A NEW KEYNESIAN MODEL

WITH WEALTH IN THE UTILITY FUNCTION

Pascal Michaillat (Brown)

Emmanuel Saez (Berkeley)

REMEDY TO ZLB PATHOLOGIES: DETERMINATE ZLB STEADY STATE

1. modification of IS & Phillips curves
   - Eggertsson, Mehrotra [2014]: OLG + wage rigidity
   - Gabaix [2016]: bounded rationality
2. addition of one state variable & one equation
   - Diba, Loisel [2017]: stock of bank reserves
   - Cochrane [2018]: fiscal theory of price level
3. this paper: modification of IS curve, no extra equation

WHY WOULD PEOPLE VALUE WEALTH IN ITSELF?

Irving Fisher anwers in “The Theory of Interest”:

> *A man may include in the benefits of his wealth…the social standing he thinks it gives him, or political power and influence, or the mere miserly sense of possession, or the satisfaction in the mere process of further accumulation.*

NK MODEL WITH WEALTH IN THE UTILITY

- production function: $y_j(t) = ah_j(t)$
- consumption index: $c_j(t) = \left[\int_0^1 c_{jk}(t)^{(\epsilon-1)/\epsilon} dk\right]^{\epsilon/(\epsilon-1)}$
- household j maximizes utility

$$\int_0^\infty e^{-\delta t}\left[\ln(c_j(t)) + u\left(\frac{b_j(t)}{p(t)}\right) - h_j(t) - \frac{\gamma}{2}\pi_j(t)^2\right] dt$$

- subject to the law of motion of bond holdings:

$$\dot{b}_j(t) = i(t)b_j(t) + p_j(t)y_j(t) - \int_0^1 p_k(t)c_{jk}(t)dk$$

- to the law of motion of price i: $\dot{p}_j(t)/p_j(t) = \pi_j(t)$
- and to the demand for good i: $y_j(t) = c(t)\left[p_j(t)/p(t)\right]^{-\epsilon}$

DYNAMICAL SYSTEM REPRESENTING GE

- Phillips curve describes optimal pricing:

$$\dot{\pi} = \delta\pi - \frac{\epsilon}{\gamma a}(y - y^n) \quad \text{with} \quad y^n = \frac{\epsilon - 1}{\epsilon} a$$

- Euler equation described optimal consumption/saving:

$$\frac{\dot{y}}{y} = \underbrace{i - \pi}_{\text{real rate}} + \underbrace{u'(0)y}_{MRS_{\text{wealth},c}} - \delta$$

  - bonds are in zero net supply: $b = 0$
  - monetary policy follows $i = \max\{0, i^* + \phi\pi\}$

TWO MODELS: NK & WUNK

- New Keynesian (NK) model:

$$u'(0) = 0$$

- wealth-in-the-utility New Keynesian (WUNK) model:

$$u'(0) > \frac{\epsilon}{\delta \gamma a}$$

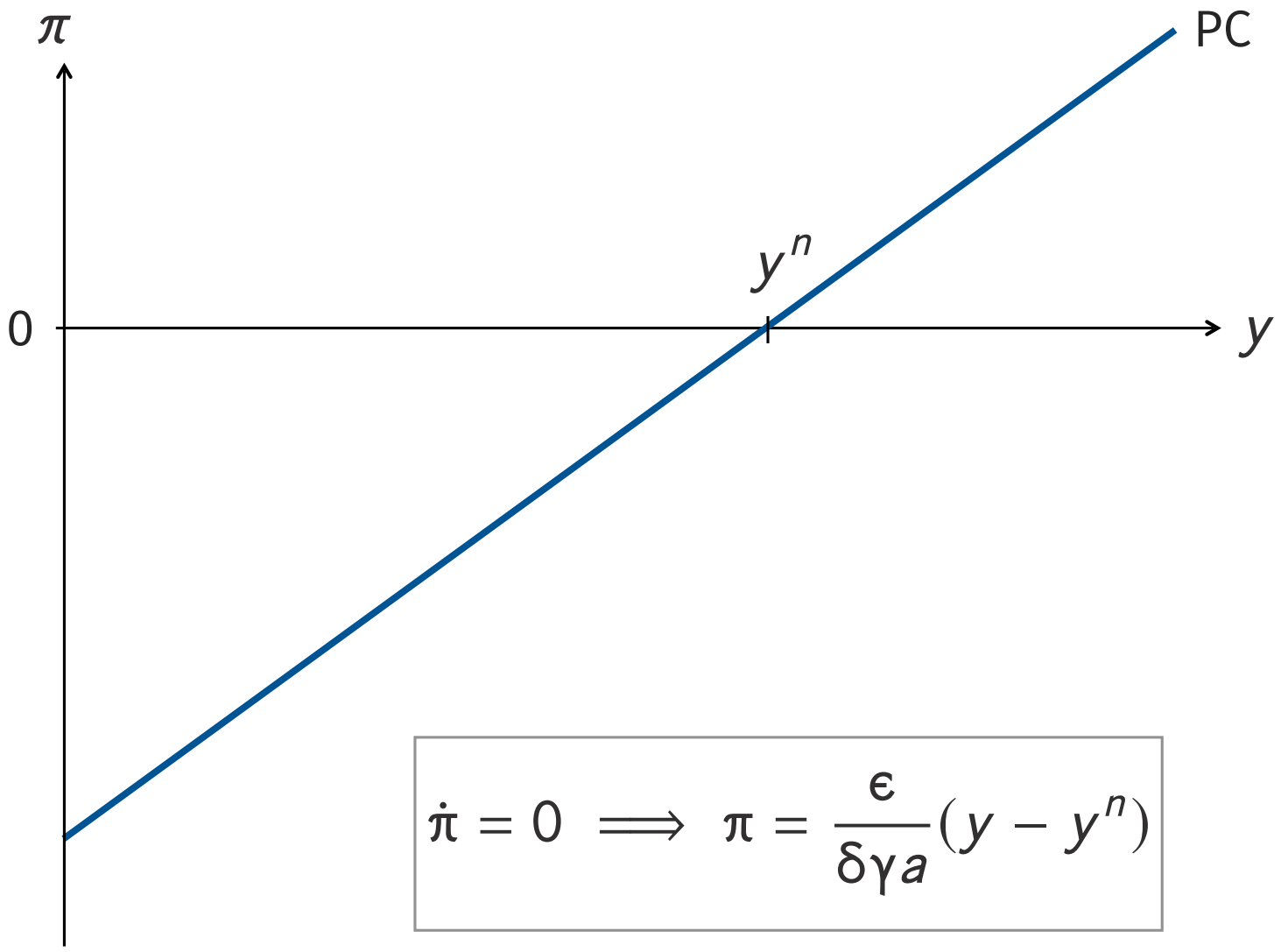
INFLATION & OUTPUT AT ZLB

NK | ZLB SCENARIO

at intended steady state	ZLB	back to intended steady state
$\delta > 0$	$\delta < 0$	$\delta > 0$
$i^* = \delta$	$i = 0$	$i^* = \delta$
$\phi > 1$		$\phi > 1$

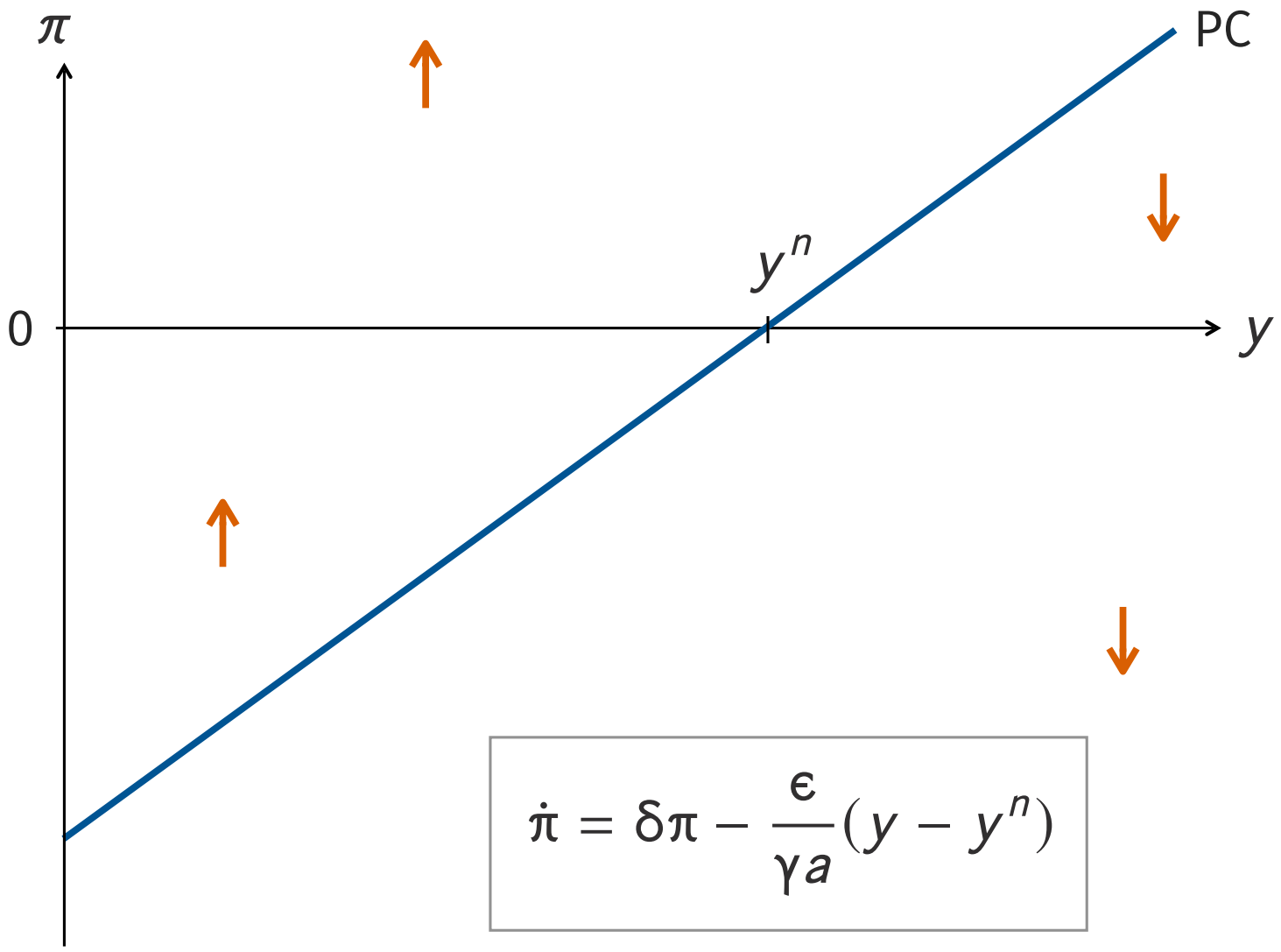
$t = 0$ $t = T$

NK | BACK TO INTENDED STEADY STATE



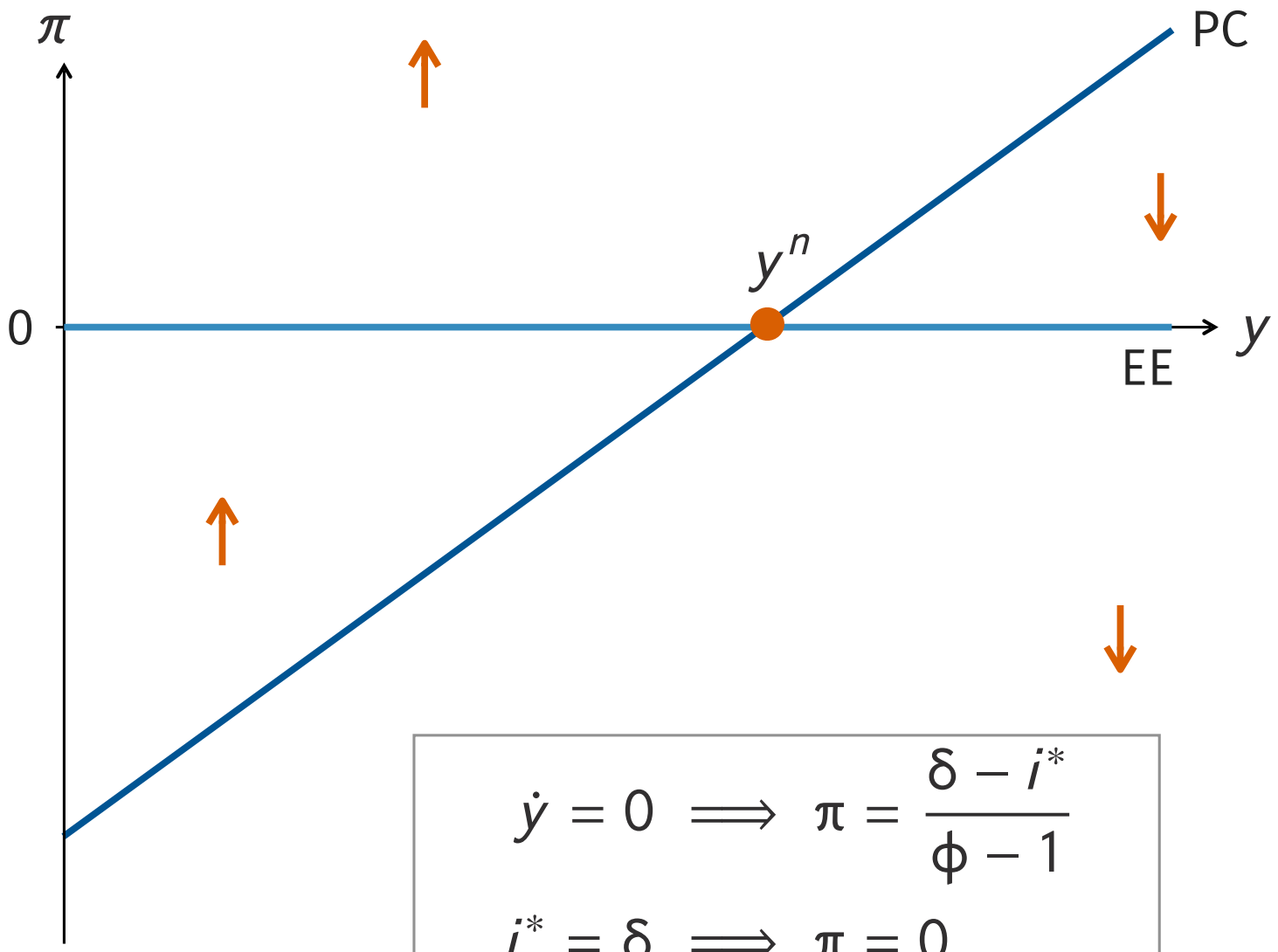
$$\dot{\pi} = 0 \implies \pi = \frac{\epsilon}{\delta\gamma a}(y - y^n)$$

