic variables.

Table 7.6. Out-of-Sample Forecasts – Turkey (%)

	2016	2017	2018	2019	2020
GDP	2.6	4.7	4.3	4.5	4.3
Value Added in Agriculture	1.2	1.2	1.2	1.3	1.3
Value Added in Manufacturing	2.7	5.4	3.7	4.7	4.1
Value Added in Services	4.9	4.9	4.8	4.8	4.7
Inflation	7.8	6.9	6.9	6.3	6.2
Exports	1.7	7.2	6.2	8.8	9.1
Imports	3.9	7.9	7.5	7.4	7.8
Direct Taxes	8.7	6.6	7.2	7.9	7.4
Indirect Taxes	9.5	7.4	7.9	8.8	8.1
Real Private Consumption	5.1	2.2	4.9	2.8	2.8
Real Government Consumption	-0.02	2.9	1.0	2.0	0.9
Real Private Investment	3.2	6.3	6.5	7.3	8.1
External Balance (Share of GDP)	-2.0	-1.9	-1.8	-1.5	-1.1

Turkey's growth prospects are reasonably robust, with an expected 4 to 5 percent growth from 2017 to 2020. Recovery in 2017 depends to some extent on a fiscal stimulus[49], but that is expected to be a short-term measure only. Mainly growth would be through the export market recovery. Exports are expected to grow at about 8 percent from 2017 to 2020, fueled by rising external demand and an increase in their competitiveness. While rebounding domestic demand will stimulate import growth. Overall it would be net exports, which are expected to contribute substantially to GDP growth in 2017 and onwards. The projected growth in imports of about 7 percent (less

[49] Fiscal stimulus package was announced in 2016 after failed coup attempt in Turkey to spur growth. In 2016, growth slowed to about 2.6 percent from 6.1 percent in previous year, as the failed coup attempt depressed consumer and business confidence and tourism revenues fell.

than of exports, i.e., about 8 percent) would help in reducing the external trade deficit by 2020 (from 2 percent in terms of GDP in 2016 to 1.1 percent in terms of GDP in 2020).

Furthermore, credit facilitation is expected to support private consumption and private investment in the period under study. Since 2010, the final consumption expenditure in terms of GDP is decreasing. This trend is expected to continue; final consumption expenditure in terms of GDP is projected to decline from about 75 percent in 2016 to about 73 percent in 2020. However, despite this decline, it will remain the main expenditure item on the demand side. Private investment is likely to remain weak in 2016, however, after the recovery of business confidence, private investment will pick up from 2017 onwards. Investments (mainly FDI from Europe) have remained the main driver of growth in Turkey for the last fifteen years or so; this is expected to continue.

On the production side, both manufacturing and services sectors are expected to support economic growth in the medium term. As discussed in Chapter 3, Turkey is classified as an emerging market economy with a strong industrial base and well-developed services sector.[50] These two sectors will continue to remain strong pillars to support economic growth on the supply side.

As per the projections on the fiscal side, both the direct and indirect taxes are expected to rise by 7 percent and 8 percent respectively from 2016 to 2020. However, in terms of GDP, they are expected to decline, which may have a negative impact on the overall budgetary balance.

On the monetary side, a stable lira eased the pressure on prices of imported goods and the average inflation rate declined in 2015; this decline is projected to continue by 2020. With expected volatility in the exchange rate, tight monetary policy would help in maintaining inflation rates in Turkey.

6. Conclusion

In this chapter, we estimated structural models for Pakistan, Iran, and Turkey intending to provide a rigorous framework for assessing

50 Turkey has high capacity utilization ratio in industry and strong appetite to invest in new areas which will keep this trend to continue.

the impact of key macroeconomic policies for development and growth. The macro-econometric models cover all the major building blocks including production, aggregate demand, fiscal and monetary framework, and foreign trade and capital inflows. The production block covers the supply side of the economy focusing on all the major commodity-producing sectors including manufacturing, agriculture, and services. The models have been specified based on the latest research in macro-econometric modeling, and the robustness of the models has been tested using accepted evaluation tests and statistical criteria. The estimated models show that the model parameters reasonably capture the macroeconomic developments of the economies and hence can be used for policy simulations and forecasting. Furthermore, the study has developed policy forecasts to work out the quantitative impact of exogenous changes in policy variables on macroeconomic aggregates including, for example, fiscal position, external account balance, private investment, and government consumption. Medium-term forecasts of key economic variables have also been estimated.

