Business Cycle Accounting
the U.S. recession in 2008-2009

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Model

- **Households**, \( N_t = (1 + g_n)^t \)

\[
\max \ E \sum_{t=0}^{\infty} \beta^t U(c_t, 1 - l_t) N_t, \quad U(c, l) = \frac{(c(1 - l)^\psi)^{1-\sigma}}{1 - \sigma}
\]

s.t. \( c_t + (1 + \tau_x t) x_t = r_t k_t + (1 - \tau_{ll} t) w_t l_t + T_t \)

\( N_{t+1} k_{t+1} = N_t [(1 - \delta) k_t + x_t], \quad c_t, x_t \geq 0 \)

- **Firm**, \( Z_t = z_t (1 + g_z)^t \)

\[
\max \ F(K_t, Z_t L_t) - r_t K_t - w_t L_t, \quad F(K, ZL) = K^\theta (ZL)^{1-\theta}
\]

- **Government**

\[
G_t + N_t T_t = N_t (\tau_{ll} w_t l_t + \tau_x t x_t)
\]

- **Markets clear**

\[
N_t(c_t + x_t) + G_t = F(K_t, Z_t L_t)
\]

\( N_t k_t = K_t \)

\( N_t l_t = L_t \)
Goal: Estimate 30 parameters of AR(1) process for wedges

\[ s_t = \{Z_t, \tau_{lt}, \tau_{xt}, g_t\} \]

\[ s_{t+1} = P_0 + Ps_t + \varepsilon_{t+1} \]

using MLE given the quarterly data on \(y_t, l_t, x_t, g_t\) from 1947:I to 2009:IV.
Data and Predictions of a Model with Efficiency, Labor, Investment or Government Wedge Wedge

Output

Labor

Investment

- **Data**
- **Efficiency wedge**
- **Labor wedge**
- **Investment wedge**
- **Government Wedge**
Data and Predictions of a Model with all but Investment, Efficiency, Labor or Government Wedge

- **Output**
- **Labor**
- **Investment**

Legend:
- Blue: Data
- Green: No efficiency wedge
- Red: No labor wedge
- Cyan: No investment wedge
- Purple: No Government Wedge