The Effect of Institutional Quality on Economic Growth

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Research Questions

- How does institutional quality affect economic growth?
- How can System Dynamics be utilized in the economic policy making management process?
- What are the unique contributions of such a model?

Literature Review

Econometric studies empirically analysed the effects of institutional quality indicators, corruption indicators, and other policy indicators on economic growth. (Mauro 1995 and Ullah et al's. 2012 and 2020)

The quality of government institutions, affects the investment and development of a country (Knack and Keefer 1995).

For many public policy problems a small model is sufficient to explain problem behavior and build intuition regarding appropriate policy responses (Ghaffarzadegan, Lyneis and Richardson 2011)

The states with centralized institutional structure and those with a much-decentralized one may suffer less from the damaging effects of corruption than the states with an intermediate level of institutional centralization. (Schleifer and Vishny 1993).

Econometric Model

$$y_{it} = \beta_0 + \sum \beta_j X_{itj} + \sum \delta_k X_{itk} + \gamma y_{i,t-1} + \alpha \frac{K_{it}}{L_{it}} + \varepsilon_{1it}$$

$$Corr_{it} = \alpha_0 + \alpha_1 Bqua_{it} + \alpha_2 Dacc_{it} + \alpha_3 Lsse_{it} + \alpha_4 Lpop_{it} + \alpha_5 Open_{it} + \alpha_6 Govt_{it} + \alpha_7 Corr_{i,t-1} + \varepsilon_{2it}$$

$$Gini_{it} = \beta_1 + \beta_2 Corr_{it} + \beta_3 y_{it} + \beta_4 Open_{it} + \beta_5 Gpop_{it} + \beta_6 Lsse_{it} + \beta_7 Govt_{it} + \beta_8 Ln(K/L)_{it} + \beta_9 Gini_{i,t-1} + \varepsilon_{3it}$$

Data Collection

World Governance Indicators
Control of corruption
Voice and accountability
Political stability and absence of violence
Rule of law
Government effectiveness
Regulatory quality

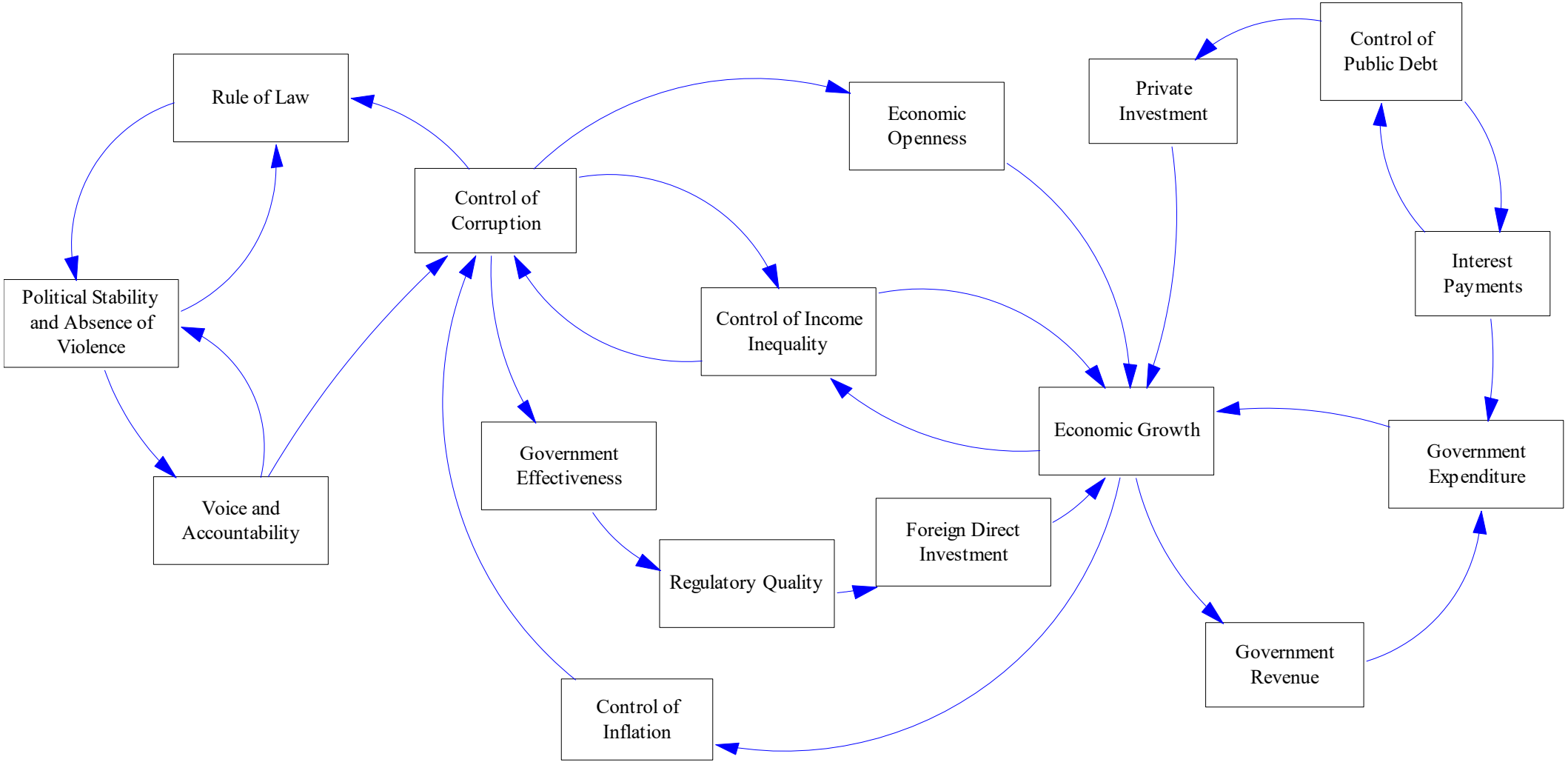
World Development Indicators
Economic growth
Economic openness
Government expenditure
Interest payment
Government revenue
Control of inflation
Control of inequality
Foreign direct investment

International Monetary Fund Indicators
Control of public debt
Private investment

Data Conversion

- World Governance Indicators in -2.5 to 2.5 scale
- World Development Indicators and International Monetary Fund Indicators converted to make higher values better
- Possible to collect data for any country