The results show that while macroeconomic policies have supported the process of economic growth in Pakistan, the economy faces diverse macroeconomic challenges that can pose a significant risk to Pakistan's growth prospects. For example, Pakistan is facing external imbalances that threaten to derail the economic recovery. These challenges call for concerted efforts by to achieve macroeconomic stabilization and promote economic growth.

Our forecasts show that while the economy will remain vulnerable on account of rising external imbalances, the manufacturing and services sector are likely to post robust growth in the medium term. Also, prudent macro-economic management is expected to help reduce the fiscal deficit through an increase in direct and indirect revenues and targeted expenditure towards productivity-enhancing spending. Pakistan needs to urgently tackle its ballooning current account deficit that is threatening macroeconomic stability and may pose a significant risk to economic growth in the short to medium term.

The estimated macro-econometric model for Iran's economy has highlighted key macroeconomic relationships in the long run as well as their short-run dynamics. The model projections show that the

economy will grow at a sluggish rate not least because of continued sanctions that may stifle international trade and investment. Macroeconomic stability in Iran is expected to prevail on the back of low fiscal deficit and prudent monetary management to contain inflationary pressures. The economy continues to rely largely on the oil sector and there is a need to achieve greater diversification for broad-based growth. The current economic reforms program can be instrumental in encouraging private investment through improvement in the business climate and the provision of better physical infrastructure.

The estimated model for Turkey suggests that while economic growth in the medium term is projected to remain modest, the macroeconomic environment is expected to be characterized by relatively high inflation. On the external front, both exports and imports are likely to show robust growth. Despite this, however, the Turkish economy is vulnerable to external shocks as its firms are leveraged with external debt and recent currency depreciation has worsened their balance sheets. These developments could hamper the growth momentum and raise the risk of macroeconomic destabilization. The immediate policy concern for Turkey is thus to bolster its currency and help its troubled firms to restructure their loans. The Turkish economy has demonstrated resilience in the past and given prudent macroeconomic management, it is expected to effectively deal with the emerging challenges and recharge the process of economic growth.

References

Atukeren, E. "Interactions Between Public and Private Investment: Evidence from Developing Countries", *Kyklos* 58, no.3, (2005): 307–330.

Basdevant, Olivier, and Ülo Kaasik. "Analyzing the Prospects of Estonia Using a Macroeconomic Model." *Eastern European Economics* 41, no. 4 (2003): 38-71.

Chaudhary, M. A. and Hamid. A. "Resource Mobilization and Tax Elasticities in Pakistan", *Pakistan Economic and Social Review* 39, no.1 (Summer 2001): 25–48.

Davidson, J. E. H, *David F. Hendry, Frank Srba and Stephen Yeo.* "Econometric Modelling of the Aggregate Time-Series

Relationship Between Consumers' Expenditure and Income in the United Kingdom", *The Economic Journal* 88, no.352, (1978): 661–692.

Davidson, R., and MacKinnon. J. G. *Estimation and Inference in Econometrics*. Oxford University Press, 1993.

Dhansekaran, K. "The decomposition of agricultural output change into the sources of technological, technical efficiency and input changes using frontier production function approach", *Asian Economic Review* 41, no.2, (1999): 200–207.

Elliott, J., Kwack, S. Y. and Tavlas, G. S. "An econometric model of the Kenyan economy", *Economic Modelling* 3, no.1, (1986):2–30.

Engle, R. F. and Granger, C. W. J. "Co - integration and Error Correction: Representation, Estimation and Testing", *Econometrica* 55, no.2, (1987): 251–276.

Granger, C. W. J. "Developments in the Study of Cointegrated Economic Variables", *Oxford Bulletin of Economics and Statistics* 48, no.3, (1986): 213–228.

Granger, C. W. J. and Newbold, P. "Spurious Regressions in Econometrics", *Journal of Econometrics* 2, no.2, (1974): 111–120.

Guru-Gharana, K. K. "Macro-Economic Modeling of South Asian Economies with Intra-SAARC Trade Link", *Institute for Integrated Development Studies, Kathmandu and South Asian Network of Economic Institutes (SANEI),* (June 2000).

Haque, N. U., Lahiri, K. and Montiel, P. J. "A Macroeconometric Model for Developing Countries" *Palgrave Macmillan Journals* 37, no.3, (1990): 537–559.

Hossain, M. I. and Razzaque, A. "A Macroeconometric Model of Bangladesh: Specification and Estimation". *MIMAP-Bangladesh technical paper, no. 06* (2003).

Hyder, K. and Qayyum, A. "Crowding-out Hypothesis in a Vector Error Correction Framework: A Case Study of Pakistan [with Comments]", *The Pakistan Development Review* 40, no.4, (Winter 2001): 633–650.

