



# Urban and real estate economics

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# Urban and real estate economics

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## Week 9

The macroeconomics of the real estate  
market II

A dynamic model

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# 1. Real estate market and macroeconomy

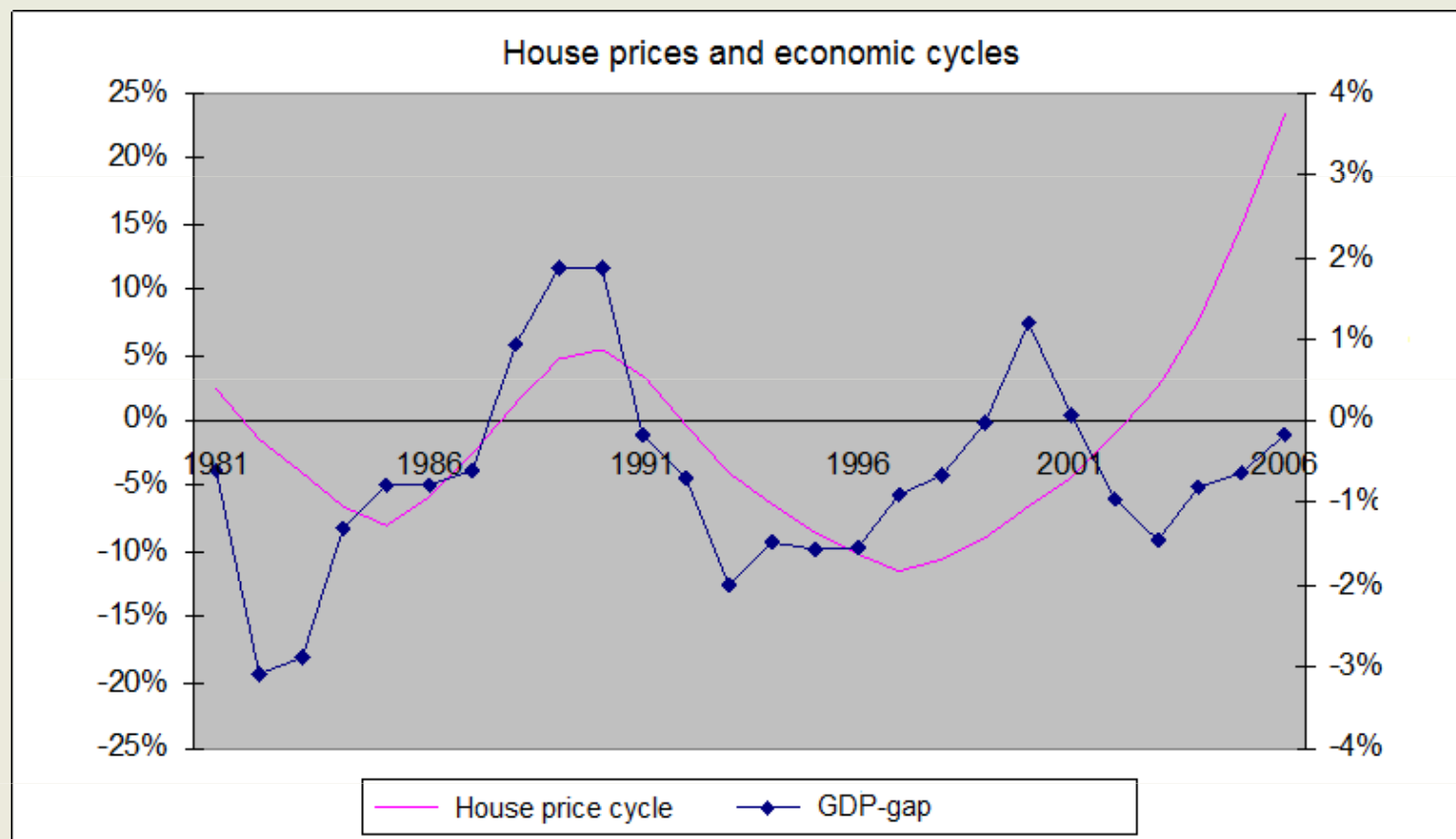
# Observations

- There is a link between the general (average) characteristics of the real estate market and macroeconomic variables.
- The real estate market should be modelled as an aggregate.
- Forecasts can be enhanced by the aggregate modelling of the real estate sector.

# Expectations play a major role

- Due to the investment (asset) nature of the real estate market the opinions about the future are a major factor.
- There are some events on the market that are hard to explain qualitatively.
- Using expectations may help to describe these outcomes.

# Link between house prices and business cycles (world-wide, weighted)





## 2. *A dynamic model*

# The market for housing

- The demand for housing depends on the number of people seeking housing and the rents.
- In equilibrium the quantity demanded will be equal to the housing stock.
- $S$ : housing stock,  $H$ : number of households,  $U$ : rent

$$S_t = H_t (\alpha_0 - \alpha_1 U_t)$$

# The market for real estate investments

- The cash flow (coming from the rents) discounted by the expected return of property development can be connected with the evolution of housing prices. If house prices are likely to go up, the investment is worth more.
- $M$ : the effective mortgage interest rate,  $P$ : house price,  $I$ : expected change in house price.

$$U_t = P_t(M_t - I_t)$$

# Connecting the previous two sets

- Price is a negative function of the a houses per capita.
- Price is a negative function of mortgage rates.
- The larger the expected price change, the higher the current price.