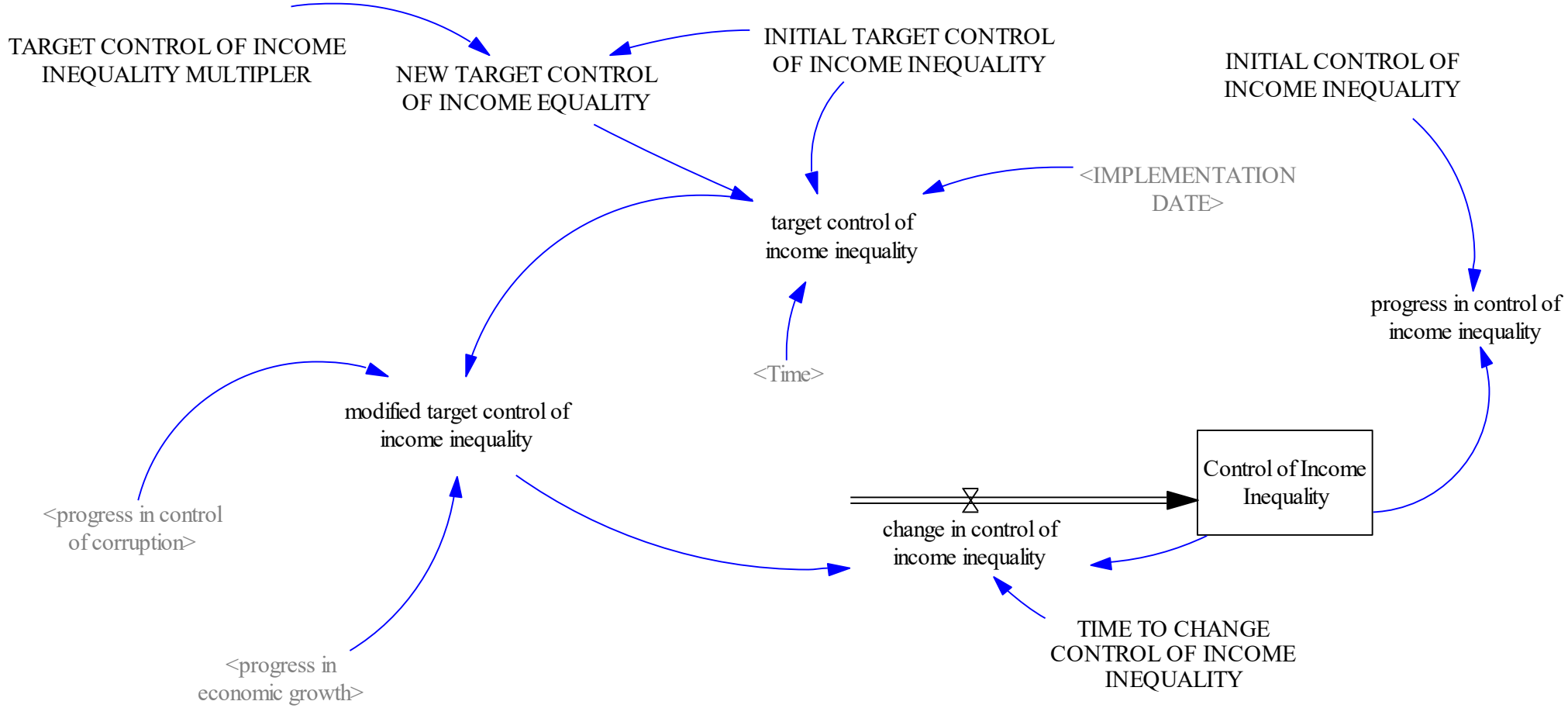
System Dynamics Model Overview



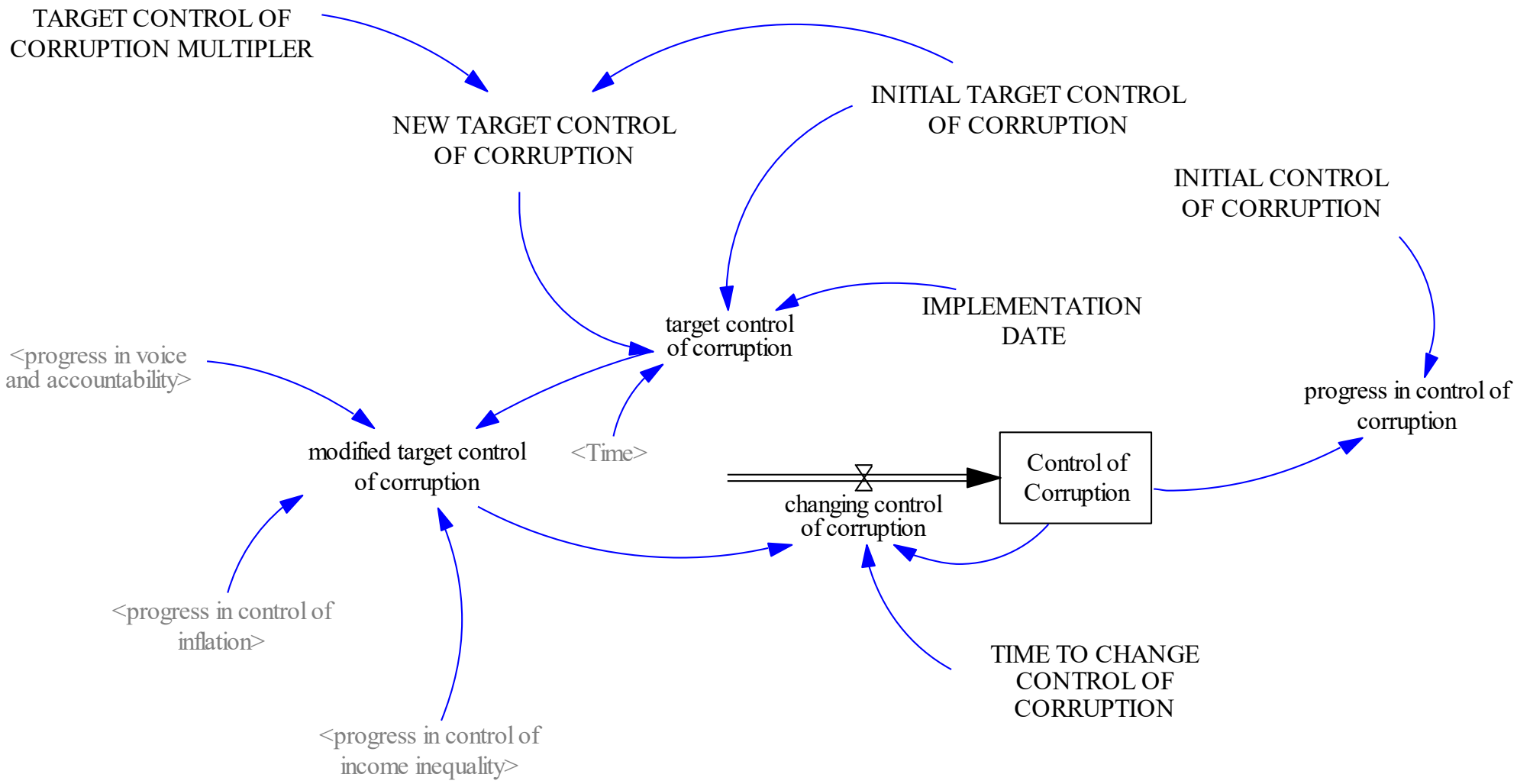
System Dynamics Implementation

- Each institution modeled as a Stock
- Initial value set in 1996
- Progress compares current value to initial value
- Target value for 2019 modified by progress in other institutions
- Attempt to close the gap between the current value and the (moving) target over time

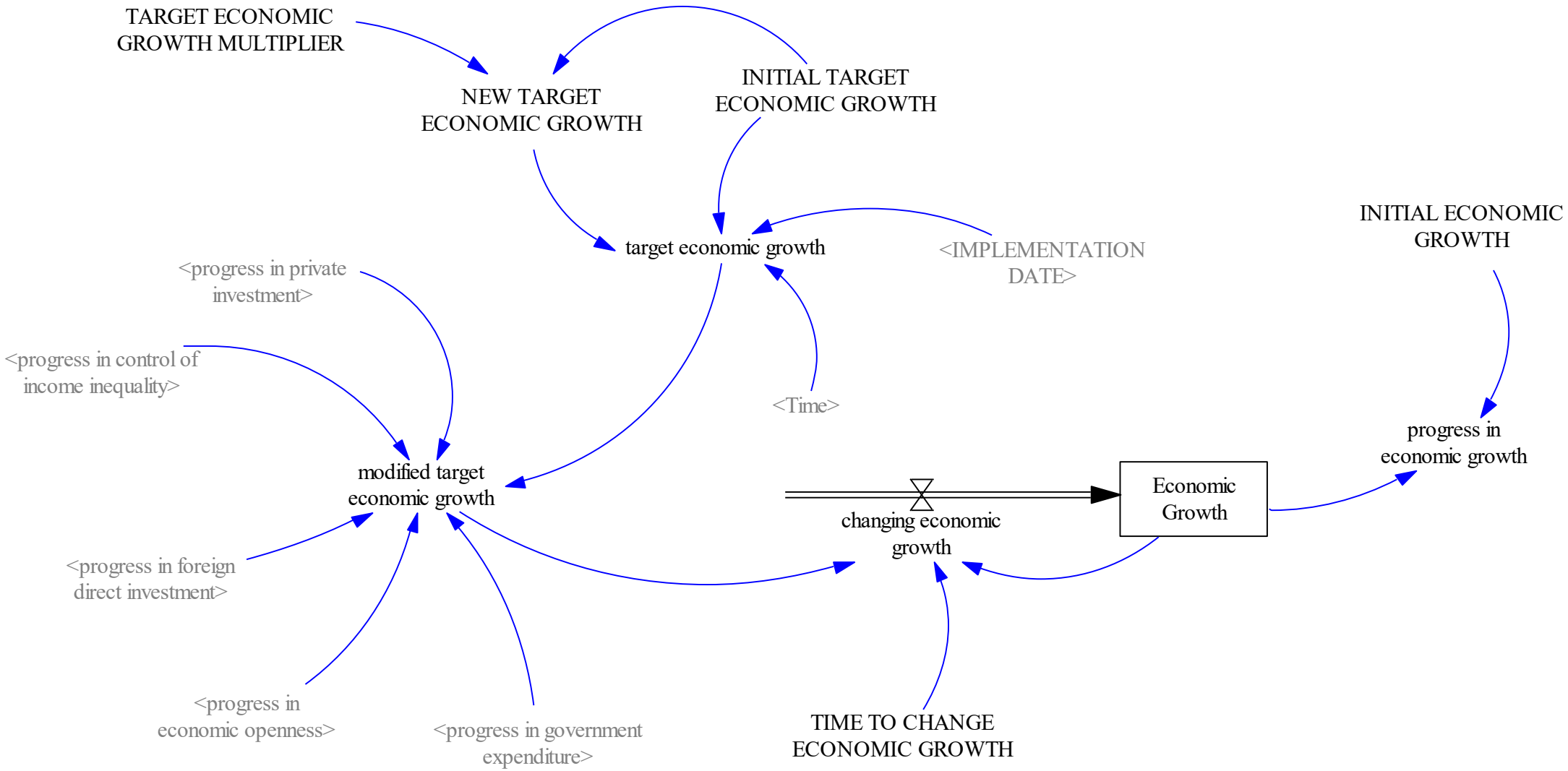
Stock and Flow Diagram for Income Inequality