NK | BACK TO INTENDED STEADY STATE



$$\dot{\pi} = \delta\pi - \frac{\epsilon}{\gamma a}(y - y^n)$$

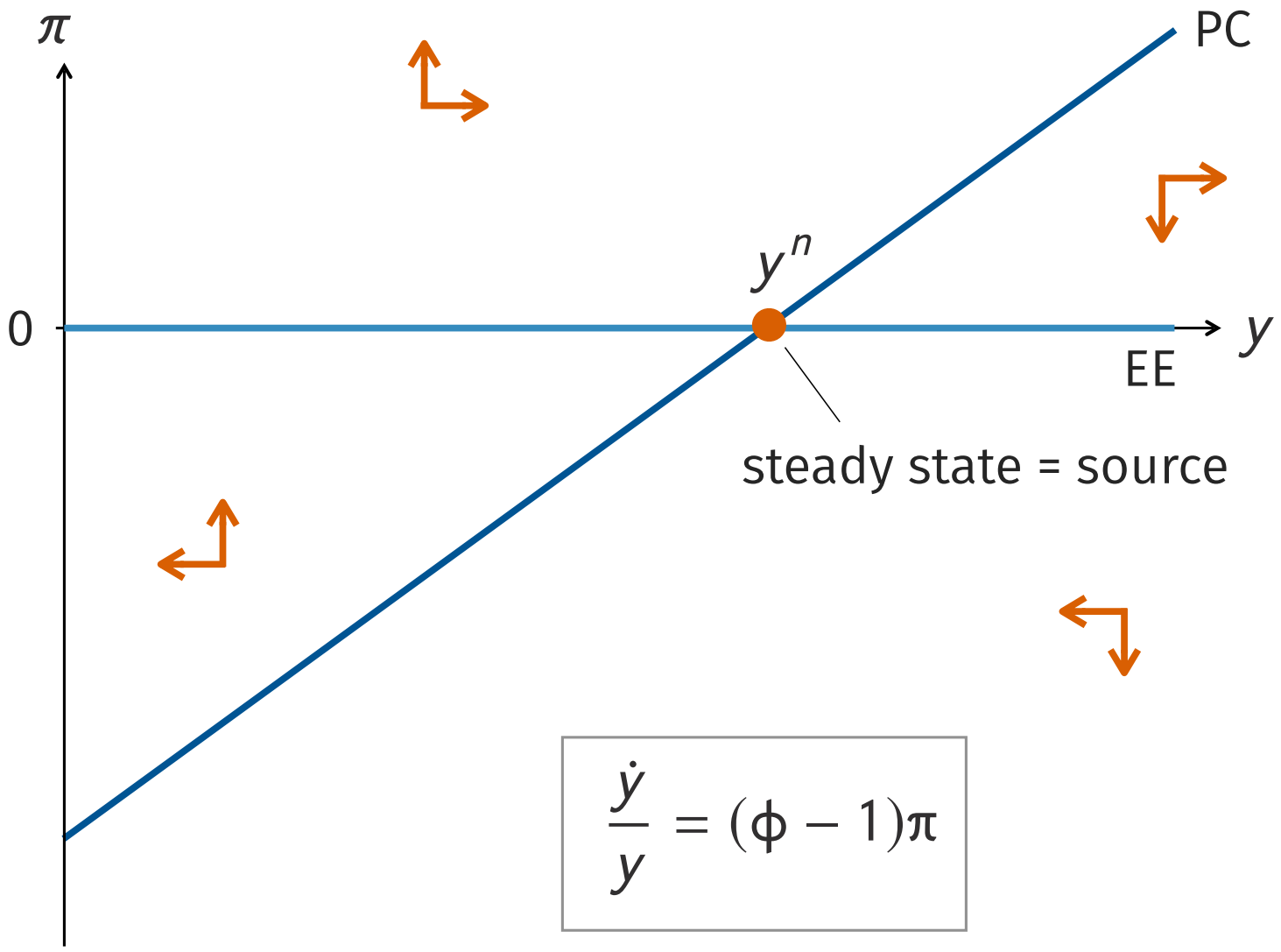
NK | BACK TO INTENDED STEADY STATE



$$\dot{y} = 0 \implies \pi = \frac{\delta - i^*}{\phi - 1}$$

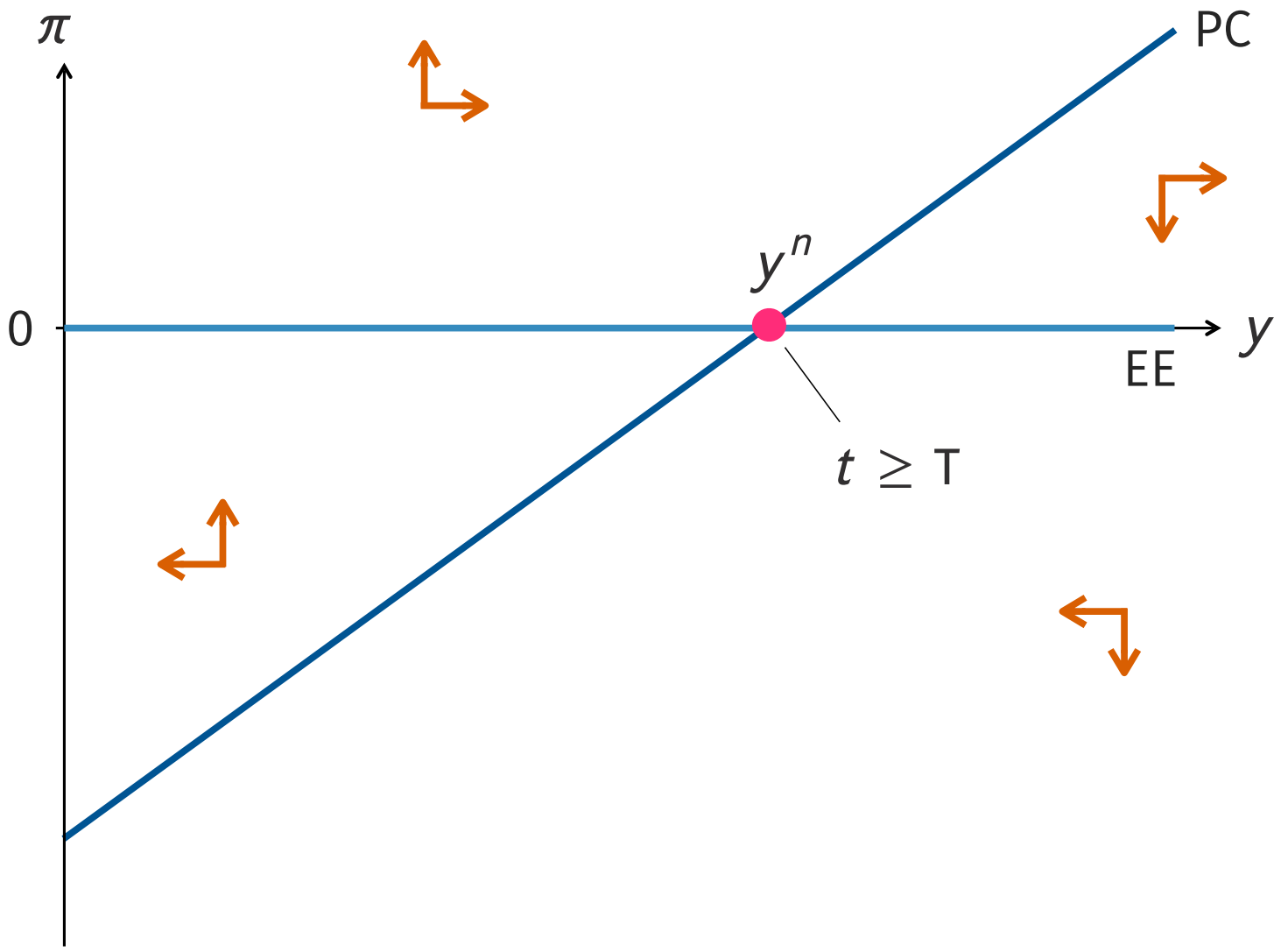
$$i^* = \delta \implies \pi = 0$$

NK | BACK TO INTENDED STEADY STATE

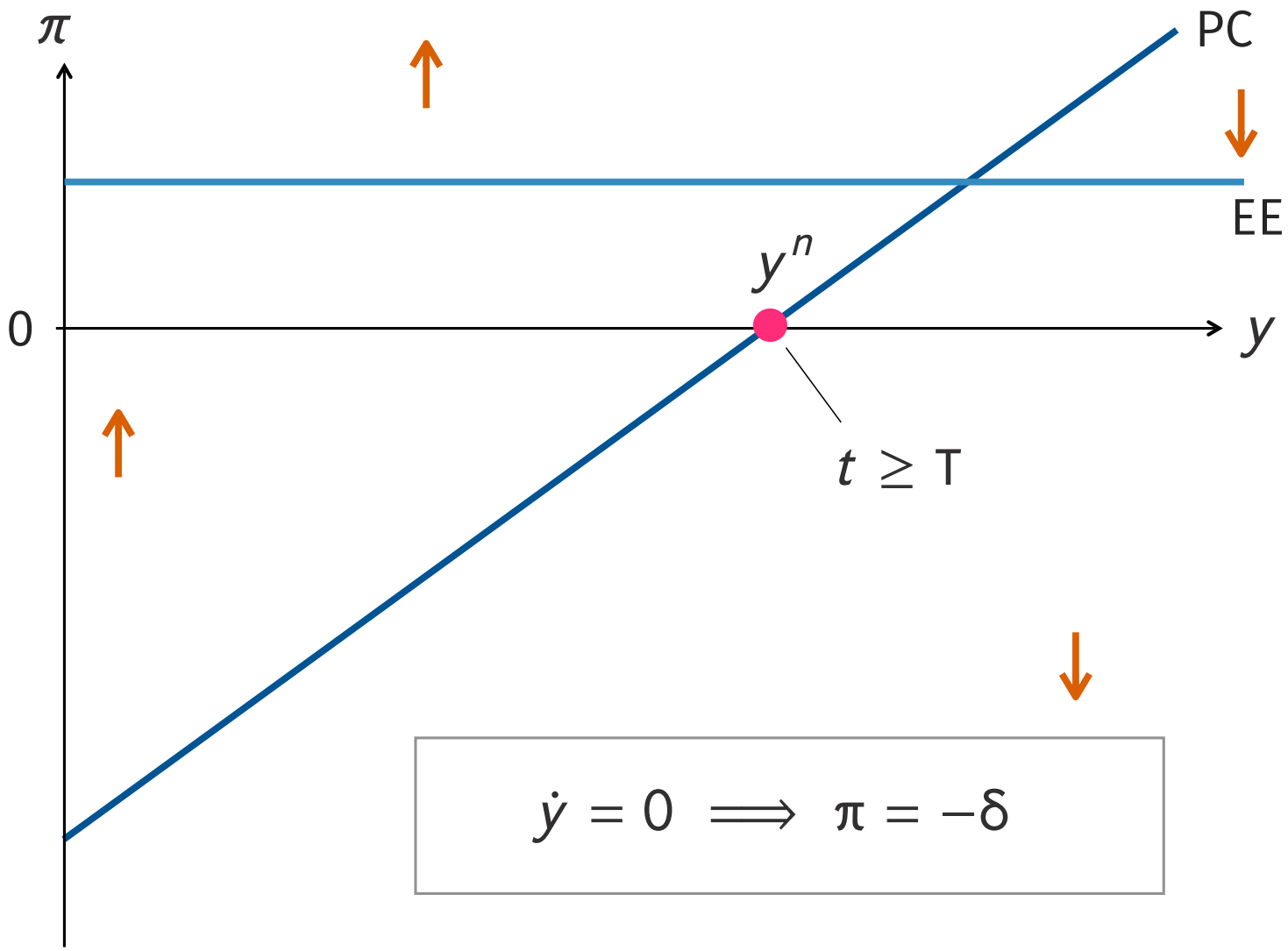


$$\frac{\dot{y}}{y} = (\phi - 1)\pi$$

NK | BACK TO INTENDED STEADY STATE

