

**WORKING PAPER 2019**

# **Gross capital flows and the balance-of-payments: a balance sheet perspective**

Karsten Kohler

**October 2020**



# Gross capital flows and the balance-of-payments: a balance sheet perspective\*

Karsten Kohler<sup>†</sup>

October 2020

## Abstract

Gross capital flows have gained increasing attention in empirical research over the last decade. Due to their effects on current accounts and financial stability, gross flows are highly relevant for key issues in macroeconomics, political economy, and public policy. However, the exact relationship between gross flows, net flows and current accounts is often poorly understood. These notes aim to clarify some basic features and implications of gross capital flows. Balance-of-payments and balance-sheet accounting is utilised to illustrate how different kinds of gross flows play out on domestic balance sheets and in the balance-of-payments. Organised around nine propositions, the notes clarify the relationship between gross flows, net flows, and trade flows; explain some interesting properties of pure financial flows; discuss issues related to exchange rates and currency unions; and clarify the nature of sudden stop crises.

**Keywords:** Gross capital flows, balance-of-payments, current account, imbalances, trilemma, TARGET2, sudden stop

**JEL Codes:** F31, F32, F36, F41

---

\*I would like to thank Thereza Balliester Reis, Robert Bigg, Sergio Cesaratto, James Culham, Héctor Labat Moles, Severin Reissl, David Richardson, and Engelbert Stockhammer for helpful comments. All errors are mine.

<sup>†</sup>King's College London. E-Mail: karsten.kohler@kcl.ac.uk.

# 1 Introduction

Gross capital flows, i.e. financial transactions between residents of different countries, have gained increasing attention in empirical research over the last decade (e.g. Avdjiev et al. 2018, Blanchard et al. 2017, Broner et al. 2013, Bruno & Shin 2014, 2015, Cerutti, Claessens & Puy 2019, Cerutti, Claessens & Rose 2019, Febrero et al. 2019, Forbes & Warnock 2012, Fratzscher 2012, Passari & Rey 2015, Rey 2015).<sup>1</sup> A growing number of scholars argues that an exclusive focus on net flows and current accounts is insufficient and that gross flows deserve special attention as they exert distinct effects on the macroeconomy and financial system (e.g. Avdjiev et al. 2016, Borio & Disyatat 2011, 2015, Obstfeld 2012, Hobza & Zeugner 2014, Shin 2012). Especially due to their implications for current accounts and financial stability, gross flows are highly relevant for key issues in macroeconomics, political economy, and public policy. However, recent research on gross flows is mostly empirically oriented and often provides little conceptual clarification about the specificities and implications of gross flows. At the same time, debates around current account imbalances and capital flows frequently display unawareness of some of the basic features of gross flows. Especially the relationship of gross flows to net flows and to trade flows is often poorly understood.

These notes aim to clarify some basic features and implications of gross capital flows. Balance-of-payments and balance-sheet accounting is utilised to illustrate how different kinds of gross flows play out on domestic balance sheets and in the balance-of-payments. The notes are organised as a set of nine propositions that will be substantiated by stylized but instructive examples. The nine propositions are grouped into four main blocks that deal with (i) gross flows, net flows and trade flows, (ii) pure financial flows, (iii) exchange rates issues and currency unions, and (iv) sudden stop crises. Some of the claims are direct implications of the definition of gross flows and their treatment in the balance-of-payments. Others follow from a monetary perspective on the economy, i.e. the view that resource constraints and financial constraints differ as private financial institutions can endogenously generate purchasing power (see, e.g., Borio & Disyatat 2011, 2015, Godley & Lavoie 2007, Jakab & Kumhof 2019, Lavoie 2014, McLeay et al. 2014).

While gross flows are rarely dissected at the balance-sheet level, exceptions are Borio &

---

<sup>1</sup>These are only some representative examples of a much more sizeable literature. Koepke (2018) surveys empirical studies on capital flows to emerging market economies. Cohen et al. (2017) review some of the literature on global liquidity and cross-border banking flows. Kalemli-Özcan & Kwak (2020) survey empirical research with micro and sectoral data on debt flows and domestic leverage.

Disyatat (2015) and Lavoie (2014, chap.7) who discuss some aspects of gross flows in the context of balance-of-payments accounting and private sector balance sheets. The present notes partly build on their work and offer a more systematic overview of key properties of gross flows, as well as implications for some frequently discussed issues in international macroeconomics.

The first set of propositions clarifies the relationship between gross flows, net flows and trade flows, and consists of the following claims:

1. *Many gross flows do not lead to net flows and leave the trade balance entirely unchanged.*
2. *Trade flows normally lead to net capital flows. Net capital flows are not export surpluses that are 'recycled' abroad.*
3. *A trade deficit vis-à-vis another country does not imply net capital inflows from that country.*

A second block explains some special properties of pure financial flows:

4. *Gross flows can become negative; especially in periods of external deleveraging.*
5. *Gross capital flows are not truly gross and only cover a subset of international financial transactions.*

The third set of propositions deals with the link between gross flows and exchange rates, exchange rate management, and how flows within currency unions are different from flows between countries with independent currencies:

6. *Gross capital flows influence exchange rates and other asset prices even if net flows are constant.*
7. *Exchange rate management through foreign exchange intervention does not necessarily imply a loss of monetary autonomy.*
8. *A member of a currency union can always finance its imports from another member of the currency union.*

The last proposition clarifies the role of capital flows in sudden stop crises:

9. *A sudden stop in capital flows plays out differently for gross and for net flows.*

The remainder of these notes is organised as follows. The next section lays out the conceptual basis for defining and classifying gross capital flows. Section 3 reviews how capital flows are represented in the balance-of-payments. Sections 4 to 7 discuss the nine claims made above.

## 2 Defining gross capital flows

Gross capital flows consist of gross inflows and gross outflows. A gross capital inflow is defined as a *net incurrence of a liability* vis-à-vis a foreigner, e.g. a British importer borrowing euros from a Spanish bank. The counterpart to this transaction is the *net acquisition of a foreign asset* by a Spanish resident, a loan, which is a gross capital outflow for Spain. Section 5.2 will clarify why, despite being called *gross* flows, these are defined as *net* acquisitions/incurrences.

