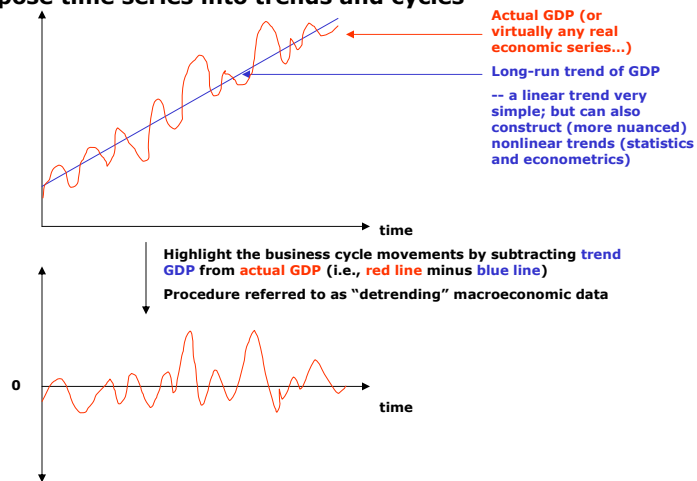


A BRIEF HISTORY OF MACROECONOMICS (CONTINUED)

APRIL 6, 2009

BUSINESS CYCLES

- Decompose time series into trends and cycles



THE RISE OF MACROECONOMICS

- ❑ **“Macroeconomics”** born as a field during and because of the Great Depression
 - ❑ Idea that government could/should regulate the periodic ups and downs of the economy rose to prominence
- ❑ **John Maynard Keynes, *The General Theory of Employment, Interest, and Money* (1936)**
 - ❑ Basic tenet: various “rigidities” in many markets lead to “disequilibria” that can last a long time
- ❑ **Burns and Mitchell, *Measuring Business Cycles* (1946)**
 - ❑ First systematic accounting of the co-movement of various aggregates
 - ❑ i.e., GDP, consumption, employment, inflation, unemployment rate, etc...
- ❑ How to **“model”** (i.e., conceptually/rigorously/mathematically think about) business cycles?
 - ❑ Phase II: The big macroeconometric models

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THE GLORY DAYS OF MACROECONOMICS

- ❑ **Big “Keynesian macroeconometric” models prominent by the 1960’s, led by**
 - ❑ Kennedy’s Council of Economic Advisers (Solow, Tobin, Samuelson)
 - ❑ MIT/Penn/Federal Reserve Board
 - ❑ ISLM and AS/AD model (Hicks, 1937) the conceptual core

General idea of Keynesian-inspired macroeconometric models

$$x_{1t} = \alpha_0 x_{2t} + \alpha_1 x_{3t} + \alpha_2 x_{3t} + \dots$$

$$x_{2t} = \alpha_3 x_{1t} + \alpha_4 x_{3t} + \alpha_5 x_{4t} + \dots$$

⋮

$$x_{136t} = \alpha_{5987} x_{1t} + \alpha_{5988} x_{13t} + \alpha_{5989} x_{69t} + \dots$$

It’s all about estimating the alpha terms...

Dozens or hundreds of variables and equations, some of which describe how policy affects the economy

Say x_3 and x_{13} are policy variables

- ❑ **Statistical relationships between various macro variables**
- ❑ **Basic approach: estimate (econometrically) these equations and use them for policy advice**
 - ❑ In particular: estimate all the alpha coefficients using historical data and posit that this is *how* the macroeconomy “works”
- ❑ **An approach to macroeconomic policy-making embodied most succinctly in the view and purported promise of the **Phillips Curve****

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THE FALL OF MACROECONOMICS

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General idea of Keynesian-inspired macroeconomic models
One of these equations is the Phillips Curve

$$\begin{aligned}
 x_{1t} &= \alpha_0 x_{2t} + \alpha_1 x_{3t} + \alpha_2 x_{3t} + \dots \\
 x_{2t} &= \alpha_3 x_{1t} + \alpha_4 x_{3t} + \alpha_5 x_{4t} + \dots \\
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 \end{aligned}$$

Dozens or hundreds of variables and equations, some of which describe how policy affects the economy