$$P_t = \frac{\alpha_0 - S_t / H_t}{\alpha_1 (M_t - I_t)}$$

# Construction market

- The more expensive a new house sells, the more houses will be built.
- With the expansion of the housing stock the costs of a new house will go up, thus construction will get gradually less profitable. Thus construction ( $C$ ) is a negative function of the current stock.
- It is not worth demolishing usable houses.

$$C_t = \tau(-\beta_0 + \beta_1 P_t - S_t)$$

$$C_t \geq 0$$

# The change of the housing stock

- In addition to new construction, amortization comes into the picture as well:

$$S_t - S_{t-1} = C_{t-1} - \delta S_{t-1}$$

# The model

- Four variables:
  1. rental prices
  2. house prices
  3. construction
  4. housing stock
- Four dynamic equations
- A system of difference equations

# The long-run equilibrium (steady state) of the model

- It can simply be rewritten into two equations:
- The market for housing and houses (demand)
- The expansion of the housing stock (supply):

$$P^* = \frac{\alpha_0 - S^* / H_T}{\alpha_1 (M_T - I_T)}$$

$$S^* = \frac{\tau(-\beta_0 + \beta_1 P^*)}{\delta + \tau}$$



# Some factors affecting the steady state

- Improving mortgage markets
- Baby-boom generation
- Introduction of restrictions on construction

# 3. The effects of shocks in the model

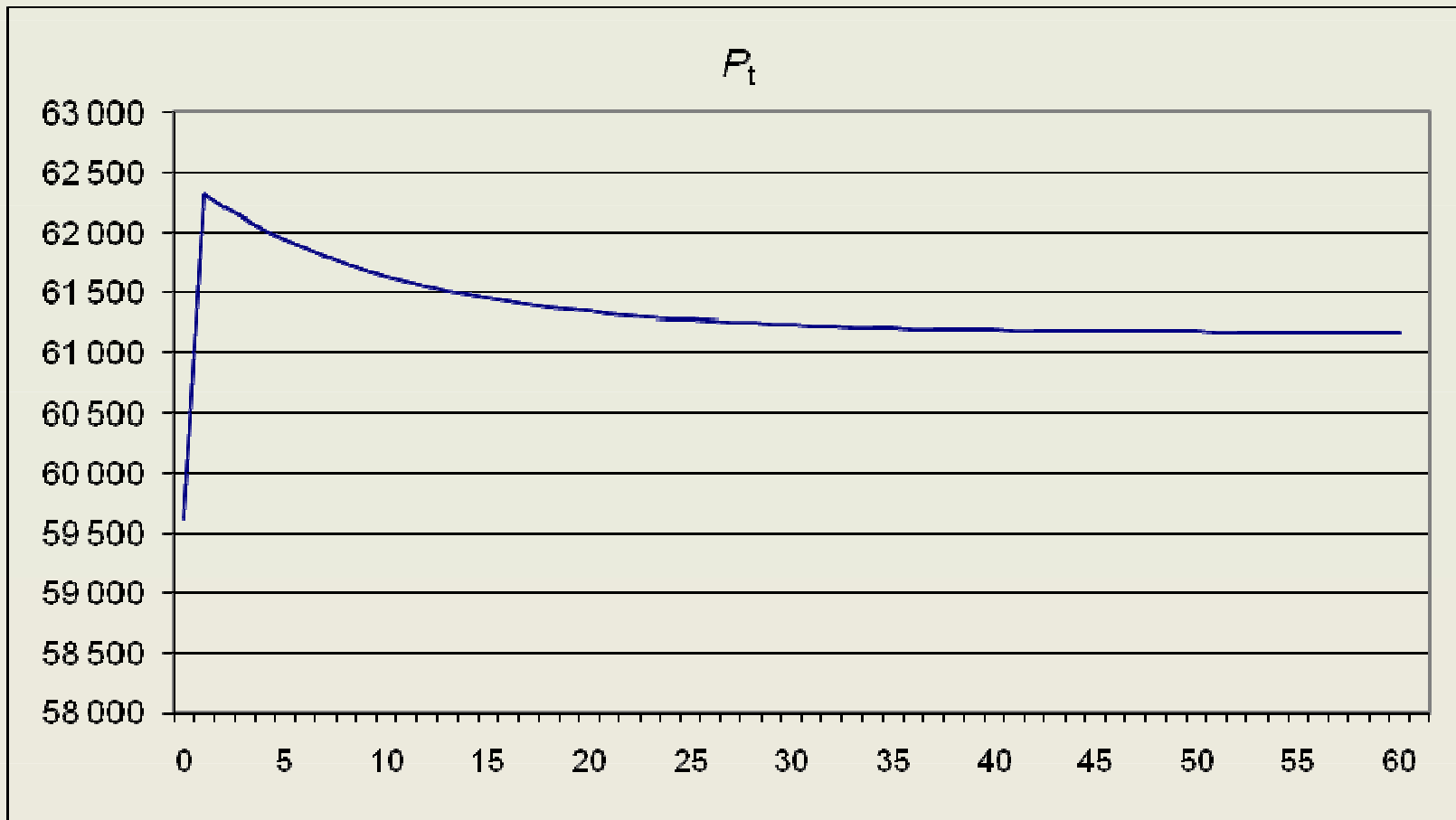
# Impulse response functions

A usual tool to understand dynamic systems:

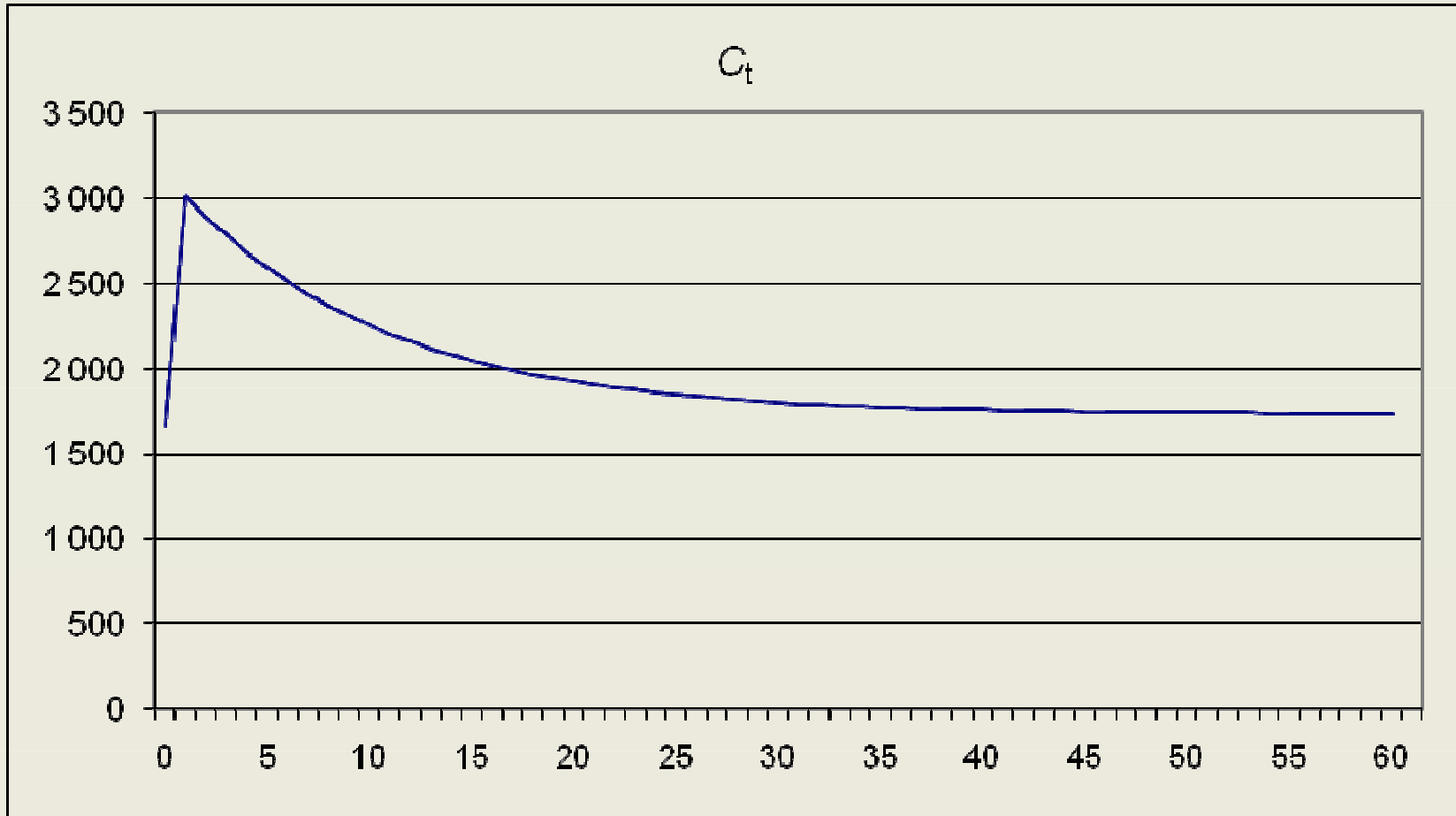
impulse response function (IRF)

It shows us what reactions are generated by a shock in the endogenous variables of the system.