Gross capital flows are recorded in the balance-of-payments (BoP), which is defined and described in detail in the IMF's Balance of Payments Manual.<sup>2</sup> Data on gross flows can be found in the IMF's balance-of-payments statistics.<sup>3</sup> Table 1 provides an overview of the four main types of gross flows and lists some of their main components.

---

<sup>2</sup>See <https://www.imf.org/external/pubs/ft/bop/2007/pdf/bpm6.pdf>

<sup>3</sup>See <https://data.imf.org/?sk=7A51304B-6426-40C0-83DD-CA473CA1FD52>

**Table 1: Types of gross capital flows**

<b>Direct investment (FDI)</b>	<b>Portfolio investment</b>	<b>Other investment</b>	<b>Derivatives and employee stock options</b>
debt instruments; equity and investment fund shares	debt securities; equity and investment fund shares	currency and deposits; loans; interbank positions; insurance, pensions, and standardised guarantee schemes; trade credit and advances	forwards; options; employee stock options

Foreign direct investment involves a controlling claim in a company (a stake of at least 10%) or transactions between a parent company and its subsidiaries. Portfolio investment refers to investment that does not lead to a controlling claim and mostly contains short-term investment in bonds and shares. This comprises both liabilities that are issued on the primary market (and thus generate new liquidity for the issuer) and existing liabilities that are traded on secondary markets. Other investment largely comprises cross-border bank flows (loans, deposits, interbank positions) and trade credit between firms. Lastly, derivatives and stock options constitute a separate (but typically small) category.

### 3 Gross and net flows in the balance-of-payments

The BoP is given by:

$$CA + FA - \Delta R = 0 \tag{1}$$

or in more disaggregated form:

$$\underbrace{X - M + NFI}_{CA} + \underbrace{KIF - KOF}_{FA} - \Delta R = 0, \tag{2}$$

where the current account ( $CA$ ) records exports ( $X$ ) and imports ( $M$ ) of goods and services plus foreign earnings minus foreign payments ( $NFI$ : net foreign income). In the following, we will ignore net foreign income, so that the current account reduces to the trade balance

( $TB = X - M$ ). The financial account ( $FA$ ) records gross inflows ( $KIF$ ) minus gross outflows ( $KOF$ ) of financial assets. The financial account is thus equal to *net* capital inflows (NKIF), so that  $FA = KIF - KOF = NKIF$ . Finally, changes in the central bank's foreign reserves are denoted by  $\Delta R$ .

A useful way of re-writing the BoP-identity is the following:

$$KIF = KOF + (M - X) + \Delta R \tag{3}$$

or equivalently

$$KOF = KIF + (X - M) - \Delta R. \tag{4}$$

These two equations illustrate the different possible uses of a gross inflow and a gross outflow, respectively. A gross inflow can be used to pay for investments in foreign assets, to pay for net imports, and to build up foreign reserves. By the same token, a gross outflow can stem from a gross inflow, net exports, and from drawing down foreign reserves.

In the next section, we first deal with the case where gross inflows are related to the acquisition of foreign assets and thus come with offsetting gross outflows. We then discuss how net flows emerge in the context of net imports. Throughout this section, we assume that reserves flows are zero ( $\Delta R = 0$ ) to focus on the relationship between gross flows, net flows, and trade flows. This implies that the monetary authorities do not intervene in the foreign exchange market and thus let the exchange rate float. In section 6.2, we will then discuss exchange rate management through changes in foreign reserves.

## 4 Gross flows, net flows, and trade flows

### 4.1 Gross flows versus net flows

The first claim states that gross flows often do not involve net flows and thus lead to no change in the financial account and in the trade balance. In fact, a large proportion of gross flows are completely unrelated to trade flows. All incurrences of foreign liabilities that are matched by an acquisition of foreign assets constitute offsetting gross flows that do not lead to net flows.<sup>4</sup>

---

<sup>4</sup>This point has been made forcefully, among others, in Avdjiev et al. (2016), Borio & Disyatat (2011, 2015), Obstfeld (2012), Hobza & Zeugner (2014), Shin (2012).

**Proposition 1** *Many gross capital flows do not lead to net capital flows and thus leave the financial account and the trade balance unchanged.*

*Example:* Suppose a US resident buys a share from a British firm, say the supermarket chain Sainsbury’s.<sup>5</sup> How does this financial transaction play out on the balance sheets of the different parties? To keep the presentation simple, we will use consolidated balance sheets of the two traders and their respective banks (Table 2).<sup>6</sup>

**Table 2: A US resident purchases a British share**

US consolidated		UK consolidated	
Assets	Liabilities	Assets	Liabilities
+Sainsbury’s share (+KOF)	+Deposit of Sainsbury’s (+KIF)	+Deposit with US bank (+KOF)	+ Sainsbury’s share (+KIF)

In this case, there was a gross outflow from the US (investment in a foreign share) that was matched by a gross inflow (increase in deposits held by a British bank). From the perspective of the UK, this was a gross inflow (sale of a domestic liability to a foreigner) that was directly matched by a gross outflow (acquisition of a deposit with a US bank). Thus, gross flows have taken place, but no net flows: the US’s (and UK’s) financial account and trade balance remain unchanged:

$$\underbrace{X - M}_{TB} + \underbrace{\uparrow KIF - \uparrow KOF}_{FA} = 0. \tag{5}$$

In conclusion, Proposition 1 illustrates the importance to distinguish between gross flows and net flows. While it is common to simply speak of ‘capital flows’, this usage is actually imprecise as it does not discriminate between flows that have no net impact on the financial account and the trade balance (i.e. offsetting gross flows) and those that do (i.e. non-offsetting flows = net flows). The next proposition will further delineate offsetting flows from non-offsetting flows by addressing the link between net flows and the trade balance.

<sup>5</sup>This and the following examples are stylized and do not aim to reflect the complexity of real-world transactions. Specific countries are only chosen to render the examples more vivid.

<sup>6</sup>A minus (plus) sign denotes a reduction (increase) of a balance sheet item. No sign means the item remains unchanged.



