

貨幣、利率與匯率

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授課講義非經同意請勿引用
[主要取材自Krugman, et al.
(2018) chap. 4/ (2023) chap. 15]

1 貨幣定義

貨幣是...

- 最重要的交易媒介
- 最常見的資產類型
- 最普遍的金融投資工具
- 貨幣管理當局(如中央銀行)最為關注的政策指標之一
 - 貨幣數量變動跟**通貨膨脹**關係密切

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1-1 貨幣的功能

- **交易媒介**(medium of exchange)
 - 用它來購買商品與服務
- **計價單位**(unit of account)
 - 眾人衡量價格與價值的共同單位
- **價值儲藏**(store of value)
 - 將購買力從現在移轉或保存至未來



"HOW AM I GOING TO LEARN THE VALUE OF A DOLLAR
IF I'M ONLY GETTING 50¢ ALLOWANCE?"

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1-1.1 貨幣作為交易媒介

- 可免除在物物交換經濟(barter economy)下，**相互需求巧合**(double coincidence of wants)的風險
 - ⇒ 降低**交易成本**或**排除**搜尋成本(search costs)
- 有助經濟個體在生產活動中更為專業分工，經濟運作更具效率

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1-1.2 貨幣作為計價單位

- **計價單位**係用來衡量經濟價值或定價的標準
 - 採相同標準有利於商品價值作相互比較
- 在物物交換經濟之下，財貨種類愈多，其間標示交換價格的數目就愈繁複
 - 此時，**訂價作業的成本高**
 - 且可能發生標準不一的問題
- 用貨幣可簡化價格標示⇒交易成本大幅下降
- 以貨幣表示的價格
 - 物價、利率、匯率

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1-1.3 貨幣作為價值儲藏工具

- **價值儲藏**的作用是将當前購買力轉移至未來的的方法
 - 許多財貨本身可儲藏的時間極短(如鮮奶)，不利商品價值的保存
- 貨幣作為購買力儲存工具，可使個人財富或所得在時間上的配置或運用更具效率與彈性
- 貨幣雖非唯一的價值儲藏工具，但最具有**流動性**
 - **流動性**表示資產轉換成交易媒介的相對便捷程度
 - 流動性愈低代表轉換所需的交易成本愈高
 - 例如房地產的流動性就相對較低
 - 流動性最高的資產如通貨，可隨時支用，亦無轉換成本

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1-2 貨幣定義與貨幣供給

- **貨幣總計數 = 貨幣數量 = 貨幣供給**
- 台灣貨幣總計數係由中央銀行統計編制
 - 刊載於按月出版的「金融統計月報」
 - [中央銀行全球資訊網 首頁 > 統計與出版品 > 出版品](#)
- 央行金融統計所定義的貨幣總計數(見次頁)
 - M1A
 - M1B
 - M2

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我國央行編製的貨幣總計數

- $M1A \equiv \text{通貨淨額} + \text{支票存款} + \text{活期存款}^*$
 - 通貨淨額 = 央行通貨發行額 - 全體貨幣機構庫存現金**
 - 支票存款包括**本票**、保付支票及旅行支票
- $M1B \equiv M1A + \text{活期儲蓄存款}$
 - 支票存款+活期存款+活期儲蓄存款 = **存款貨幣**
- $M2 \equiv M1B + \text{準貨幣}$
 - **準貨幣**(quasi money)[或稱**近似貨幣**(near money)]包括定期及定期儲蓄存款(含NCD)、**外匯存款**(含外幣NCD)、郵政儲金、附買回交易餘額、外國人新台幣存款、**貨幣市場共同基金**(money market mutual fund, MMMF)(始於2004年10月)*
 - **NCD**：可轉讓定期存單

*存款係指企業及個人在「其他貨幣機構」的存款

**「全體貨幣機構」包括中央銀行、銀行與中華郵政儲匯處等機構；

「其他貨幣機構」則是不含央行的全體貨幣機構

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央行的貨幣總計數統計(2019年12月)[¶]

單位：新台幣十億元、%		
通貨	2,074.5	5%
+支票存款	371.6	1%
+活期存款	4,704.9	10%
=M1A	7,151.0	16%
+活期儲蓄存款	11,284.5	25%
=M1B	18,435.5	41%
+準貨幣	26,728.2	59%
=M2	45,163.7	100%

[台灣2019年GDP接近19兆]

¶ 日平均數

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1-2

- When we speak in this book of the **money supply**, we are referring to the monetary aggregate the Federal Reserve calls M1, that is, the total amount of currency and checking deposits held by households and firms
- The large deposits traded by participants in the foreign exchange market are not considered part of the money supply
- 但是...M1B甚或M2較佳
 - 台灣 vs. 美國
- **We assume for now that the central bank simply sets the size of the money supply at the level it desires**

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2 民眾的貨幣需求

- 民眾決定其貨幣需求(暨資產)時3個主要考量因素
- (1)相對預期報酬、利率與機會成本
 - 預期報酬(expected return)：持有期間的可能收益(+)
 - 其他條件不變時，若某個資產的預期報酬相較其他資產來得高，則該資產的需求會增加
 - Because an \uparrow in the i is a rise in the rate of return on less liquid assets relative to the rate of return on money, individuals will want to hold more of their wealth in nonmoney assets ... and less ... in ... money if the $i \uparrow$
 - The interest rate measures the *opportunity cost* of holding money rather than interest-bearing bonds
 - **機會成本**(opportunity cost)係指持有貨幣而未能擁有非貨幣資產(如債券)的犧牲與損失，即放棄獲取額外報酬的機會