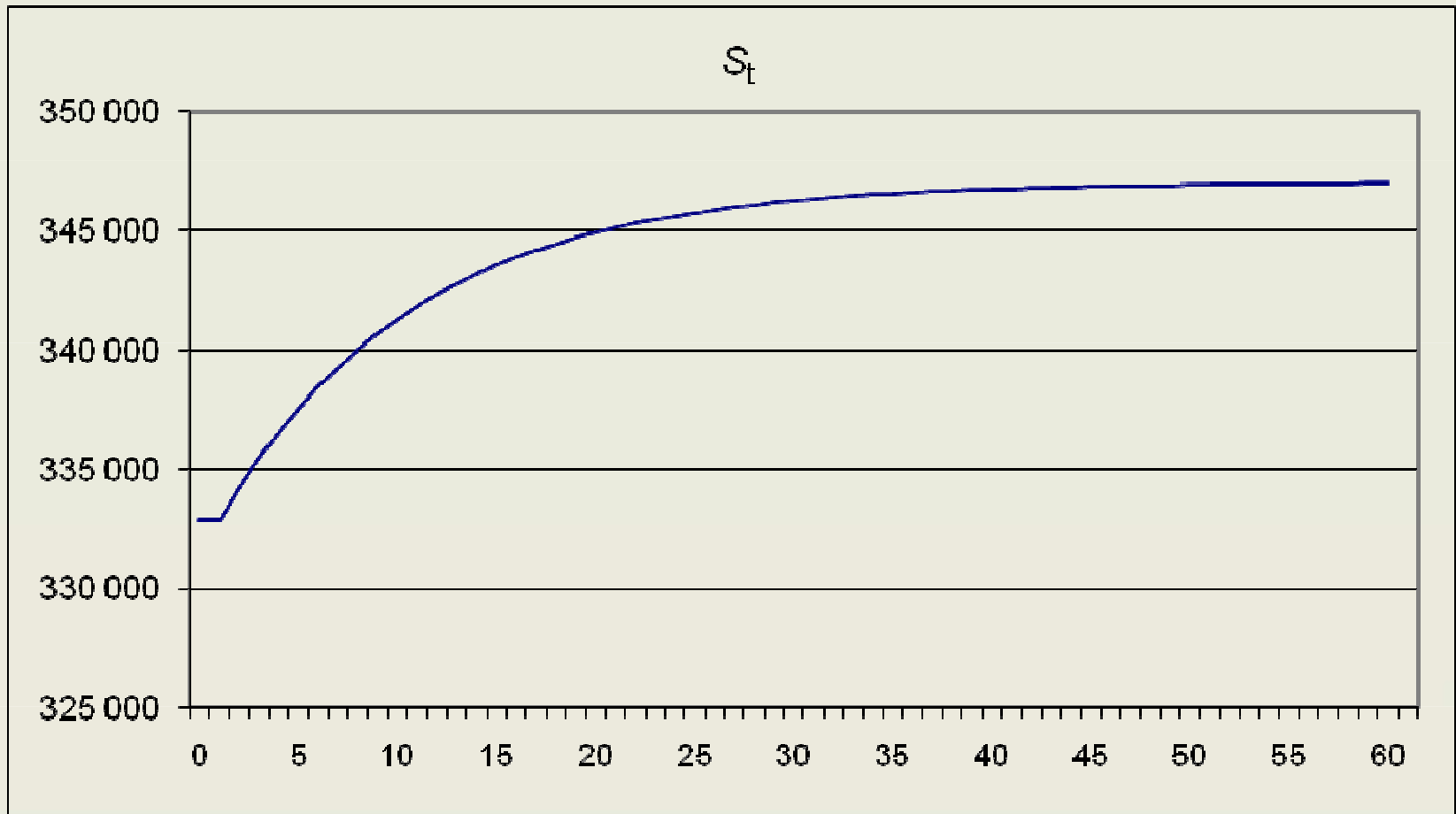
# The effect of a persistent demand shock on the prices



# The effect of a persistent demand shock on construction



# The effect of a persistent demand shock on the housing stock



# The effect of a persistent demand shock

- Due to the increased demand the prices will rise persistently.
- The housing stock will also increase in the long run.
- It takes time to finish those new buildings.
- Due to the steady increase in the supply prices will drop.
- Although in the beginning prices will explode.

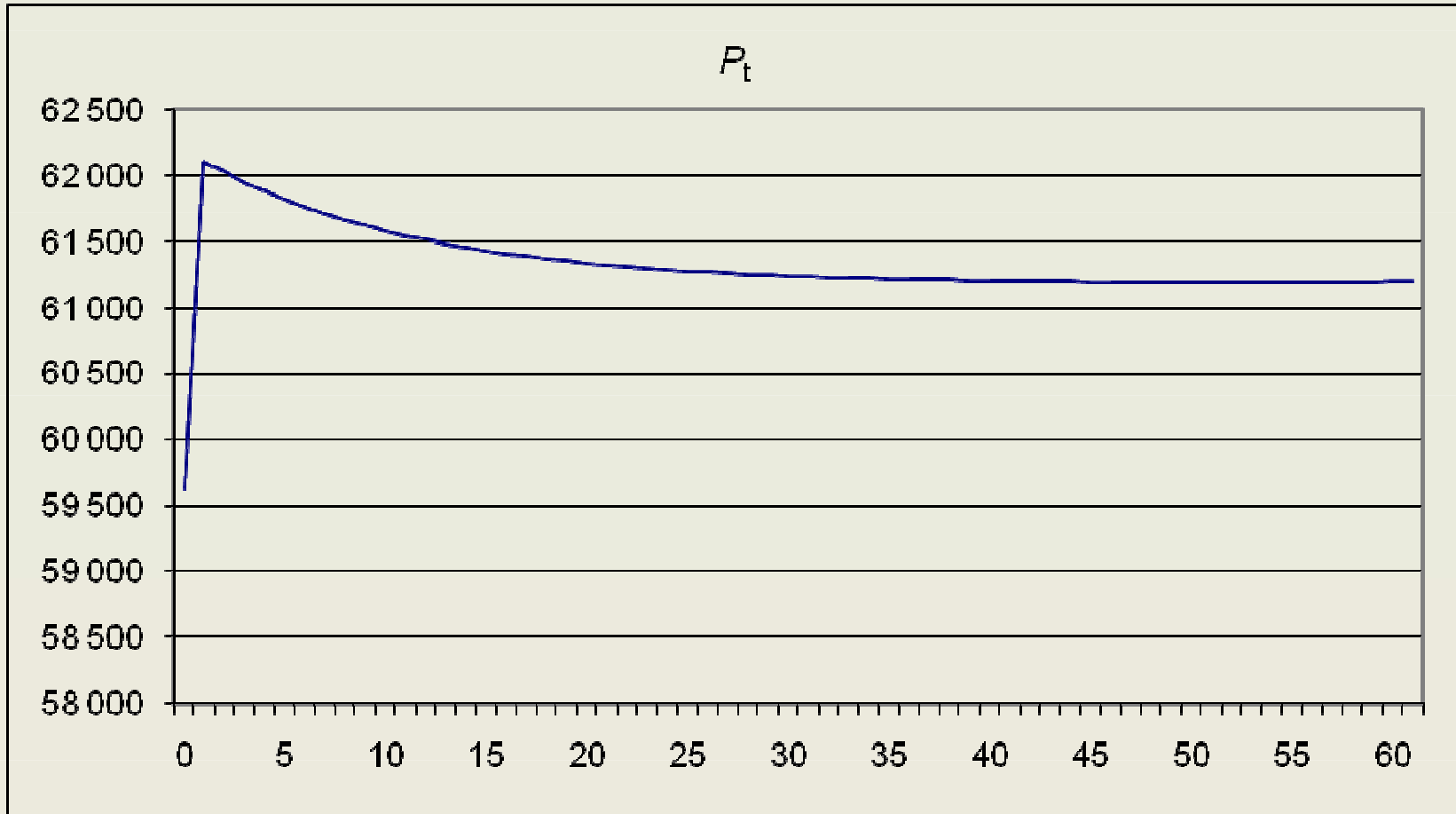
# 4. The role of the expectations in the model