## 4.2 Net flows and trade flows

The second claim clarifies the relationship between trade flows and net capital flows. The logic of balance-of-payments accounting dictates that (for constant foreign reserves) a change in the trade balance must be accompanied by a change in the financial account, and thus involve net capital flows. In this sense, it is trivial to assert that a country that runs a current account deficit receives capital inflows. However, proposition 2 goes a step further and claims that in normal times, trade flows will lead to net flows, i.e. causality runs from the trade balance to the financial account. There can be circumstances under which this direction of causality does not hold, e.g. sudden stops in capital flows (see section 7) or cases of crisis-ridden countries that cannot get credit to finance their desired level of imports. However, as a rule of thumb for trade between stable economies during normal times, it is reasonable to assume that trade flows are endogenously financed by net flows. A possibly more controversial implication is that it is not meaningful to conceive of net capital flows as export surpluses that are recycled abroad – a trope that can often be found in debates around current account imbalances. We will illustrate this with an example.

**Proposition 2** *Trade flows normally lead to net capital flows. Net capital flows are not export surpluses that are ‘recycled’ abroad.*

*Example:* Suppose the British supermarket chain Sainsbury’s imports Spanish olive oil (Table 3). This is an import that reduces the UK’s current account. We will consider two scenarios of how the import is paid for. First, suppose the import is invoiced in euros. The British bank may obtain euros through an interbank loan from the Spanish bank, which expands its balance sheet accordingly. The UK bank can then use these funds to supply Sainsbury’s with the necessary euros for the import.<sup>7</sup> This is a gross inflow for the UK that is not matched by a gross outflow and thus implies a net capital inflow.<sup>8</sup>

---

<sup>7</sup>In reality, this may be accomplished via so-called nostro/vostro accounts that internationally active banks hold with each other (see, e.g., Lavoie 2014, pp.458-462). For the sake of brevity, we abstract from this complication here.

<sup>8</sup>Alternatively, if the British bank already had euro deposits, it could have drawn down these deposits; this would have been a negative capital outflow (see section 5.1).

**Table 3: Sainsbury’s (UK) buys Spanish olive oil (in euros)**

Sainsbury’s UK bank		Bank of Spanish olive oil exporter	
Assets	Liabilities	Assets	Liabilities
	–Sainsbury’s deposit	+Euro loan to UK	+Euro deposits of
	+Interbank loan in	bank (+KOF)	olive oil exporter
	euros (+KIF)		

In the UK’s BoP, the transaction leads to a fall in the trade balance and an increase in the financial account:

$$\underbrace{X - \uparrow M}_{\downarrow TB} + \underbrace{\uparrow KIF - KOF}_{\uparrow FA} = 0. \quad (6)$$

Now suppose the import is invoiced in pounds (Table 4). In this case, the British bank only needs to transfer Sainsbury’s deposits to the Spanish bank. The Spanish bank will then record this as an increase in the pound deposits of the exporter. The outcome is the same: a net inflow for the UK and a net outflow for Spain.

**Table 4: Sainsbury’s (UK) buys Spanish olive oil (in pounds)**

Sainsbury’s UK bank		Bank of Spanish olive oil exporter	
Assets	Liabilities	Assets	Liabilities
	–Sainsbury’s deposit	+Pound deposit with	+Pound deposits of
	+Deposit of Spanish	UK bank (+KOF)	olive oil exporter
	bank (+KIF)		

Importantly, in no way does it make sense to say that Spain ‘recycles’ its export surpluses in the form of a loan or deposit to the British bank. It is entirely possible that the British bank first borrow euros from the Spanish bank before the import takes place. In this case, the Spanish bank would create the necessary financing for the British importer without prior exports. When the trade takes place, the deposits of the British bank with the Spanish bank would simply be replaced by the deposits of the exporter – the export surplus for Spain. The export surpluses arise at the end of this process, they are not a precondition for the flows to take place.

It is also important to note that the net capital flow to the UK has not created any

additional resources that could be lent out domestically. For the British bank, the loss of a liability (Sainsbury's deposit) was simply compensated for by another liability (interbank loan or deposit of Spanish exporter). The size of its balance sheet is unchanged. There is thus no reason to assume that net capital inflow accelerate domestic credit expansion.<sup>9</sup>

By the same token, in no way has Spain forfeited any resources that could no longer be lent to domestic borrowers – another misleading notion that is often based on the assumption there was a fixed stock of domestic saving that can either be lent abroad or domestically. While Spain has made a loan to a British bank, nothing prevents it from expanding its balance sheet further by making additional loans to (creditworthy) Spanish customers.

Dwelling a bit further on this point, consider the national income identity for an economy without government:  $Y = C + I + X - M$ , where  $Y$  is total national income,  $C$  is consumption,  $I$  is investment and the other variables are defined as before. Total saving is defined as income that is not consumed:  $S = Y - C$ . From this, one can obtain the identity  $S - I = X - M$ . A common interpretation of this is that excess saving leads to trade surpluses and thus net capital outflows. Based on this, it is sometimes said that surplus countries 'export their saving'. This is misleading. Saving is merely income not spent on consumption. It is not something that can be exported. On the contrary, saving arises from the (net) exportation of goods and services. The associated net capital outflows are simply the remuneration for those net exports. They are not a resource of the surplus country that is transferred abroad.

The bottom line is that in normal times, trade flows are endogenously financed by corresponding net flows. Those net flows do not cause the trade flow, but are merely their flip side. The capacity of the exporting party to provide the necessary financing for the transaction is completely independent from any prior export surpluses or saving. Export surpluses and saving are the *outcome* of trade transactions that are financed by the endogenous creation of purchasing power through banks. Export surpluses are not the source of such financing, neither abroad nor domestically.

---

<sup>9</sup>The situation is different when net flows arise from gross inflows that are matched by an increase in foreign reserves. In this case, some private agent has received fresh liquidity (in domestic currency) that can be used to acquire domestic assets, e.g. bonds.

### 4.3 The link between bilateral trade and capital flows

The third proposition follows up on the previous one and clarifies the link between trade flows and net flows in a multilateral environment. While in a two-country world, a trade deficit of country A must be matched by a net capital inflow from country B, this no longer holds in a world with  $n > 2$  countries.