Say x_3 and x_{13} are policy variables

- ❑ Became widely used for policy-making...
- ❑ ...until they stopped "working" in the 1970's
 - ❑ Amidst a high-inflation environment (U.S. inflation between 15-20% in second half of 1970's), sparked by OPEC oil embargoes
- ❑ **Lucas Critique (1976): The alpha's themselves should be thought of / modeled as functions of government policy!**

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THE LUCAS CRITIQUE

- ❑ Crucial inconsistency in Keynesian macroeconomic approach
 - ❑ The estimated coefficients (the alpha's) themselves may change if policy (monetary and/or fiscal) changes!
 - ❑ In which case the macroeconomic approach *cannot* usefully give policy advice – unless one "knows"/makes assumptions about **how** the alpha's themselves depend on policy...
- ❑ Discovered in the 1970's amidst world-wide macroeconomic turbulence induced (seemingly...) by the two oil crises
 - ❑ The usual Phillips relation "stopped working" even as policy-makers tried harder than ever to exploit it
 - ❑ Led to breakdown of existing macroeconomic theory and opened the door for a complete re-thinking of the basic tenets of macroeconomics
- ❑ Keynesian macroeconomic models are **not economic models**
 - ❑ Merely a statistical description of historical events
 - ❑ Economics: the study of how incentives influence behavior of individuals/market participants
 - ❑ **A damning criticism of the entire macroeconomics profession...**

This "problem" was always present, but didn't reveal itself until the 1970's

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- ❑ **How to “model” (i.e., conceptually/rigorously/mathematically think about) business cycles?**
 - ❑ **Phase II: The big macroeconometric models**
 - ❑ **Death knell spelled by the devastating Lucas Critique**
 - ❑ **Phase III: Microeconomic foundations and DGE modeling**

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THE REBIRTH OF MACROECONOMICS

- ❑ **Kydland and Prescott (1982)**
 - ❑ A **dynamic general equilibrium (DGE)** view of business cycles
 - ❑ A “real” business cycle (RBC)
 - ❑ TFP shocks the driving force, not policy shocks
 - ❑ Business cycles are efficient and “natural”...
 - ❑ ...so macroeconomic policy aimed at stabilizing cycles is unimportant/misguided

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- ❑ **An economic theory, not a statistical theory**
 - ❑ **Building blocks**
 - ❑ Consumer preferences
 - ❑ Production technology
 - ❑ Interactions through markets (goods, labor, and financial markets)
 - ❑ The "alpha's" are functions of policy variables (if policy variables present in the model)...
 - ❑ ...thus immune to Lucas Critique

PRINCIPLES OF RBC MACROECONOMICS

- ❑ **Basic Tenets**
 - ❑ Markets operate (nearly) perfectly competitively
 - ❑ Price rigidities/inflexibilities are *not* very important – **conceptual break from Keynesian principles**
 - ❑ Model the economic interactions, not merely the statistical relationships – **methodological break from Keynesian principles**

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EXAMPLE

Period	Output	Capital	Labor	TFP
2004	12.0	16	9	
2005				
2006				
2007				

Suppose alpha = 0.5 for simplicity (U.S. economy: alpha ≈ 0.30)

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What's “left over” after accounting for what we can account for

EXAMPLE

Period	Output	Capital	Labor	TFP	
2004	12.0	16	9	1.0	Productivity improved between 2004 and 2005
2005	14.4	16	9	1.2	
2006	19.2	16	16	1.2	Productivity stagnated between 2005 and 2006
2007	17.6	16	16	1.1	

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TFP SHOCKS

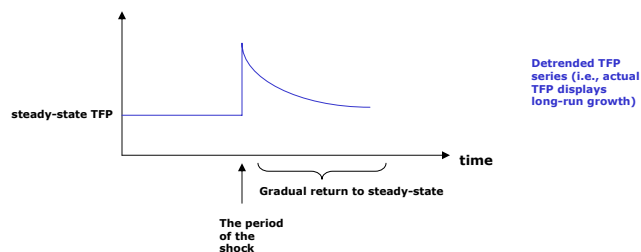
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TFP SHOCKS

- Shocks to TFP are **persistent**
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 - Example: If $A_{2000} > A_{1999}$, then A_{2001} is likely to be higher than A_{1999} as well, **but not as large as** A_{2000}