Stock and Flow Diagram for Control of Corruption



Stock and Flow Diagram for Economic Growth



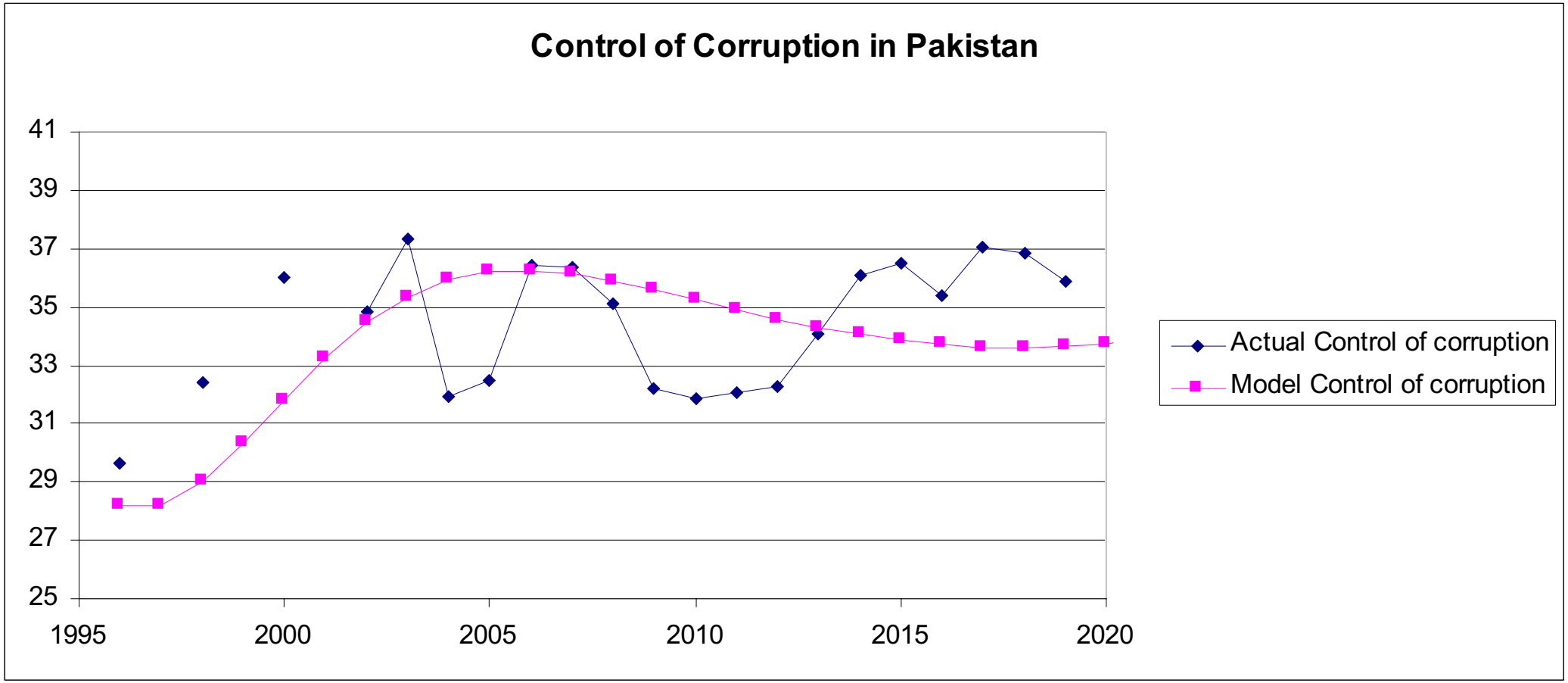
Implementation Methodology

- Built model in Vensim
- Converted to Excel and verified
- Calibrated model using Solver
- Maximized economic growth under effort constraints using Solver

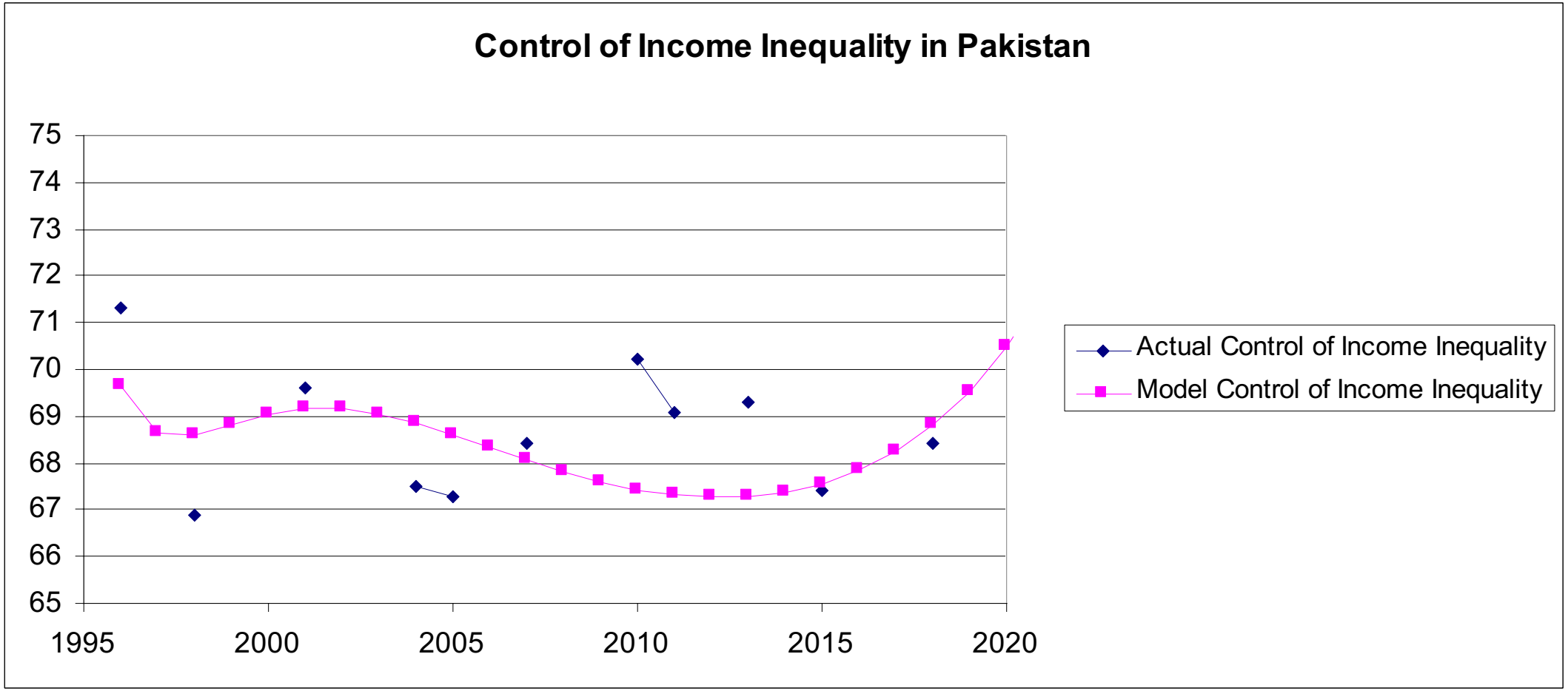
Model Calibration

- Calibrated the model parameters by minimizing total weighted sum of squared error
  - Combining all time-series and all model estimates over the time period 1996 to 2019
  - By varying initial values, progress targets, and time to make progress