**Proposition 3** *A trade deficit vis-à-vis country B does not imply net capital inflows from country B.*

*Example:* Suppose a Spanish firm imports goods from a German firm (Table 5). The bank of the Spanish firm, however, decides to borrow from a French bank to compensate for its loss of deposits. In this case, Spain receives a net inflow from France, not Germany. The German bank, in turn, may lend money to the French bank and thus records a net outflow to France, not Spain. Net flows do not change for France, but it increases its financial integration vis-à-vis Spain and Germany without being involved in the trade at all.

**Table 5: Spain imports from Germany and receives net inflows from France**

Spanish bank		French bank		German bank	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
	–Deposits of Spanish importer				+Deposits of German exporter
+Interbank loan from French bank (+KIF)		+Interbank loan to Spanish bank (+KOF)	+Interbank loan from German bank (+KIF)	+Interbank loan to French bank (+KOF)	

Proposition 3 calls for caution with the assumption that a country with a large trade deficit vis-à-vis another country is also highly indebted to that country (Spain and Germany in this example). Likewise, it illustrates that a country can have a relatively balanced trade account but exhibit substantial financial exposure to other countries (France in this example).<sup>10</sup> We will return to the significance of this phenomenon in the next subsection.

<sup>10</sup>See Borio & Disyatat (2011, 2015) and Hobza & Zeugner (2014) for evidence on the empirical significance of these multilateral interlinkages in the context of the Global Financial Crisis and the Eurozone crisis.

## 5 Special properties of pure financial flows

Having examined trade and net flows in more detail, we now discuss some further aspects of gross flows.

### 5.1 Negative gross flows

An interesting feature of gross flows is that they can become negative. While positive gross flows constitute an increase in international financial integration, negative flows represent a reduction in external assets and liabilities. Gross inflows become negative when domestic residents reduce their liabilities vis-à-vis foreigners, e.g. by paying down external debts. Likewise, gross outflows become negative when foreign assets are sold and converted into domestic assets.

**Proposition 4** *Gross capital flows can become negative; especially in periods of external deleveraging.*

*Example:* Suppose a British investor had previously acquired a Spanish government bond and now sells it back to a Spanish investor.

**Table 6: British investor sells Spanish government bond to Spanish investor**

UK consolidated		Spain consolidated	
Assets	Liabilities	Assets	Liabilities
–Spanish bond (–KOF)	–Deposit of Spanish bondholder (–KIF)	–Deposit with British bank (–KOF)	–Spanish bond (held by British investor) (–KIF)

For Spain, this is a negative gross inflow (a reduction in foreign liabilities through the repurchase of a domestic bond) that is matched by a negative gross outflow (the reduction of a deposit with a British bank). Similarly, negative matching flows arise for the UK, which undergoes a negative gross outflow and a negative gross inflow. At the end of this transaction, the total outstanding debt of the Spanish government is unchanged (unless the bond has come due and was repaid) but a higher share of its debt is now held domestically rather than abroad. As a result, international financial integration between the UK and Spain has decreased.

Negative gross flows often arise during periods of external deleveraging. Although such processes are likely to have strong macroeconomic repercussions as agents cut back on their spending to pay down debts, they can be quite unrelated to the position of the trade balance. In the previous subsection, we saw that a country can have a balanced trade account but be financially highly integrated with other countries (in the example in Table 5, this was the case with France). Domestic financial distress may enforce a reduction of international financial integration, despite the fact that the trade account position of a country may be perfectly sustainable. We will return to the phenomenon of negative flows in section 7.

## 5.2 Flows that are not contained in gross flows

A further possibly surprising fact about gross flows relates to the question what kind of (international) financial transactions are *not* a part of them. It turns out that gross flows are actually just a subset of the universe of international financial transactions – many of which are not systematically recorded. In this context, we will also return to the point made in section 4.2 about the misleading notion of trade surpluses being ‘recycled’ in the form of capital flows abroad.

**Proposition 5** *Gross capital flows are not truly gross and only cover a subset of international financial transactions.*

*Example:* To illustrate, consider again the example of Sainsbury’s that has imported Spanish olive oil (see section 4.2, Table 4). As a result of this transaction, the Spanish olive oil exporter ended up with a pound deposit. To discuss subsequent transactions, we use consolidated balance sheets at the country level (UK and Spain, respectively) (see Table 7). The first row depicts the situation after the Spanish firm has exported olive oil and received pound deposits in return. Now suppose the firm decides to reinvest these deposits in a share from Sainsbury’s. This is depicted in the second row: the firm converts its pound deposit into a share from Sainsbury’s. Importantly, although this is clearly an international financial transaction, no gross flows take place on an aggregate basis. The reason for this is that while the Spanish firm has acquired a foreign asset (a share from Sainsbury’s), which is a positive gross outflow for Spain, it has also sold a foreign asset (its pound deposit), which is a negative gross outflow.

**Table 7: Spain exports olive oil to UK and invests the proceeds in a British share**

UK consolidated		Spain consolidated	
Assets	Liabilities	Assets	Liabilities
	Deposit of Spanish bank	Pound deposit with UK bank	
	–Deposit of Spanish bank (–KIF)	–Pound deposit with UK bank (–KOF)	
	+Sainsbury’s share (+KIF)	+Sainsbury’s share (+KOF)	
		–Sainsbury’s share	
		+Apple’s share	

However, at a more disaggregated level, these flows are recorded in the BoP as a positive portfolio outflow and a negative other investment outflow:

$$\underbrace{X - M}_{TB} + \underbrace{KIF - (\uparrow KOF^{PORTF} + \downarrow KOF^{OTHER})}_{FA} = 0. \quad (7)$$

Now suppose in a next step, the Spanish firm decides to exchange its Sainsbury’s share with a US resident against a share from, say, Apple (third row of Table 7). In this case, a foreign asset is exchanged against a foreign asset within the same asset category. No net acquisition of foreign assets has taken place and thus no gross flows, not even on a disaggregated basis. Recall that gross outflows are defined as *net* acquisition of foreign assets (see section 2).

Interestingly, in these two examples it does seem apt to say that the Spanish firm has ‘recycled’ some of its export surpluses in the form of foreign assets. However, on an aggregate basis, this transaction does not involve any capital flows, neither on a net nor on a gross basis! At the same time, the structure of the financial integration between the Spain and the rest of the world has clearly changed, a Spanish firm now holds a claim on a foreign firm (and will receive dividends). Proposition 4 thus highlights that the true scale and complexity of international flows exceeds not only net flows but also (aggregate) gross flows.