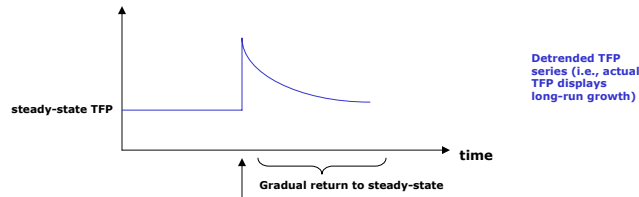
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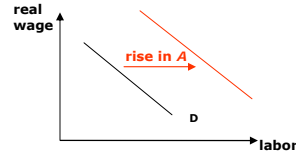
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- **RBC view**
 - Persistent TFP shocks the driver of business cycles
 - NOT policy shocks
- Over two-thirds of business-cycle fluctuations driven by TFP shocks

RBC MECHANISM: AN EXAMPLE

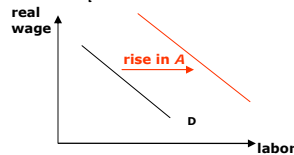
- **Positive TFP shock occurs (i.e., TFP rises)**
 - **Effect on labor market:** rise in $A_t \rightarrow$ rise in $MPN_t \rightarrow$ shift in labor demand



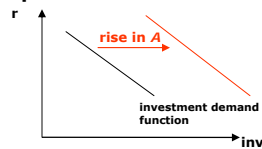
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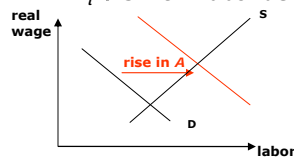
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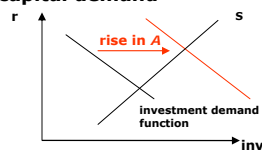
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Superimposing the supply sides of the labor and financial markets:

1. Investment (one of the components of GDP) rises
2. EQUILIBRIUM quantity of labor rises...
3. Hence total output (i.e., GDP) rises (because both A_t and n_t rise)

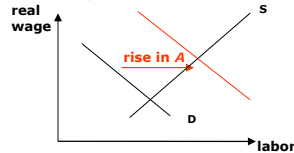
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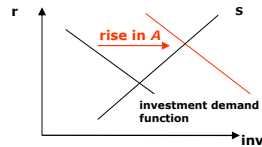
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TFP shocks lead to fluctuations in GDP

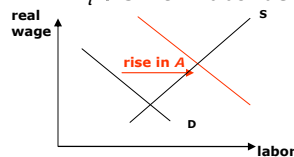
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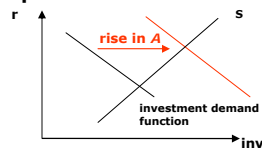
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What is TFP? Could be...

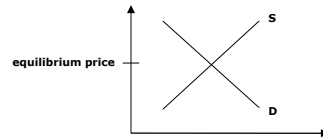
- Literally technology (better computers, etc.)
- Better-educated workers
- More open international trade
- Financial market turmoil
- ...

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APPRECIATING EQUILIBRIUM

- Prices coordinate activity of suppliers and demanders (whether P , w , or r ; basic idea same in any market)

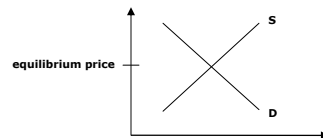


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- Macro markets (suppose no taxes anywhere for simplicity)

CONSUMERS

Consumption-leisure
optimality condition

$$\frac{u_l(c_t, l_t)}{u_c(c_t, l_t)} = w_t$$

Consumption-savings
optimality condition

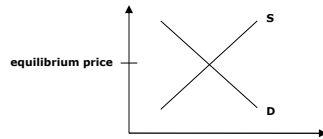
$$\frac{u'(c_t)}{\beta u'(c_{t+1})} = 1 + r_t$$

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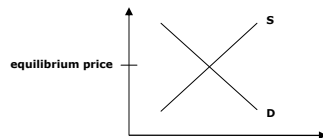
FIRMS

$$w_t = mpn_t (= A_t f_n(k_t, n_t)) \quad \text{Optimal labor demand}$$

$$r_t = mpk_t (= A_t f_k(k_t, n_t)) \quad \text{Optimal investment demand}$$

APPRECIATING EQUILIBRIUM

- Prices coordinate activity of suppliers and demanders (whether P , w , or r ; basic idea same in any market)



- Macro markets (suppose no taxes anywhere for simplicity)