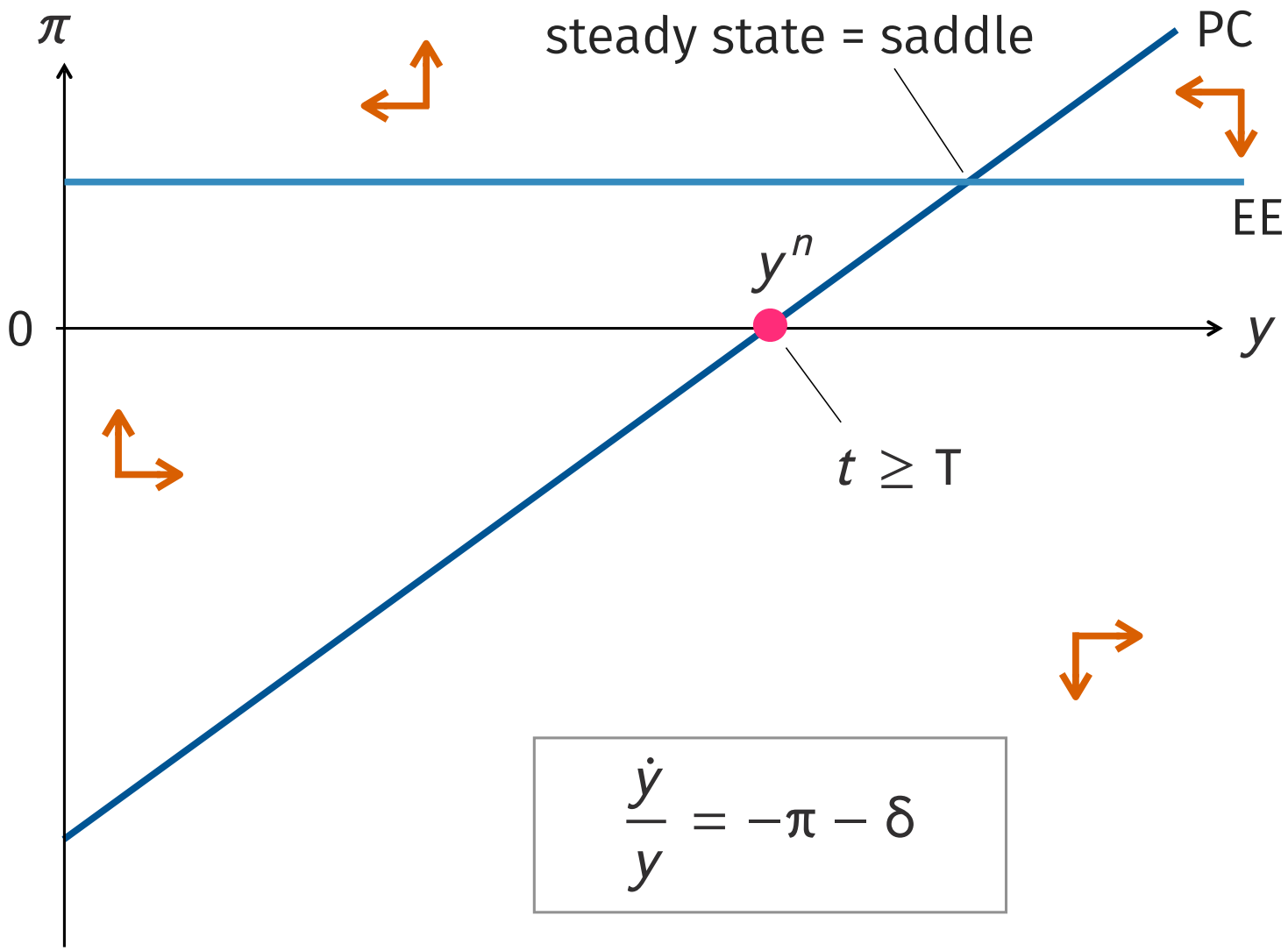


NK | ZLB



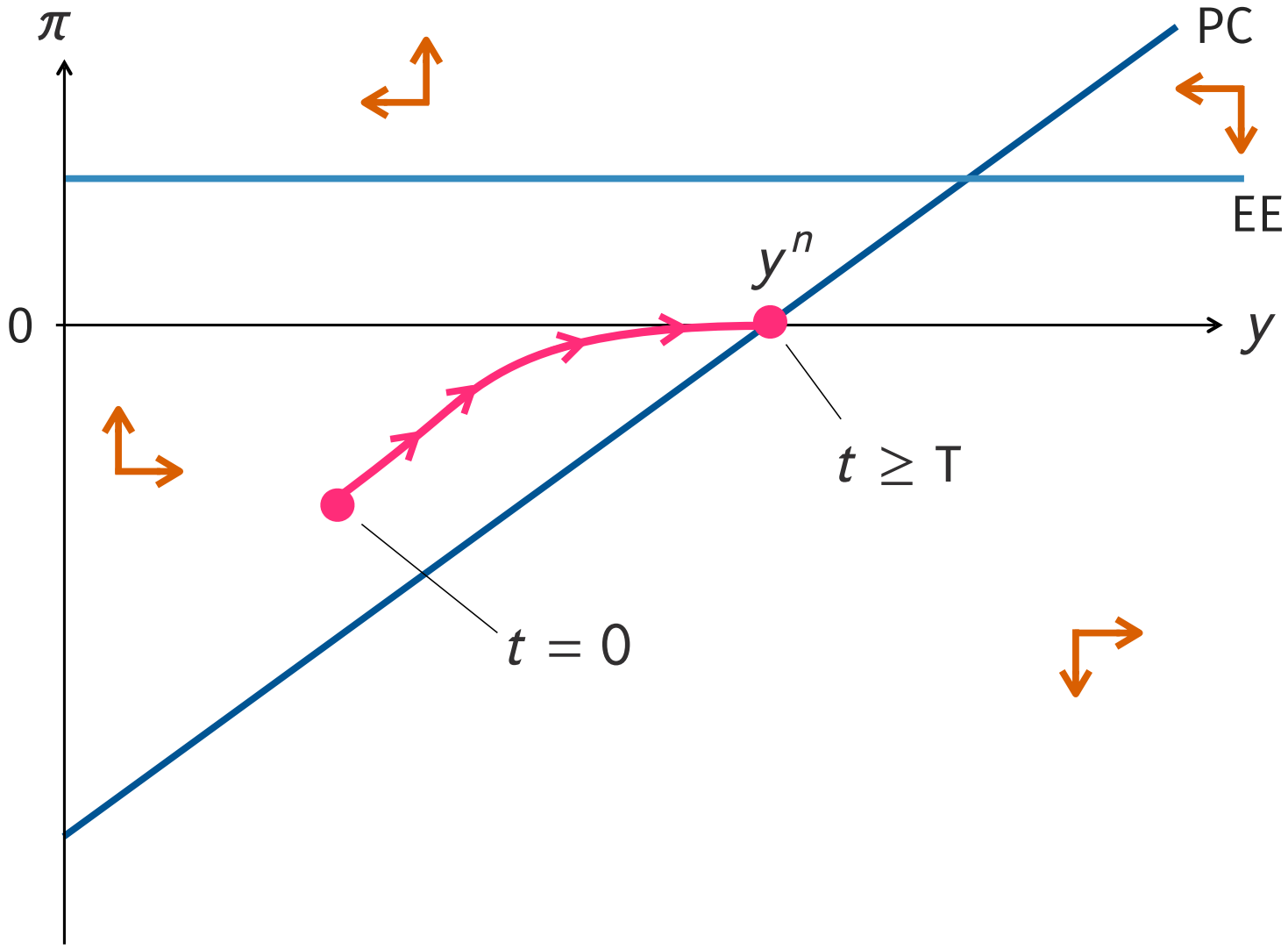
$$\dot{y} = 0 \implies \pi = -\delta$$

NK | ZLB

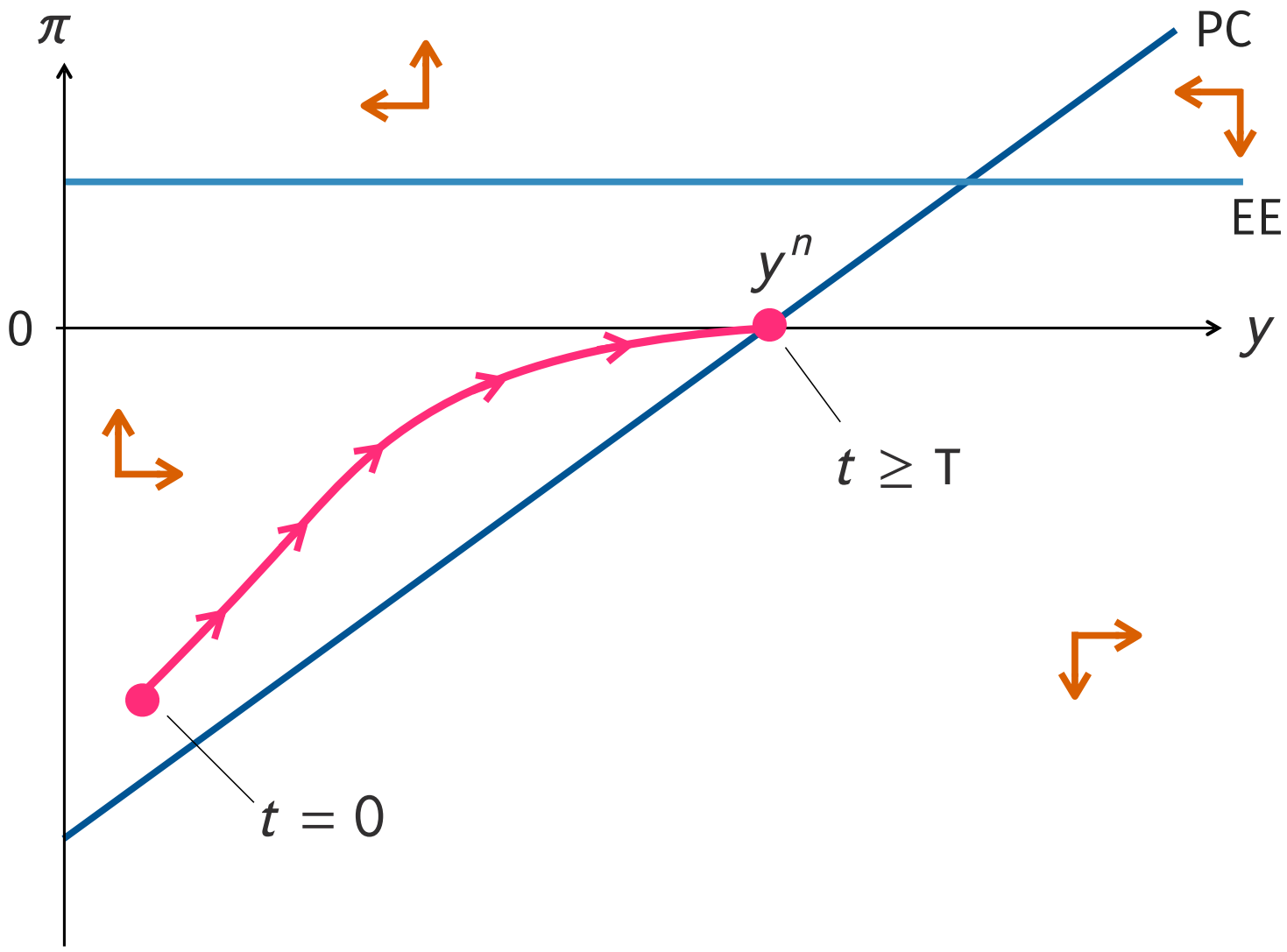


$$\frac{\dot{y}}{y} = -\pi - \delta$$

NK | ZLB



NK | LONGER ZLB

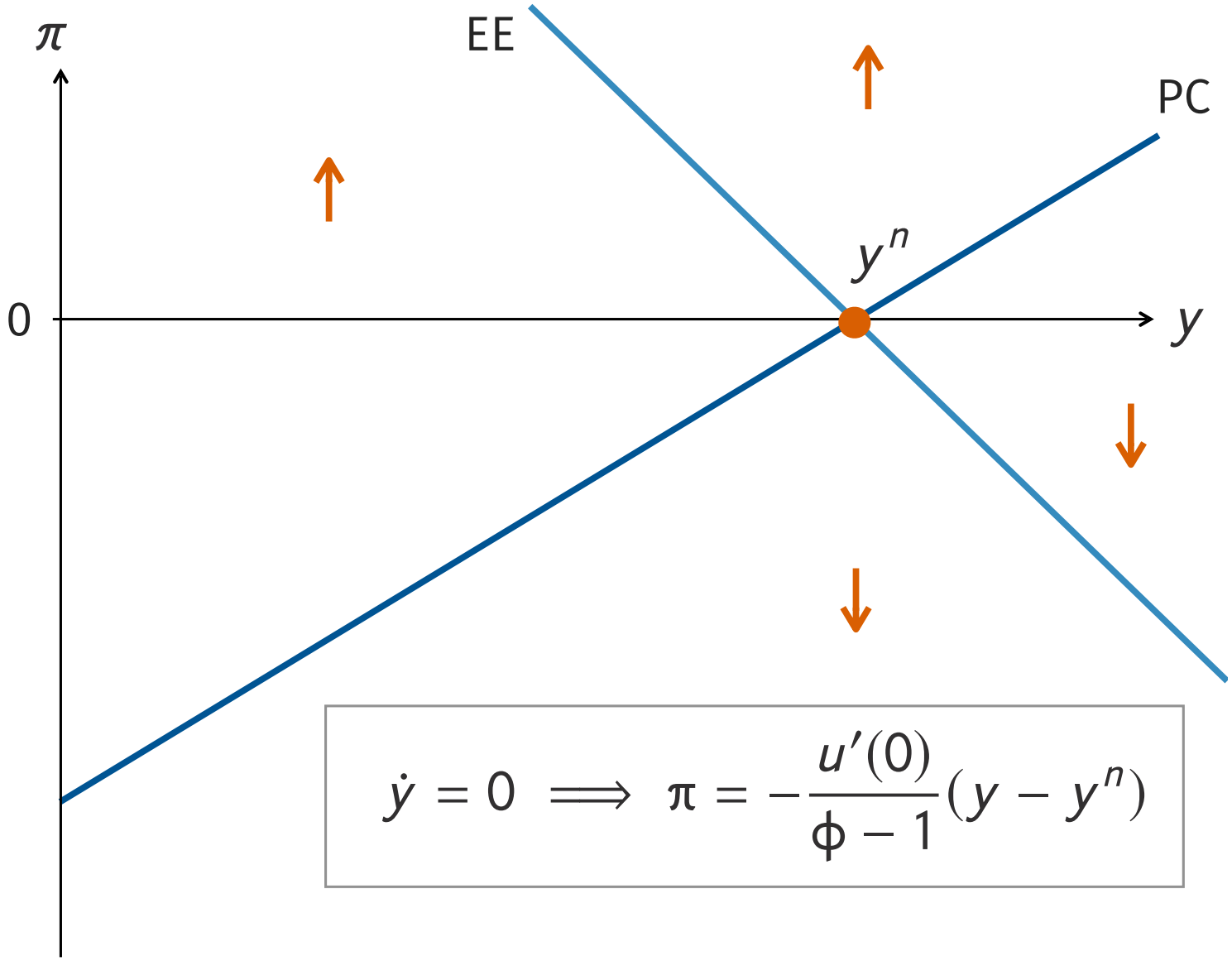


WUNK | ZLB SCENARIO

at intended steady state	ZLB	back to intended steady state
$r^n \equiv \delta - u'(0)y^n$	higher $u'(0)$:	
$r^n > 0$	$r^n < 0$	$r^n > 0$
$i^* = r^n$	$i = 0$	$i^* = r^n$
$\phi > 1$		$\phi > 1$