## 6 Gross flows, exchange rates, and currency unions

### 6.1 Gross flows and exchange rate determination

We have seen that many kinds of gross flows leave the financial and the trade balance completely unchanged. However, this does not mean gross flows do not affect exchange rates and, indirectly, trade flows and other financial variables.

**Proposition 6** *Gross capital flows influence exchange rates and other asset prices even if net flows are constant.*

*Example:* To see this, let us return to the very first example from section 4.1 where a US resident bought a share from Sainsbury's. An implicit assumption in this example was that the US resident pays for the share by drawing on its deposits with a US bank. However, this would imply the share is paid with US dollars, which might not be the case. Suppose Sainsbury's shares are denominated in British pounds. In this case, the bank of the US resident will first have to supply its customer with British pounds. To this end, it might either draw on existing pound reserves (and subsequently replenish them) or directly obtain pounds on the foreign exchange market. Let's focus on the second case. The first row of Table 8 captures this foreign exchange market transaction: US dollars deposits are converted into a deposit in pounds. In return, the UK obtains US dollar deposits. This transaction leads to matching gross inflows and outflows for both countries.

Having obtained the required pounds, the US resident can then use them to purchase the share from Sainsbury's (second row). As explained in section 5.2, this does not constitute a net acquisition of foreign assets for the US as an existing foreign asset is exchanged for another one.

**Table 8: A US resident purchases a British share denominated in British pounds**

US consolidated		UK consolidated	
Assets	Liabilities	Assets	Liabilities
+Pound deposit (+KOF)	+US dollar deposit of UK bank (+KIF)	+ US dollar deposit (+KOF)	+Pound deposit of US bank (+KIF)
−Pound deposit +Sainsbury's share			−Pound deposit of US bank +Sainsbury's share



Importantly, the first transaction depicted in Table 8 is likely to put downward pressure on the US dollar, since – everything else constant – the British bank has no excess demand for US dollars. The US bank may thus have to offer its dollars for a better price (i.e. a more depreciated US dollar exchange rate) to convince the British bank to buy. As a result, the US dollar may depreciate in response to a gross flow that by itself has no impact on the trade balance and net flows. Subsequently, the demand for Sainsbury’s shares might also push up their prices and thus affect domestic asset prices in the UK.<sup>11</sup> This, in turn, may stimulate private spending and credit creation, leading to the often cited but rarely analysed correlation between capital flows and domestic credit booms. Importantly, such dynamics are driven by gross, not net flows.

While thus neutral with respect to the financial account and trade balance, offsetting gross flows can influence exchange rates and asset prices, which may then feed into other economic processes. Of course, this can ultimately also impact the trade balance: the exchange rate will influence the price competitiveness of exports and asset price inflation can stimulate import demand. However, it is important to distinguish logical accounting relationships, such as instantaneously offsetting gross flows, from causal relationships that are mediated by numerous factors and may play out over longer and varied time horizons (e.g. a relatively fast response of exchange rates and asset prices to gross flows versus a sluggish response of the trade balance to the exchange rate).

## 6.2 Gross flows, exchange rate management and monetary autonomy

Thus far we have focused on gross flows between countries whose monetary authorities did not intervene in the foreign exchange market, which allowed us to abstract from changes in foreign exchange reserves. Now we will address some aspects related to gross flows and foreign exchange management. A well-known tenet in international macroeconomics has it that countries cannot have an open financial account, manage their exchange rate, and enjoy monetary policy autonomy at the same time (see, e.g., Obstfeld et al. 2005). The underlying assumption behind this so-called *trilemma* is that exchange rate management must be accomplished via interest rate policy, so that the policy rate can no longer be used for other purposes (such as hitting an inflation target or a desired employment rate). Alternatively, if the central bank uses its foreign exchange reserves to steer the

---

<sup>11</sup>See Blanchard et al. (2017) on the effect of gross flows on domestic asset returns.

exchange rate to a desired level, this would affect the supply of bank reserves and thereby influence the policy rate. As a result, the central bank would lose control over its policy rate.

Proposition 7 puts this view into question and states that a trade-off between exchange rate policy and domestic monetary policy need not hold. In fact, several central banks of emerging market economies successfully smooth exchange rate fluctuations through sterilised foreign exchange intervention, while using the policy rate to pursue an inflation target.<sup>12</sup> Let us see how such sterilised intervention works.

**Proposition 7** *Exchange rate management through foreign exchange intervention does not necessarily imply a loss of monetary autonomy.*

*Example:* Consider again the previous example from section 6.1, but let us assume the US resident acquires a share from a Brazilian rather than a British company. Recall that the country that sold the share ended up with US dollars after this transaction (row 1 of Table 9). We saw that this transaction is likely to result in a depreciation of the US dollar, which implies an appreciation of the Brazilian real against the dollar. Suppose the Brazilian central bank wishes to prevent this appreciation. It can do so by buying up the US dollars against Brazilian real from the domestic banks at the desired exchange rate (row 2). This will push down the value of the real and thus offset the appreciation caused by the gross inflow from the US.

---

<sup>12</sup>There is a large literature on sterilised foreign exchange intervention, see for example Benes et al. (2015), Bofinger & Wollmershäuser (2003), Ghosh et al. (2016).

**Table 9: Brazilian central bank purchases US dollars to offset currency appreciation**

US consolidated		Brazil private sector		Brazilian central bank	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
Brazilian share	US dollar deposit of Brazilian bank	US dollar deposit	Brazilian share	+US dollar reserves (+ $\Delta R$ )	+Bank reserves (in real)
		-US dollar deposit (-KOF) + Bank reserves (in real)	Brazilian share		

In the BoP, this transaction is recorded as a negative gross outflow for Brazil (as its private sector reduces its holding of foreign assets) that is matched by an increase in foreign exchange reserves. Importantly, this constitutes an increase in net capital inflows, although the trade balance remains unchanged:

$$\underbrace{X - M}_{TB} + \underbrace{KIF - \downarrow KOF}_{\uparrow FA} - \uparrow \Delta R = 0. \quad (8)$$

In Brazil, the foreign exchange intervention has led to an increase in bank reserves (row 2). If these are supplied on the interbank market, the overnight rate targeted by the central bank may fall and thus compromise its domestic monetary policy strategy. This phenomenon is the theoretical foundation for the trade-off between exchange rate management and domestic monetary autonomy highlighted by the trilemma. However, Table 10 shows that this need not be the case if the central bank sterilises the impact of its intervention on the stock of bank reserves in the system. There are many ways in which this can be accomplished; here we assume the central bank sells central bank bonds to the banking sector and thereby destroys the reserves that have been created in the course of the intervention (see row 2 of Table 10).