CONSUMERS

Consumption-leisure
optimality condition

$$\frac{u_l(c_t, l_t)}{u_c(c_t, l_t)} = w_t$$

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FIRMS

Consumption-savings
optimality condition

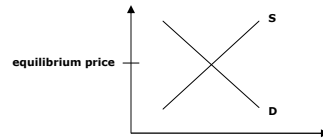
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$$\frac{u_l(c_t, l_t)}{u_c(c_t, l_t)} = mpn_t \quad \text{EQUILIBRIUM IN THE LABOR MARKET}$$

$$\frac{u'(c_t)}{\beta u'(c_{t+1})} = 1 + mpk_t \quad \text{EQUILIBRIUM IN THE CAPITAL MARKET}$$

- Prices **anonymously** coordinate activity of suppliers and demanders
 - “Invisible hand” described by Adam Smith (*Wealth of Nations*, 1776)

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WHERE IS MACROECONOMICS TODAY?

- **Keynesian Macroeconomics**
 - **Ideology:** Price rigidities/“sticky prices”
 - **Policy stance:** policy (fiscal and monetary) of crucial importance for macroeconomic performance
 - **Methodology:** econometric/statistical modeling
- **RBC Macroeconomics**
 - **Ideology:** Prices are not rigid or “sticky”
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- ❑ **Today's crucible issue in macroeconomics: monetary neutrality?**
 - ❑ **Does monetary policy have any important effects on the *real* economy?**

MONEY AND BONDS

APRIL 6, 2009

Introduction

IS MONETARY POLICY NEUTRAL?

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- ❑ **RBC view:** money is neutral (because prices are not rigid/sticky in any important way)
- ❑ To seriously consider the issue, need to finally explicitly think about money and monetary policy
 - ❑ It's only been in the background of our analyses thus far...

THE ROLES OF MONEY

- ❑ The roles played by **money**
 - ❑ **Medium of exchange**
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$$u\left(c_t, \frac{M_t}{P_t}\right)$$
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 - ❑ **IMPORTANT: It's not M_t in the utility function, but rather M_t/P_t**

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REAL MONEY BALANCES

- ❑ M_t/P_t a key variable for macroeconomic analysis
- ❑ **Unit Analysis (i.e., analyze algebraic units of variables)**
 - ❑ **Units(M_t) = \$**
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 - ...which is presumably what people most care about
- M_t and P_t can potentially grow at different rates
 - In which case real money balances change

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MONEY MARKETS AND BOND MARKETS

- A prerequisite for studying money and monetary policy: understanding bonds and bond markets
- Bond markets and money markets intimately linked to each other

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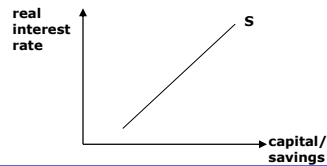
THE THREE MACRO (AGGREGATE) MARKETS

Many different *types* of assets exist...hence many different *types of financial markets*

1. Stock markets (Chapter 8)
2. Real-estate markets (Problem Set 5)
3. Bond markets (Chapter 14)
4. Money markets (Chapter 14)
5. Foreign-currency markets (Chapter 16)

❑ **Capital/Savings/Funds/Asset Markets
(aka Financial Markets)**

- ❑ Supply derived from C-S model



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 - ❑ Coupon bonds – pay something back ("coupon payments") every so often until the final date of maturity
 - ❑ Zero-coupon bonds – only pay back at final date of maturity

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 - ❑ Also sheds light on the pricing kernel (recall from Chapter 8)
 - ❑ Stock prices linked to bond prices

Asset-pricing lurking in the background again...

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BOND MARKETS

- ❑ Key relationship between price of a bond and nominal interest rate

Bonds priced according to present-value of future payoff

$$P_t^b = \frac{FV_{t+1}}{1+i_t}$$

- ❑ Notation
 - ❑ P_t^b : nominal price of a one-period bond
 - ❑ i_t : nominal interest rate between period t and period $t+1$
 - ❑ FV_{t+1} : face-value of bond (i.e., how much will be repaid in $t+1$)

In reality, many different values of FV (\$100, \$1000, \$10,000, etc...)