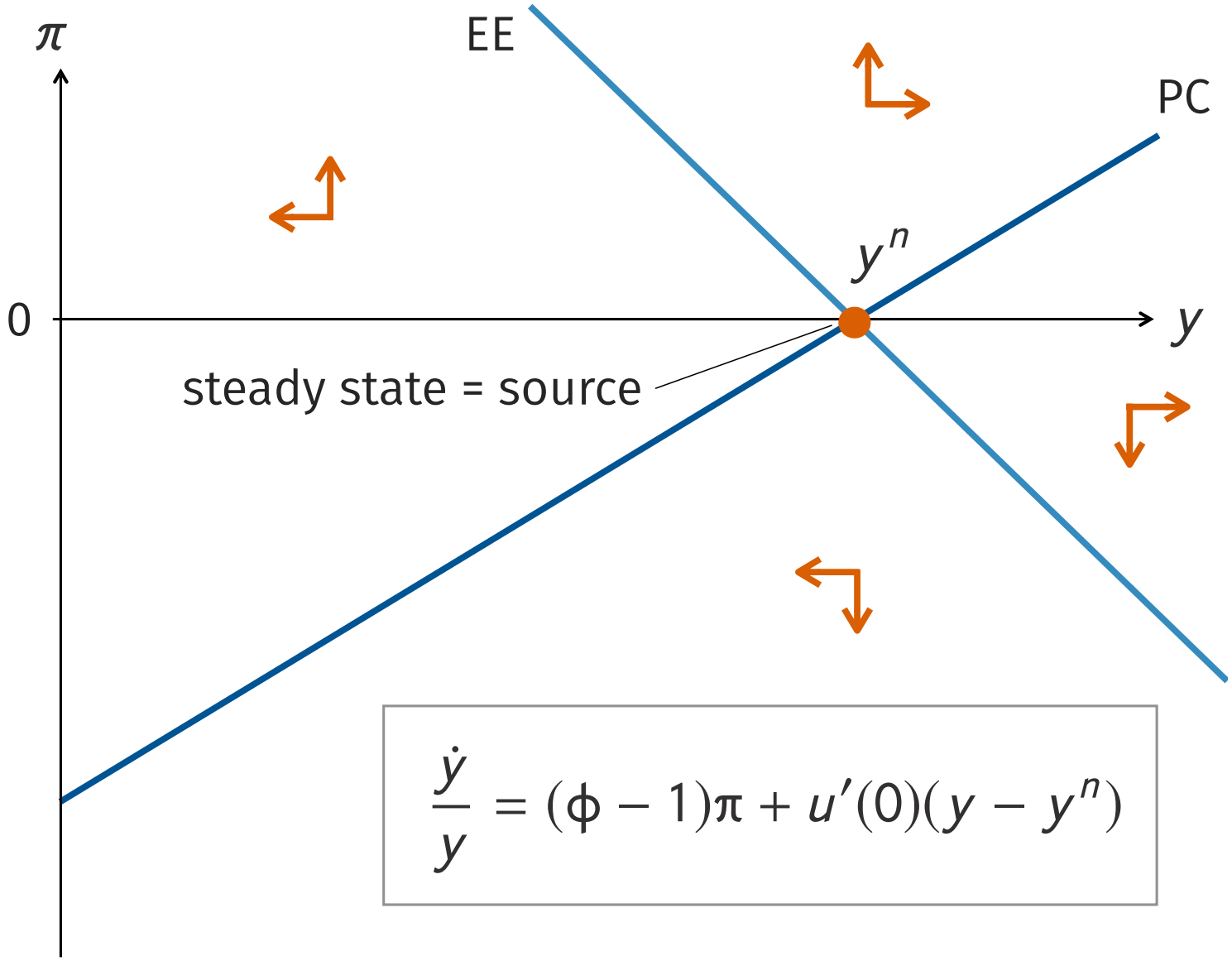
$t = 0$ $t = T$

WUNK | BACK TO INTENDED STEADY STATE



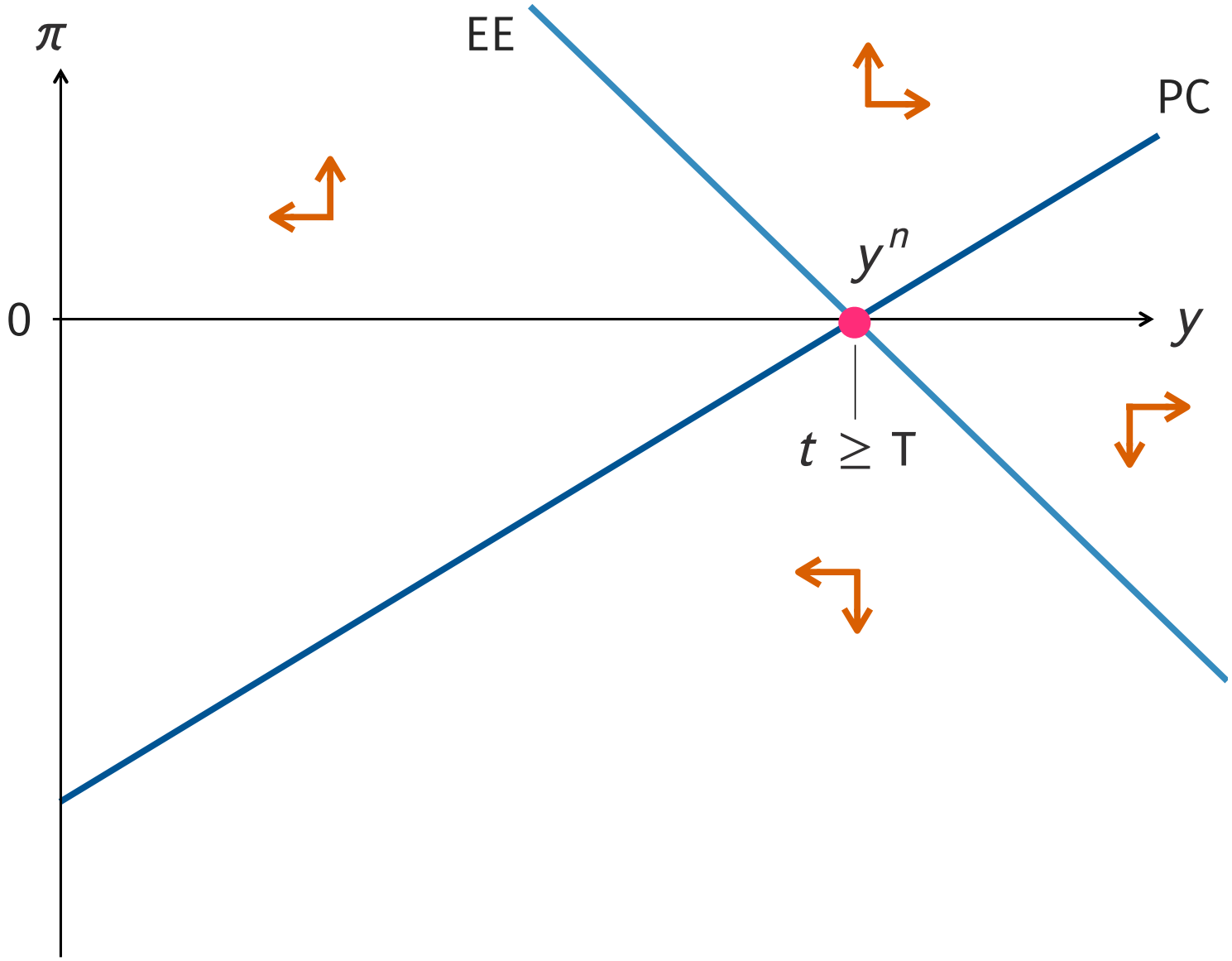
$$\dot{y} = 0 \implies \pi = -\frac{u'(0)}{\phi - 1}(y - y^n)$$

WUNK | BACK TO INTENDED STEADY STATE

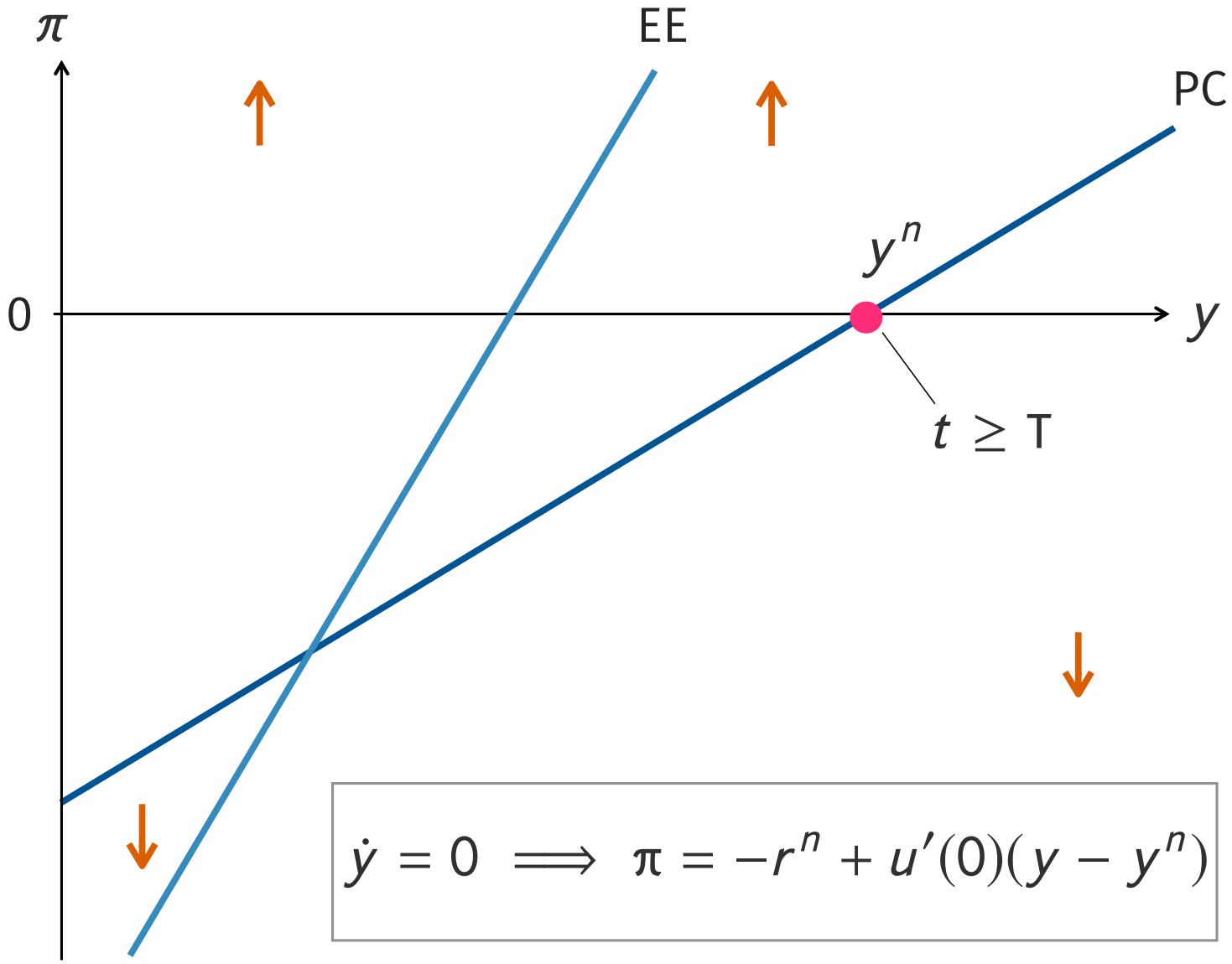


$$\frac{\dot{y}}{y} = (\phi - 1)\pi + u'(0)(y - y^n)$$

WUNK | BACK TO INTENDED STEADY STATE

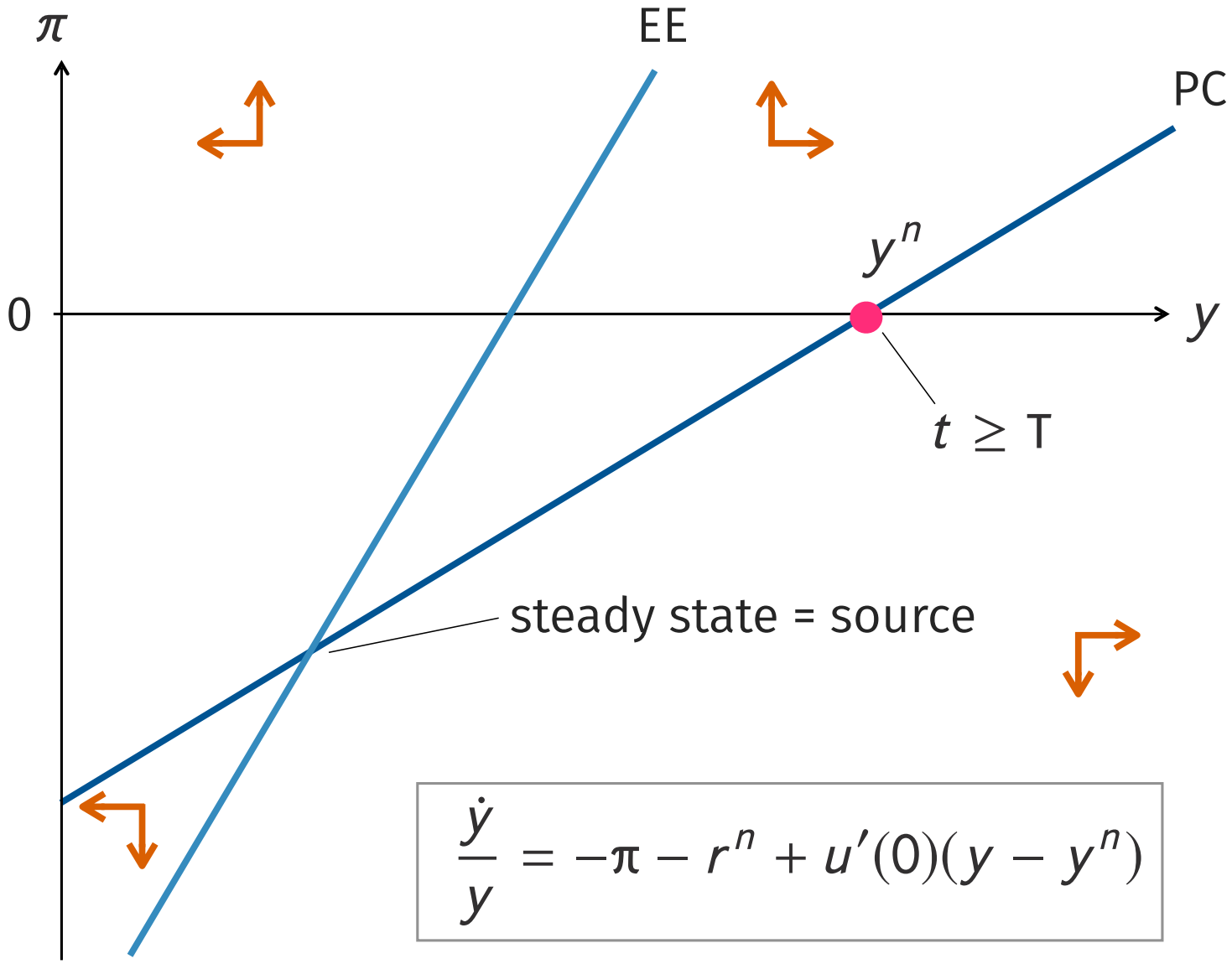


WUNK | ZLB



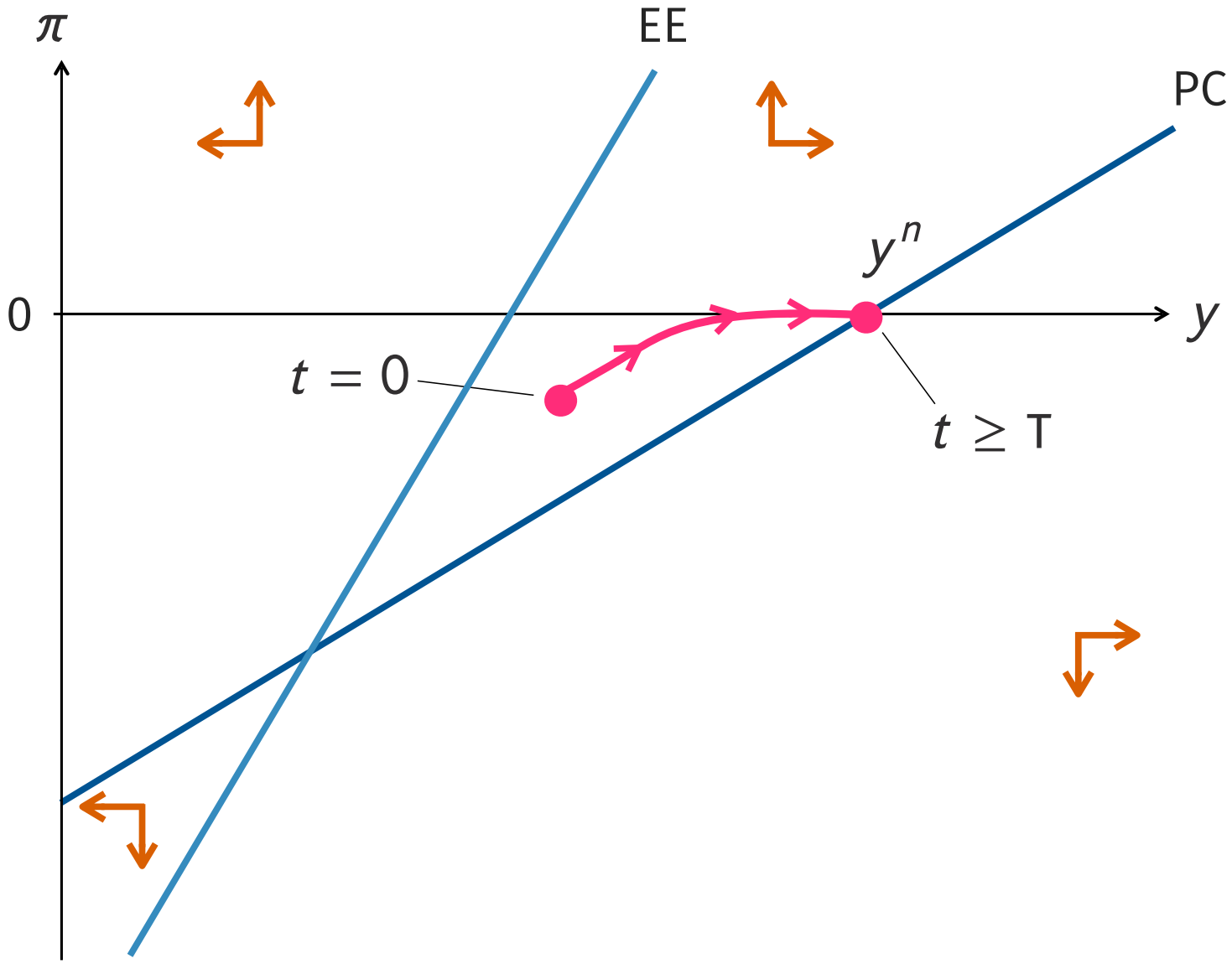
$$\dot{y} = 0 \implies \pi = -r^n + u'(0)(y - y^n)$$

WUNK | ZLB

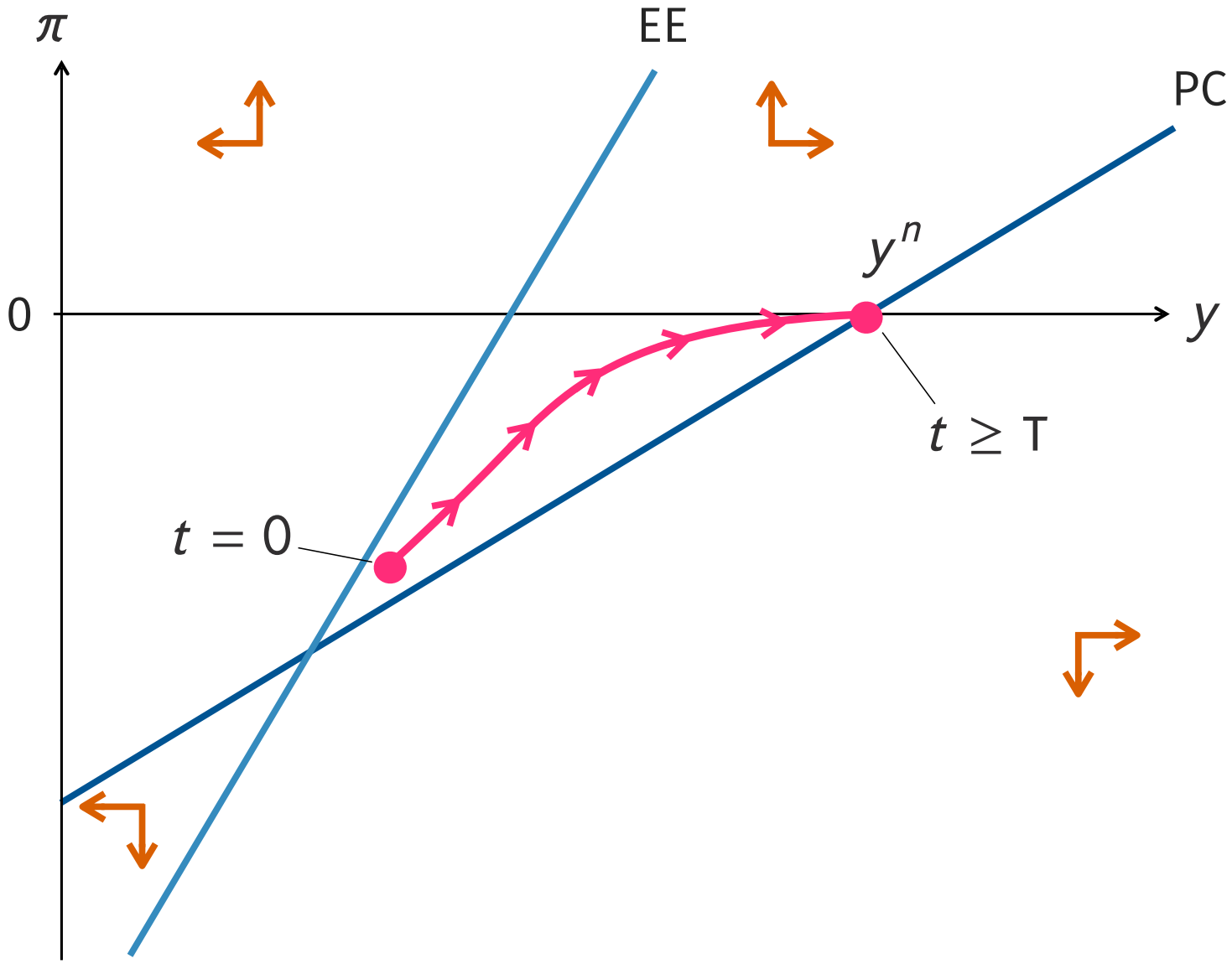


$$\frac{\dot{y}}{y} = -\pi - r^n + u'(0)(y - y^n)$$

WUNK | ZLB



WUNK | LONGER ZLB



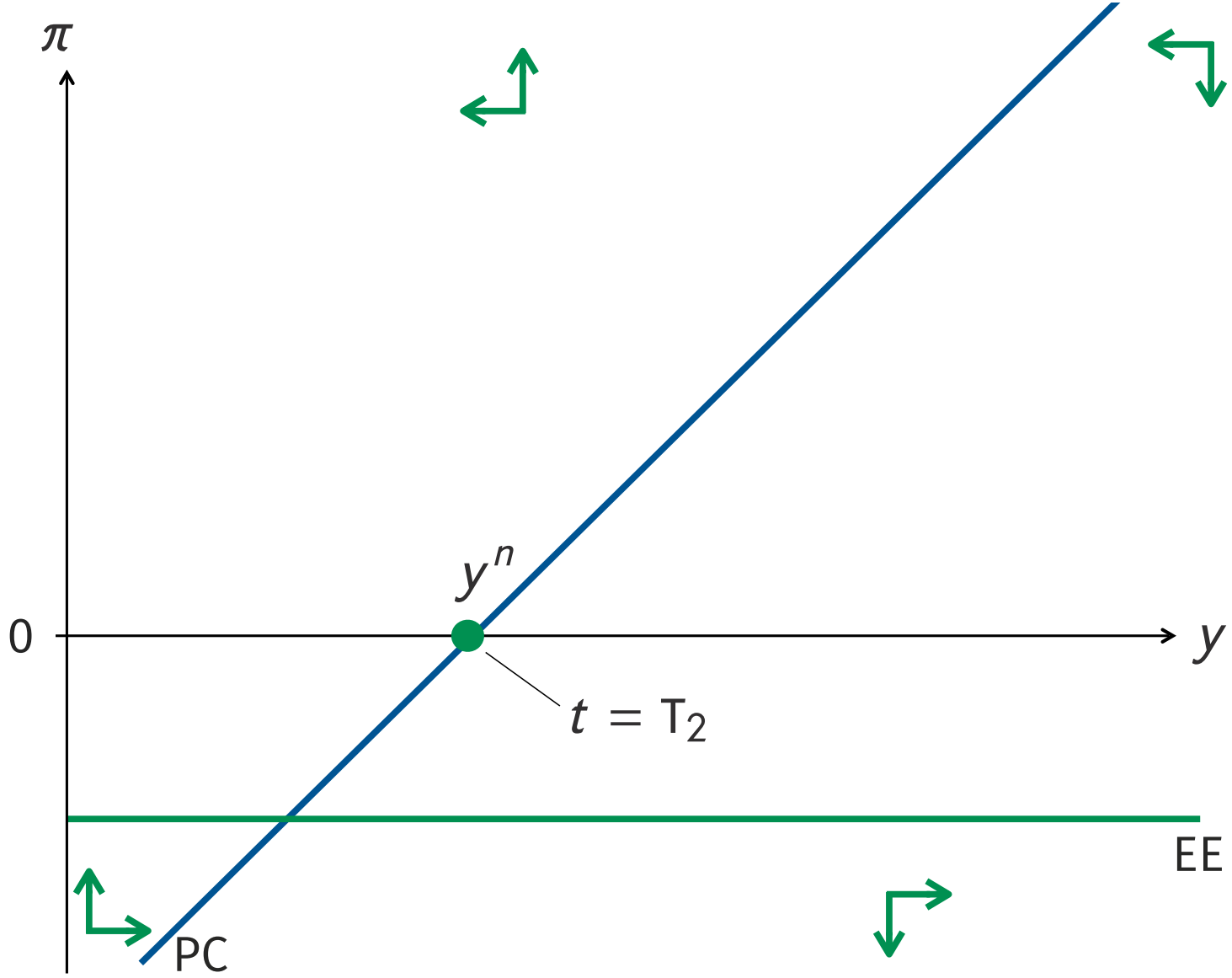
FORWARD GUIDANCE

NK | FORWARD-GUIDANCE SCENARIO

intended steady state	ZLB	forward guidance	intended steady state
$\delta > 0$	$\delta < 0$	$\delta > 0$	$\delta > 0$
$i^* = \delta$	$i = 0$	$i = 0$	$i^* = \delta$

$t = 0$ $t = T_1$ $t = T_2$

NK | FORWARD GUIDANCE



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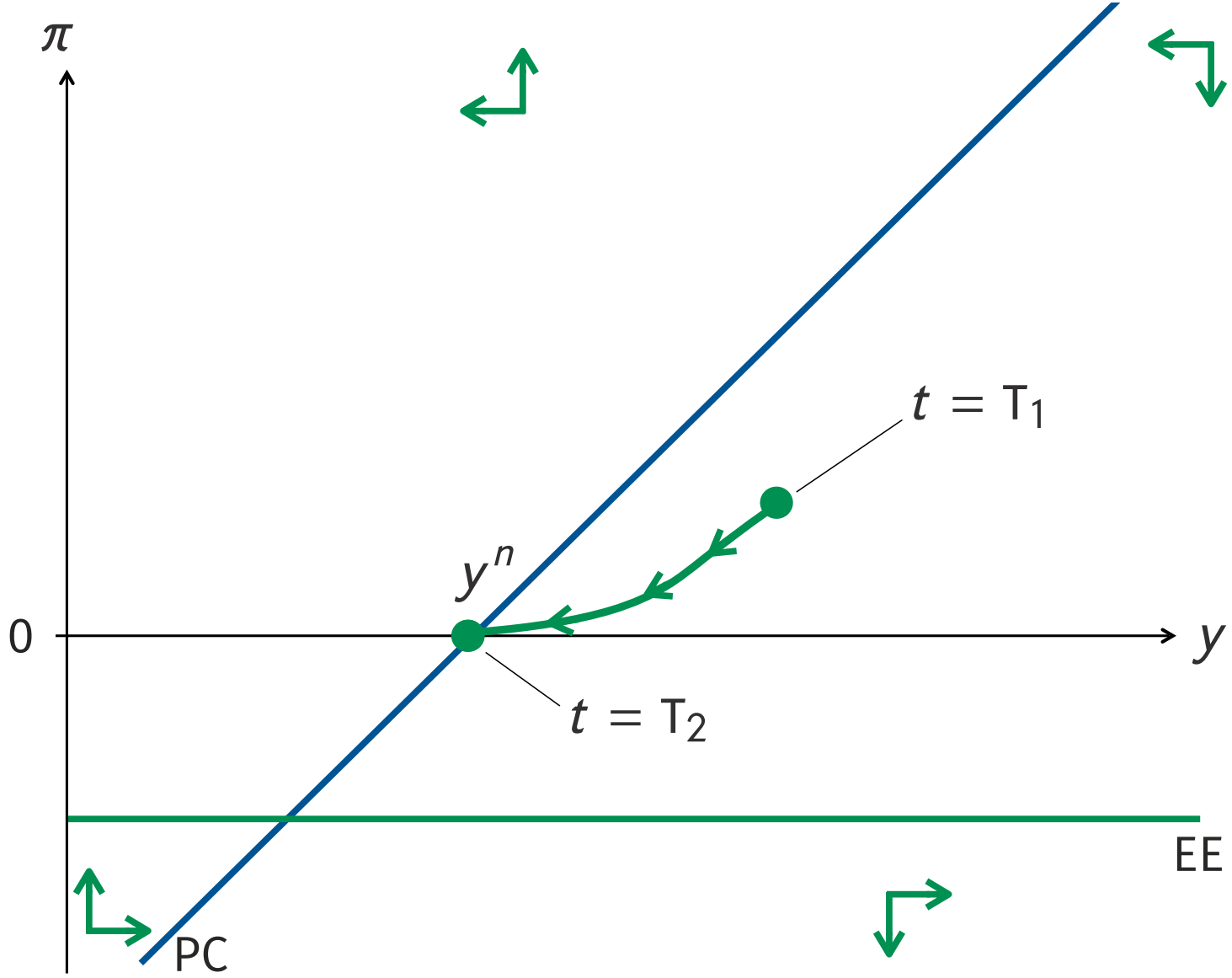

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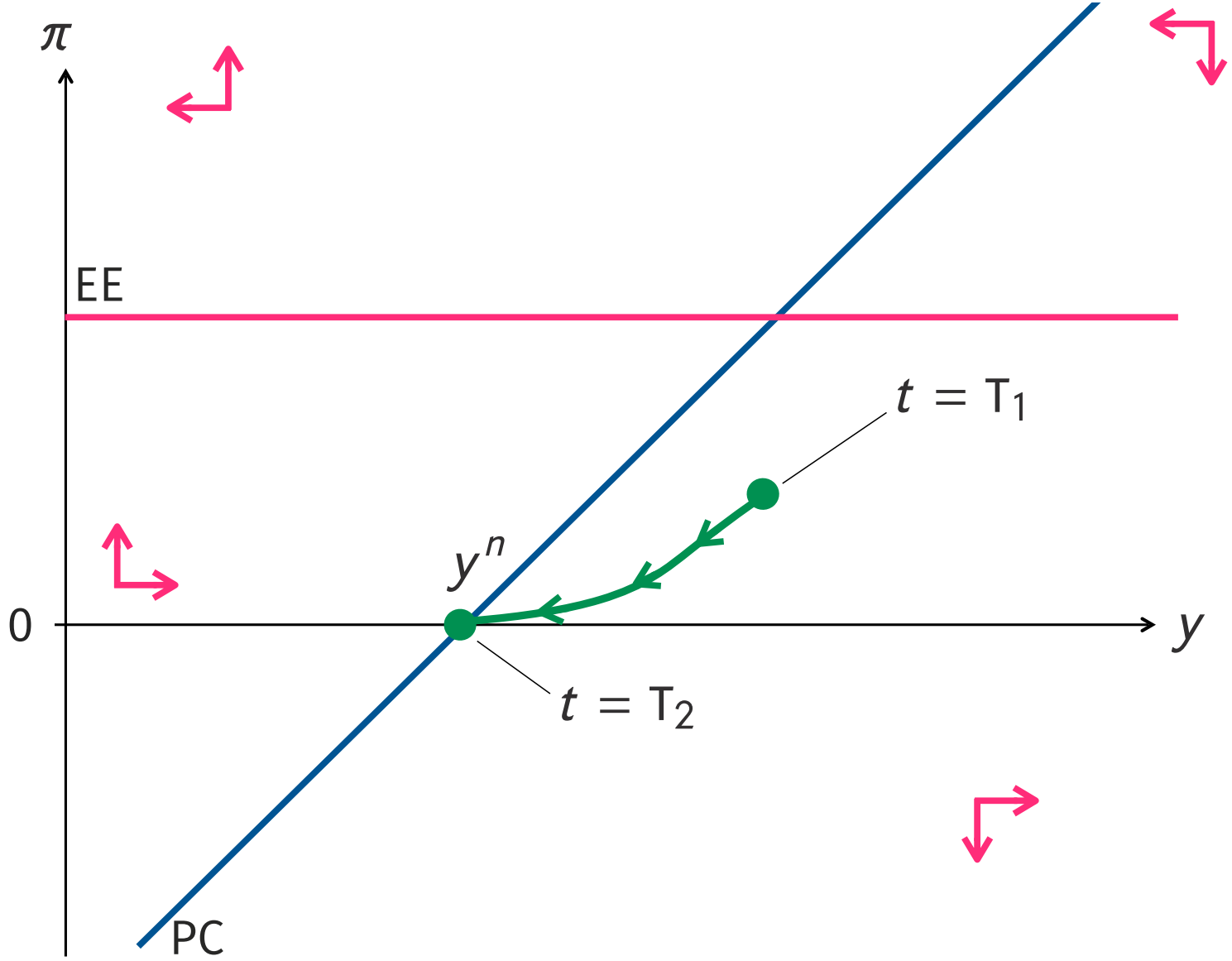
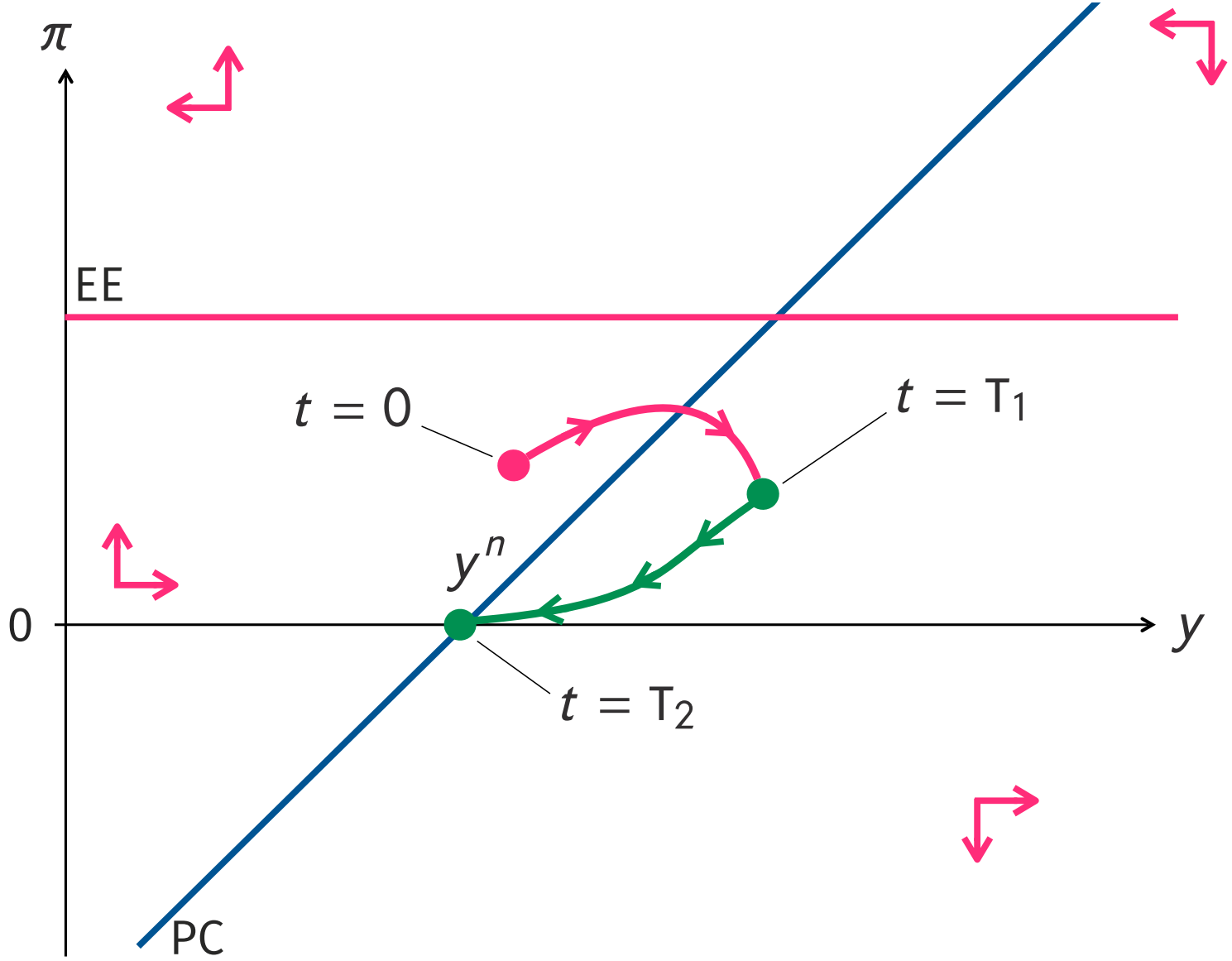


NK | ZLB + FORWARD GUIDANCE



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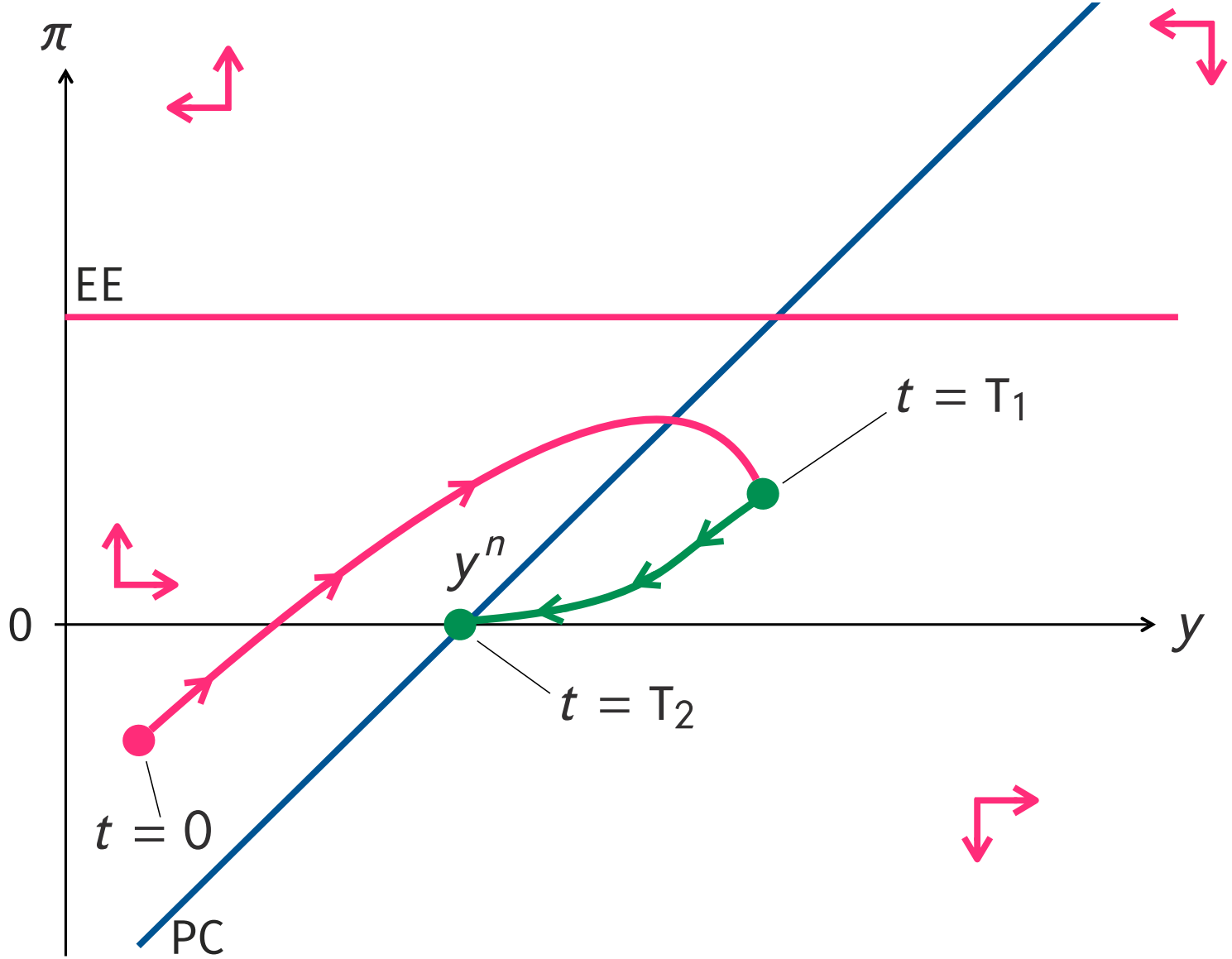
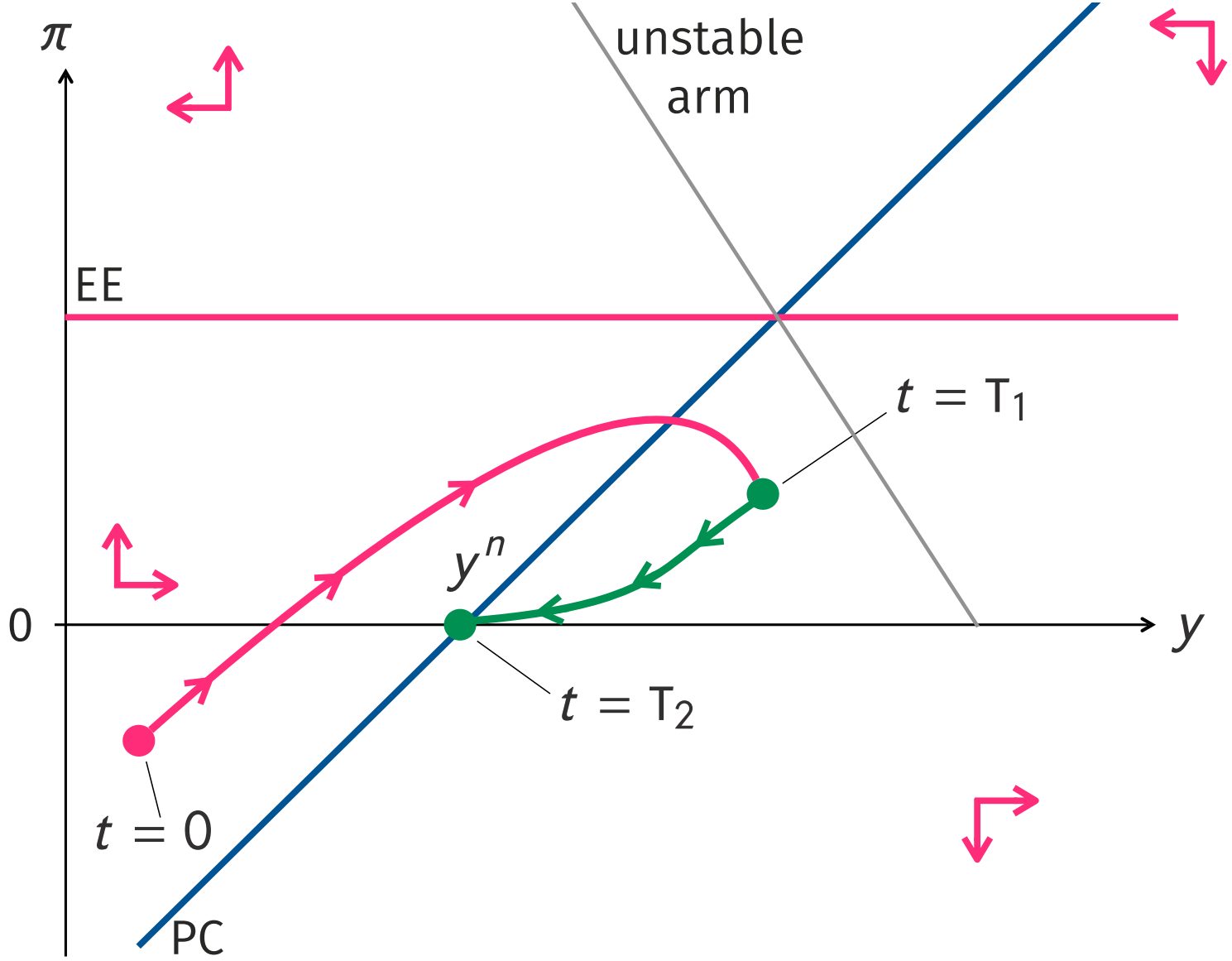


NK | DISCONTINUITY OF FORWARD GUIDANCE



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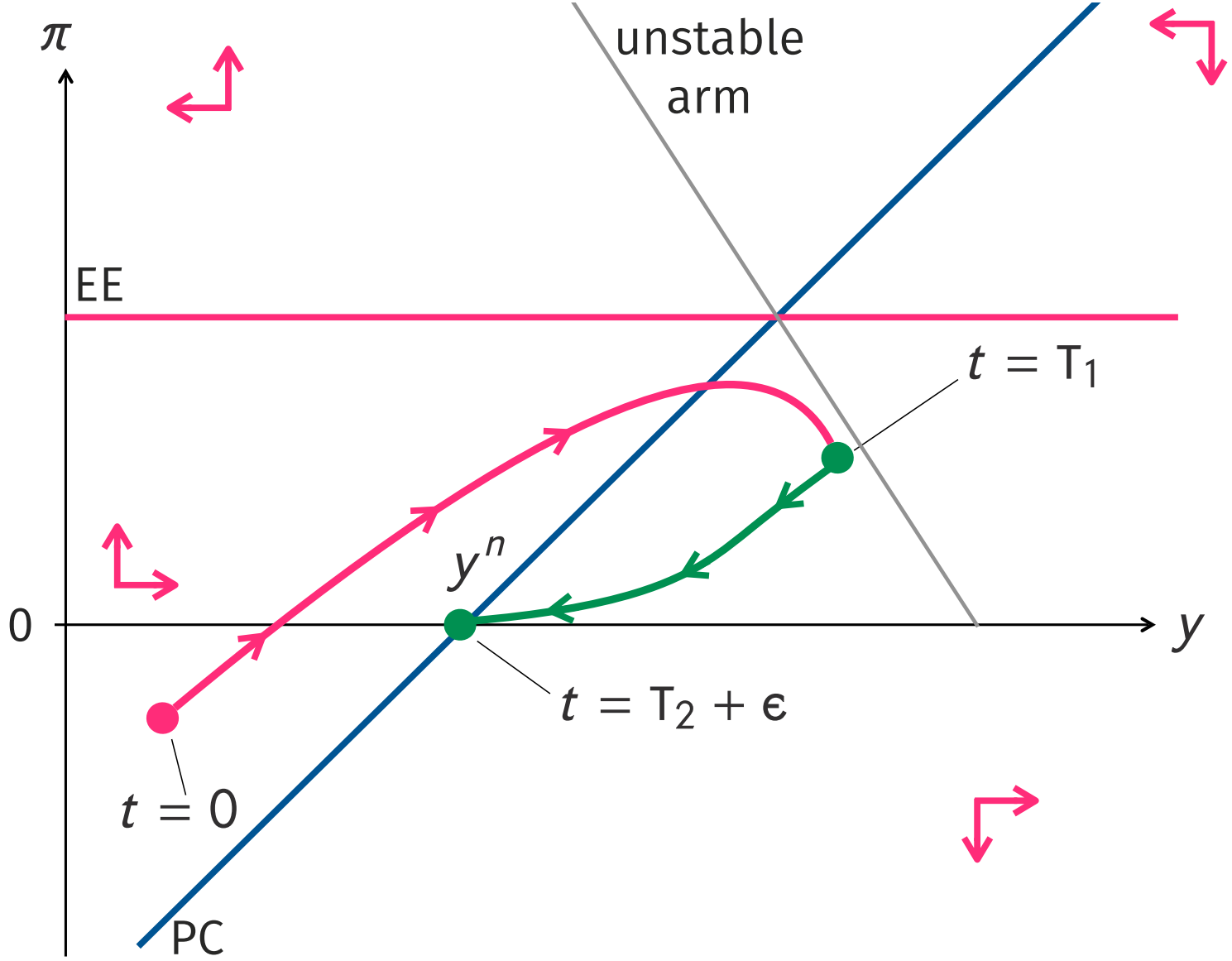