Iqbal, M., Ahmad, M. and Abbas, K. "The Impact of Institutional Credit on Agricultural Production in Pakistan [with Comments]", *The Pakistan Development Review* 42, no.4 Part II (Winter 2003): 469–485.

Johansen, S. "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models", *Econometrica* 59, no.6, (1991): 1551–1580.

Jongwanich, J. and Kohpaiboon, A. "Private Investment: Trends and Determinants in Thailand" *World Development* 36, no.10, (2008): 1709–1724.

Khan, A. H. and Qasim, M. A. "Inflation in Pakistan Revisited". *The Pakistan Development Review* 35, no.4, (1996): 747–759.

Khan, M. A. and Sajjid, M. Z. "The Exchange Rates and Monetary Dynamics in Pakistan: An Autoregressive Distributed Lag (ARDL) Apporach". *Lahore Journal of Economics* 10, no.2, (2005): 87–99.

Khan, S. and Khan, M. A. "What Determines Private Investment? The Case of Pakistan", *PIDE Working Papers,* (2007).

Looney, R. E. "Infrastructure and Private Sector Investment in Pakistan", *Journal of Asian Economics* 8, no.3, (1997): 393–420.

Looney, R. E. and Frederiken, P. C. "Government Investment and Follow-on Private Sector Investment in Pakistan, 1972-1995", *Journal of Economic Development* 22, no.1, (1997): 91–100.

McKinnon, R. I. *Money and Capital in Economic Development*. Brookings Institution Press, 1973.

Mukarram, F. "Elasticity and Buoyancy of Major Taxes in Pakistan". *Pakistan Economic and Social Review* 39, no.1 (Summer 2001): 75–86.

Musila, J. W. "An econometric model of the Malawian economy". *Economic Modelling* 19, no.2, (2002): 295–330.

Naqvi, N. H. "Crowding-in or Crowding-out? Modelling the Relationship between Public and Private Fixed Capital Formation Using Co-integration Analysis: The Case of Pakistan 1964-2000". *The Pakistan Development Review* 41, no.3 (Autumn 2002): 255–275.

Naqvi, N. H. et al. *The PIDE Macroeconometric Model of Pakistan's Economy*. Islamabad: Pakistan Institute of Development Economics, 1983.

Odada, J., Eita, J. and Nhuleipo, O. *An Aggregate Consumption Function of Namibia: An Empirical Exploration.* Windhoek: University of Namibia, Multi-disciplinary Research Consultancy Centre, Social Sciences Division, 2000.

Parikh, A. "Construction of a Macroeconomic Model of the Bangladesh Economy". *The Bangladesh Development Studies* 11, no.4, December 1983: 1–16.

Phillips, P. C. B. "Understanding Spurious Regressions in Econometrics". *Journal of Econometrics* 33, no.3, (1986): 311–340.

Qayyum, A. "Modelling the Demand for Money in Pakistan", *The Pakistan Development Review* 44, no.3 (Autumn 2005): 233–252.

Ra, S. and Rhee, C. Y. "Nepal Macroeconometric Model", *Asian Development Bank.* NRP Working Paper Series, no.1 (June 2005).

Rankaduwa, W., Rao, U. L. G. and Ogwang, T. "A forecasting model of the Sri Lankan economy", *Economic Modelling* 12, no.4, (1995):343–375.

Rashid, A. and Ahmad, I. "Public / Private Investment Linkages: A Multivariate Cointegration Analysis", *The Pakistan Development Review* 44, no.4 (Winter 2005): 805–817

Rashid, M. A. "A Macro-Econometric Model of Bangladesh" *Bangladesh Institute of Development Studies* 9, no.3, (1981): 21–44.

Sakr, K. "Summary of WP/93/30: "Determinants of Private Investment in Pakistan"", IMF Working Papers 1993, 063 (1993), A029.

Shaw, E. S. *Financial deepening in economic development*. New York: Oxford University Press, 1973.

Tjipe, T., Nielsen, H. and Uanguta, E. T. Tjipe, H. Nielsen, and E. Uanguta, "Namibia Macroeconometric Model (NAMEX)" Paper presented at Ninth Annual Conference on Econometric Modelling for Africa, 30 June-2 July 2004.

World Bank. "Jobless Growth" South Asia Economic Focus, (Spring 2018) Washington, DC: World Bank.

Zerfu, D. *The Macroeconomic Impact of HIV, Aids in Ethiopia*. Department of Economics, Addis Ababa Univ, 2002.