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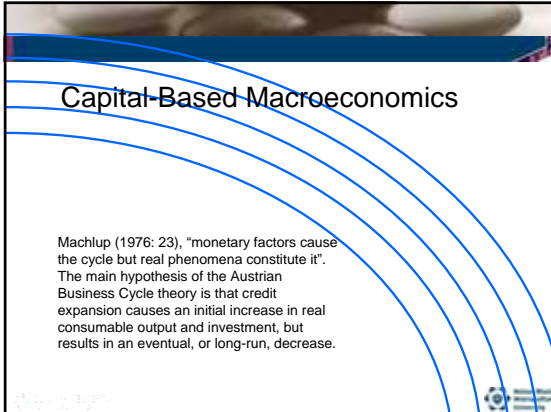


Pierre le Roux and Gary Sharp

The impact of interest rates on real consumable output and investments: a capital-based approach.

Capital-Based Macroeconomics

Machlup (1976: 23), "monetary factors cause the cycle but real phenomena constitute it". The main hypothesis of the Austrian Business Cycle theory is that credit expansion causes an initial increase in real consumable output and investment, but results in an eventual, or long-run, decrease.




Capital-Based Macroeconomics in Perspective

The Elements of Capital-Based Macroeconomics

- The Production Possibilities Frontier
- The Loanable-Funds Market
- The Structure of Production
- Stage-Specific Labor Markets

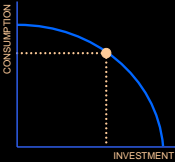
Applications of Capital-Based Macroeconomics

- Sustainable Growth (supported by saving)
- Unsustainable Growth (triggered by credit creation)



In capital-based macroeconomics, consumption and investment represent *alternative* uses of the economy's resources.

Under favorable conditions, a fully employed market economy allocates resources to both uses, making the most of the trade-off.

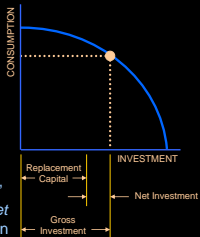
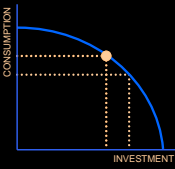


The Production Possibilities Frontier

"Investment" in this construction represents *gross* investment, which includes replacement capital.

Typically, the investment needed just to replace worn out or obsolete capital is something less than total, or gross, investment.

The difference between the "replacement" and the "gross" magnitudes constitutes *net* investment, which allows for the expansion of the economy.

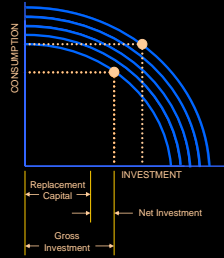



Watch the movement *along* the PPF.

Importantly, a change in saving preferences, which provokes a movement *along* the initial PPF, affects the rate at which the PPF expands outward. Suppose people become more thrifty, more future oriented. They reduce their current consumption and save instead. With the increased saving (and investment), the economy grows at a faster rate.

Watch the economy grow.

Four periods of growth are shown—with consumption, as well as saving and investment, increasing in each period.

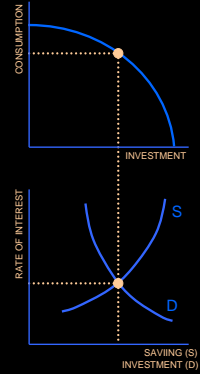


The loanable-funds market and the production possibilities frontier tell mutually reinforcing stories.

The loanable-funds market shows how the interest rate brings saving and investment in line with one another.

The production possibilities frontier shows how the tradeoff is struck between consumption and investment.

Market adjustments in output prices, wage rates, and other input prices keep the economy functioning on its PPF.

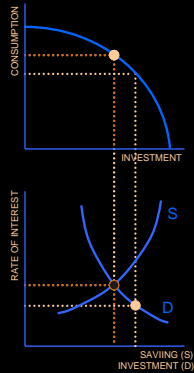


These two elements of capital-based macroeconomics show the pattern of movements in consumption, saving, investment, and the interest rate that are consistent with a change in intertemporal preferences.

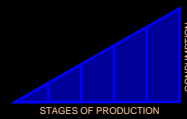
As before, we let savers become more future-oriented. They save more, which transmits a signal (a *lower* interest rate) to the business community.

Watch the saving-induced decrease in the interest rate and the corresponding movement along the PPF.

The lower interest rate establishes a new equilibrium in the loanable-funds market, as the economy moves *along* the PPF in the direction of more investment and less (current) consumption.



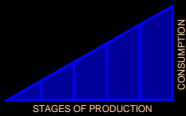
The Structure of Production



For pedagogical convenience, the initial capital structure is shown as having five stages. With growth, the number of stages will increase.

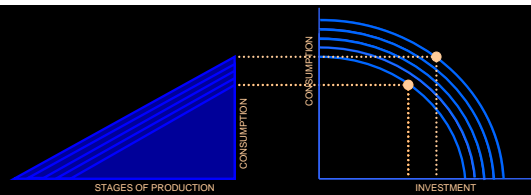
Although all five of these stages are in operation during each time period, resources can be tracked through the structure of production over time.

Watch the resources, or "goods in process," move through the stages.



Together, the sequence of stages form a Hayekian triangle, a summary depiction of the economy's intertemporal structure of production.

In a growing economy, the triangle increases in *size* along with the outward expansion of the production possibilities frontier.



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Watch the PPF and the Structure of Production expand together.

Stage-Specific Labor Markets

An increase in saving has differential effects on the demand for labor in the early and late stages.

In the late stages, the derived-demand effect (investment moves with consumption) dominates the interest-rate effect.

In the early stages, the differential rate effect (adjustment to a lower interest rate) dominates the gradient effect (the gradient of the investment curve is steeper than the gradient of the labor demand curve). Watch the economy respond to an increase in saving.

Credit Expansion

Increases in the money supply enter the economy through credit markets. The central bank literally lends money into existence.

The new money masquerades as saving. That is, the *supply of loanable funds* shifts rightward—but without there being any increase in *saving*.

Watch the opposing movements of saving and investment as the central bank adds money (ΔM) to the supply side of the market for loanable funds.

Responding to a lower interest rate, people actually save less and consume more.

The result is not a new sustainable equilibrium but rather a disequilibrium that, for a time, is masked by the infusion of loanable funds.

Pumping new money through credit markets drives a wedge between saving and investment.

Investors move down along their demand curves, taking advantage of the lower borrowing costs.

Savers move down along their unshifted saving curves in response to the weakened incentive to save.

The discrepancy between saving and investment is papered over with newly created money, which itself represents no investable resources.

Much of Hayek's writings on money is aimed as shifting the focus away from the bedrock relationship between money and the general level of prices and toward the intertemporal discoordination that is caused by credit expansion.

The dynamics traced out by the loanable-funds market and recorded on the PPF give us two perspectives on the consequences of credit expansion.

Watch the credit-driven movements.

There is some scope for movement beyond the PPF. The unemployment rate can fall (temporarily) below the level associated with full employment. And similarly, equipment can be kept in usage (again, temporarily) by delaying normal maintenance.

But the economic boom that takes the economy off its PPF will end in a bust before the implicit extra-PPF point is actually reached.

The low interest rate, consistent with a future orientation, stimulates investment activities in the early stages. But without sufficient resources being freed up elsewhere, many of these investment projects will never be completed.

In fact, increased consumer demand draws some resources toward the late stages, further reducing the prospects for completing a new capital structure.

The dynamics of boom and bust entail both overinvestment (as shown in the PPF diagram) and malinvestment (an unsustainable lengthening of the Hayekian triangle).

These distortions are compounded by overconsumption (as shown in both the PPF and the Hayekian triangle).

Mises repeatedly used the phrase "malinvestment and overconsumption."

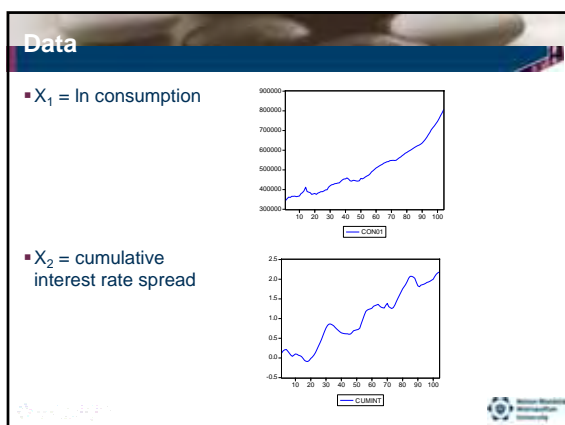
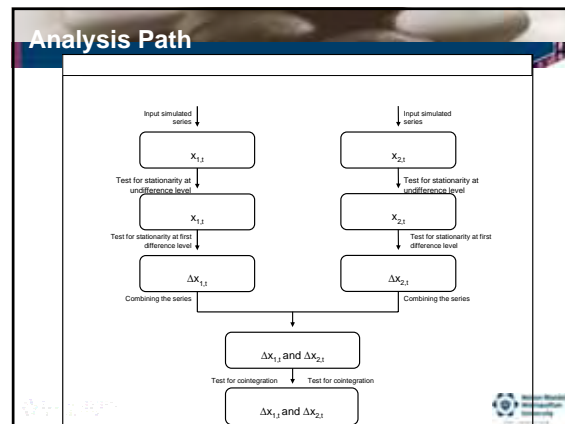
Methodology and data

The interest rate spread is calculated by subtracting the 91-day Treasury bill from the 10-year Eskom bond yield. (real Interest rate)

A decrease (increase) in the interest rate spread is, usually, indicative of an expansionary (contractionary) monetary action

Consumption was estimated by summing the seasonally adjusted annual rates of final consumption expenditure by households on durable goods, semi-durable goods, non-durable goods and services in constant 2000 prices.