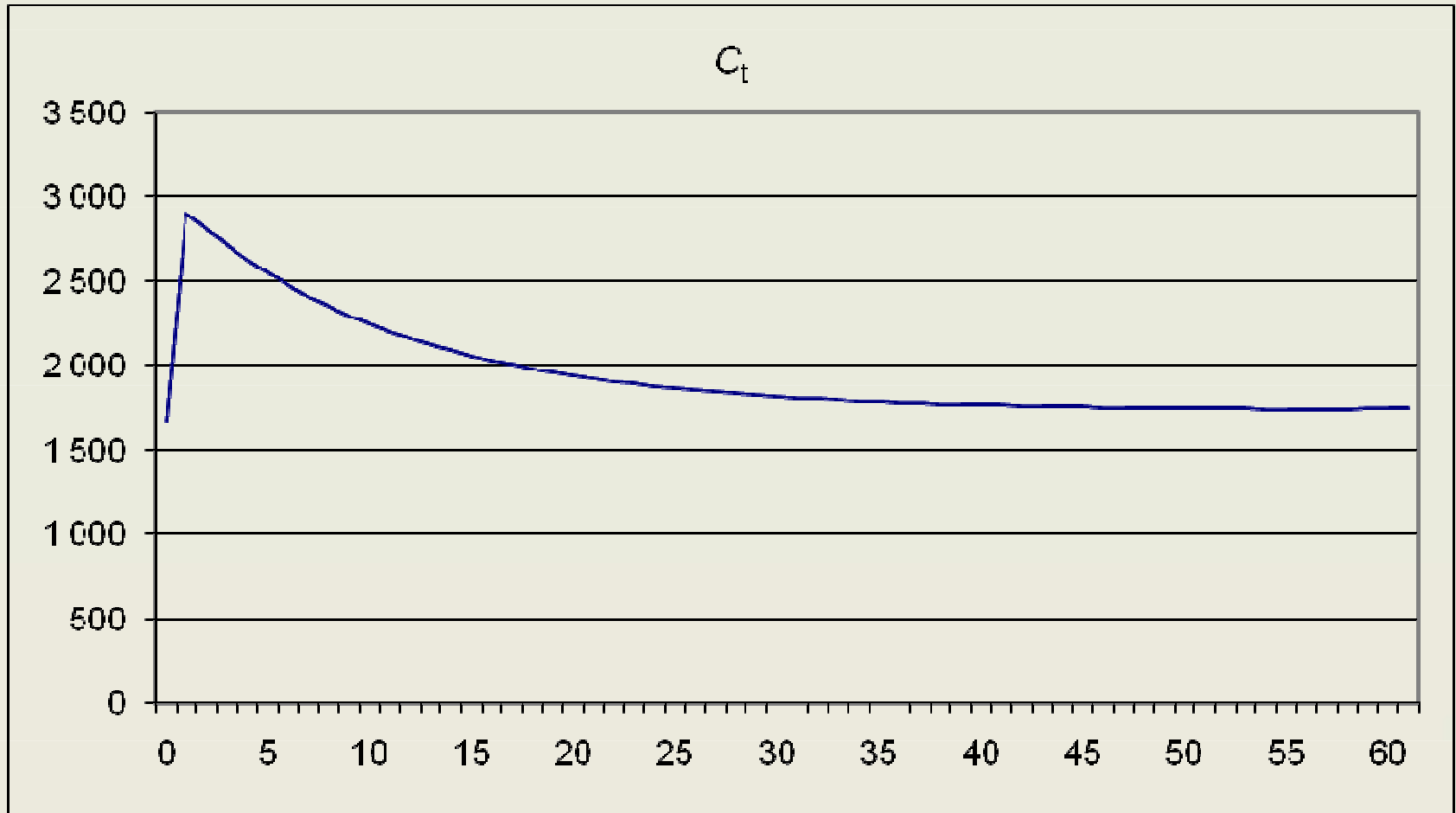
# The expected price change

- If the model is useful, it is likely that it has something to do with the way how the prices evolve in the model.
- The actors think the price change is persistent : adaptive expectations.
- Model-consistent expectations: if the model describes the reality well, there is no systematic bias in the judgement of the actors.