**Table 10: Brazilian central bank sells bonds to sterilise foreign exchange intervention**

US consolidated		Brazil private sector		Brazilian central bank	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
Brazilian share	US dollar deposit	Bank reserves	Brazilian share	US dollar reserves	Bank reserves
		–Bank reserves			–Bank reserves
		+Central bank bond			+Central bank bond

While this a purely domestic transaction that has no effect on gross flows or the BoP at all, it is important to appreciate its implications for the relationship between capital flows, exchange rate management and monetary policy. By mopping up the additional reserves that were created by the foreign exchange intervention, the central bank offsets any effects on the domestic interbank market and thus the policy rate. As a result, there is no interference with its domestic monetary policy strategy and thus no trade-off: the trilemma doesn't bite.<sup>13</sup>

There is of course an asymmetry with respect to the ability of the central bank to manage the exchange rate in this way. In the previous example, the Brazilian central bank aimed to stem appreciation pressures by exchanging Brazilian real against US dollars. There is no limit to intervening in this direction, as the central bank can generate infinite amounts of Brazilian real to pay for dollars. However, if the real had depreciated and the central bank wanted to raise its value, it would have to sell its foreign reserves, which are indeed finite. If it runs out of reserves and fails to obtain foreign currency by other means, it is left with no choice other than letting the real depreciate – a classic balance-of-payments crisis.

The bottom line is that the possibility of sterilised foreign exchange intervention drives a wedge between the frequently assumed relationship between foreign exchange management and loss of monetary policy autonomy. This is another case where a closer look at balance-sheet relations lends itself to a conclusion that differs from received wisdom.

<sup>13</sup> Lavoie (2014, chap.7) argues from a monetary perspective that the sterilisation of bank reserves takes place automatically as the banks will want to get rid of their excess reserves.

### 6.3 Flows in a currency union

Up until now we have mostly dealt with gross flows across countries with different currencies. This section illustrates how capital flows between residents of the same currency union play out. The Euro Area will be the prime example. The main insight from this exercise is that in a currency union, there can never be a shortage of currency to pay for imports from within the union. This constitutes a crucial difference to the case of two different currency areas discussed in the previous section, where a country can in principle run out of foreign reserves.

**Proposition 8** *A member of a currency union can always finance its imports from within the union.*

*Example:* Suppose a Spanish household transfers deposits to a German bank (Table 11). This could either be the result of an import from Germany, in which case there would be a reduction of Spain's trade balance that would be matched by a net capital inflow, or the Spanish household might simply acquire a deposit with a German bank (displayed in grey colour in Table 11), in which case the gross inflow would be matched by a gross flow with no impact on the trade balance. In the Euro Area, this transaction is settled via the so-called TARGET2 system.<sup>14</sup> In the first step, the Spanish bank draws on its bank reserves with the national central bank Banco de España to enact the deposit transfer requested by the Spanish household. As those reserves are transferred to a German bank, they are drained from the Spanish banking system and do not return to the Banco de España. The latter thus needs to compensate for the loss in bank reserves by drawing liquidity from the European Central Bank (ECB). This is recorded as a TARGET2 (T2) liability vis-à-vis the ECB.<sup>15</sup> At the same time, the German bank receives fresh deposits (either from the German exporter or directly from the Spanish household in the case of a deposit transfer). These deposits will be matched by an increase in bank reserves with the Bundesbank. The latter may park these excess reserves with the ECB, leading to a TARGET2 claim vis-à-vis the Eurosystem. In the second step in row 2, the Spanish bank obtains an interbank loan from the German bank to replenish its reserves. As a result, the Banco de España receives new reserves and the T2 liability is destroyed.

---

<sup>14</sup>Whelan (2014) provides a detailed discussion of the workings of TARGET2 and some empirical evidence.

<sup>15</sup>I thank Sergio Cesaratto for pointing this out to me.

**Table 11: Spanish household transfers deposit to German bank,  
Spanish bank borrows from German bank**

Spanish household		Spanish bank		Banco de España		ECB		Bundesbank		German bank	
A	L	A	L	A	L	A	L	A	L	A	L
–Deposit w/ Spanish bank +Imported good +Deposit w/ German bank (+KOF)		–Bank reserves	–Deposits of Spanish household		–Bank reserves +T2 liability w/ ECB	+T2 claim on BdE	+T2 liability to BB	+T2 claim on ECB	+Bank reserves	+Bank reserves	+Deposits of German exporter +Deposits of Spanish household (+KIF)
		+Bank reserves	+Interbank loan from German bank (+KIF)		+Bank reserves –T2 liability	–T2 claim on BdE	–T2 liability to BB	–T2 claim	–Bank reserves	–Bank reserves +Interbank loan to Spanish bank (+KOF)	

Notes: A: Assets, L: Liabilities; ECB: European Central Bank; T2: TARGET2; BdE: Banco de España; BB: Bundesbank.

**Table 12: Spanish household transfers deposit to German bank,  
Spanish bank cannot borrow from German bank**

Spanish household		Spanish bank		Banco de España		ECB		Bundesbank		German bank	
A	L	A	L	A	L	A	L	A	L	A	L
–Deposit w Spanish bank +Imported good +Deposit w German bank (+KOF)		–Bank reserves	–Deposits		–Bank reserves +T2 liability	+T2 claim on BdE	+T2 liability to BB	+T2 claim	+Bank reserves	+Bank reserves	+Deposits of German exporter +Deposits of Spanish household (+KIF)
		+Bank reserves	+Loan from BdE	+Loan to Spanish bank	T2 liability +Bank reserves	T2 claim on BdE	T2 liability to BB	T2 asset	Bank reserves	Bank reserves	Deposits

Notes:A: Assets, L: Liabilities; ECB: European Central Bank; T2: TARGET2; BdE: Banco de España; BB: Bundesbank.

Now suppose the Spanish bank is unable to obtain a loan on the interbank market to compensate for its loss in deposits (Table 12). In this case, it can borrow instead from the Banco de España to replenish its reserves (row 2 of Table 12). Importantly, in this case, the T2 liability of the Banco de España will not disappear as it has not obtained any reserves that could be used to reduce its liability vis-à-vis the ECB. As a result, a TARGET2 imbalance remains at the end of this process.

It can be helpful to think of TARGET2 balances as the equivalent of foreign reserves in a country with an independent currency. If a country fails to obtain private liquidity to pay for its net imports or acquisition of foreign assets, it has to draw on its TARGET2 balances. The case where the Spanish household uses its deposits to purchase a good from Germany and the Spanish banking system fails to borrow back reserves from Germany can be represented as follows:

$$\underbrace{X - \uparrow M}_{\downarrow TB} + \underbrace{KIF - KOF}_{FA} - \downarrow T2 = 0. \quad (9)$$

As long as such TARGET2 balances are created without friction, the Spanish private sector will face no limitations to deposit transferrals towards other member states of the currency union. The existence of unlimited financing through TARGET2 thus implies that member states are always able to finance their imports and acquisitions of assets from other member states – unless political interventions put a cap on the level of TARGET2 balances.

In the context of widening TARGET2 imbalances in the Euro Area since 2010, a debate over the nature of the 2010-12 Eurozone crisis broke out. One of the contentious issues was the question whether the Eurozone crisis constituted a balance-of-payments crisis.<sup>16</sup> As shown in this subsection, a mechanism such as TARGET2 removes the kind of balance-of-payments constraint that sometimes pushes deficit countries with independent currencies into crises. This removal of the balance-of-payments constraint is a unique feature of currency unions. On the other hand, this does not mean that currency unions are free of any economic and political adjustment pressures on deficit countries.

---

<sup>16</sup>See, e.g., the exchange between Cesaratto (2013, 2015) and Lavoie (2015*a,b*) and between Febrero et al. (2018) and Cesaratto (2018). Lavoie and Febrero et al. argue that the unlimited availability of TARGET2 liabilities made a balance-of-payments crisis impossible within the Euro Area. However, Cesaratto points out that in the face of rising government bond spreads and only partial liquidity support from the ECB, deficit countries nevertheless faced severe pressures to rebalance their current accounts, especially through austerity.

## 7 Gross flows and sudden stop crises

The term ‘sudden stop’ refers to an abrupt drying up of capital inflows. The most common perception of a sudden stop refers to net flows: a country runs a trade deficit that is financed by net inflows; at some point foreign creditors refuse to supply further credit; the country is forced to reduce its deficit as soon as it runs out of foreign reserves. However, sudden stops can also arise with respect to gross flows, in which case they may play out differently for the domestic economy.<sup>17</sup> Let us consider a net sudden stop and a gross sudden stop in turn.

**Proposition 9** *A sudden stop in capital flows plays out differently for gross and for net flows.*

*Example:* Suppose a Brazilian firm wishes to import goods from a US firm. The bank of the Brazilian importer would have to convert deposits from Brazilian real into US dollars and transfer them to the account of the US exporter. This would lead to a loss of deposits from the Brazilian banking system and demand for US dollars. Previously, the Brazilian bank would have received a loan from the US bank to pay for imports. Suppose now that for whatever reason the Brazilian banking system is not able to get those US dollars from abroad: a *net sudden stop* occurs. At the same time, let us assume that the Brazilian central bank has run out of foreign reserves (see section 6.2). In this case, the Brazilian bank would have to decline the transaction and the import cannot go ahead (Table 13). This is a classic sudden stop turning into a full blown balance-of-payments crisis, forcing the country to reduce its trade deficit.

**Table 13: US bank refuses to finance Brazilian imports: net sudden stop**

Brazilian bank		US bank	
Assets	Liabilities	Assets	Liabilities
	<del>-Deposit of Brazilian importer (planned)</del>	<del>+Loan to Brazil (+KOF)</del>	<del>+Deposit of US exporter</del>
	+Loan from US (+KIF) (planned)		

As discussed in section 6.3, while a currency union can in principle also undergo a net sudden stop in private capital flows, it will always be able to finance its imports from within the union as long as a mechanism such as TARGET2 is in place. One could thus argue

<sup>17</sup>The classic reference on sudden stops is Calvo (1998) who only considered net flows. See Cavallo et al. (2015) for a comprehensive taxonomy of net and gross sudden stops and an empirical analysis.



that while net sudden stops are possible in currency unions, they are unlikely to turn into balance-of-payments crises.

Next, consider a different scenario where the Brazilian current account is balanced but its banking system has invested in a (long-term) collateralised debt obligation (CDO) issued in the US. It has financed the acquisition of CDOs with short-term loans from the US money market that need to be rolled over regularly (row 1 of Table 14). Now suppose the Brazilian banking system is suddenly unable to roll over these short-term external debts. In this case, it will have to sell its CDO (or other foreign assets) to wind down its short-term liabilities vis-à-vis the US money market (row 2). As a result, there is a sudden and large reduction in gross outflows and inflows between Brazil and the US: a *gross sudden stop*.

**Table 14: US bank refuses to finance Brazilian investment in US assets: gross sudden stop**

Brazilian banking system		US banking system	
Assets	Liabilities	Assets	Liabilities
US CDO (long term)	Loan from US money market (short term)	Loan to Brazil	CDO
–US CDO (long term) (–KOF)	–Loan from US money market (short term) (–KIF)	–Loan to Brazil (–KOF)	–CDO (–KIF)

*Notes:* CDO: Collateralised Debt Obligation.

Importantly, the gross sudden stop is entirely unrelated to the current account. It may occur although Brazil has an entirely balanced current account, as assumed in this example. Likewise, the gross sudden stop has no instantaneous implications for Brazil’s trade. However, it might come with severe distress in the Brazilian banking sector and might also put pressure on the exchange rate. If it leads to a depreciation and a decline in aggregate income due to financial turmoil, the gross sudden stop can indirectly also impact the current account. But the mechanism is different and much less tight compared to the net sudden stop.