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$$\longleftrightarrow i_t = \frac{1}{P_t^b} - 1$$

IMPORTANT: inverse relationship between P^b and i

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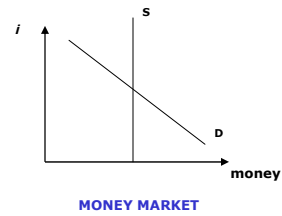
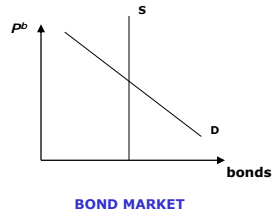
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- Inverse relationship between price of a bond and nominal interest rate – critical
- Bond markets are/have been the **usual** conduit through which Fed conducts monetary policy

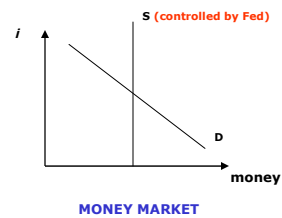
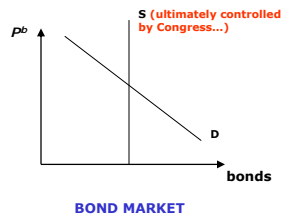
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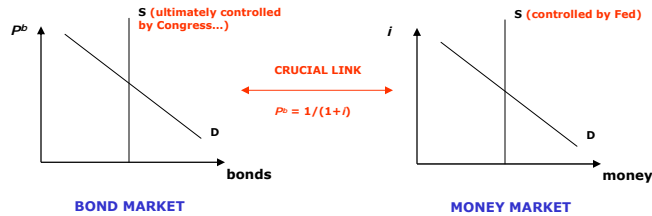
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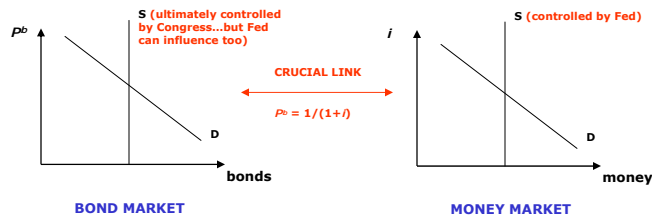
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 - Opportunity cost of holding money
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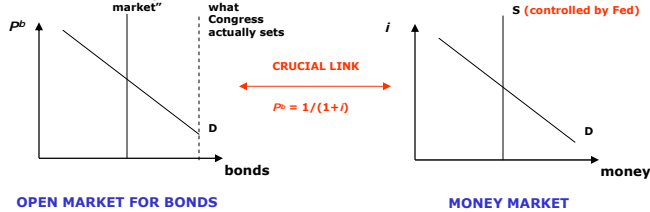
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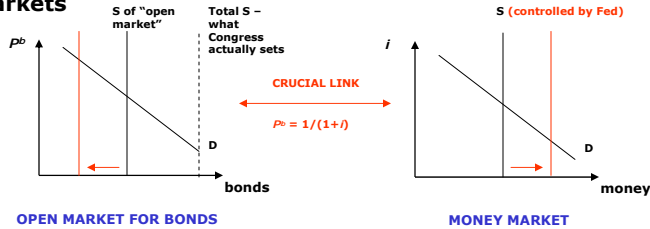
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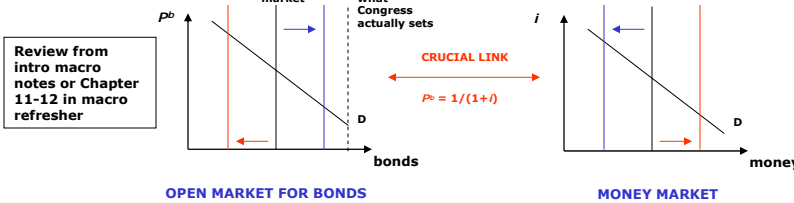
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- Expansionary monetary policy by Fed
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MONEY MARKETS AND BOND MARKETS

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 - ...by printing new money, increasing its supply in money market...
 - ...which causes i to decrease
- **Contractionary monetary policy by Fed**
 - Fed sells bonds to banking sector, increasing supply on open market...
 - ...in exchange for money, decreasing its supply in money market...
 - ...which causes i to increase

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- ❑ **The "art" and "science" of monetary policy**
 - ❑ Activist monetary-policy-making a fairly recent phenomena (only since 1970's)
 - ❑ History of money and the Federal Reserve at www.federalreserve.gov