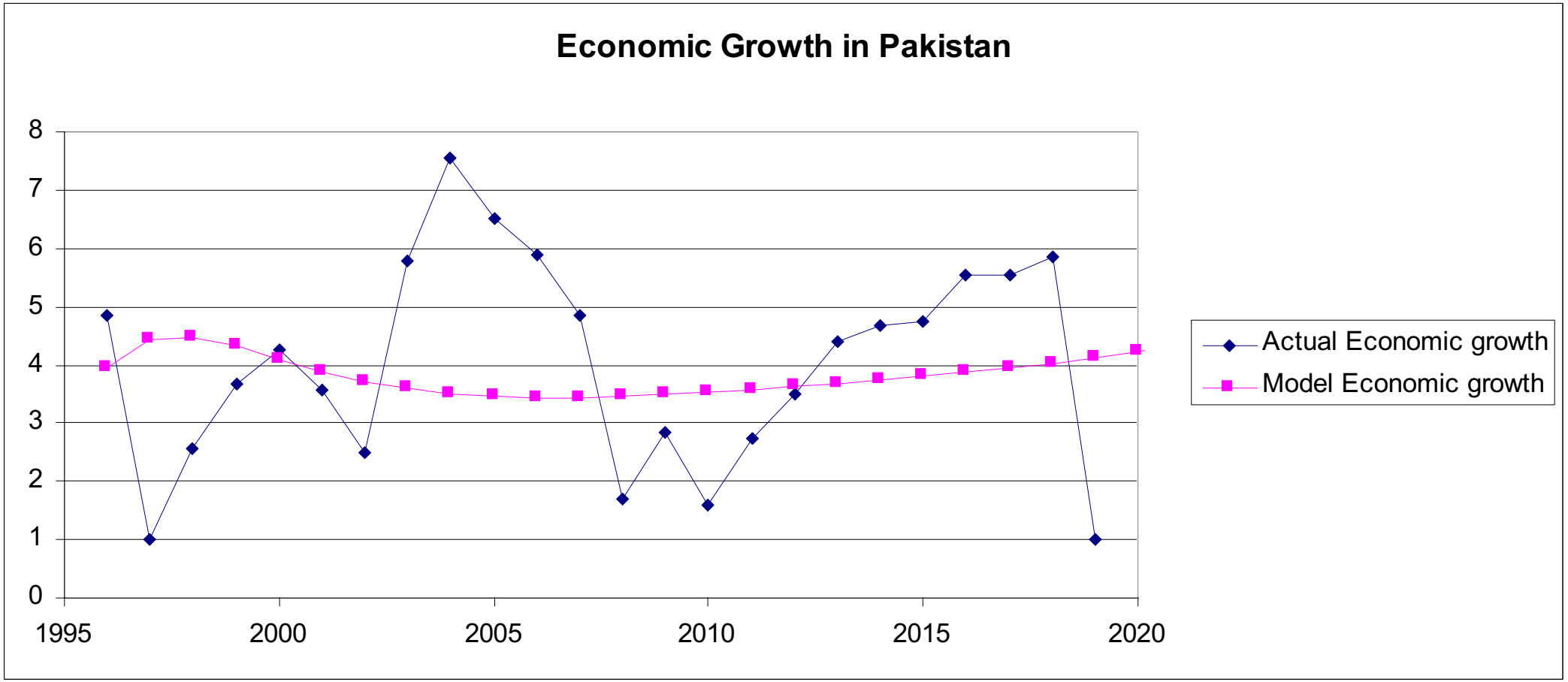
Model Calibration for Pakistan



Model Calibration for Pakistan



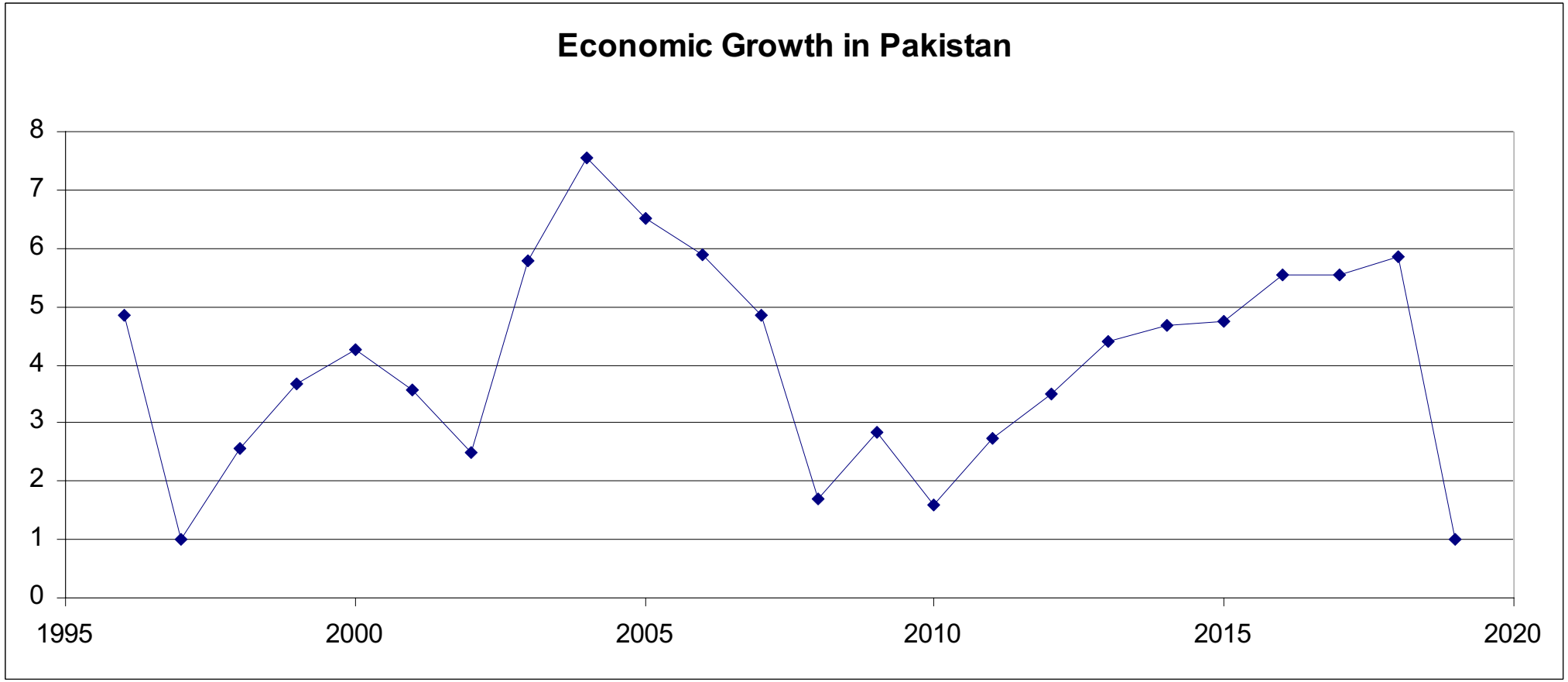
Model Calibration for Pakistan



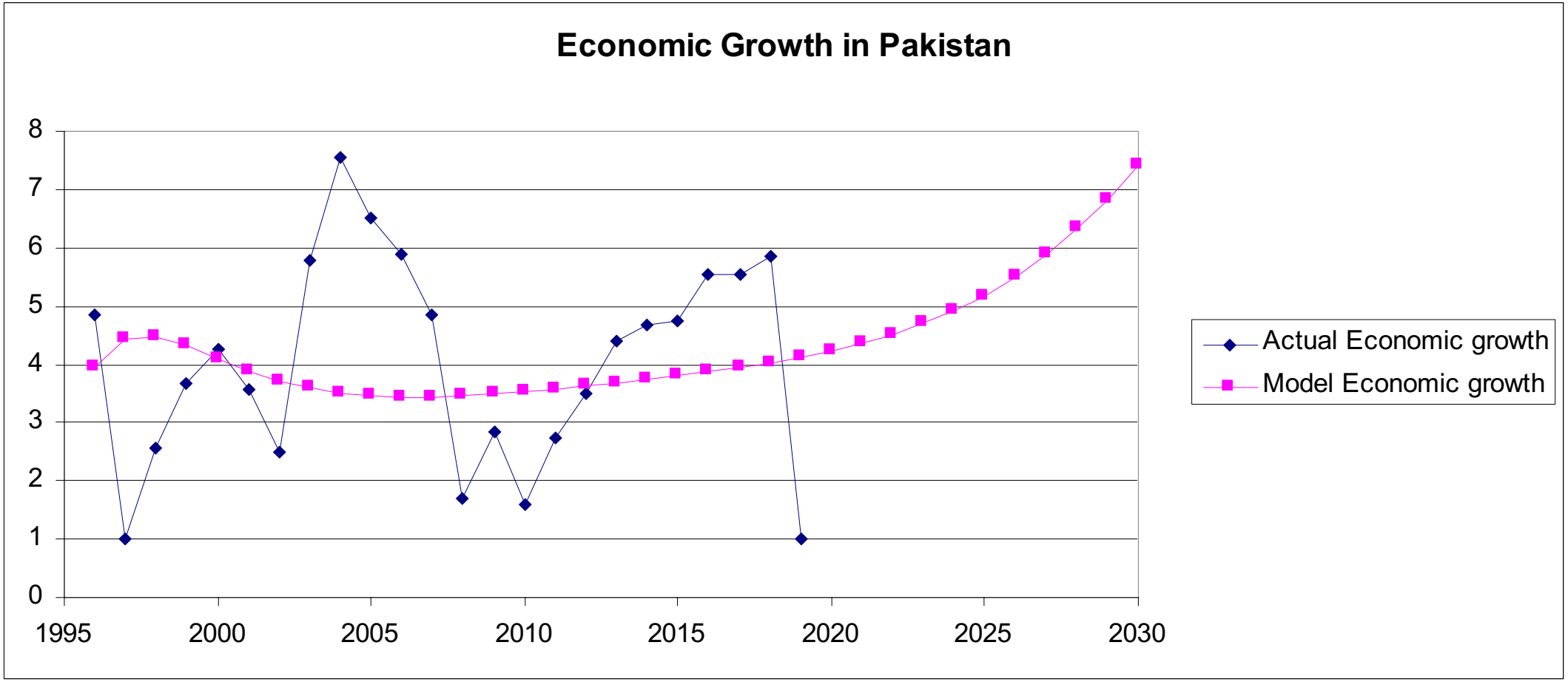
Model Projections

- Projection from 2020 to 2030 using calibrated model assuming no policy changes
- Some Countries Examined
  - Pakistan
  - Mexico
  - Greece
  - South Africa
  - Iran

