

Moreover, the source of the shock could have been different, we could have shocked investments by the same amount and the result would have been the same. It happens because these variables are both exogenous. Although shock can have different nature and influence, it is essential to understand the possible impact on the whole economy to moderate the potential outcome.

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## **SYSTEM DYNAMICS MODELING OF PRODUCTION TARGET FOR UKRAINE**

Desired production is a short-term decision that typically calls for temporary under- or over-utilization of production capacity (e.g., 'overtime'). This model jumpstarts the production process by targeting the fraction of productive capacity that will be utilized. Once 'desired production' is determined, decisions on utilization of labor and capital will follow.

The main target of the model is to develop the system dynamics model about Production Target for Ukraine. The driving force is aggregate demand: the sum of household consumption, government consumption, and net exports. The desired production depends on aggregate demand and desired inventories.

Goods producers, wholesalers, and retailers maintain an inventory level that is proportional their sales. This would be the normal inventory sales ratio or fraction.

Inventories depend on historical real private AD and constant normal inv: sales ratio equals 4/52. It means we have 4 weeks in the month and 52 weeks in years. In addition, the condition of inventories wherever they are above or below desired levels will influence the desired production.

Expected sales depend on information about aggregate demand, and the information is averaged over time. Expected sales is assumed to be a weighted-average of recent sales, with more weight on recent than distant-past sales and that contributes to the estimate of desired production. In the equation of expected sales we use SMTH function because we can't get the immediately full effect of real AD. And we assume that time to avg sales in Ukraine is 1/12 year.

Meanwhile, expected sales influence other factors such as the desired inventory. The desired inventory level is the quantity you want to be at once you replenish your stock. It leads to profit for the produces.

The inventory gap is the difference between the desired inventory and the actual inventory. The inventory adjustment ratio depends on how quickly manufacturers seek to close the gap between the desired and actual inventory levels. The inventory adjustment rate raises desired production if inventories are below desired levels, and conversely. In equilibrium, the inventory adj rate would be zero, and desired production would be expected sales.

The other component of the desired production is the rate at which inventories should be adjusted. In Ukraine, we assume, inventory adjustment time equals 1 year.

### **The model equation Production Target**

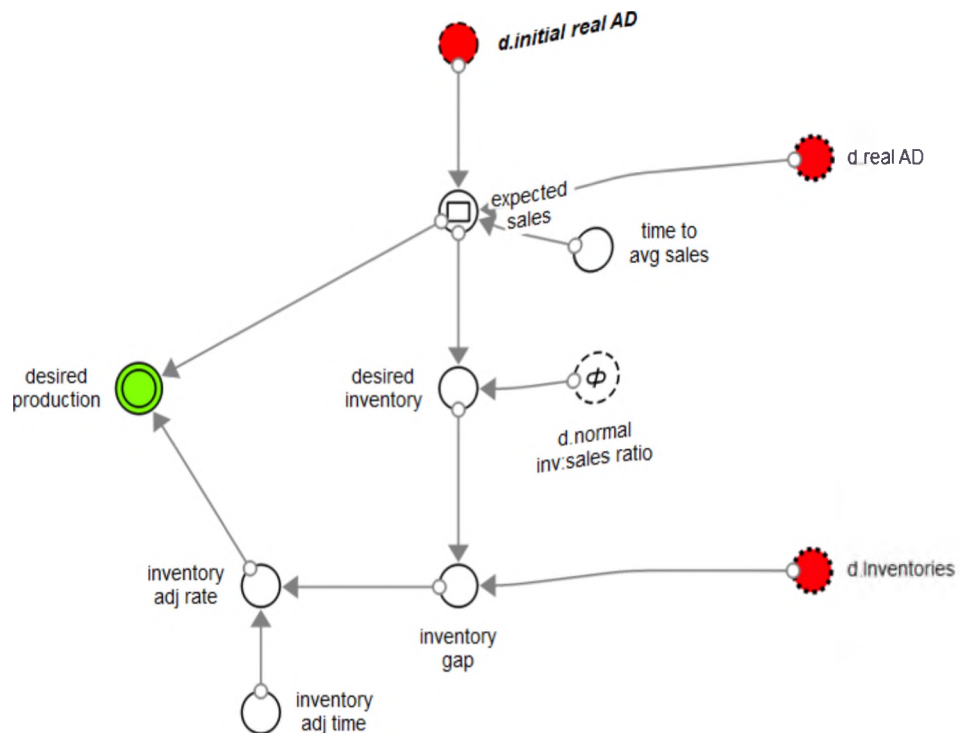
desired production = expected sales + inventory adj rate [UAH/Year]

