

# Countercyclical policy

## TheoryGuru applications

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### Load Economicreasoning package only if it is not already loaded

```
If[Length@Names["PLTools`*"] < 10,  
  Get["http://economicreasoning.com"]]
```

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### Notes

Interpret *gdp* as a detrended indicator of economic activity absent policy intervention; *gdp*'s average is therefore the scalar denoted as *trendgdp*.

*policy* lists mean-zero additions and subtractions to *gdp*. GDP with policy is therefore *gdp + policy*

*gdp* and *policy* are (time series) vectors: one element for each point in time.

In the Wolfram Language, *x.y* refers to the tensor DOT PRODUCT, NOT scalar multiplication. For TheoryGuru purposes, tensor means vector, so that the result of *x.y* is a scalar.

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### Analysis

#### Setup

```
variance[x_] := (x - trendgdp).(x - trendgdp)  
countercyclicalpolicy = policy.(gdp - trendgdp) < 0 ;  
(* on average, policy adds to GDP when GDP  
  is low and subtracts from it when GDP is high *)  
(* i.e., countercyclical policy is in the right direction on average *)
```

## Result 1: Countercyclical policy could exacerbate the business cycle

```
TheoryGuru[
  {countercyclicalpolicy, trendgdp2 ≥ 0 (* clarify that trendgdp is a scalar *)},
  variance[gdp + policy] ≥ variance[gdp]
  (* policy exacerbates the business cycle *)]
True for some, False for others
```

### Text interpretations of key inequalities

```
rtext = {First@MostRecentAssumption → "Countercyclical policy",
  Not@First@MostRecentHypothesis → "policy to soften the business cycle."};
```

## Result 2: Countercyclical policy is necessary but not sufficient for policy to soften the business cycle

### with formulas

```
TheoryOverlap[trendgdp2 ≥ 0,
  countercyclicalpolicy,
  variance[gdp + policy] < variance[gdp]]
  gdp.policy < 1.policy trendgdp is necessary but not sufficient for 2 gdp.policy + policy.policy < 2 × 1.policy trendgdp
```

### formulas replaced with text interpretations

```
TheoryOverlap[trendgdp2 ≥ 0,
  countercyclicalpolicy,
  variance[gdp + policy] < variance[gdp]] /. rtext
  Countercyclical policy is necessary but not sufficient for policy to soften the business cycle.
```

## Variable interpretations