Macroeconomic Theory

Francesco Franco

T3 2026

Shocks in the Ramsey Model

Unexpected permanent shocks

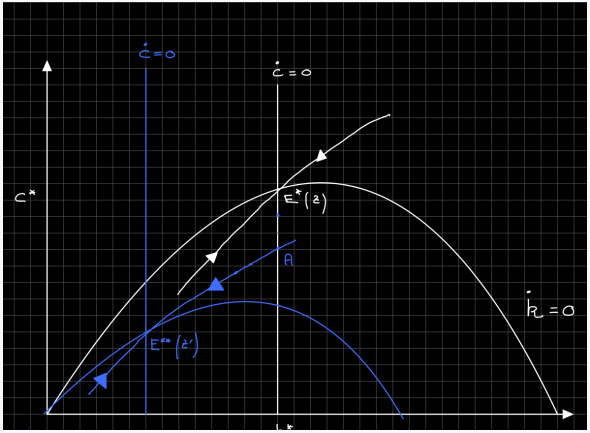
Consider a permanent shock to TFP so that z decreases to z' in period 0.

In this case the competitive equilibrium dynamics correspond to the dynamics of the economy with TFP z' from $[0, \infty)$.

The economy immediately transitions to the new steady state dynamics.

Unexpected Permanent Shocks

Phase diagram analysis



Unexpected Permanent Shocks

Solution path and dynamics

The solution path is:

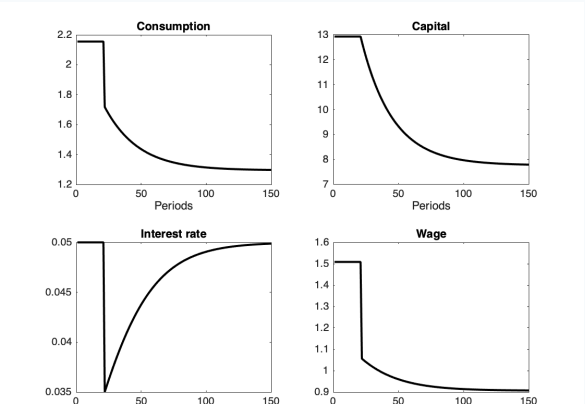
$$E^* \to A \to E^{**}$$

- Consumption jumps down to A at the shock
- Then consumption continues to decrease with capital along the saddle path for the blue dynamics
- Economy converges to new steady state E^{**}

Unexpected Permanent Shocks

Time series dynamics

The negative shock happens at $t = 0$ and is permanent.



Unexpected Temporary Shocks

Setup and timing

Consider a temporary shock to TFP so that z decreases to z' from period 0 to period T.

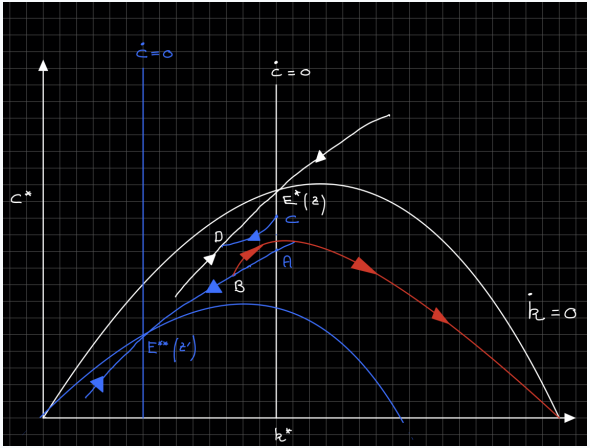
In this case the competitive equilibrium dynamics correspond to:

- Economy with TFP z' from $[0, T)$
- Economy with TFP z from $[T, \infty)$

The challenge: ensuring continuity at time T when shock ends.

Unexpected Temporary Shocks

Phase diagram analysis



Unexpected Temporary Shocks

Solution path and dynamics

The solution path is:

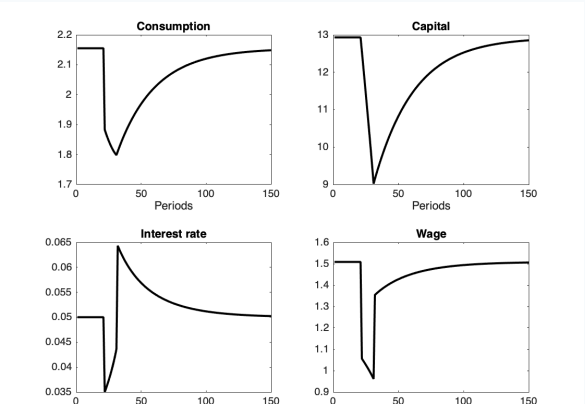
$$E^* \to C \to D \to E^*$$

- Consumption jumps down to C at the shock
- Economy follows explosive path $C \to D$ under blue dynamics
- Path $C \to D$ is the **only** explosive path that crosses point D at time T
- At time T, economy jumps to saddle path returning to E^*

Unexpected Temporary Shocks

Time series dynamics

The negative shock happens at $t = 10$ and lasts until $t = 20$.