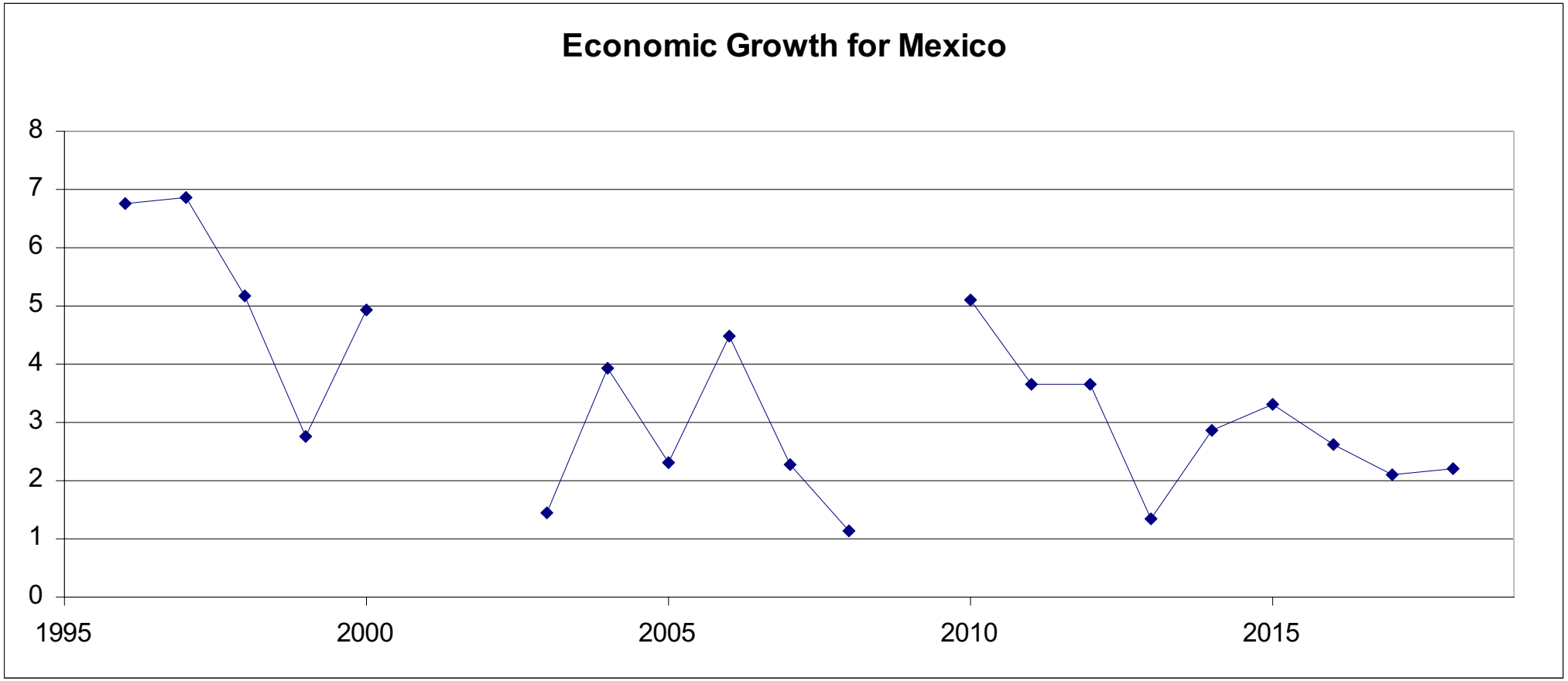
Time-Series of Economic Growth for Pakistan



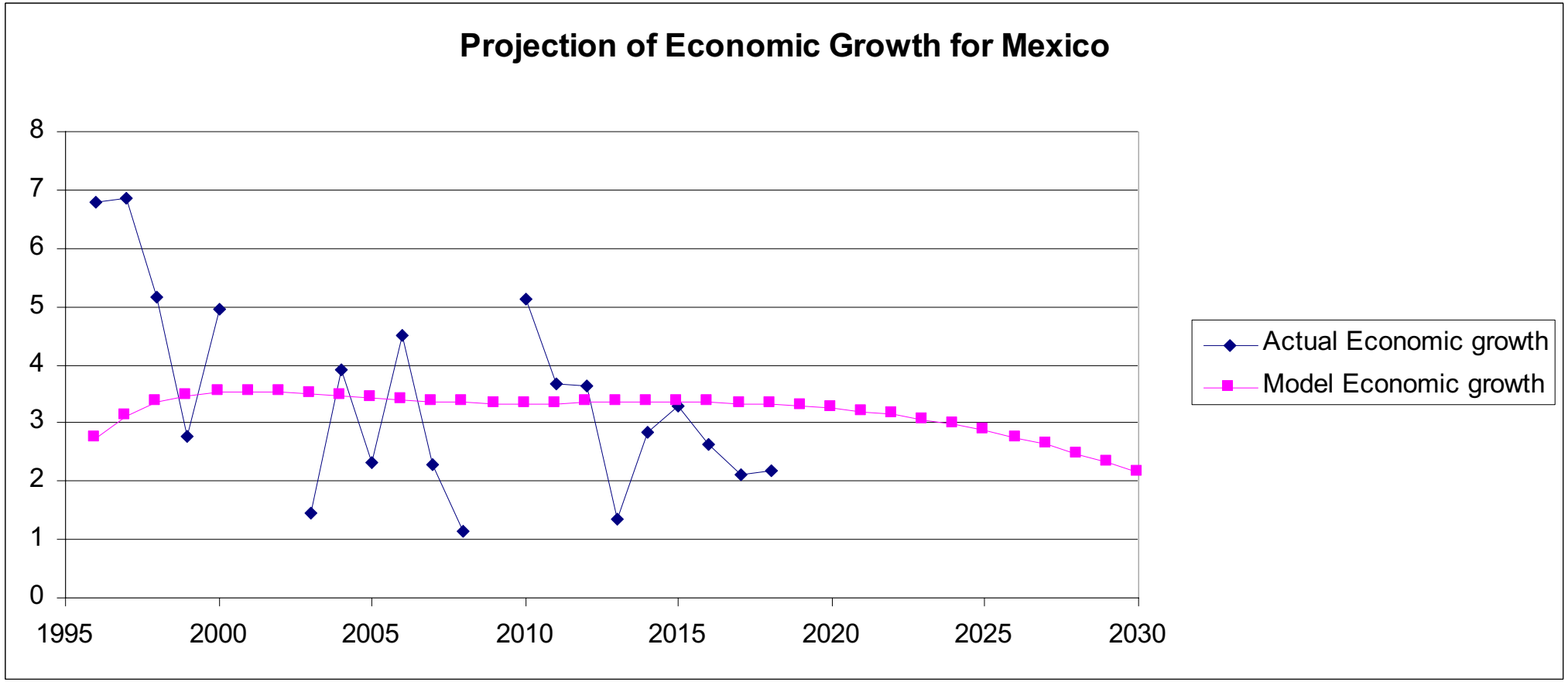
Projection of Economic Growth for Pakistan



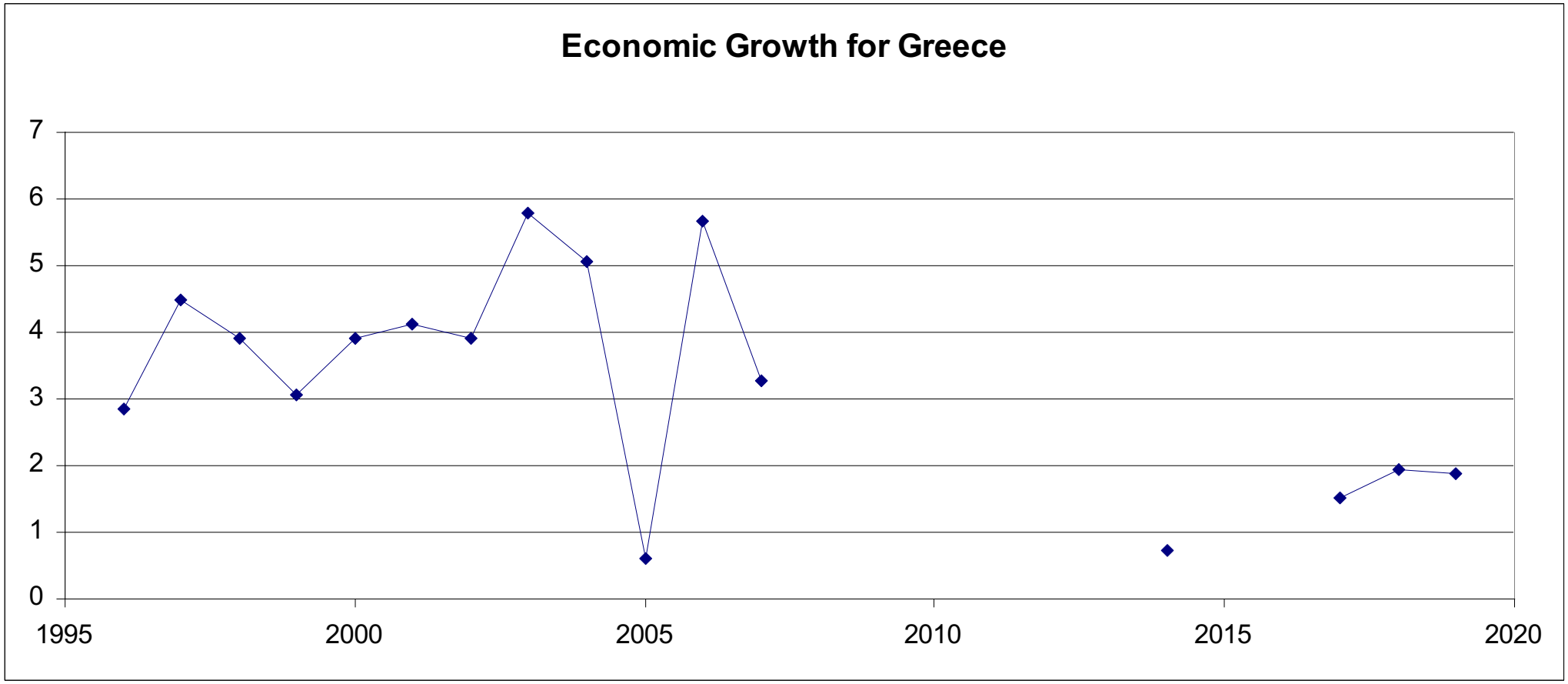
Time-Series of Economic Growth for Mexico



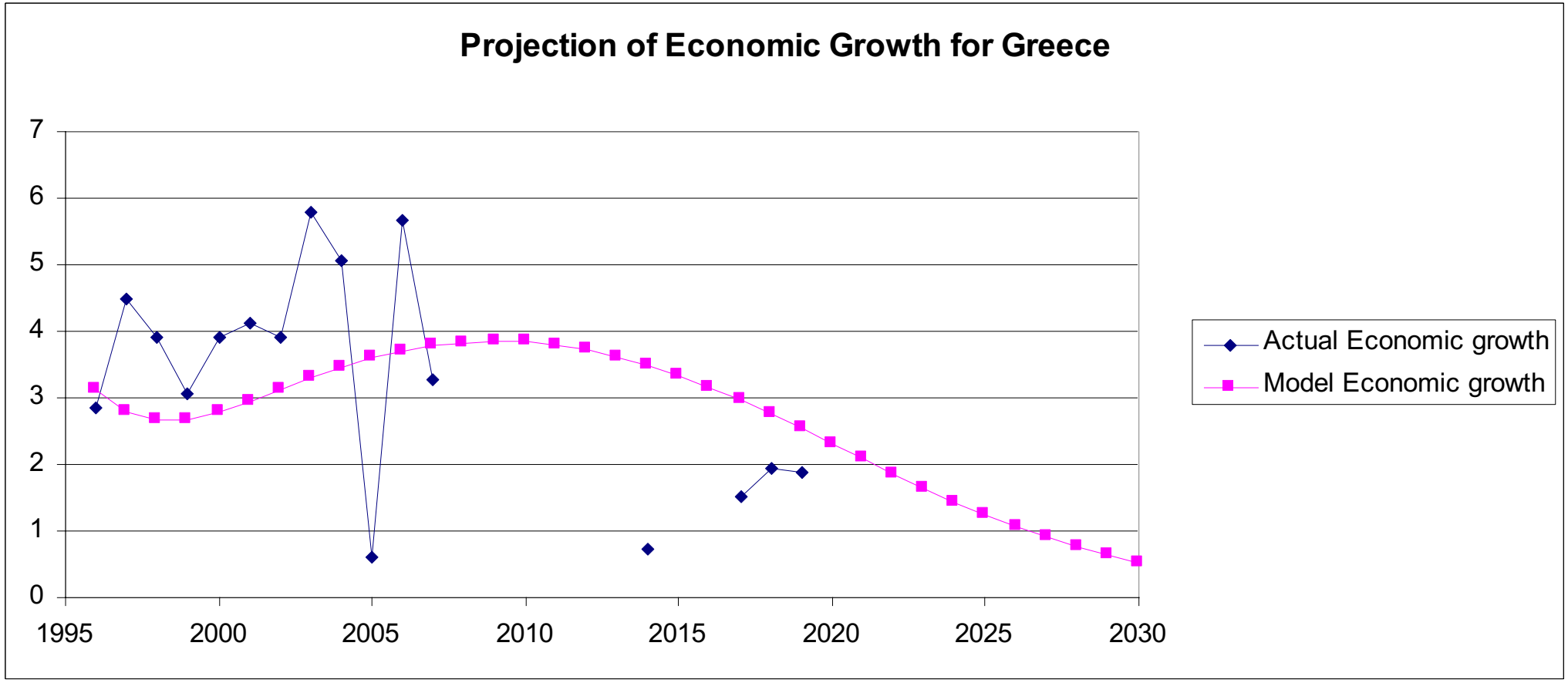
Projection of Economic Growth for Mexico



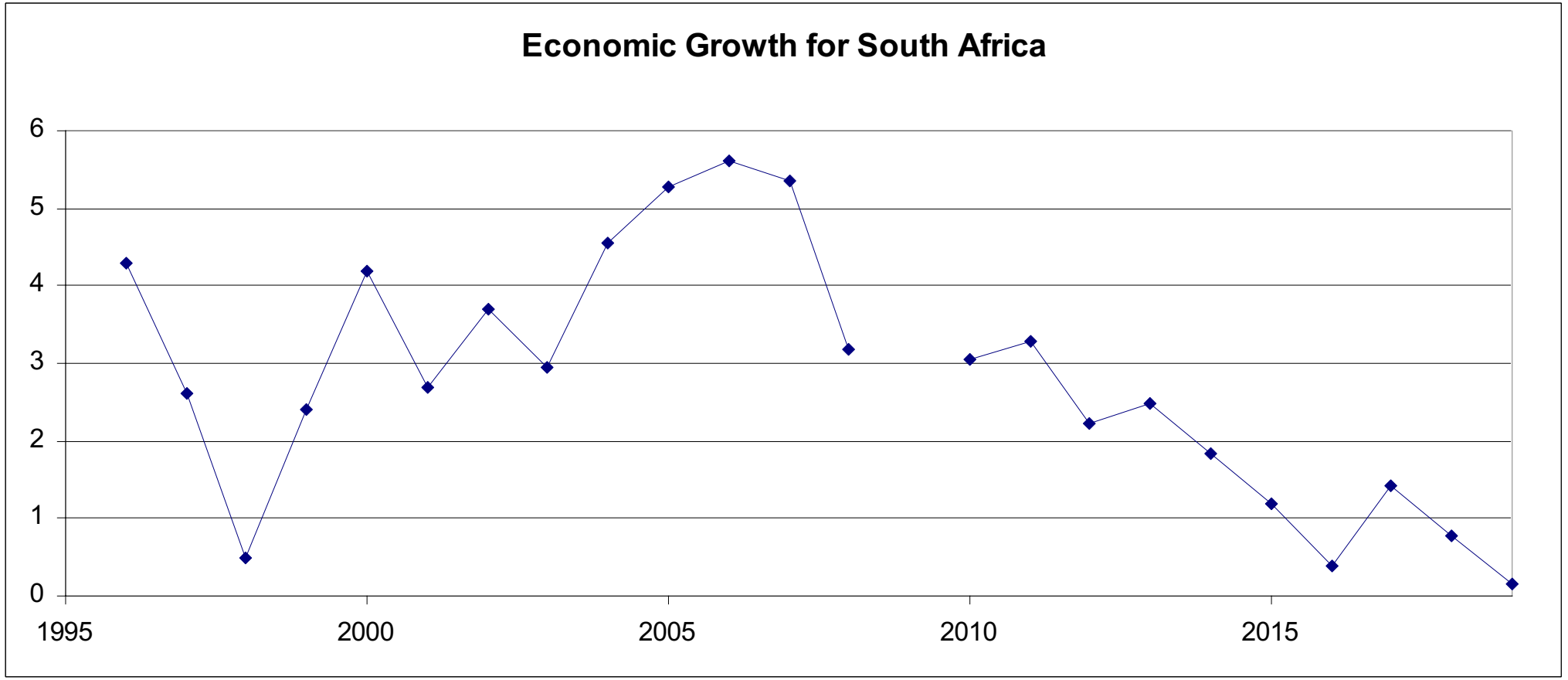
Time-Series of Economic Growth for Greece