The frequency of the data on the average yields of Eskom bonds was converted (to quarterly estimates) from monthly estimates, while the frequency of the data on the 91-day Treasury bill rate was converted (to quarterly estimates) from weekly estimates.



Unit root tests

- $X_1 = \ln \text{consumption}$
 - Series is nonstationary, whilst differenced series is stationary
- $X_2 = \text{cumulative interest rate spread}$
 - Series is nonstationary, whilst differenced series is stationary

Bivariate VAR model as VEC model (2 lags)

$$x_{1,t} = a_{11}x_{1,t-1} + a_{12}x_{2,t-1} + b_{11}x_{1,t-2} + b_{12}x_{2,t-2} + \varepsilon_{1,t}$$

$$x_{2,t} = a_{21}x_{1,t-1} + a_{22}x_{2,t-1} + b_{21}x_{1,t-2} + b_{22}x_{2,t-2} + \varepsilon_{2,t}$$

$$\Delta x_{1,t} = x_{1,t} - x_{1,t-1} = (a_{11}x_{1,t-1} - 1x_{1,t-1}) + (a_{12}x_{2,t-1} - 0x_{2,t-1}) + b_{11}x_{1,t-2} + b_{12}x_{2,t-2} + \varepsilon_{1,t}$$

$$\Delta x_{2,t} = x_{2,t} - x_{2,t-1} = (a_{21}x_{1,t-1} - 0x_{1,t-1}) + (a_{22}x_{2,t-1} - 1x_{2,t-1}) + b_{21}x_{1,t-2} + b_{22}x_{2,t-2} + \varepsilon_{2,t}$$

$$\begin{bmatrix} \Delta x_{1,t} \\ \Delta x_{2,t} \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} x_{1,t-1} \\ x_{2,t-1} \end{bmatrix} + \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \begin{bmatrix} x_{1,t-2} \\ x_{2,t-2} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \end{bmatrix}$$

Bivariate VAR model as VEC model (2 lags)

$$\Delta X_t = (A_1 - I)X_{t-1} + A_2X_{t-2} + E_t$$

$$= -(I - A_1 - A_2)X_{t-1} - A_2\Delta X_{t-1} + E_t$$

$$= \Pi X_{t-1} - \Pi_1 \Delta X_{t-1} + E_t$$

$$A_1 = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \quad A_2 = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \quad I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \quad E_t = \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \end{bmatrix}$$

$$\Pi = -(I - A_1 - A_2) \quad \Pi_1 = -\sum_{j=1}^p A_j$$

$$\Pi = \begin{bmatrix} \pi_{11} & \pi_{12} \\ \pi_{21} & \pi_{22} \end{bmatrix} = [\alpha_{ij}] [\beta_{ij}] = \begin{bmatrix} \alpha_1 \\ \alpha_2 \end{bmatrix} [\beta_1 \quad \beta_2] = \begin{bmatrix} \alpha_1\beta_1 & \alpha_1\beta_2 \\ \alpha_2\beta_1 & \alpha_2\beta_2 \end{bmatrix}$$

Cointegration Test

- Bivariate model – five year lag period
- Both trace and eigenvalue test indicate one cointegrating relationship

Cointegration Equation			
	Coefficient	Standard Error	t-Statistic
Constant	-12.42795		
Trend	-0.039927	0.00717	-5.56655
Cum. Spread	2.214249	0.47516	4.66003
Error Correction Process			
	ln(Consumption)	Cum. Spread	
Cointegrating Equation	-0.029918 (0.02467)	-0.082341 (0.02357)	
	[-1.21293]	[-3.49310]	
R-Squared	0.671712	0.967407	
Adjusted R-Squared	0.351241	0.935590	
Sum Square Residuals	0.001806	0.001650	
S.E. Equation	0.006558	0.006267	
F-Statistic	2.096012	30.40548	
Log Likelihood	332.1978	336.0052	
Akaike AIC	-6.909472	-7.000123	
Schwarz SIC	-5.694064	-5.791165	

Conclusions

The cointegrating equation firstly gives that all variables concerned are significant, given their t-statistics. Secondly it gives the result that a one unit change in the cumulative interest rate spread will result in roughly a 2% long-run change in the level of household consumption.

What is interesting to note is that a one unit decrease in cumulative interest rate spread will result in a 2% decrease in the level of household consumption. From the construction of the cumulative interest rate a decrease can only occur when the interest rate spread is negative. If the interest rate spread has changed from a positive value to a negative or indeed from a negative value to one that is more negative (i.e. if it has itself decreased) then this indicates the effect of an expansionary monetary policy decision.

This expansionary decision will then, according to the cointegrating equation, decrease the level of household consumption in the long run: the hypothesis of the Austrian Business Cycle Theory.

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