Unexpected Temporary Shocks

Why not jump to point A?

Consider the alternative path where the initial jump would go to A:

- This would be the solution after a **permanent** shock
- Economy would be on the saddle path that goes to E^{**}
- However, at time T the economy would be at point B
- From there it would follow an **explosive path** under the original equilibrium

This solution violates transversality conditions — phase diagrams help visualize this constraint.

Permanent Expected Shocks

News shocks and anticipation

Consider a different shock where agents expect z to increase in T periods.

- Agents react immediately to the "news" shock
- The solution requires that they find themselves on the final saddle path at time T
- Forward-looking behavior creates immediate adjustments

Permanent Expected Shocks

Solution path — Case 1

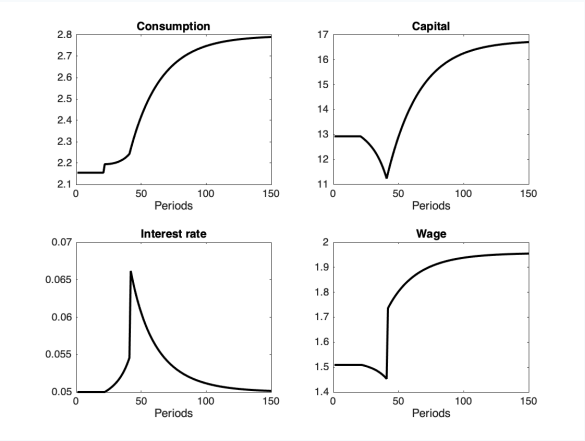
The solution path is:

$$E^* \to A \to B \to E^{**}$$

- Consumption jumps to A immediately upon news
- Follows the unique explosive path that crosses the green saddle path at time T (point B)
- After time T, follows saddle path to new steady state E^{**}

Permanent Expected Shocks

Time series — Case 1



Permanent Expected Shocks

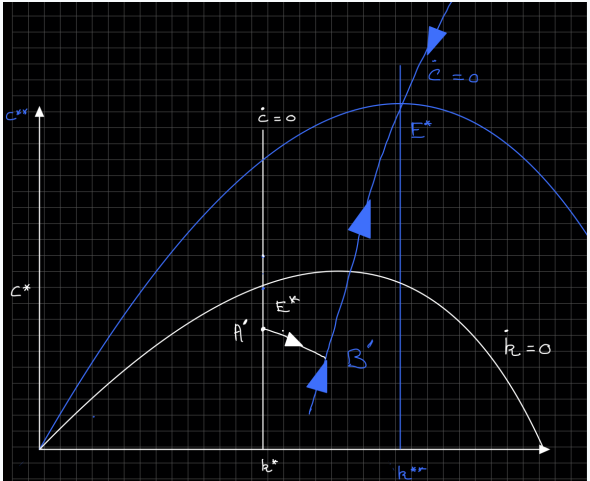
Alternative case with high substitution

Note that there could be another solution: with very high intertemporal substitution, the saddle path would be very steep.

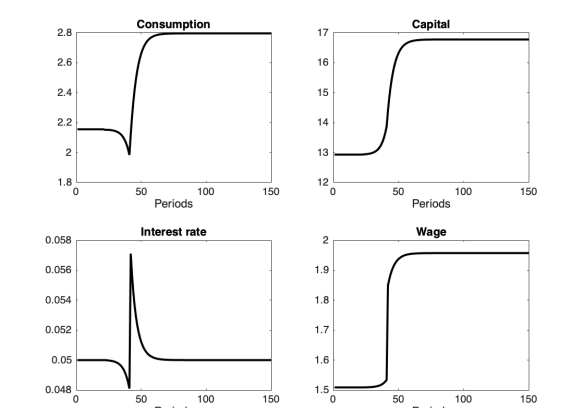
- Consumption would fall initially
- The adjustment would be much faster
- Different slope of saddle path leads to different dynamics

Permanent Expected Shocks

Phase diagram — Case 2



Permanent Expected Shocks

Time series — Case 2

In this second case the endogenous variables have the following dynamics: