Measuring World Real Economic Activity

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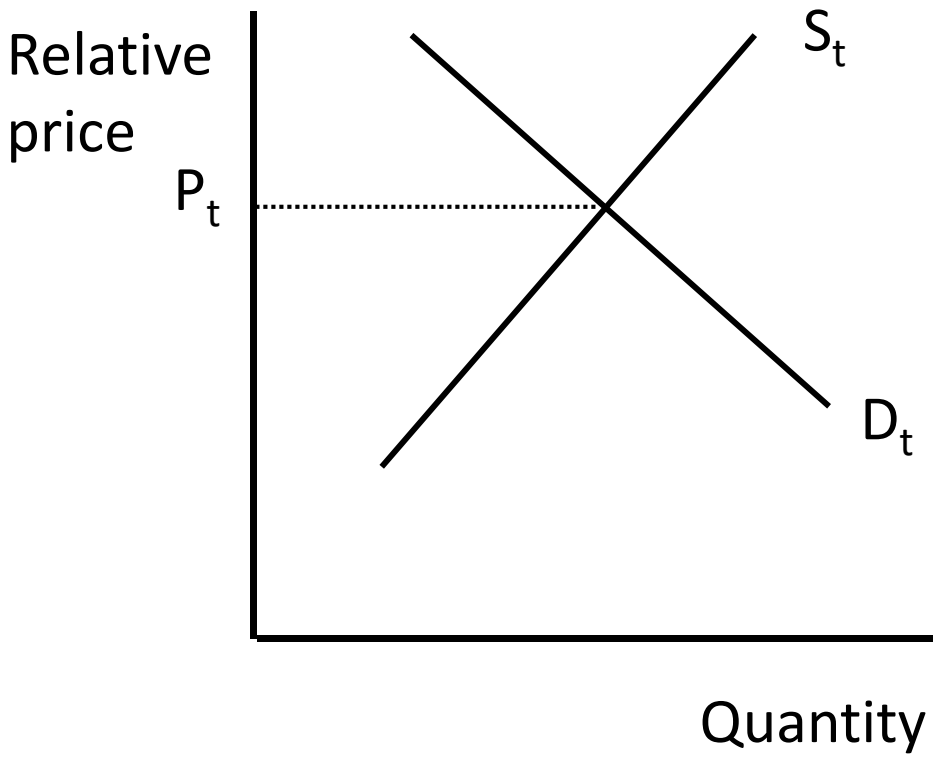
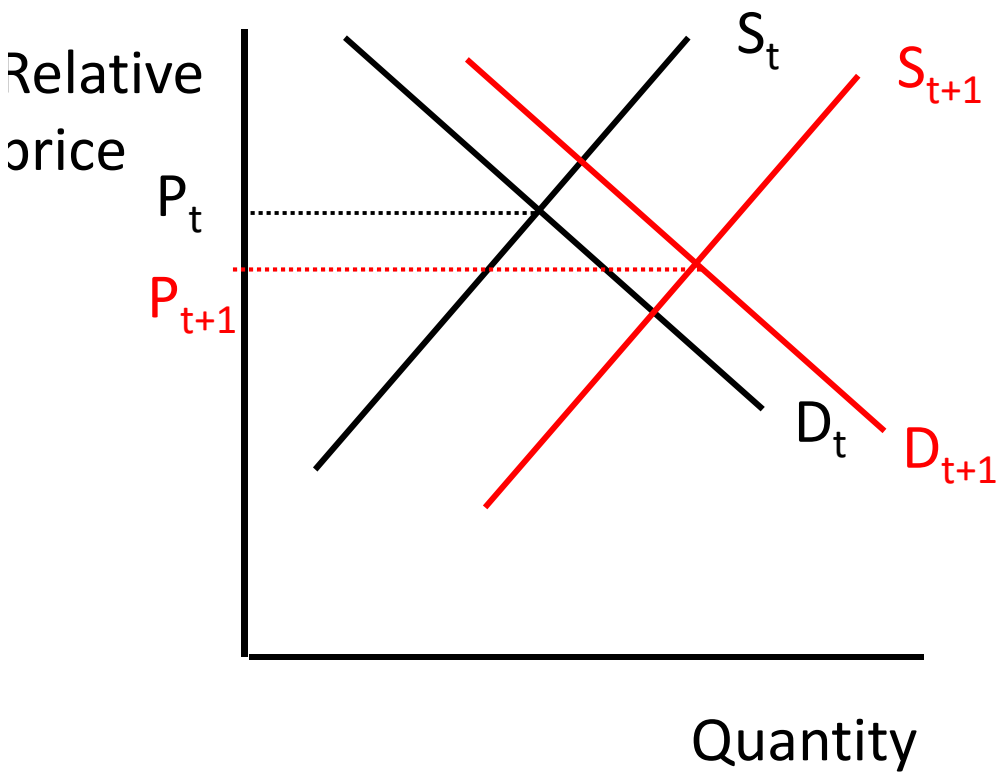
World market for shipping





- Demand shifts right most years as global economic activity increases
- Supply shifts right as capacity added and technology improves
- Supply shifts usually dominate and relative price falls

Kilian (AER): Model shifts in supply and growth in potential output using deterministic time trend, interpret deviations from trend as real economic activity

x_t = index of nominal shipping cost

$x_{1968:1} = 1$

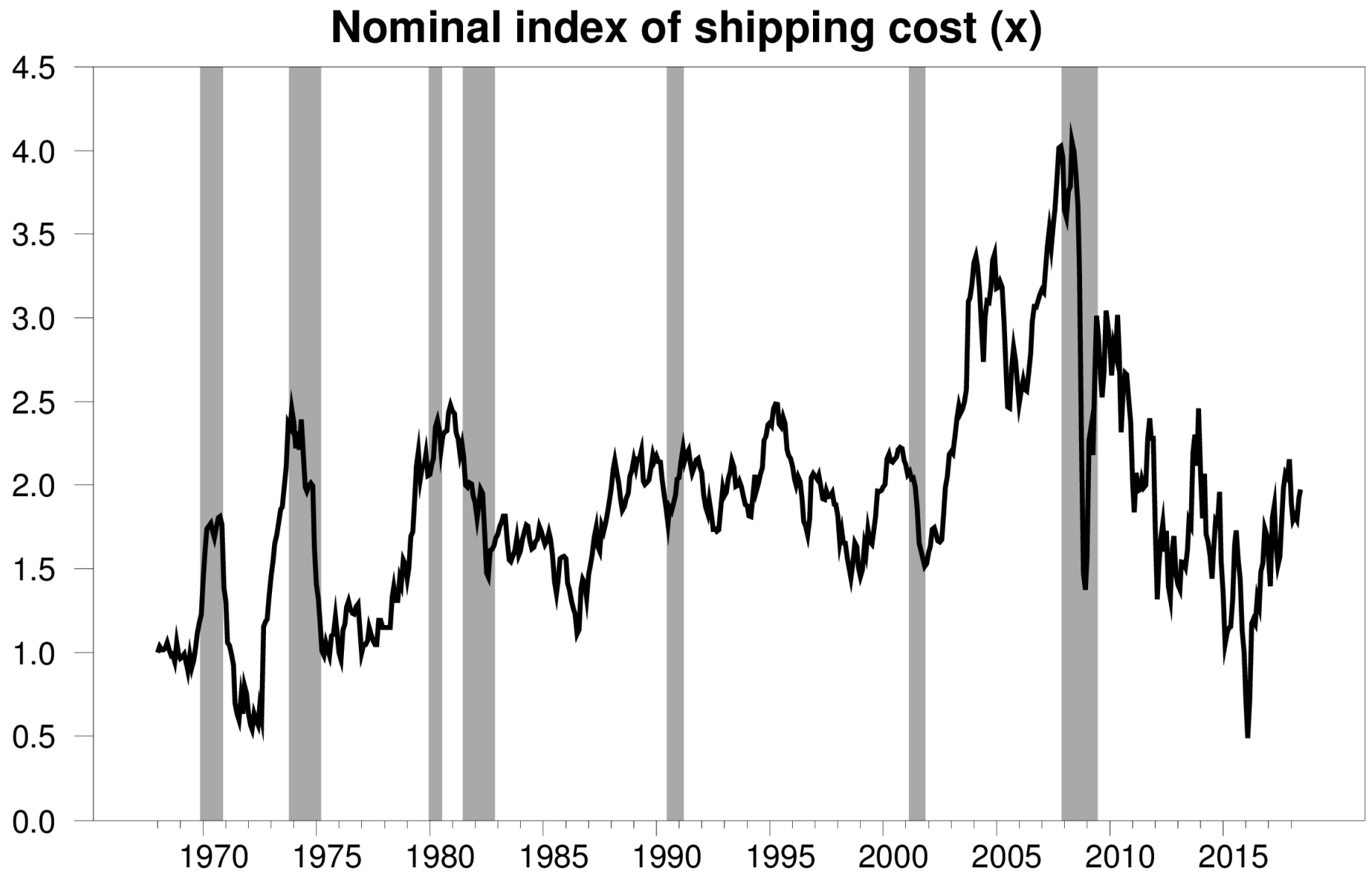
$x_t = x_{t-1}$ + avg change in log of individual measures

for $t \leq$ 2007:12

$x_t = x_{t-1} + \Delta \log(BDI_t)$ for $t \geq$ 2008:1

$$\Rightarrow x_t = \log(BDI_t) + x_{2008:1} - \log(BDI_{2008:1})$$

$$= \log(BDI_t) - 5.236 \text{ for } t \geq 2008:1$$


Nominal index of shipping cost (x)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015

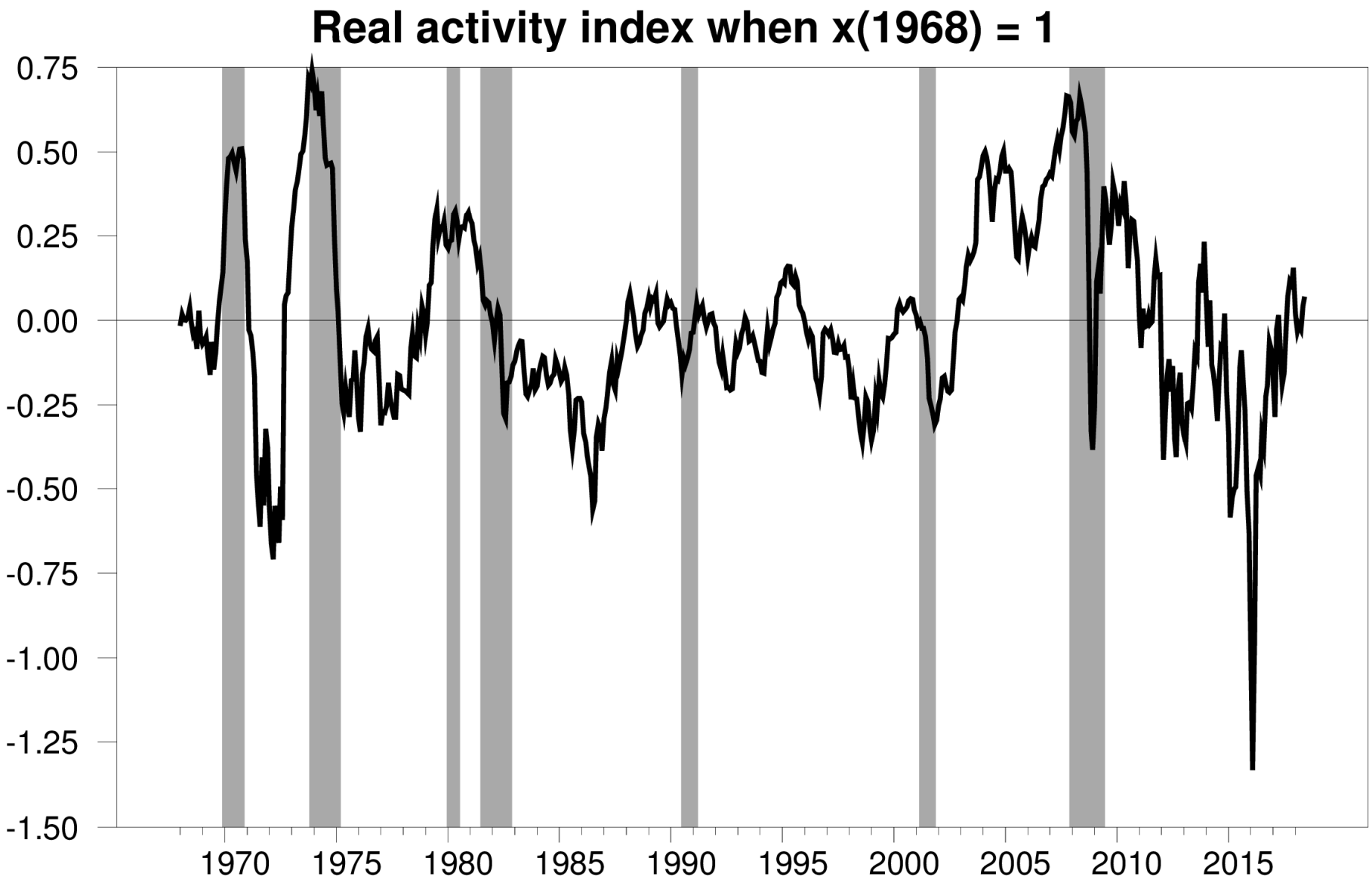
Calculate

$$\log(x_t/CPI_t) = \log(x_t) - \log(CPI_t)$$

Regress

$$\log(x_t) - \log(CPI_t) = \alpha + \beta t + \varepsilon_t$$

residuals ε_t are the Kilian REA index


Real activity index when x(1968) = 1
0.75
0.50
0.25
0.00
-0.25
-0.50
-0.75
-1.00
-1.25
-1.50
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015

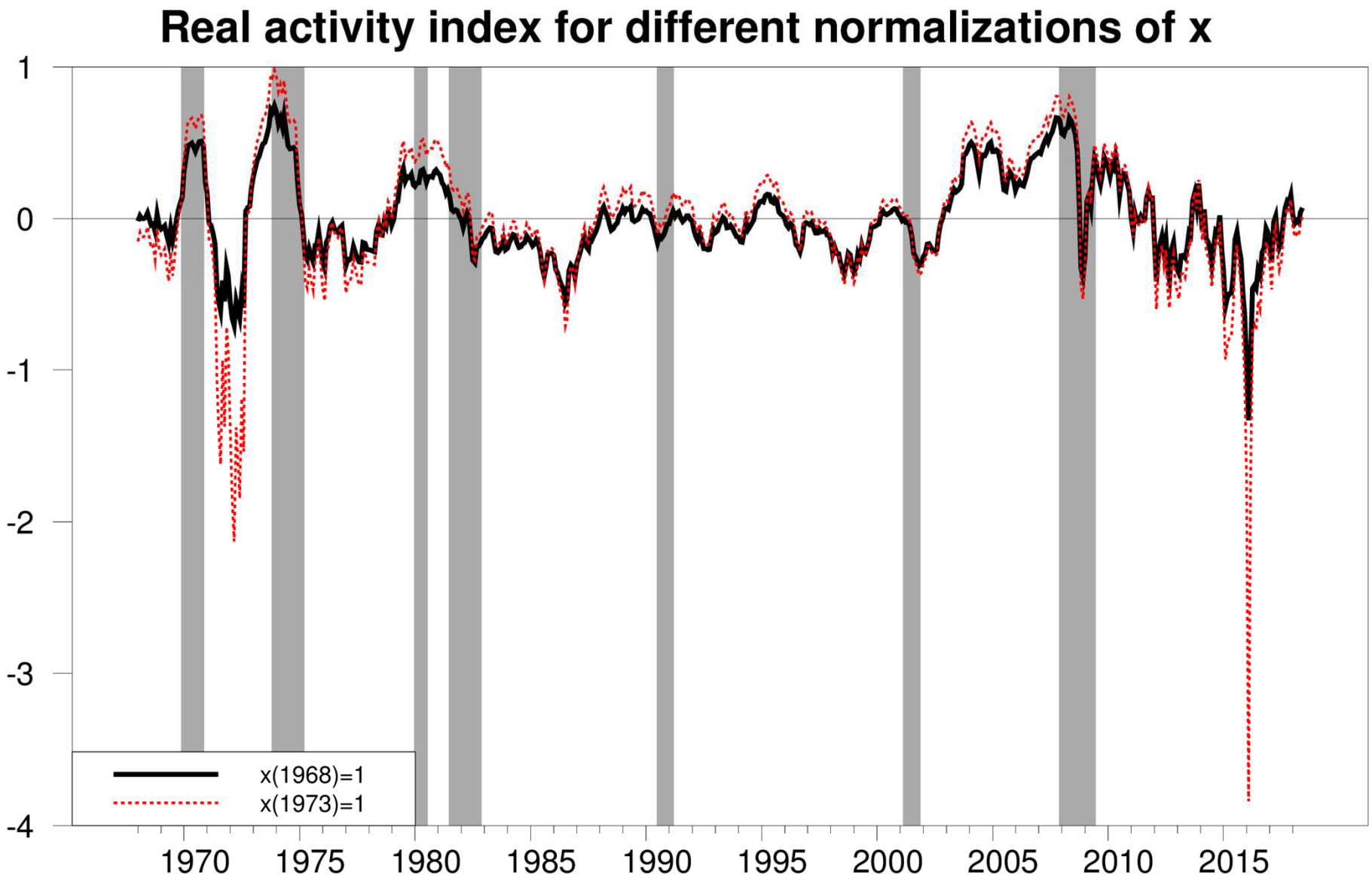
$x_t = \log(BDI_t) - 5.236$ for $t \geq$ 2008:1 when $x_{1968:1} = 1$

$\log(x_t) - \log(CPI_t) = \alpha + \beta t + \varepsilon_t$

$= \log[\log(BDI_t) - 5.236] - \log(CPI_t)$ when $x_{1968:1} = 1$

Would be

$\log[\log(BDI_t) - 5.694] - \log(CPI_t)$ if $x_{1973:1} = 1$


Real activity index for different normalizations of x
1
0
-1
-2
-3
-4
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
x(1968)=1
x(1973)=1

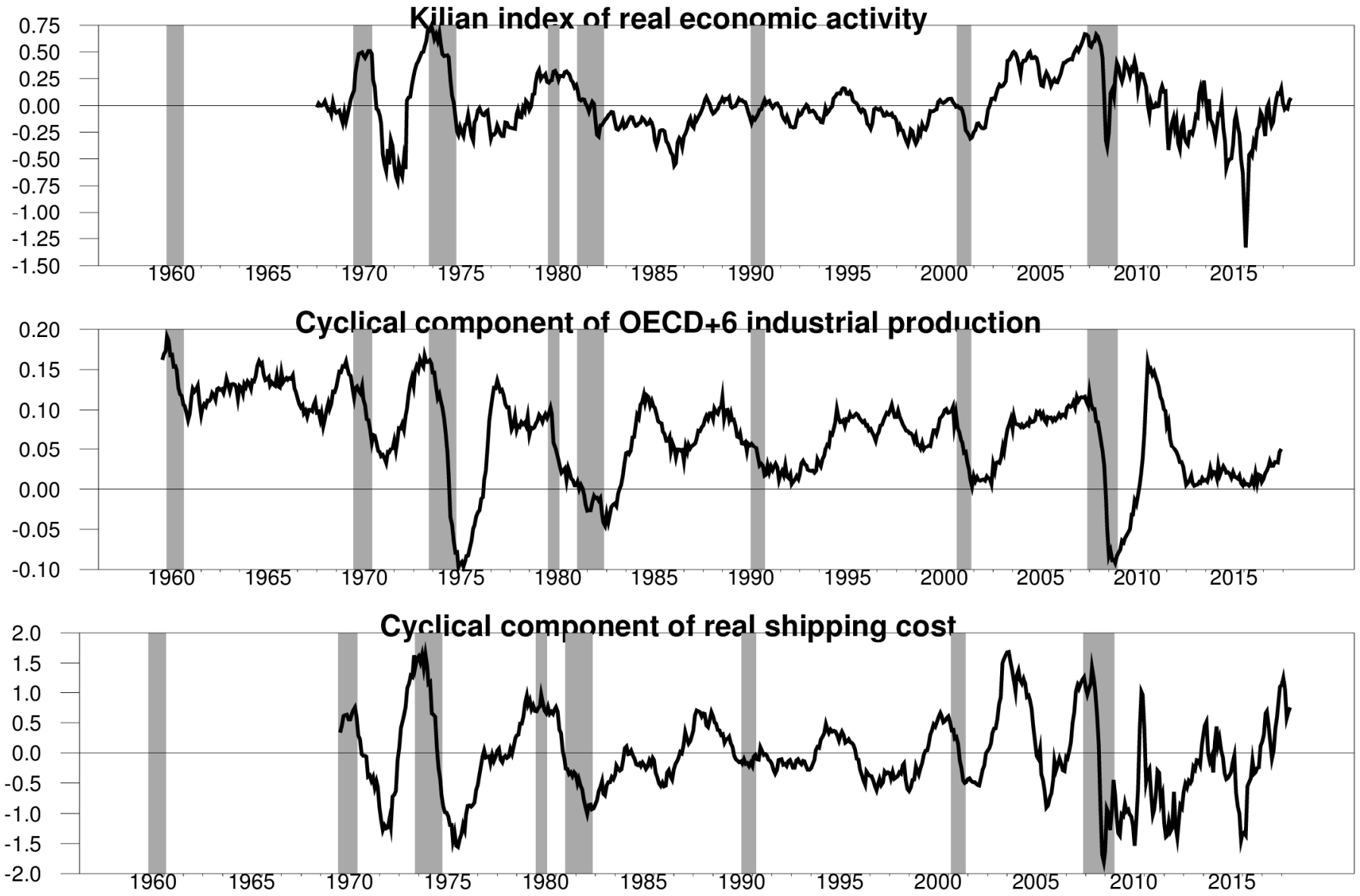
Why would linear trend fit to

$$\log[\log(BDI_t) - c_0] - \log(CPI_t)$$

summarize growth in shipping capacity, improvements in shipping technology, and potential GDP?

Alternative option:

- OECD Main Economic Indicators of industrial production in OECD + 6 major countries goes back to 1958:1
- Includes China since 1999
- Updated by Baumeister and Hamilton (2018)
- Isolate cyclical component as in Hamilton (forthcoming) by $\log(y_t/y_{t-24})$
- If want to use shipping cost instead, better measure is $x_t - x_{t-24} - \log(CPI_t/CPI_{t-24})$


Kilian index of real economic activity
0.75
0.50
0.25
0.00
-0.25
-0.50
-0.75
-1.00
-1.25
-1.50
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Cyclical component of OECD+6 industrial production
0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Cyclical component of real shipping cost
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015

Daily cyclical component of real shipping cost, Mar 16, 2011 - Jul 16, 2018