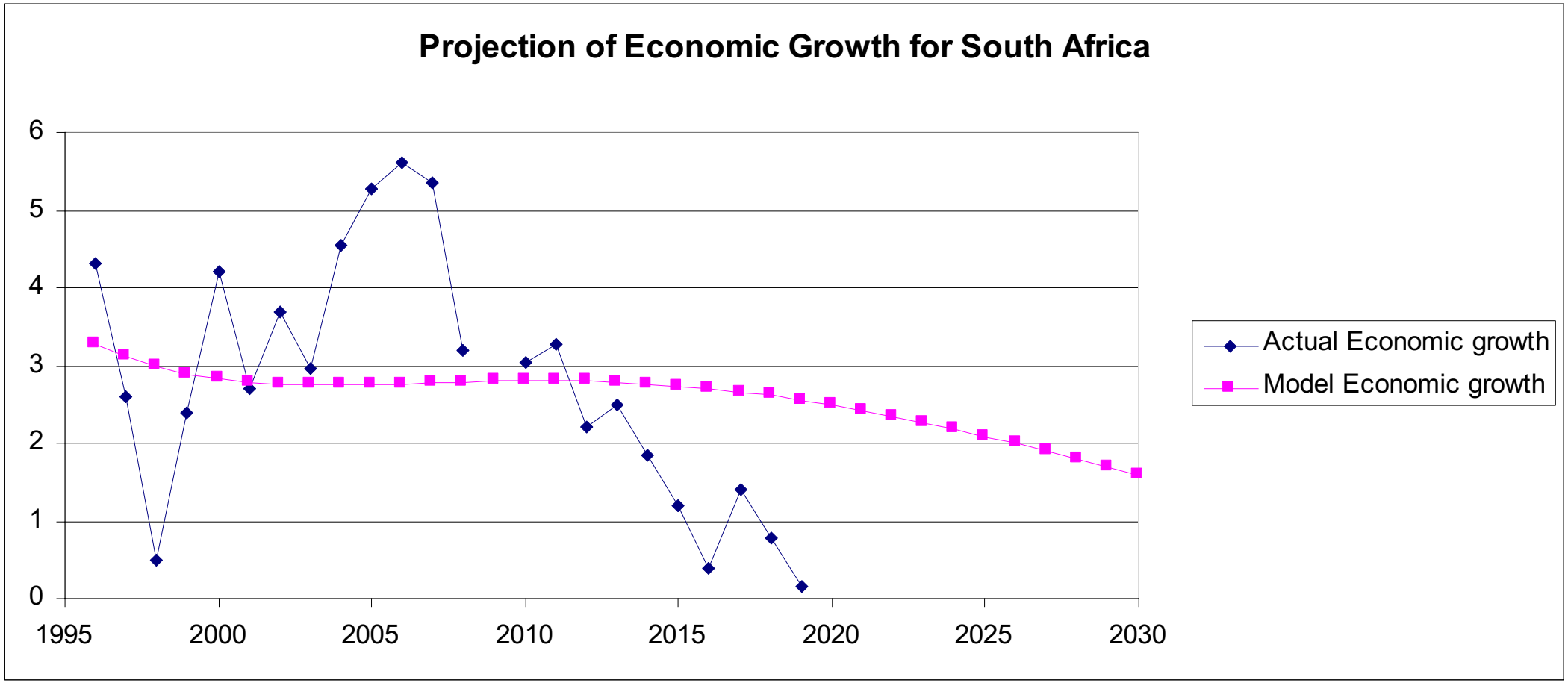
Projection of Economic Growth for Greece



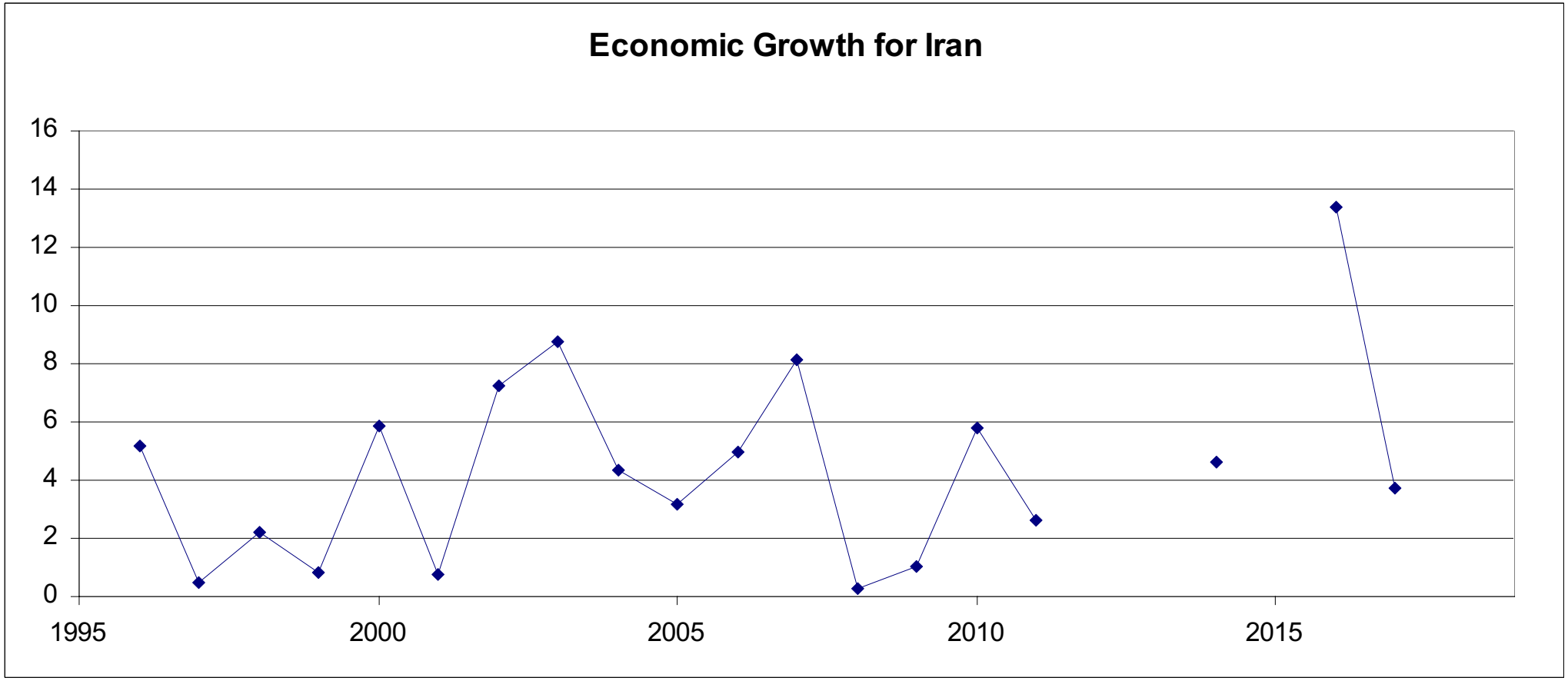
Time-Series of Economic Growth for South Africa



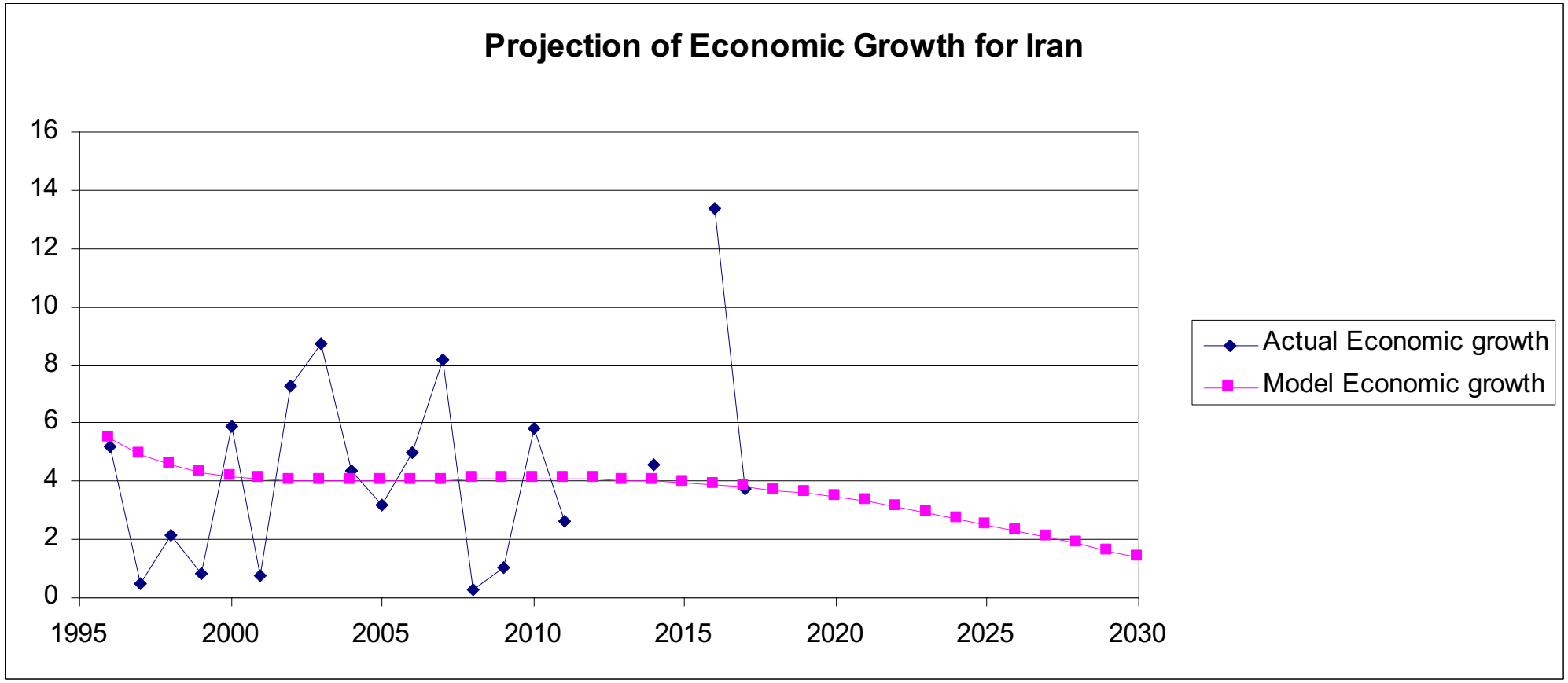
Projection of Economic Growth for South Africa