Desired inventory = d.normal inv: sales ratio\*expected sales [UAH]

inventory\_gap = desired\_inventory-d.Inventories [UAH]

inventory adj rate = inventory gap/inventory adj time [UAH/Year]

Expected Sales = SMTH1(d.real AD; time to avg sales; d.initial real AD) [UAH/Year]



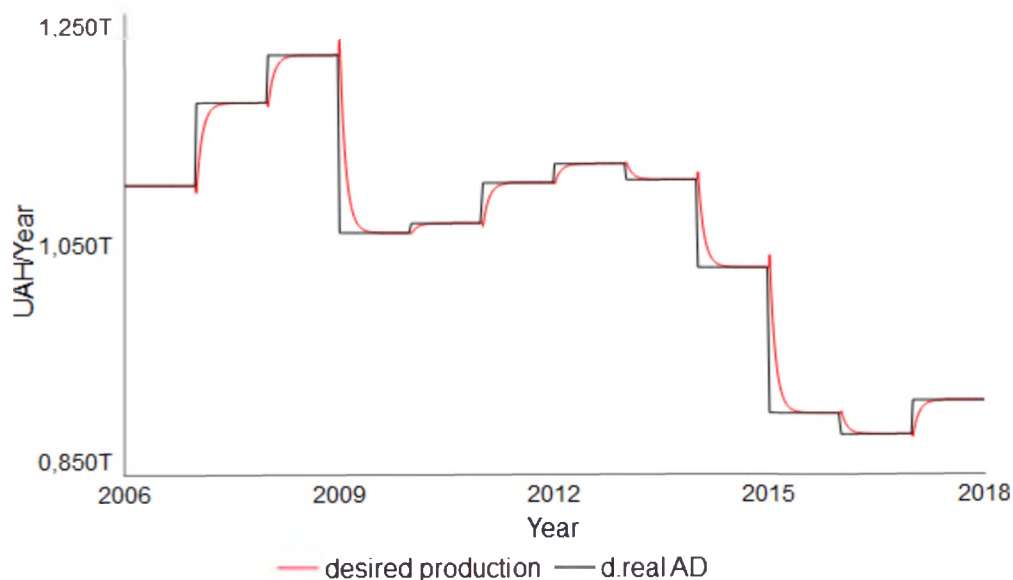
**Figure 1. System Dynamics Model of Production Target Behavior of Production Target model**

Variables in model:

- time to avg. sales = 0,08 year;
- inventory adj. time =1 year;
- normal inv: sales ratio = 0,08 year.

Based on our research, we have obtained this model of behavior:

The graph shows historical data and simulated data of desired production. The behavior is well replicated with the historical data. If we increase the value of time to avg. sales then the curves of desired production will have the same behavior. After 2013 desired production and real AD reduce. It shows on Figure 2.



**Figure 2. Result of System Dynamics Model for desired production**

Data for 2014 are given without taking into account the temporarily occupied territories of the Autonomous Republic of Crimea and the city of Sevastopol, since 2015 – also without part of the temporarily occupied territories in Donetsk and Luhansk regions.

Every parameter in model has a big influence on desired production.

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