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- (2)風險(risk)：報酬不確定的程度(-)
 - 其他條件不變時，若某個資產的風險相對上升，則該資產的需求會減少
 - 雖然Risk is not an important factor in money demand
但若非貨幣資產(如債券)的風險 \uparrow \Rightarrow 貨幣需求 \uparrow
- (3)流動性(liquidity)：資產變現的速度與提供交易的方便性(+)
 - 在其他條件相同下，若某個資產的流動性較其他資產高，則該資產愈具吸引力
 - a rise in the average **value of transactions** carried out by a household or firm causes its demand for money to rise

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3 總合貨幣需求

- 決定總合貨幣需求(aggregate money demand, M^d) 3個主要因素

– (1) 利率(i) (-)

- 機會成本(i)愈高，貨幣需求(即貨幣持有意願)愈低
- $i \uparrow \Rightarrow M^d \downarrow$; 反之... ($i \equiv R$ in Krug.)

– (2) 物價水準(P) (+)

- 物價效果：大眾關心貨幣的購買力(與交易時的方便性)，也就是貨幣所能買到的商品與服務數量；
- 當物價 $P \uparrow$ ，為維持貨幣購買力與流動性(即保持 M^d/P 不變)， M^d 右移(\uparrow)

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- 總合貨幣需求3個主要決定因素(cont.)

– (3) 實質所得(y) (+) ($y \equiv Y$ in Krug.)

- $y \uparrow \Rightarrow$ 交易性的貨幣需求 $\Rightarrow M^d$ 右移(\uparrow)

- 總合貨幣需求函數

$$M^d = P \times L(R, Y), \quad (4-1)$$

- 或以實質餘額(real balance)表示...

$$M^d/P = L(R, Y), \quad (4-2)$$

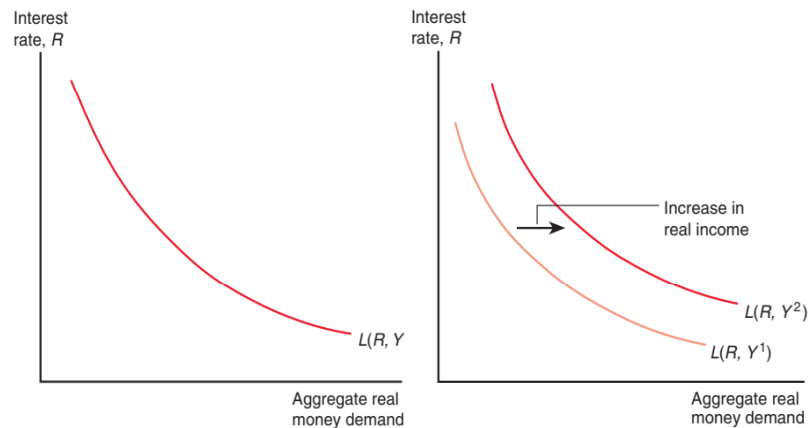
- 或稱**實質**(總合)貨幣需求函數
- 強調貨幣購買力；a demand to hold a certain amount of real purchasing power in liquid form
- **desired money holdings** measured in terms of a typical reference basket of commodities (如實質GDP或消費財)

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實質餘額、利率與實質所得



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4 均衡利率－貨幣市場均衡

- 流動性偏好理論的利率決定架構
 - 以貨幣的供需決定均衡利率的模型是為流動性偏好理論(或架構)(theory of liquidity preference)
 - 為經濟學家凱因斯(John Maynard Keynes, 1883-1946)所提倡的理論架構

- 貨幣市場均衡條件

$$M^d = M^s$$

- 或是(以實質餘額表示)

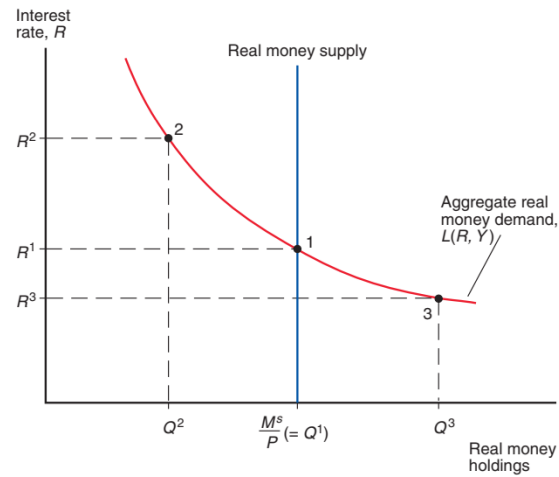
$$M^s/P = L(R, Y). \quad (4-4)$$

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Determination of the Equilibrium Interest Rate



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4-1 如何達到貨幣市場均衡？

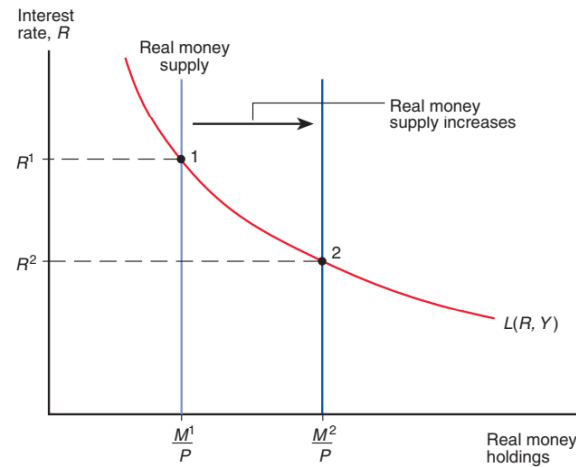
- 在均衡利率下，貨幣供需相等
- 當利率偏高時($R^2 > R^1$)
 - 貨幣市場產生超額供給($M^s > M^d$) \Leftrightarrow 非貨幣資產市場 (如債券市場)產生超額需求(如 $Bond^d > Bond^s$) $\Rightarrow R \downarrow$ ($p_{bond} \uparrow$)
- 當利率偏低時($R^1 > R^3$)
 - 貨幣市場產生超額需求($M^s < M^d$) \Leftrightarrow 債券市場產生超額供給($Bond^d < Bond^s$) $\Rightarrow R \uparrow$ ($p_{bond} \downarrow$)

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4-2 利率與貨幣供給

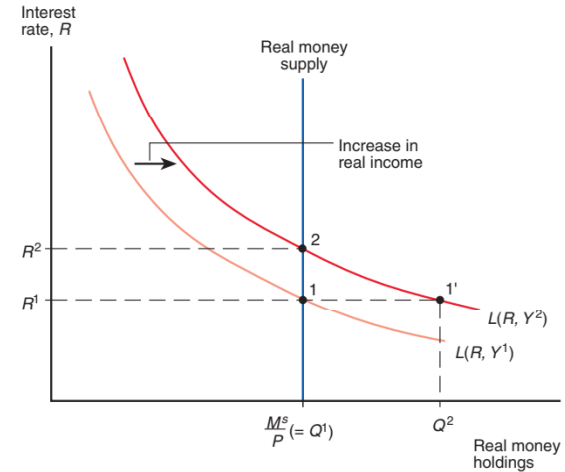


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4-3 產出與利率



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5 貨幣供給與匯率的短期關係

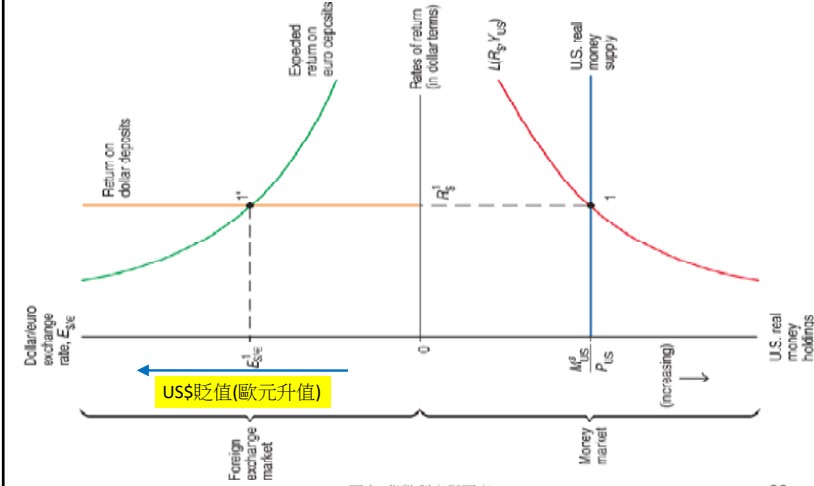
- an increase in a country's money supply causes its currency to depreciate in the foreign exchange market, while a reduction in the money supply causes its currency to appreciate
- to take the price level (along with real output) as given, and for that reason we label the analysis of this section **short run**
 - The long-run analysis of an economic event allows for the complete adjustment of the price level (which may take a long time) and for full employment of all factors of production

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5-1 連結貨幣、利率與匯率

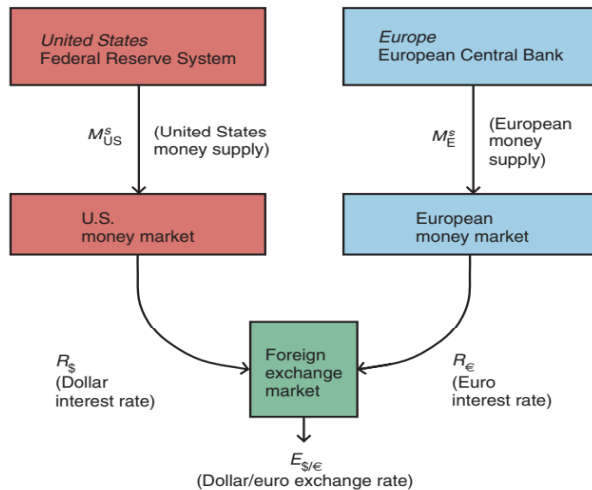


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(國內外)貨幣市場與匯率的連結



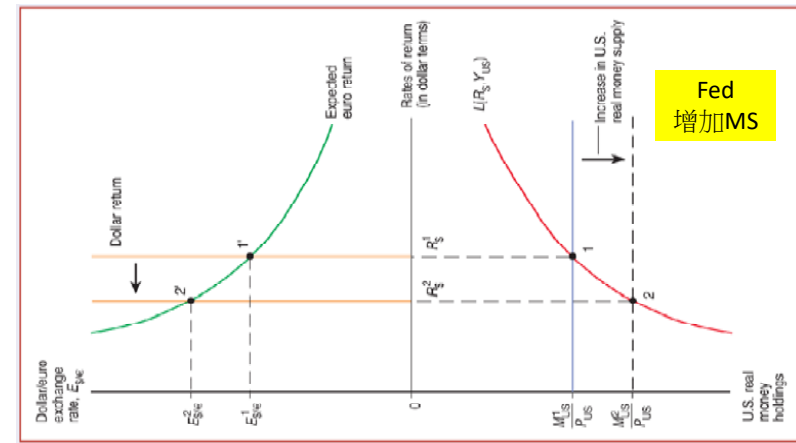
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5-2 U.S. 貨幣供給 and the Dollar/Euro 匯率

- Dollar/Euro 匯率：美國的直接報價、歐洲的間接報價

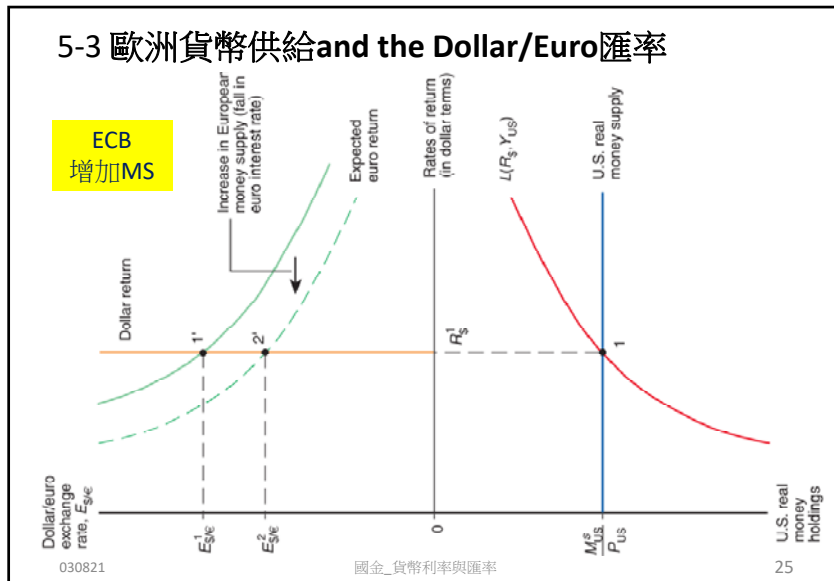


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5-3 歐洲貨幣供給and the Dollar/Euro匯率



6 貨幣、物價與匯率的長期關係

- Our **short-run analysis** of the link between countries' money markets and the foreign exchange market rested on the simplifying assumption that **price levels** and **exchange rate expectations** were given
- An economy's **long-run equilibrium** is the position it would eventually reach if no new economic shocks occurred during the adjustment to full employment
 - long-run equilibrium as the equilibrium that would be maintained after all wages and prices had had enough time to adjust to their **market-clearing** levels
 - ... that would occur if **prices were perfectly flexible** and always **adjusted immediately** to preserve full employment

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6-1 貨幣與物價(貨幣數量說)

- The **long-run equilibrium price level** is just the value of P that satisfies condition (4-5) when the interest rate and output are at their long-run levels, that is, at levels consistent with full employment

$$P = M^s / L(R, Y), \quad (4-5)$$

- 一般而言，the price level depends on the **interest rate**, **real output**, and the domestic **money supply**
- *All else equal, an increase in a country's money supply causes a **proportional** increase in its price level* (貨幣數量說)
 - 若 M^s 與 P 變動固定比例，(4-5) 關係不變，貨幣市場依然保持均衡

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6-2 貨幣供給變動的長期效果

- The full-employment output level is determined by the economy's endowments of labor and capital, so in the long run, **real output** does not depend on the money supply
- Similarly, the **interest rate** is independent of the money supply **in the long run**
 - Fisher 方程式： $i = r + \pi^e$ ($i \equiv R$ in Krug. 為名目利率)
 - **實質利率** r 由實體經濟(如實質可貸資金市場)決定+預期通膨 π^e (為外生給定) $\Rightarrow \dots$

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補充: 流動性偏好、利率與預期通膨

- Fisher效果: $\pi^e \uparrow (\downarrow) [AEE] \Rightarrow i (\text{即} R) \uparrow (\downarrow)$
- 流動性偏好理論下...
 - 流動性偏好需求可擴充為: $L(R, Y, -\pi^e, \dots)$, $\Delta L / \Delta (-\pi^e) > 0$ 此為貨幣的本身報酬(反映(1) π^e 的所得效果)
 - Note: 預期通膨愈大, 握有貨幣的本身報酬愈小(即 $-\pi^e \downarrow \Rightarrow L(\dots) \downarrow$)
 - (2) π^e 變動產生的替代效果: 若 π^e 變大, 非流動性(固定所得(fixed income))工具如債券的預期實質報酬 \downarrow , $L(\dots) \uparrow$ (vs. 債券需求 \downarrow)
 - 若所得效果 < 替代效果 $\Rightarrow R \uparrow$ (如同Fisher效果)
 - ...反之 $R \downarrow$

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補充: 古典vs凱因斯學派的貨幣與物價

- 古典架構
 - $R = r + \pi^e$, $Y = Y^*$ (皆屬實質變數...)
 - $L = L^* \Rightarrow P = M/L^* = M / ([1/V(R)]Y^*)$ (即 $MV = PY$) ; 貨幣數量決定物價水準
- 凱因斯架構
 - 流動性偏好理論決定市場利率 R
 - $R \Rightarrow$ (連同其他變數) AD (相關為(-))
 - 短期物價僵固: $AD \Rightarrow Y$
 - 長期物價調整: $AD + AS \Rightarrow P, Y$
 - 長期若生產投入充分就業 $Y = Y^*$: $AD \Rightarrow P$

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6-2

- *A permanent increase in the money supply causes a proportional increase in the price level's long-run value. (貨幣中立性—無實質效果)*
 - *In particular, if the economy is initially at full employment, a permanent increase in the money supply eventually will be followed by a proportional increase in the price level*

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6-3 實證上貨幣數量與物價的關係

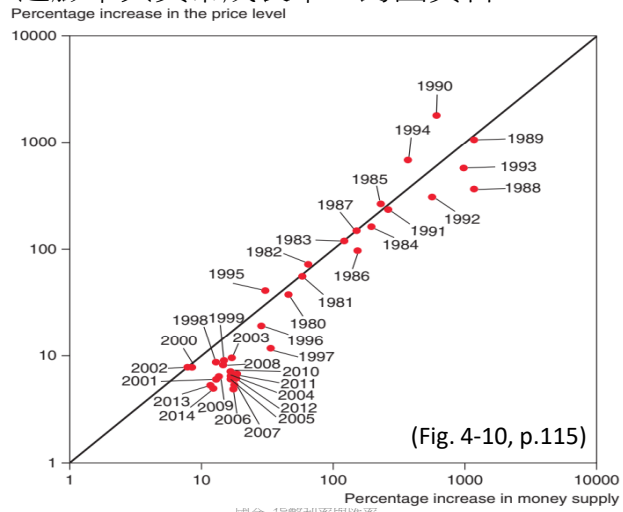
- 貨幣數量說推測...
 - 貨幣成長率較高的國家會有較高的通貨膨脹率
 - 一國之通貨膨脹的長期趨勢會近似於該國之貨幣成長率的長期趨勢

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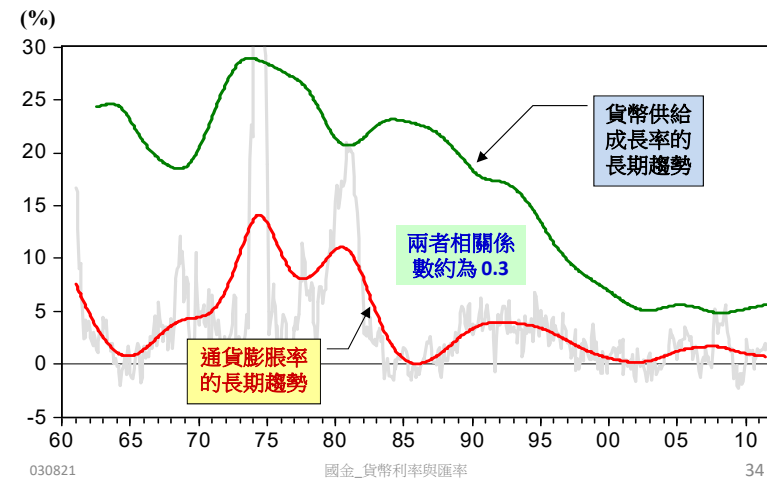
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6-3.1 通膨率與貨幣成長率—跨國資料*



6-3.2 台灣的通貨膨脹與貨幣成長(1962-2010)



6-4 貨幣與匯率的長期關係(購買力平價說)

- all else equal, a permanent increase in a country's money supply causes a proportional long-run depreciation of its currency against foreign currencies
- Similarly, a permanent decrease in a country's money supply causes a proportional long-run appreciation of its currency against foreign currencies

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6-4.1 購買力平價說(Purchasing Power Parity)

- PPP:

$$e \times P = P^*$$

以外國通貨計算的
外國商品籃成本。

以外國通貨計算的
本國商品籃成本。

以本國通貨計算的
本國商品籃成本。

- 求解 e (匯率=外幣/本幣) $\Rightarrow e = P^*/P$
- PPP 意味著兩國間的名目匯率 e 等於此二國之物價水準的相對比率(即兩國相對物價)
- 而且 $\% \Delta e = \pi_{\text{國外}} - \pi_{\text{國內}}$

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7 通膨與匯率的動態行為

- An economy experiences **inflation** (通膨) when its price level is rising and **deflation** (通縮) when its price level is falling
 - c.f. Disinflation (通膨減緩)
- ... how the exchange rate adjusts to monetary disturbances in the economy

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7-1 短期物價僵固與長期物價彈性調整

- 短期物價僵固(vs. 匯率, 見次頁)
 - Many prices in the economy, ...are written into long-term contracts and cannot be changed immediately when changes in the money supply occur (如勞工薪資)
- This assumption would not be reasonable, however, for all countries at all times
- 即便如此, (it is) most applicable to countries with histories of comparative price level stability (如美國與台灣)

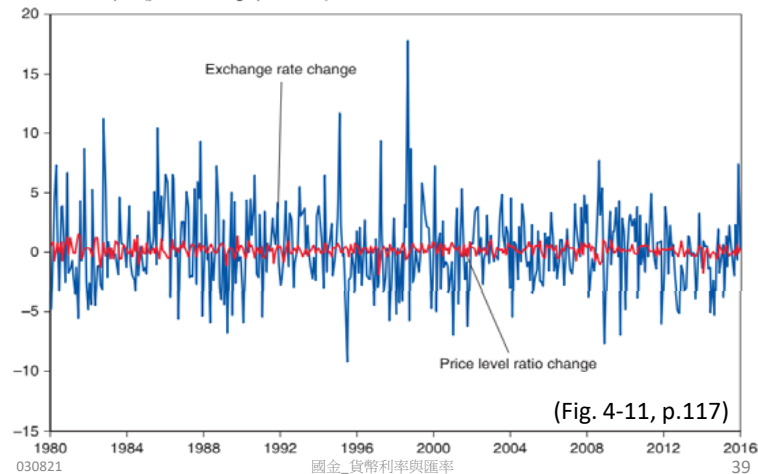
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匯率與相對物價變動(US/Japan)

Changes in exchange rate and price level ratios-U.S./Japan (percent change per month)



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7-1

- 就算短期間物價僵固, 但Ms的變化最終仍將給未來物價帶來若干上升的壓力包括來自:
 - 產出與勞動的超額需求 \Rightarrow 薪資(成本)、 $P \uparrow$
 - 通膨預期 \uparrow
 - 原物料價格 \uparrow
- 貨幣供給成長與惡性通貨膨脹(hyperinflation)

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7-2 惡性通貨膨脹(Hyperinflation)

- 定義：每個月的 $\pi \geq 50\%$ (Phillip Cagan, 1956)
- 貨幣不再具有價值儲存功能，且其他功能也可能跟著不保 (計價單位、交易媒介).
- 民眾可能改採以物易物的方式或用外國通貨來作交易
 - 參見以下Zimbabwe的例子
- 二戰前的德國與近代實例

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惡性通膨 – 1923年一條麵包在德國的價格

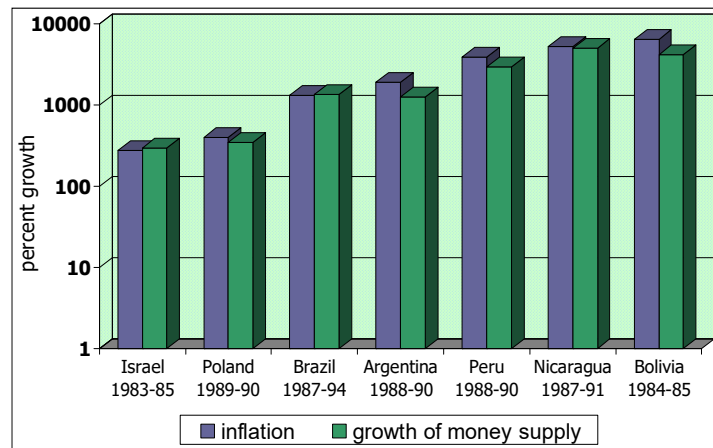
1921	1.35 (Mark)
1922.6月	3.5
1923.1月	700
.5月	1,200
.7月	100,000
.9月	2,000,000
.10月	670,000,000
.11月	80,000,000,000
1924	0.35

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惡性通貨膨脹 – 近代的例子



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7-2.1 惡性通貨膨脹的成因

- 元兇包括：
 - 貨幣數量急速增加(過度的貨幣供給成長)
 - 財政嚴重惡化(進而誘發貨幣融通)
- 惡性通貨膨脹係因貨幣供給嚴重過度成長所致：
 - 中央銀行印製鈔票時，物價水準上升。
 - 故增加的貨幣數量不足以支付財政原定的實質支出水準
 - 為了支撐實質政府消費增加，勢須進一步提高貨幣融通速度
 - 中央銀行有增無減的加速印製鈔票，其結果就產生惡性通貨膨脹

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7-2.2 委內瑞拉的惡性通膨

The IMF's 2018 Year-End Inflation Projections for Venezuela

Date of Projection	IMF Inflation Projection ¹
October, 2018	2,500,000%
July, 2018 ²	1,000,000%
April, 2018	12,874.6%
October, 2017	2,529.6%
April, 2017	2,529.6%

¹ These are the International Monetary Fund's year-end inflation projections for 2018 found in the biannual World Economic Outlook reports for 2017 and 2018.

² On July 23, 2018, in the IMF Blog, "Outlook for the Americas: A Tougher Recovery," Alejandro Werner, Director of the Western Hemisphere Department of the IMF, revised Venezuela's projection.

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7-2.2

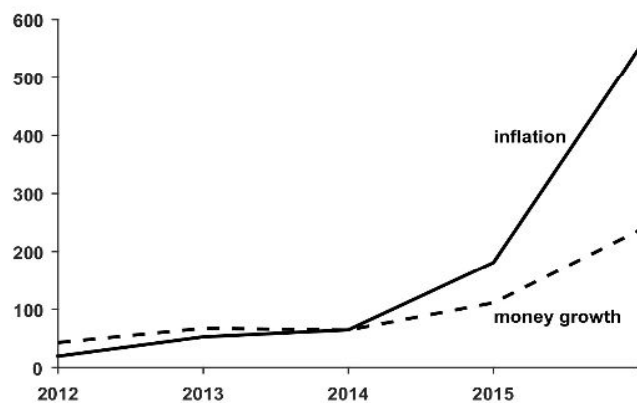
- to increase both spending and borrowing since Hugo Chavez came into power in 1998
- Inflation began to build up in 2003
- 2014年間國際油價崩跌⇒經濟下滑(30% from 2013 through 2017)、政府收入大幅減少、財政赤字嚴重惡化(greater than 20 percent as of 2015)
- 加上外匯存底流失、貨幣貶值(from \$30 billion in 2013 to less than \$10 billion in Aug. 2018)、進口價格飆升、對外舉債受阻等等
- 最後只有訴諸**貨幣融通**；但是，The more money it prints to fund imports, the more the currency depreciates (**and the higher the inflation is...** (見下圖))

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2012年之後委內瑞拉的貨幣成長與通膨*

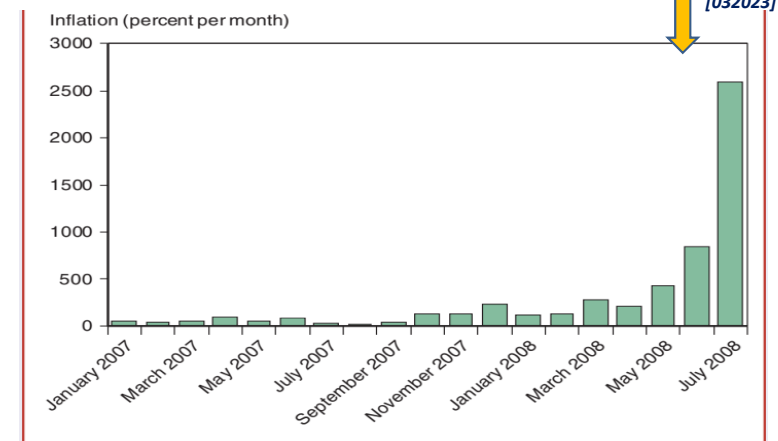


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7-2.3 另一現代版的惡性通膨－Zimbabwe



Monthly Inflation in Zimbabwe, 2007–2008

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7-2.3

[Congo War (1998-2003)]



1. Inflation rose from an annual rate of 32% in 1998, to an official estimated high of **11,200,000%** in August 2008 according to the country's Central Statistical Office
2. In January, 2009, Zimbabweans permitted **to use other, more stable currencies** (e.g. Sterling, Euro, South African Rand and **the United States Dollar**) to do business, alongside the Zimbabwe dollar.
3. On February 2, 2009, the RBZ announced that a further **12 zeros were to be taken off** the currency, with 1,000,000,000,000 (third) Zimbabwe dollars (Z\$) being exchanged for 1 new (fourth) dollar.
4. 最終辛巴威完全終止Z\$作為其法償貨幣(legal tender)；更重要的是，放棄印鈔的能力，且同時採嚴格的財政紀律法則("cash budgeting" rule) ... 結果通膨(以美元衡量)得以巨幅下降*

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7-2.3 (2009年之後的辛巴威)

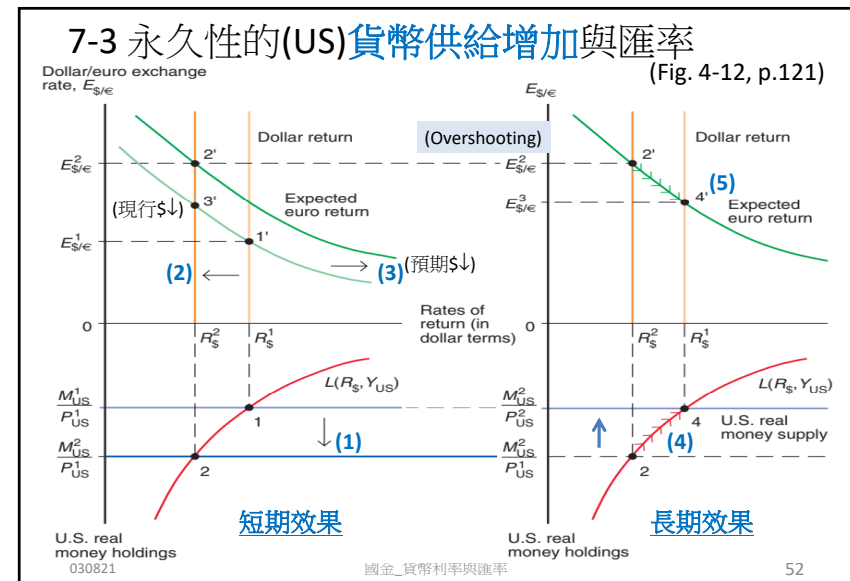
- 縱使依然有許多問題困擾著經濟，但通膨終於獲得控制(5%以下)
- 在2014年甚至發生通縮(deflation)
 - 主要反映美國低通膨、國際原物料及其出口價格崩跌(致經濟成長受阻)
- 因採外幣作為通貨，而無力自主創造貨幣來對抗通縮；又因出口不振，也無從累積外匯來增加MS，最後不得不對外舉債(向AEIB*)
- 2019年底又開始印Z\$鈔券(前身為電子通貨)
- 貨幣-財政-通膨的惡性循環重現(2020/3月通膨率高達676%/yr.)

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7-2.4 如何解決惡性通貨膨脹？

- 當政府無法任意增稅或舉債時...
- 貨幣融通—
印鈔票成為融通財政支出的唯一手段
- 理論上，解決惡性通膨十分簡單，就是：
停止印鈔票！
- 但是，這需要激烈且痛苦的**財政緊縮**

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7-3

- (1)美國貨幣寬鬆 \Rightarrow 美元報酬 $R_{\$}$ \downarrow 、美元貶值(3')
- 由於貨幣為永久性增加、帶動預期美元貶值 \Rightarrow 歐元報酬 \uparrow (曲線向右移) \Rightarrow 現行美元更為貶值(2')
 - Note: 美元匯價 – (2') < (3') [當預期匯價給定時]
- 之後，物價開始上升、實質餘額 $\downarrow \Rightarrow$ 利率上升(回到1 = 右下圖4)、美元報酬 \uparrow 、美元回升(至4')
- Like the price level (貨幣中立性), the dollar/euro exchange rate has risen **in proportion to the increase in the money supply** (購買力平價說)

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重點: 永久性政策、長期與短期影響

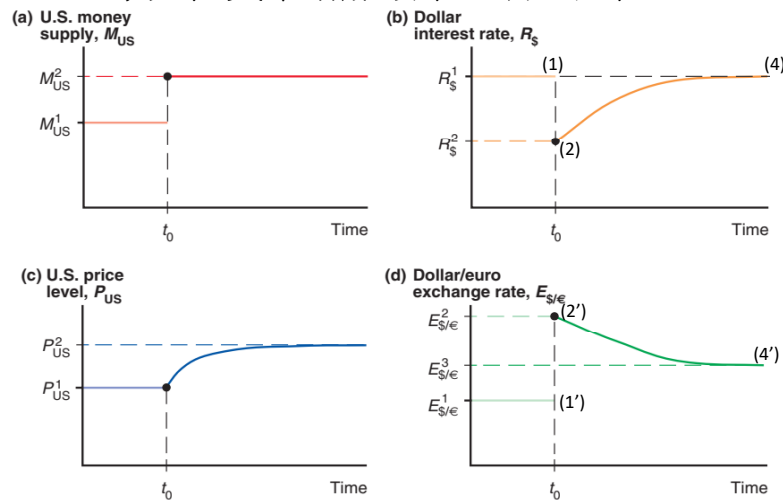
- 永久性政策 \Rightarrow 牽動改變預期(原假設給定)
- 短期環境: 物價僵固
- 長期情境: 物價會相應調整
 - 貨幣完全中立
 - 財政完全排擠
- 其他長期情境的可能變化
 - 生產資源到位: 如投資造就資本增加
 - 總體經濟能充分調整到達(新的)均衡
 - 包括貨幣面(如物價)與實質面(如產出與就業)...等等

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7-3.1 永久性貨幣增加效果—調整過程



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7-3.2 匯率超調(overshooting)

- The exchange rate is said to overshoot (調整過度) when its immediate response to a disturbance is greater than its long-run response (E2 vs E3 雖皆貶(cf E1)...)
- **Exchange rate overshooting** is an important phenomenon because it helps explain why exchange rates move so sharply from day to day
- Overshooting is a direct consequence of the **short-run rigidity** of the price level
- In a hypothetical world where **the price level could adjust immediately... there would be no need for overshooting...** The exchange rate would maintain equilibrium simply by jumping to its new, long-run level right away

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7-4 新興經濟的通膨目標與匯率(CS. pp123-5)

- 多元貨幣政策架構
 - 通膨目標、匯率目標、貨幣目標
- 複數的政策目標與通膨目標的挑戰
 - 經濟成長、物價穩定、匯率穩定
- 利率工具之於總經表現與通膨目標的兩難
 - It can have a **notable contradictory effect** when, in order to slow inflation, a central bank raises the interest rate but this increase slows GDP growth and attracts an inflow of foreign capital. This, in turn, puts pressure on the exchange rate (幣值↑). Similarly, (反之...⇒ π ↑)

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7-4

- Some empirical studies suggest that **inflation targeting** helps improve macroeconomic performance by keeping a check on both inflation and inflationary expectations while managing long-term interest rates
 - The IMF's Annual Report... in 2014, 34 countries were found to be directly targeting inflation, and 19 of these countries could be classified as emerging market economies
- 不過... A 2014 study by Samarina, Terpstra, and De Haan ... found inflation targeting (雖然) to have **no effect** for advanced economies but a significant **negative impact for emerging market economies**

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7-4.1 通膨目標與匯率

- Since the Asian Financial Crisis of 1997–1998... All inflation-targeting countries have either floating or free-floating exchange rate arrangements to avoid conflict with the management of interest rate
- 諸多學者的研究發現，... associated **low volatility in exchange rates** with the adoption of inflation targeting (特別是貨幣貶值如1997年...)
- 幣值暴跌不利物價穩定...
 - ⇒匯率穩定有助物價穩定

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7-4.1

- **通貨貶值**對國內物價與通膨的影響－匯率轉嫁效果(FX pass-through)
 - 兩階段影響：
 - (1) an immediate impact through the rise of **import prices**
 - (2) a “second round” impact, i.e., the change in **inflation expectations** that affect prices and wages and create a **permanent** effect on inflation
 - the IMF (2014) concludes that the exchange rate pass-through in countries that target inflation is smaller (why and how?...因有助掌控通膨預期，限縮(2))
- 但是... 採通膨目標機制也有明顯的副作用

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7-4.1

- 通膨與經濟成長的抵換：Ouyang and Rajan found that emerging market inflation targeting regimes in Asia face a lower rate of inflation... **However**, they also seemed to be experiencing a **lower growth rate**

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7-4.2 新興經濟的最佳策略

- Since every economy has its own macroeconomic challenges, **a single appropriate monetary policy is difficult to prescribe**
- Emerging market economies are also moving towards a mixed inflation-targeting strategy where their central banks manage both inflation and **real exchange rates**
- Ostry, David, Ghosh, and Chamon (2012) ...conclude ... that ...another instrument of monetary policy would be **foreign exchange intervention**. This would match the **two targets of monetary policy, inflation and exchange rate, with the number of instruments!** **FIN**

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