Time-Series of Economic Growth for Iran



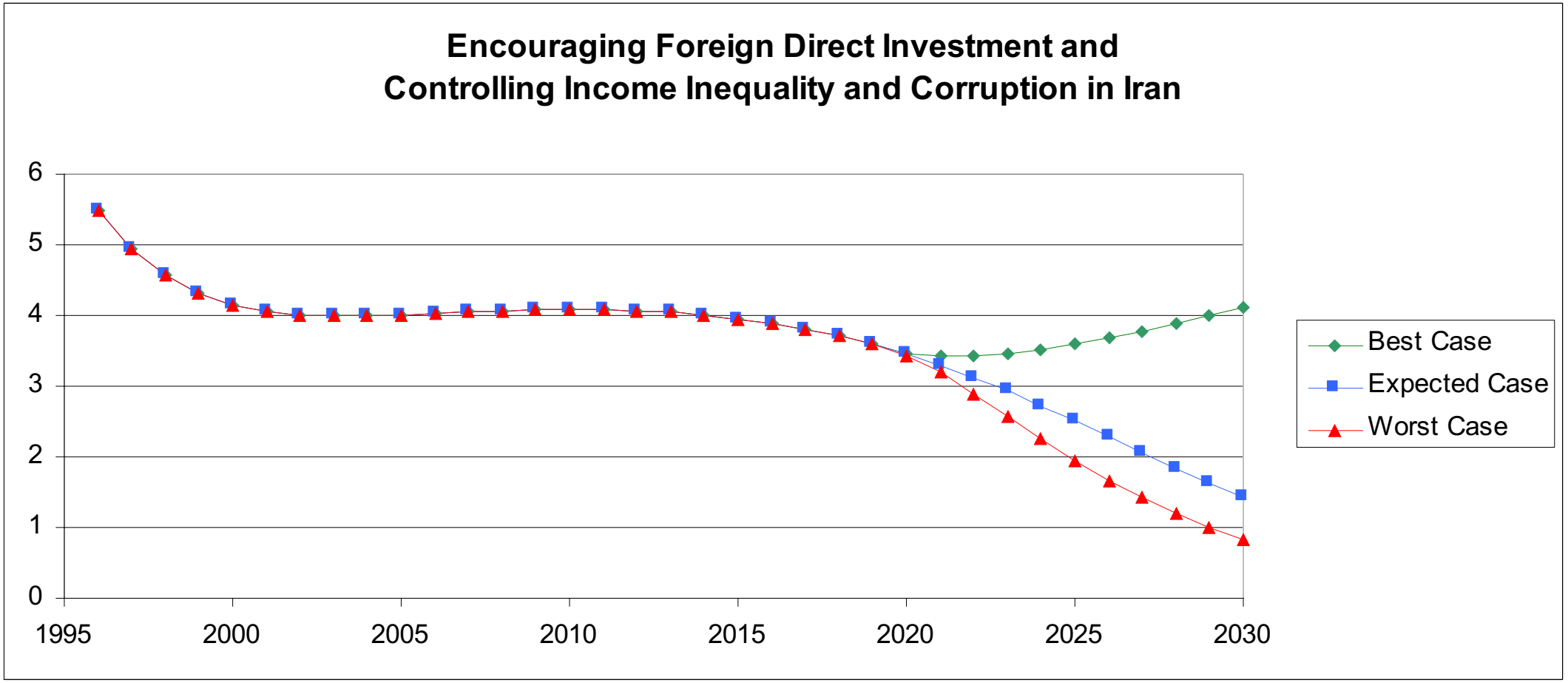
Projection of Economic Growth for Iran



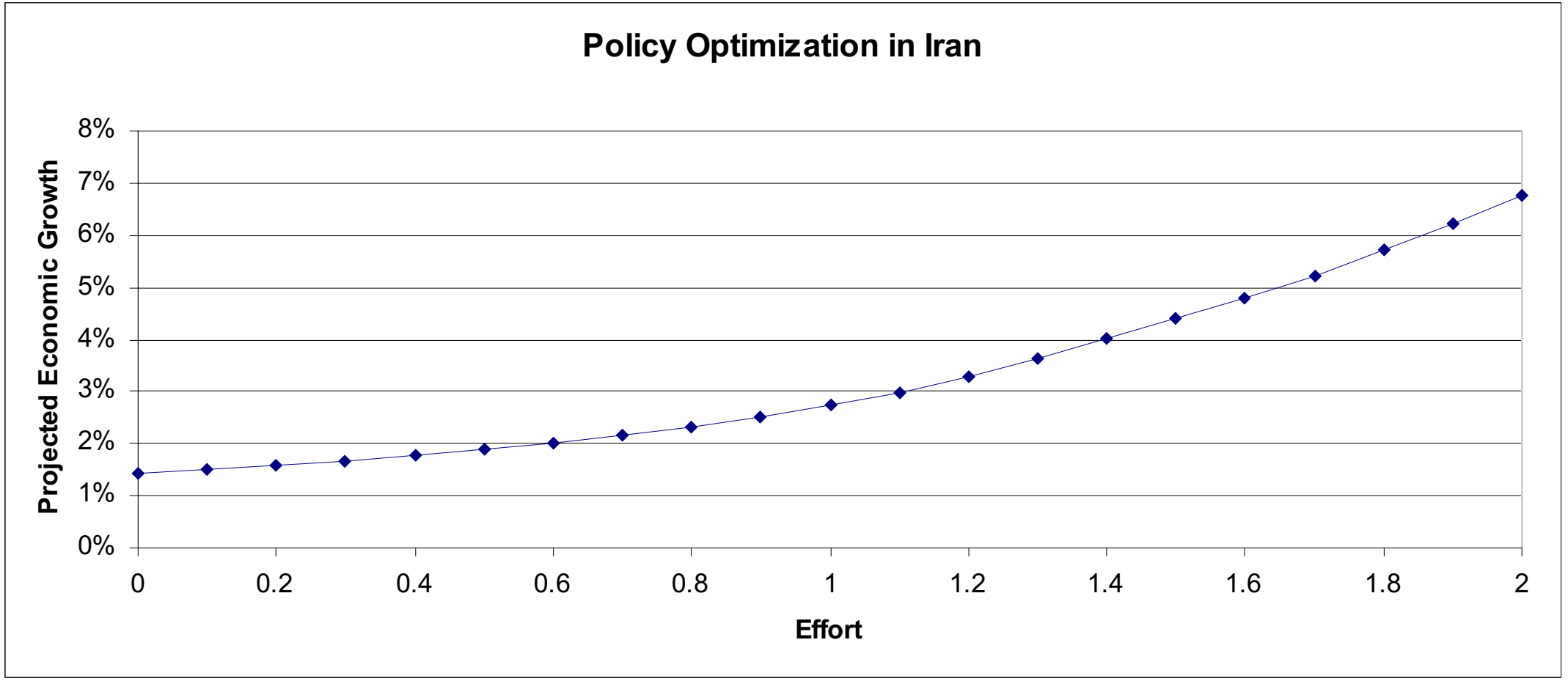
Policy Analysis

- Examine impact of applying effort to change progress targets after 2020
  - Scenarios
  - Optimization

Scenarios for Economic Growth Based on Changes in Policy Effort



Maximizing Economic Growth By Varying Policy Effort



Discussion

- It is necessary to test combinations of the policies to select best combination of policies that may help the economies to grow.
  - Scenario 1: Reduce income inequality
  - Scenario 2: Increase government revenue
  - Scenario 3: Reduce government expenditure
  - Scenario 4: Increase public investment
  - Scenario 5: Improve regulatory quality
  - Scenario 6: Improve institutional quality
  - Scenario 7: Composite policy
- Economic growth was trending downwards in all the country cases except Pakistan.
- Clearer and more stable picture of the growth dynamics

Conclusions

- System dynamics used to study economic growth.
- Used Vensim and Excel.
- System dynamics contributes to policy making, because of:
    i. a feedback approach;
    ii. aggregated and non-linear variables;
    iii. use of simulation.
- Can examine the potential trade-offs between alternative policies.

Comments and Questions?

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