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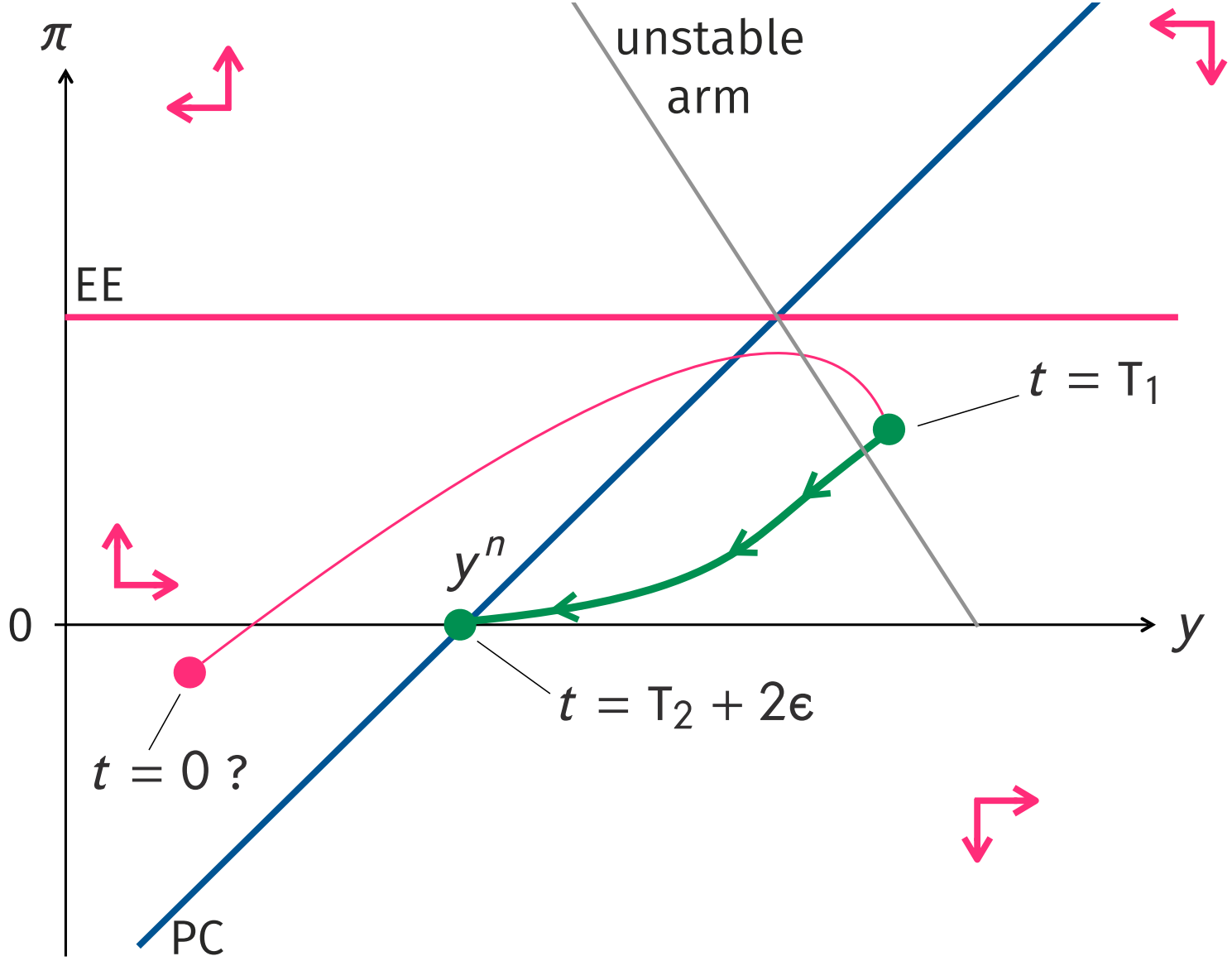

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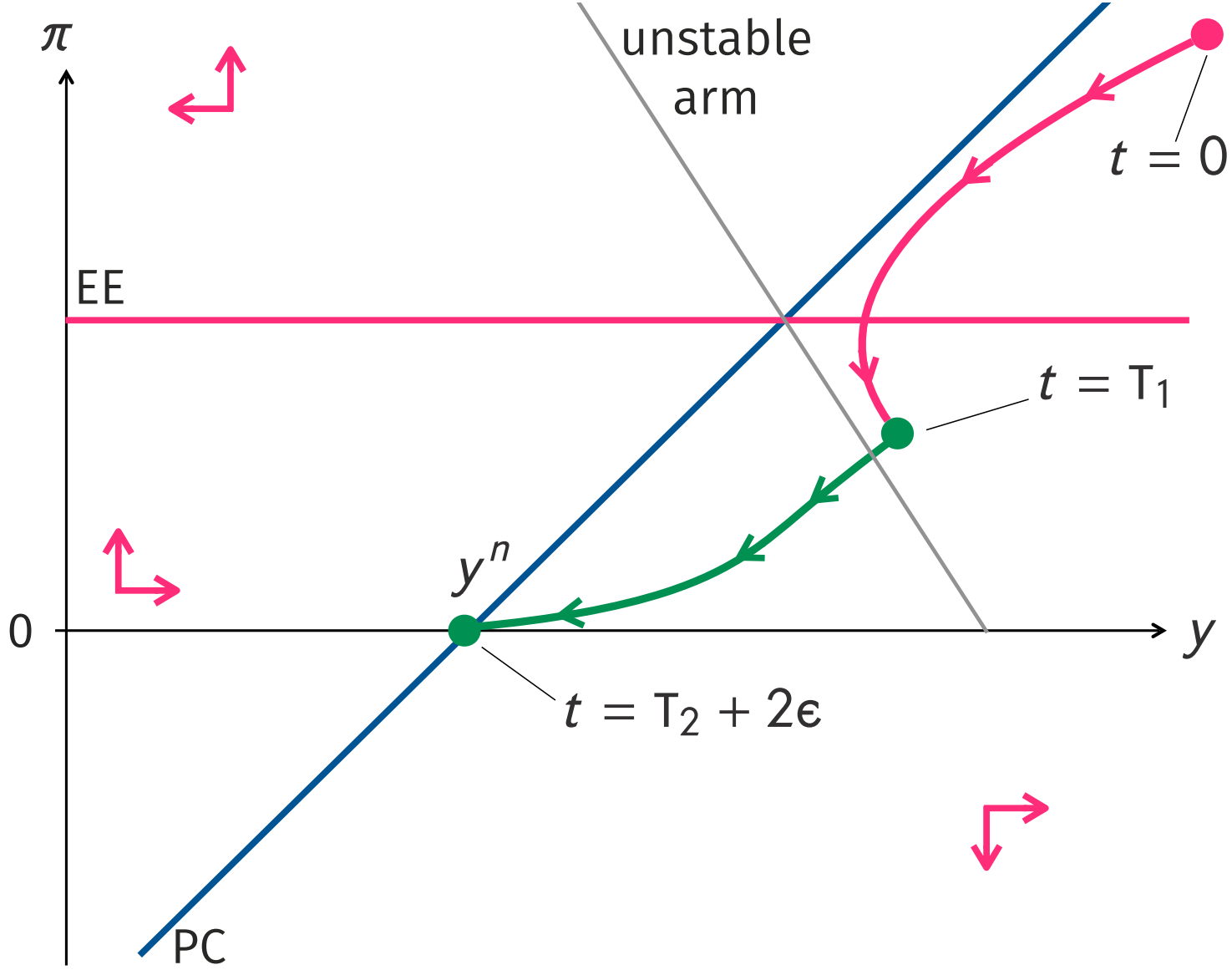

WUNK | FORWARD-GUIDANCE SCENARIO

intended steady state	ZLB	forward guidance	intended steady state
$r^n > 0$	$r^n < 0$	$r^n > 0$	$r^n > 0$
$i^* = r^n$	$i = 0$	$i = 0$	$i^* = r^n$

$t = 0$ $t = T_1$ $t = T_2$

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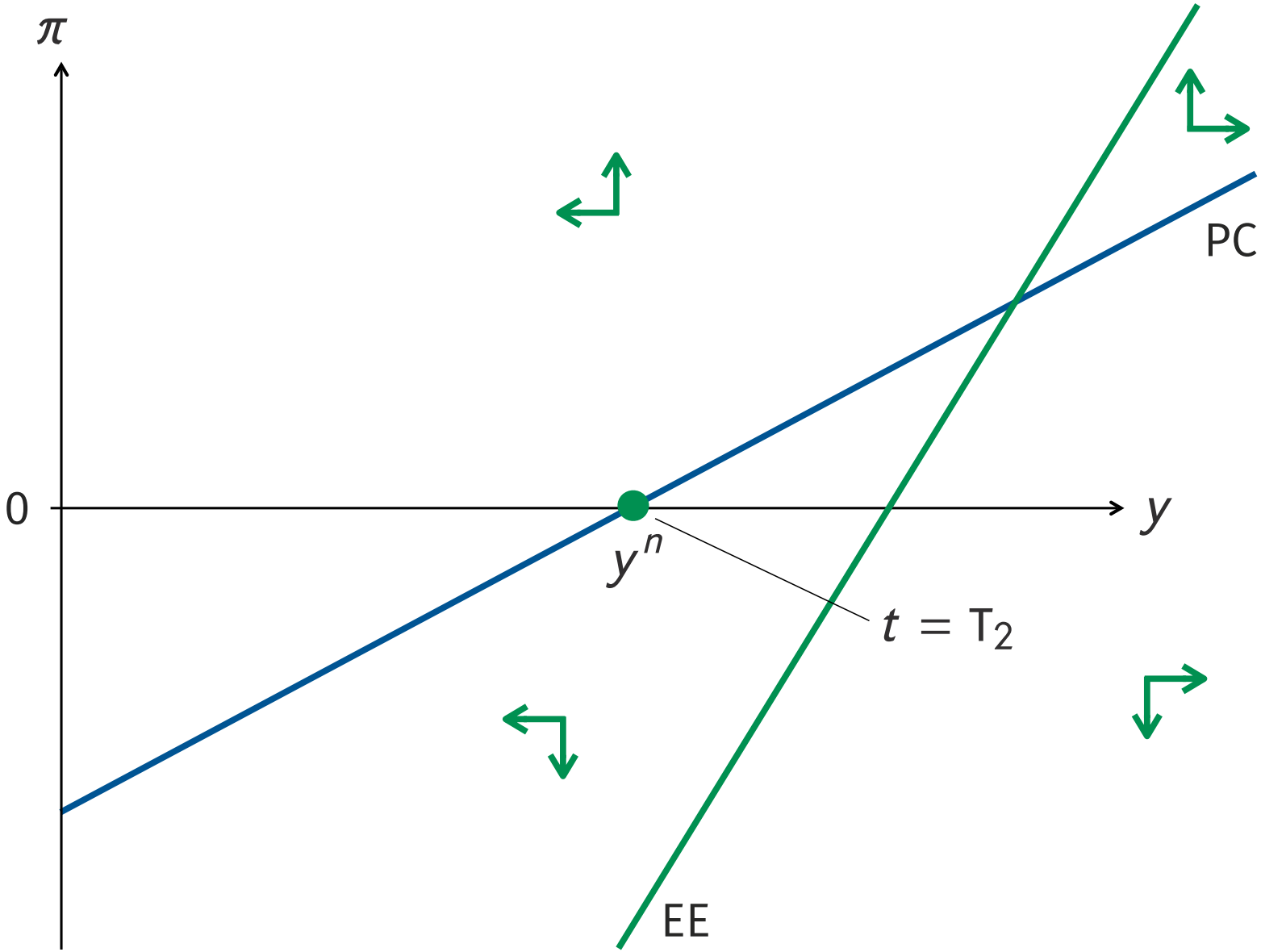
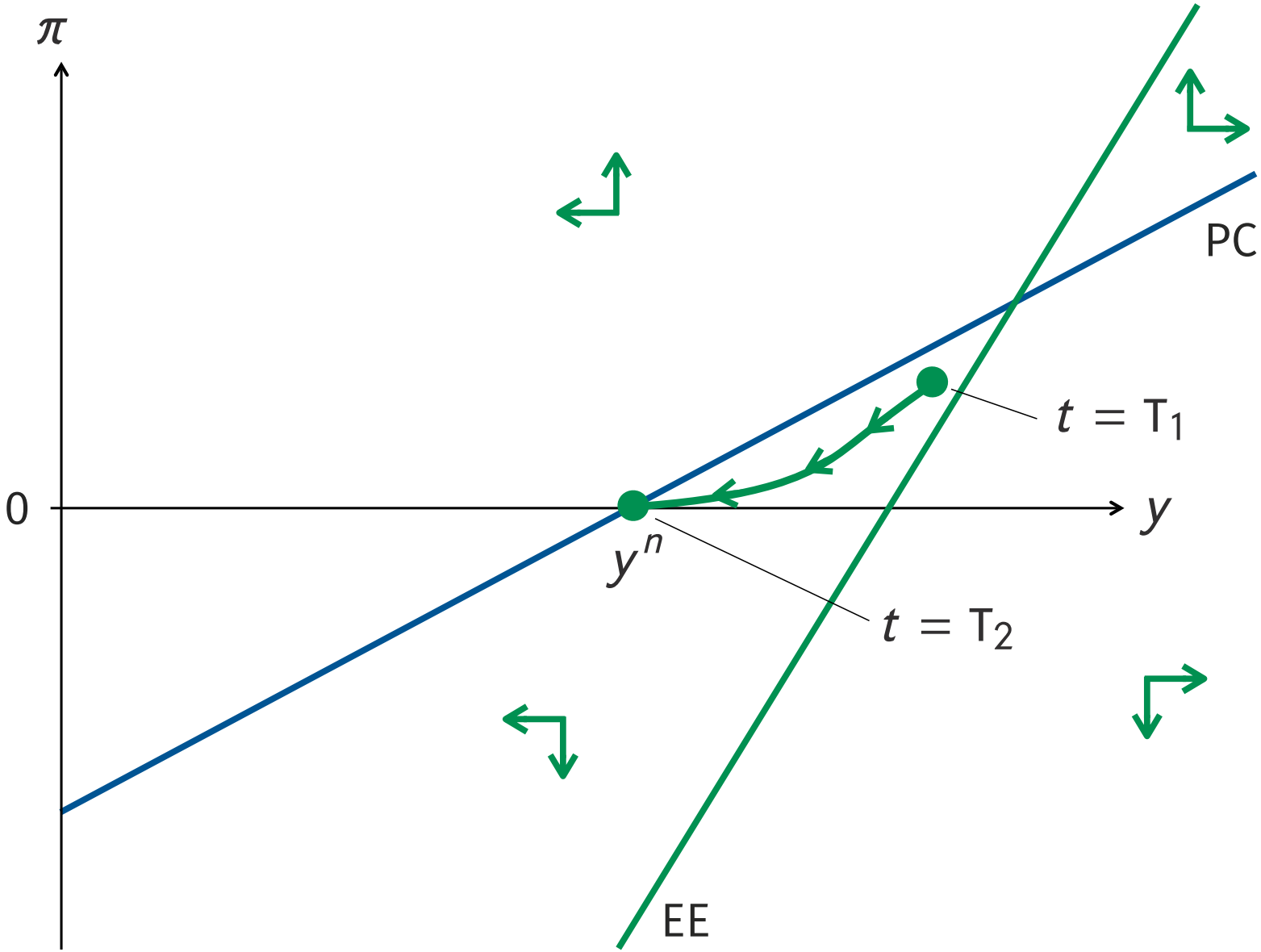
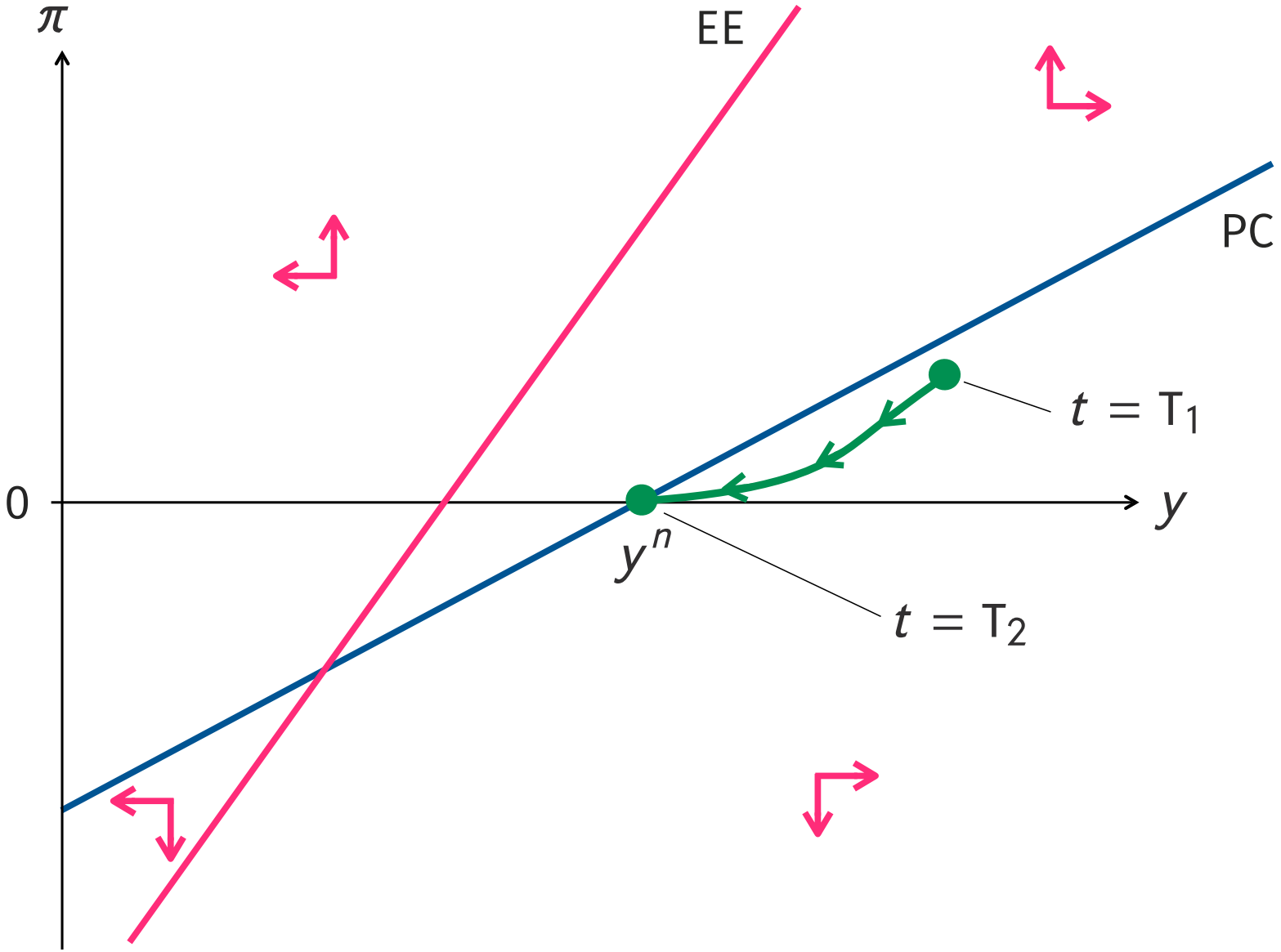


