

# International macroeconomics

## Collection of formulas

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# 1 Balance sheets

<b>Households</b>	<b>Assets</b>		<b>Liabilities</b>	
	Money	[1], [2]	Net wealth	
	Bonds, shares	[3], [4]	Loans from banks	[5]
	Real assets			
<b>Firms</b>	<b>Assets</b>		<b>Liabilities</b>	
	Money	[1], [2]	Equity	[4]
	Bonds, shares	[3], [4]	Loans from banks	[6]
	Real assets		Corporate bonds	[3]
<b>Government</b>	<b>Assets</b>		<b>Liabilities</b>	
	Money	[1], [2]	Net wealth	
	Bonds, shares	[3], [4]	Government bonds	[3]
	Real assets			
<b>Banks</b>	<b>Assets</b>		<b>Liabilities</b>	
	Bank notes and coins	[1]	Equity	[4]
	Bank reserves	[8]	Bonds	[3]
	Bank loans to households	[5]	Bank deposits	[2]
	Bank loans to firms	[6]		
<b>Central bank</b>	<b>Assets</b>		<b>Liabilities</b>	
	Domestic credit	[3]	Bank reserves	[8]
	Official reserves	[7]	Bank notes and coins	[1]

Table 1: Balance sheets of economic agents.

<b>Home economy</b>	<b>Assets</b>		<b>Liabilities</b>	
	Bank notes and coins	[1]	Domestic real wealth	
	Bank reserves	[8]	Net external wealth (excl. CB)	
	Real assets		Domestic credit	[3]
	Net foreign assets (excl. CB)			
<b>Home central bank</b>	<b>Assets</b>		<b>Liabilities</b>	
	Domestic credit	[3]	Bank reserves	[8]
	Domestic official reserves	[7]	Bank notes and coins	[1]

Table 2: Consolidated balance sheets of home economy and central bank.

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<b>Home country</b>	<b>Assets</b>	<b>Liabilities</b>
	Real assets	Domestic real wealth
	Net foreign assets	Net external wealth

Table 3: Consolidated balance sheet of home country.

<b>Households</b>	<b>Assets</b>		<b>Liabilities</b>	
	Money	[1], [2]	Net wealth	
	Bonds, shares	[3], [4]	Loans from banks	[5]
	Real assets			
<b>Firms</b>	<b>Assets</b>		<b>Liabilities</b>	
	Money	[1], [2]	Equity	[4]
	Bonds, shares	[3], [4]	Loans from banks	[6]
	Real assets		Corporate bonds	[3]
<b>Government</b>	<b>Assets</b>		<b>Liabilities</b>	
	Money	[1], [2]	Net wealth	
	Bonds, shares	[3], [4]	Government bonds	[3]
	Real assets			
<b>Banks</b>	<b>Assets</b>		<b>Liabilities</b>	
	Bank notes and coins	[1]	Equity	[4]
	Bank reserves	[8]	Bonds	[3]
	Bank loans to households	[5]	Bank deposits	[2]
	Bank loans to firms	[6]		
<b>Central bank</b>	<b>Assets</b>		<b>Liabilities</b>	
	Domestic credit	[3]	Bank reserves	[8]
	Official reserves	[7]	Bank notes and coins	[1]
<b>Home economy</b>	<b>Assets</b>		<b>Liabilities</b>	
	Bank notes and coins	[1]	Domestic real wealth	
	Bank reserves	[8]	Net external wealth (excl. CB)	
	Real assets		Domestic credit	[3]
	Net foreign assets (excl. CB)			
<b>Home central bank</b>	<b>Assets</b>		<b>Liabilities</b>	
	Domestic credit	[3]	Bank reserves	[8]
	Domestic official reserves	[7]	Bank notes and coins	[1]
<b>Home country</b>	<b>Assets</b>		<b>Liabilities</b>	
	Real assets		Domestic real wealth	
	Net foreign assets		Net external wealth	

Table 4: Balance sheet summary.