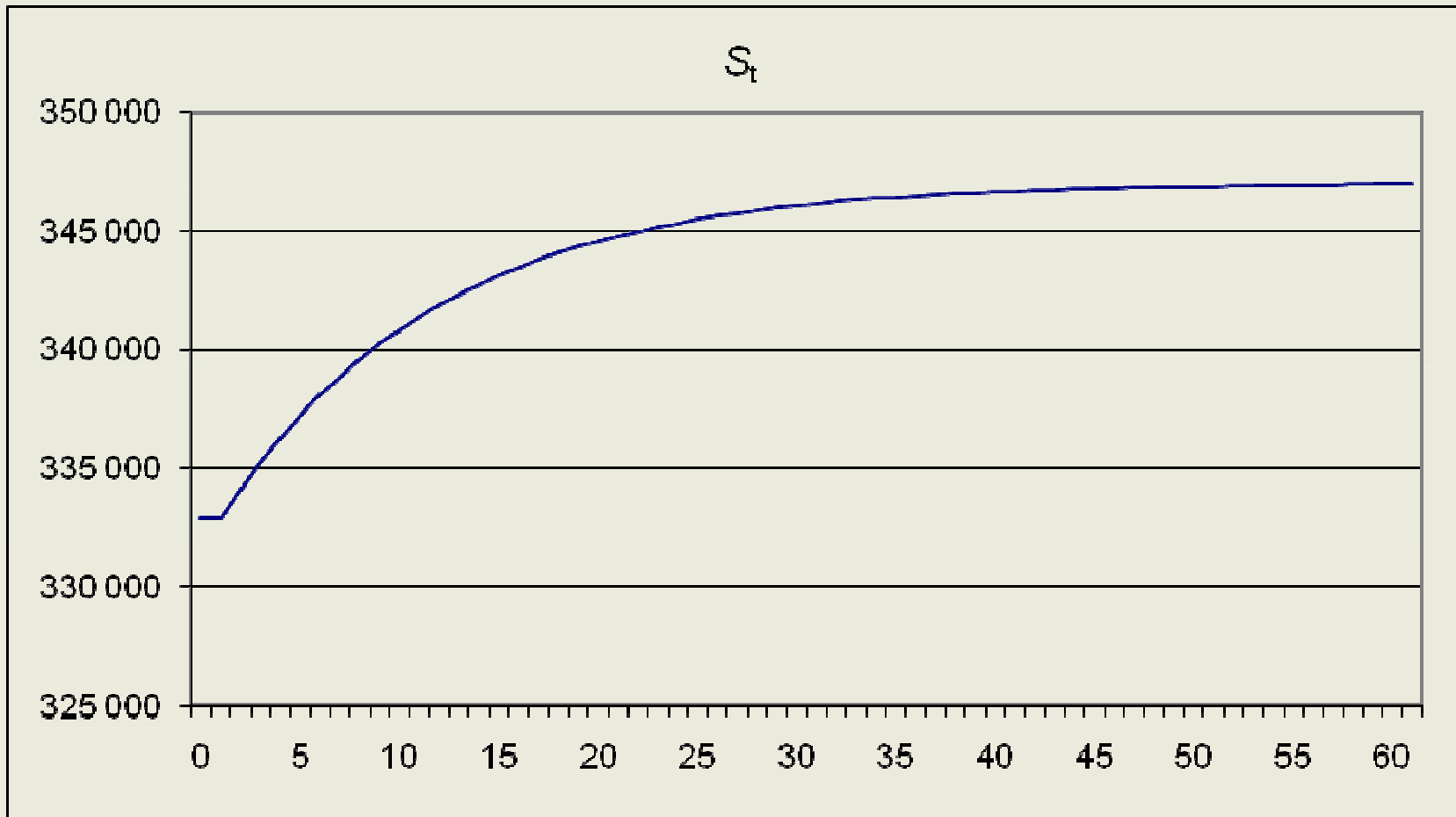
# Evolution of prices (rational expectations)