WUNK | FORWARD GUIDANCE



WUNK | ZLB + FORWARD GUIDANCE



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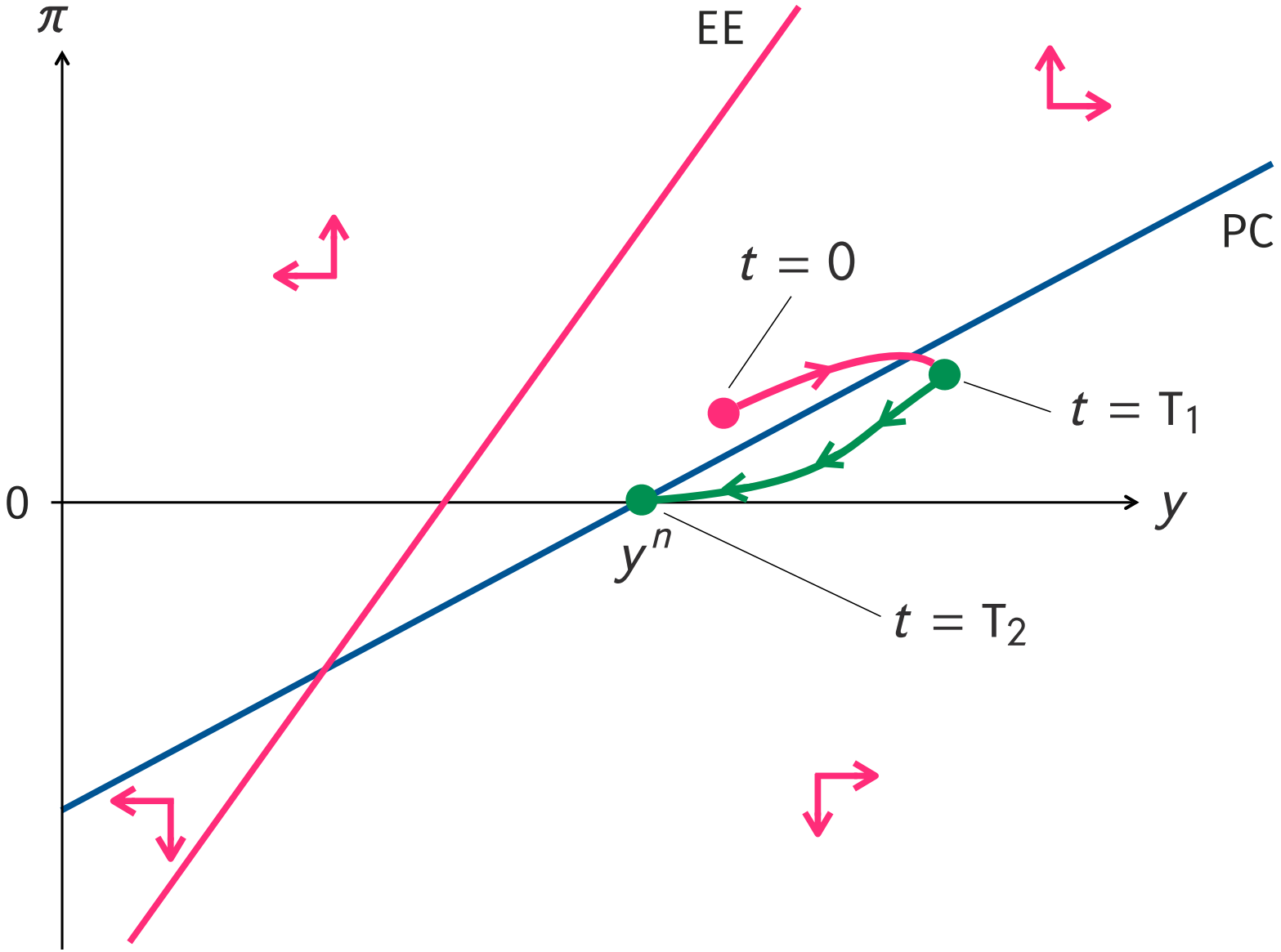

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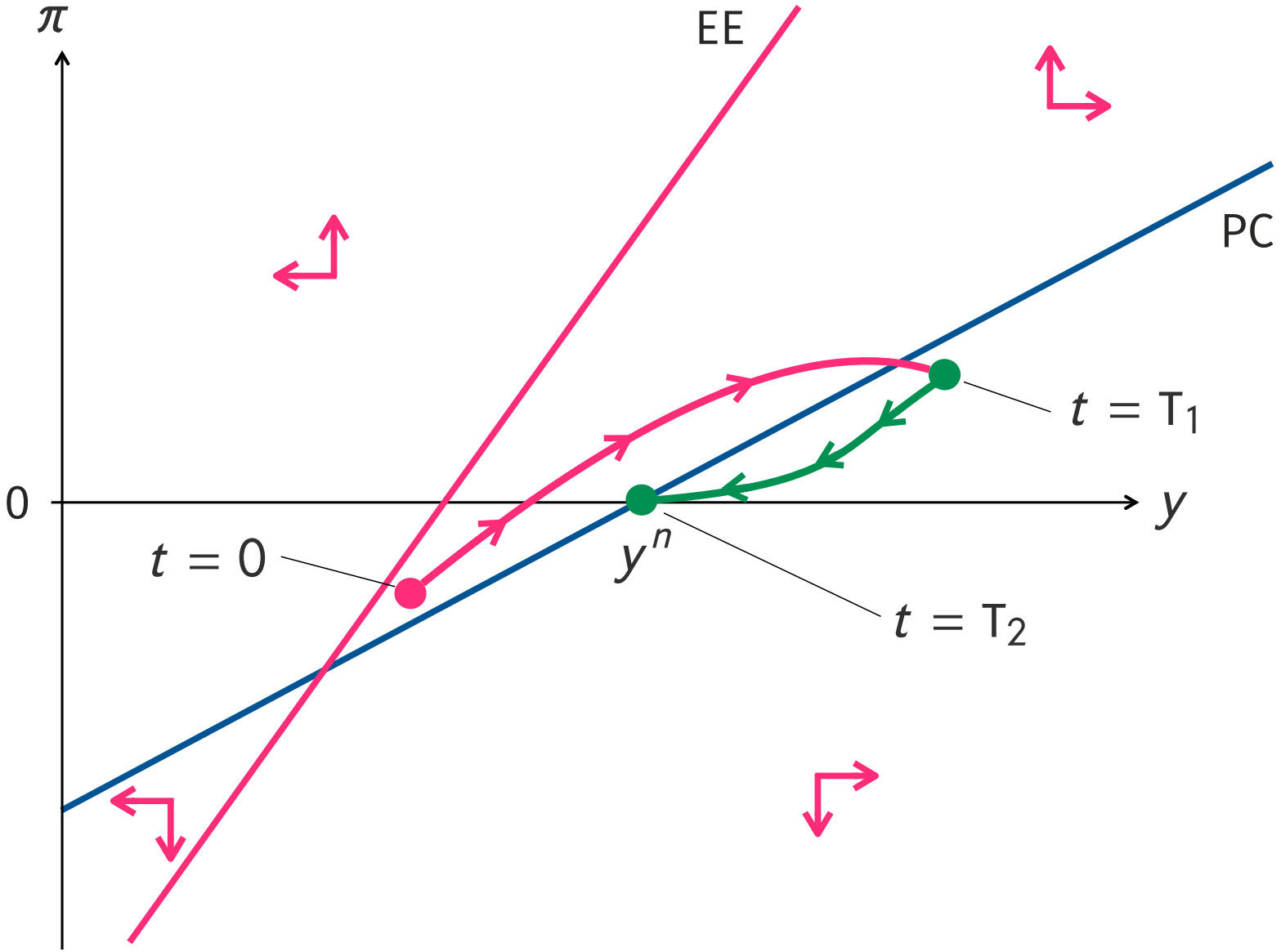
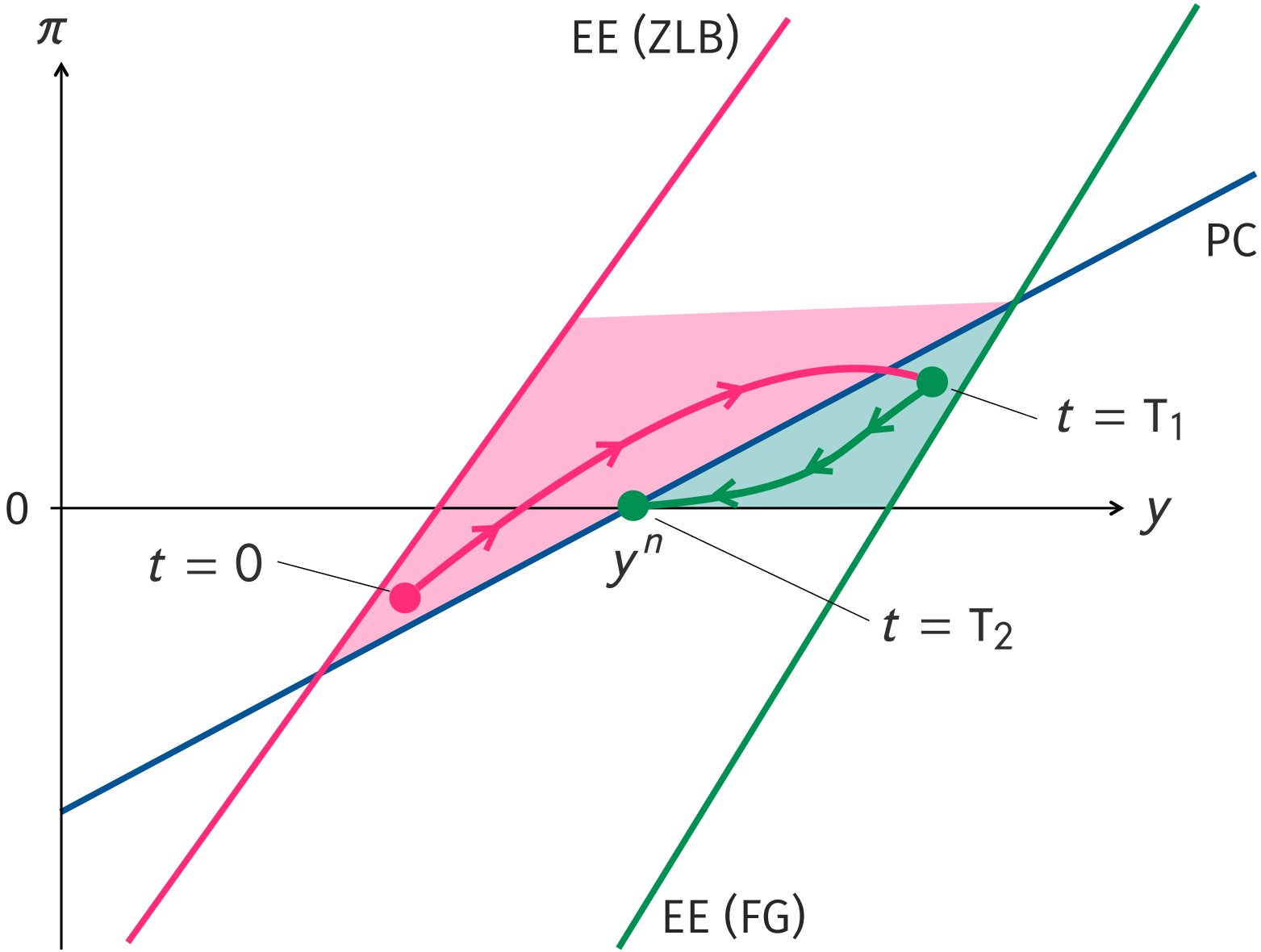


WUNK | CONTINUITY OF FORWARD GUIDANCE



IS THE WUNK ASSUMPTION REALISTIC?

- WUNK assumption:

$$u'(0) > \frac{\epsilon}{\delta \gamma a}$$

- equivalent to: $\delta \times (\delta - r^n) >$ output gap coeff. in Phillips curve
  - macro evidence: coeff. in Phillips curve $\approx 3\%$
  - experimental evidence: annual $\delta \approx 40\%$
  - macro evidence: annual $r^n \approx 2\%$
- WUNK assumption holds: $0.4 \times (0.4 - 0.02) = 0.15 > 0.03$