## **2 Exchange rates**

Eq. no.	Equation or formula	In logarithms	Equiv- alence	Type	Economic interpretation	Economic justification
1	$P^H$	$p^H$		Definition	Domestic price level	
2	$P^F$	$p^F$		Definition	Foreign price level	
3	$S$	$s$		Definition	Nominal exchange rate (foreign-currency price of domestic currency)	
4	$Q = \frac{SP^H}{P^F}$	$q = s + p^H - p^F$		Definition	Real exchange rate (ratio of domestic and foreign price level, where both price levels are converted to the same currency)	
5	$\frac{1}{P^H}$	$-p^H$		Definition	Purchasing power of domestic currency at home	
6	$\frac{S}{P^F}$	$s - p^F$		Definition	Purchasing power of domestic currency abroad	
7	$\frac{1}{SP^H}$	$-s - p^H$		Definition	Purchasing power of foreign currency at home	
8	$\frac{1}{P^F}$	$-p^F$		Definition	Purchasing power of foreign currency abroad	
9	$\pi_t^H = \frac{P_t^H - P_{t-1}^H}{P_{t-1}^H}$	$\pi_t^H = \Delta p_t^H$		Definition	Domestic inflation (in percent)	
10	$\pi_t^F = \frac{P_t^F - P_{t-1}^F}{P_{t-1}^F}$	$\pi_t^F = \Delta p_t^F$		Definition	Foreign inflation (in percent)	
11	$\frac{S_t - S_{t-1}}{S_t}$	$\Delta s_t$		Definition	Nominal appreciation (in percent)	
12	$\frac{Q_t - Q_{t-1}}{Q_t}$	$\Delta q_t$		Definition	Real appreciation (in percent)	

13	$Q = 1$	$q = 0$	13-17	Theory	Purchasing power parity (PPP)	Good market arbitrage: $Q > 1 \Rightarrow D^H \downarrow, D^F \uparrow \Rightarrow P^H \downarrow$ $, P^F \uparrow \Rightarrow Q \downarrow \Rightarrow Q = 1$
14	$P^H = \frac{1}{S} P^F$	$p^H = -s + p^F$	13-17	Theory	Equality of domestic and foreign good prices, both being expressed in the domestic currency ( $\Leftrightarrow$ PPP)	Good market arbitrage
15	$S P^H = P^F$	$s + p^H = p^F$	13-17	Theory	Equality of domestic and foreign good prices, both being expressed in the foreign currency ( $\Leftrightarrow$ PPP)	Good market arbitrage
16	$\frac{1}{P^H} = S \frac{1}{P^F}$	$-p^H = s - p^F$	13-17	Theory	Equality of purchasing powers of domestic currency at home and abroad (PPP)	Good market arbitrage
17	$\frac{1}{S P^H} = \frac{1}{P^F}$	$-s - p^H = -p^F$	13-17	Theory	Equality of purchasing powers of foreign currency at home and abroad (PPP)	Good market arbitrage
18	$S = \frac{1/P^H}{1/P^F}$	$s = -(p^H - p^F)$		Theory	Nom. exchange rate in basic model (implying PPP)	Currency conversions without effect on purchasing power
19	$S = \frac{1/P^H}{1/P^F} \times e^{\xi m^{HF}}$	$s = -(p^H - p^F) + \xi m^{HF}$	19-20	Theory	Nom. exchange rate in currency flow model	Net foreign money holdings $\Rightarrow$ net currency market pressure
20	$Q = e^{\xi m^{HF}}$	$q = \xi m^{HF}$	19-20	Theory	Purchasing power parity fallacy (Eleftheriou and Müller-Plantenberg, 2018a,b): Real exchange rate proportional to currency market pressure, but independent of price levels	Combination of equations 4 and equation 19: Good market arbitrage $\Rightarrow$ price level convergence offset by purchasing power divergence $\Rightarrow$ no effect on real exchange rate

## References

Eleftheriou, Maria and Nikolas A. Müller-Plantenberg. Price level convergence and purchasing power divergence. *International Finance*, vol. 21, no. 1, 2018a, 71–91.

Eleftheriou, Maria and Nikolas A. Müller-Plantenberg. The purchasing power parity fallacy: Time to reconsider the PPP hypothesis. *Open Economies Review*, vol. 29, no. 3, 2018b, 481–515.