# Evolution of construction (rational expectations)



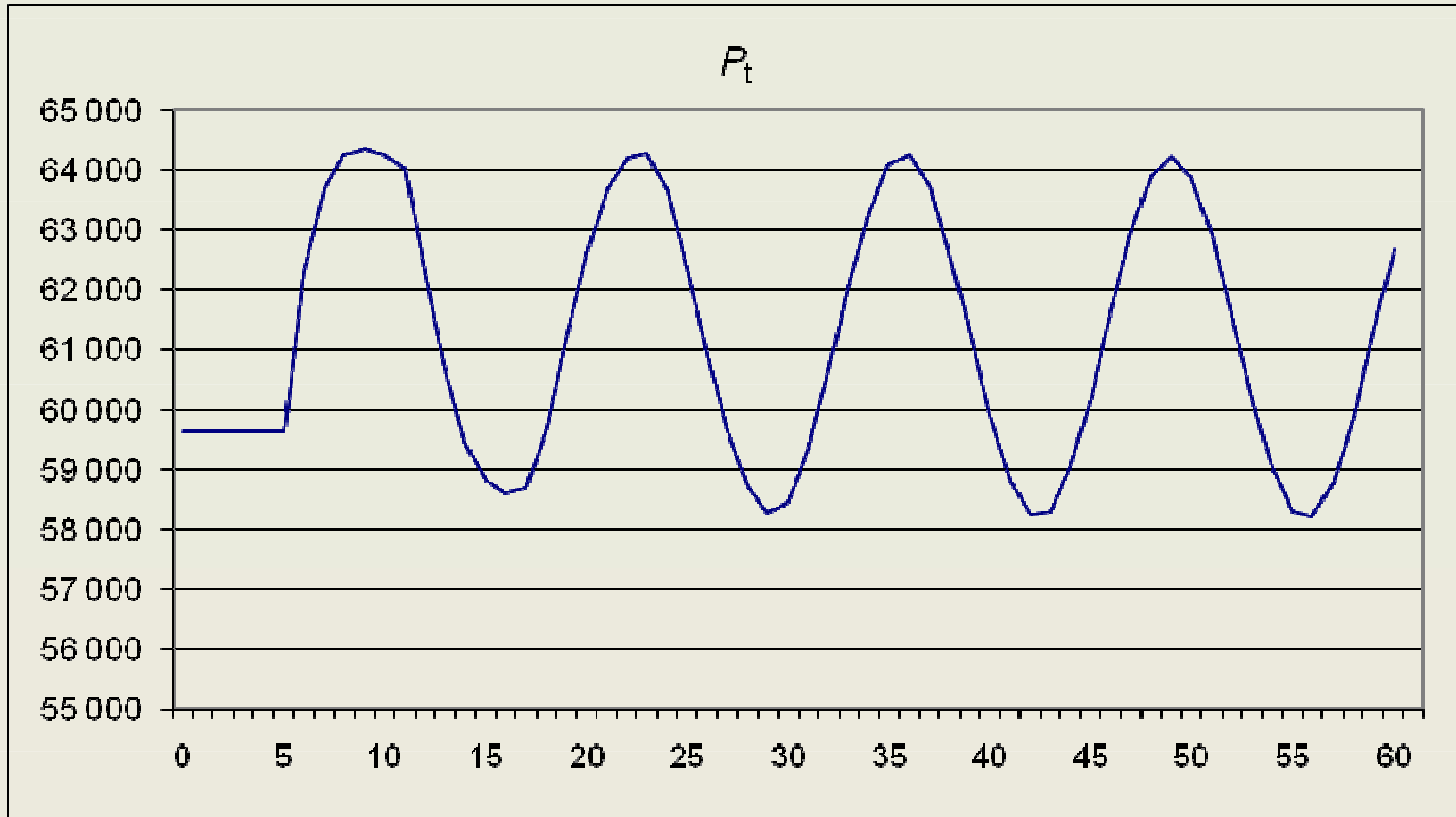
# Evolution of housing stock (rational expectations)



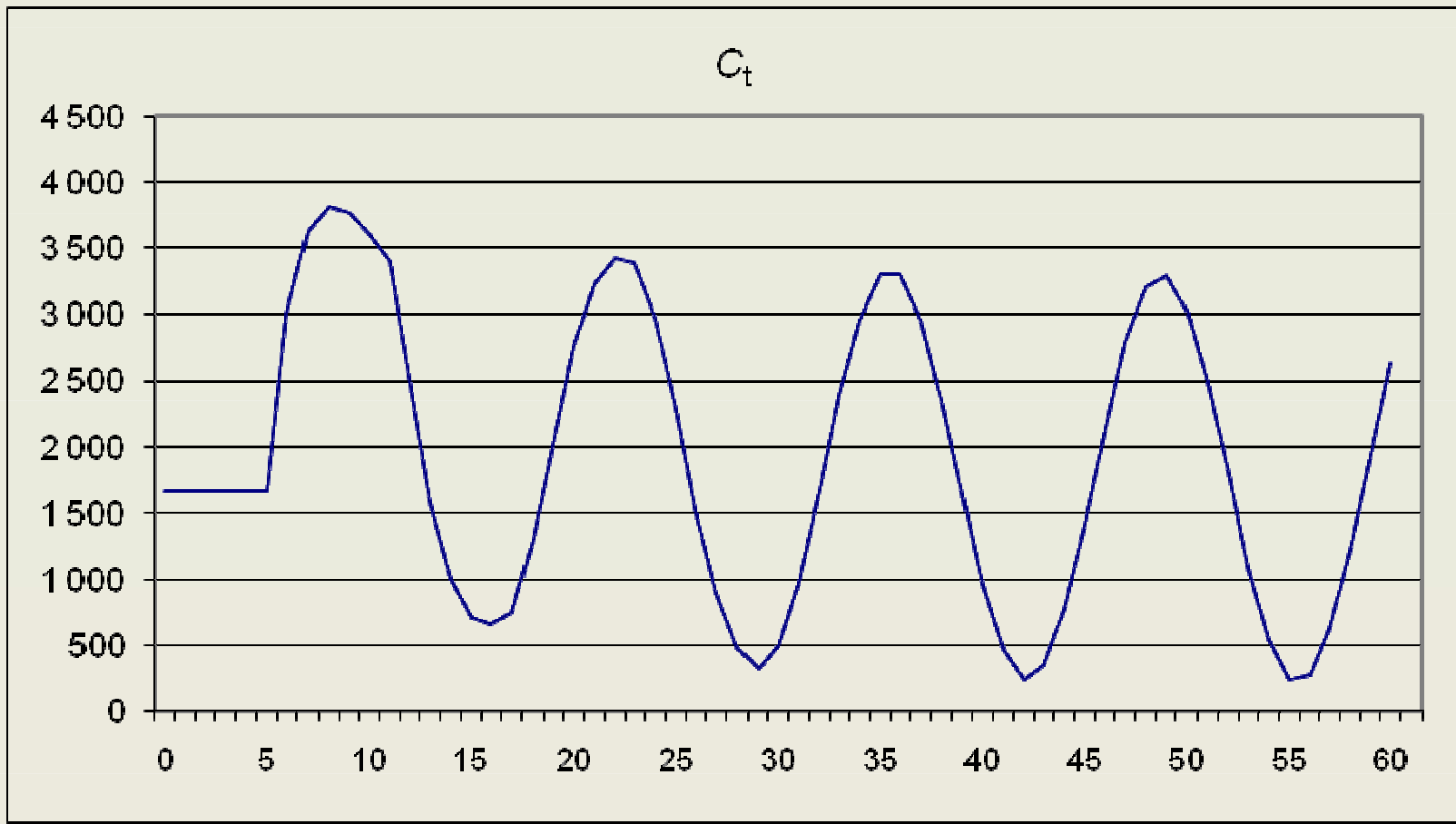
# If expectations are rational

- The actors will take into account the continuous adaptation of the market
- They will know that the rate of price increases will slow down.
- Thus the prices increase to a lesser degree even now.

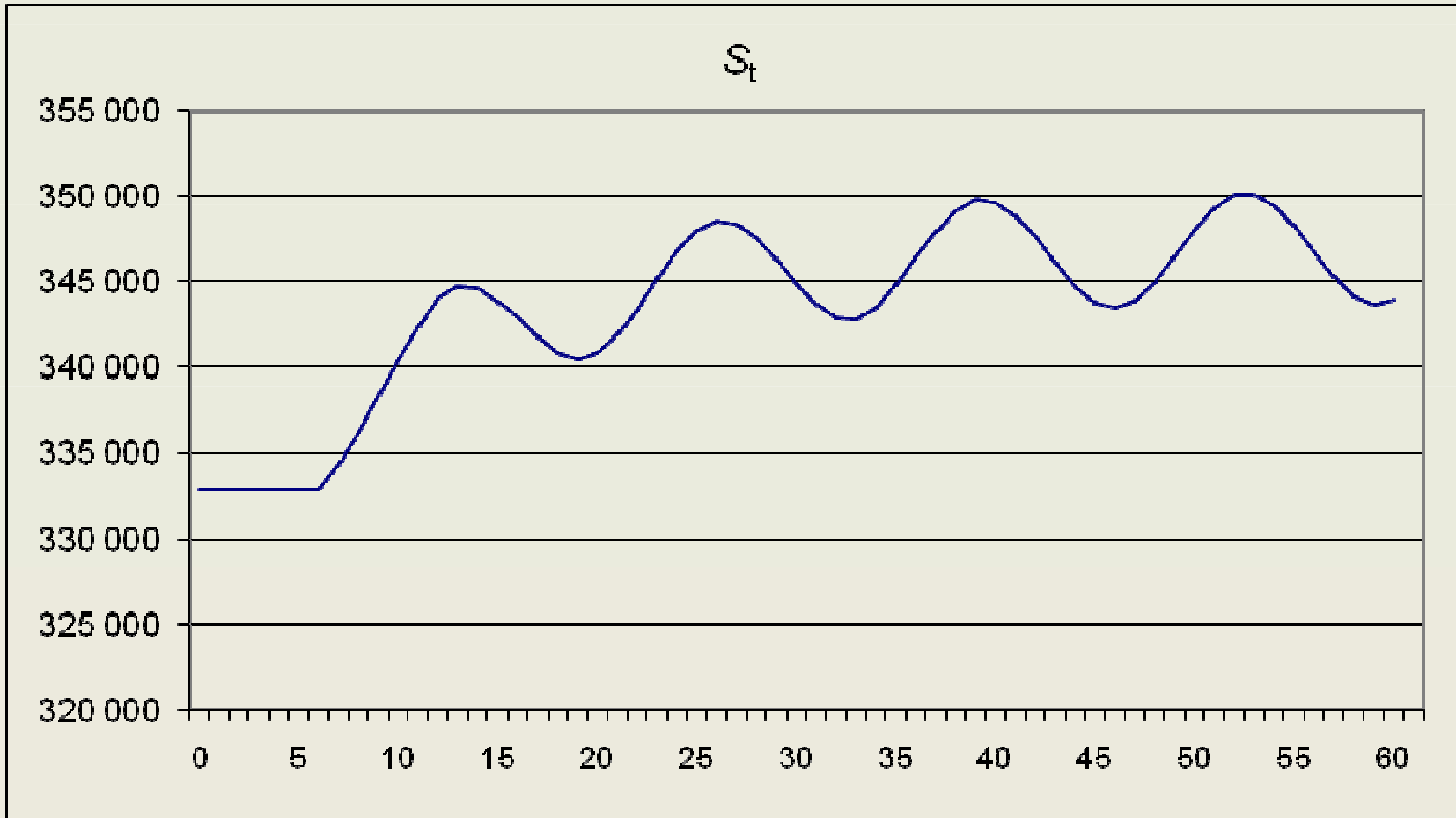
# Price response (adaptive expectations)



# Construction response (adaptive expectations)



# Housing stock response (adaptive expectations)





# What have we learnt by working with expectations?

- Cyclical movement is not an inherent characteristic of the real estate market.
- In case of exogenous expectations the model will overshoot before coming to an equilibrium.
- In case of rational (model-consistent) expectations the dynamic adaptations are faster and the overshoot is smaller. This class of models will describe the market well if the exogenous factors governing the market are cyclical as well.
- In case of adaptive expectations a real estate cycle can develop endogenously.

# What's a bubble?

- When the price of an asset becomes detached from the fundamentals.
- Price-to-rent ratio is often used to illustrate this.
- It could signify high valuation but opinions differed on whether it was a natural consequence of financial innovations.

# Curriculum

- Denise DiPasquale–William C. Wheaton [1996]: *Urban Economics and Real Estate Markets*. Chapter 10.