Finally note that a gross sudden stop can also occur within a currency union. How much of a mess it will make depends on the reaction of the national central bank. As explained in section 6.3, a loss of liquidity of the domestic banking system due to a reduction in inflows

can in principle be compensated by liquidity from the national central bank, which will lead to rising TARGET2 imbalances. However, in the case of a gross sudden stop, the quality of the assets that banks use as collateral to obtain liquidity from the central bank might be questionable. How the central bank handles this problem thus ultimately depends on discretionary monetary policy decisions.

## 8 Conclusion

Against the backdrop of a growing interest in gross capital flows, these notes clarified some basic features of gross capital flows from a balance sheet perspective. Organised around a set of nine propositions, we discussed (i) the relationship between gross flows, net flows, and trade flows; (ii) explained some special properties of pure financial flows; (iii) showed how gross flows can impact exchange rates and examined issues related to exchange rate management and currency unions; and (iv) discussed different types of sudden stops in capital flows. Besides a number of (possibly surprising) specific features of gross flows and how they impact economies, the wider implication from these notes is that gross flows should indeed be examined in their own right. They are analytically and economically distinct from net flows and trade flows. This vindicates and extends to the international level a monetary approach to economic analysis that treats resource constraints and financial constraints as distinct and allows for the endogenous creation of purchasing power through banks – independently of prior saving through export surpluses.

## References

- Avdjiev, S., Hardy, B., Kalemli-Özcan, S. & Servén, L. (2018), ‘Gross capital flows by banks, corporates and sovereigns’, *Bank for International Settlements Working Paper* (760).
- Avdjiev, S., McCauley, R. N. & Shin, H. S. (2016), ‘Breaking free of the triple coincidence in international finance’, *Economic Policy* **31**(87), 409–451.
- Benes, J., Berg, A., Portillo, R. A. & Vavra, D. (2015), ‘Modeling Sterilized Interventions and Balance Sheet Effects of Monetary Policy in a New-Keynesian Framework’, *Open Economies Review* **26**(1), 81–108.
- Blanchard, O., Ostry, J. D., Ghosh, A. R. & Chamon, M. (2017), ‘Are capital inflows expansionary or contractionary? theory, policy implications, and some evidence’, *IMF Economic Review* **65**(3), 563–585.
- Bofinger, P. & Wollmershäuser, T. (2003), ‘Managed floating as a monetary policy strategy’, *Economics of Planning* **36**(2), 81–109.
- Borio, C. & Disyatat, P. (2011), ‘Global imbalances and the financial crisis: Link or no link?’, *Bank for International Settlements Working Paper* (346).
- Borio, C. & Disyatat, P. (2015), ‘Capital flows and the current account: Taking financing (more) seriously’, *Bank for International Settlements Working Paper* (525).
- Broner, F., Didier, T., Erce, A. & Schmukler, S. L. (2013), ‘Gross capital flows: Dynamics and crises’, *Journal of Monetary Economics* **60**(1), 113–133.
- Bruno, V. & Shin, H. S. (2014), ‘Cross-border banking and global liquidity’, *The Review of Economic Studies* **82**(2), 535–564.
- Bruno, V. & Shin, H. S. (2015), ‘Capital flows and the risk-taking channel of monetary policy’, *Journal of Monetary Economics* **71**, 119–132.
- Calvo, G. A. (1998), ‘Capital flows and capital-market crises: The simple economics of sudden stops’, *Journal of Applied Economics* **1**(1), 35–54.
- Cavallo, E., Powell, A., Pedemonte, M. & Tavella, P. (2015), ‘A new taxonomy of sudden stops: Which sudden stops should countries be most concerned about?’, *Journal of International Money and Finance* **51**, 47–70.

- Cerutti, E., Claessens, S. & Puy, D. (2019), ‘Push factors and capital flows to emerging markets: why knowing your lender matters more than fundamentals’, *Journal of International Economics* **119**, 133–149.
- Cerutti, E., Claessens, S. & Rose, A. K. (2019), ‘How important is the global financial cycle? evidence from capital flows’, *IMF Economic Review* **67**(1), 24–60.
- Cesaratto, S. (2013), ‘The implications of TARGET2 in the European balance of payments crisis and beyond’, *European Journal of Economics and Economic Policies: Intervention* **10**(3), 359–382.
- Cesaratto, S. (2015), ‘Balance of Payments or Monetary Sovereignty? In Search of the EMU’s Original Sin’, *International Journal of Political Economy* **44**(2), 142–156.
- Cesaratto, S. (2018), ‘The nature of the eurocrisis: a reply to Febrero, Uxó and Bermejo’, *Review of Keynesian Economics* **6**(2), 240–251.
- Cohen, B. H., Domanski, D., Fender, I. & Shin, H. S. (2017), ‘Global liquidity: A selective review’, *Annual Review of Economics* **9**(1), 587–612.
- Febrero, E., Álvarez, I. & Uxó, J. (2019), ‘Current Account Imbalances or Too Much Bank Debt as the Main Driver of Gross Capital Inflows? Spain During the Great Financial Crisis’, *Journal of Economic Issues* **53**(4), 1126–1151.
- Febrero, E., Uxó, J. & Bermejo, F. (2018), ‘The financial crisis in the eurozone: a balance-of-payments crisis with a single currency?’, *Review of Keynesian Economics* **6**(2), 221–239.
- Forbes, K. J. & Warnock, F. E. (2012), ‘Capital flow waves: Surges, stops, flight, and retrenchment’, *Journal of International Economics* **88**(2), 235–251.
- Fratzscher, M. (2012), ‘Capital flows, push versus pull factors and the global financial crisis’, *Journal of International Economics* **88**(2), 341–356.
- Ghosh, A. R., Ostry, J. D. & Chamon, M. (2016), ‘Two targets, two instruments: Monetary and exchange rate policies in emerging market economies’, *Journal of International Money and Finance* **60**, 172–196.
- Godley, W. & Lavoie, M. (2007), *Monetary Economics: An Integrated Approach to Credit, Money, Income, Production and Wealth*, Palgrave Macmillan, Basingstoke [England] ; New York.

- Hobza, A. & Zeugner, S. (2014), ‘Current accounts and financial flows in the euro area’, *Journal of International Money and Finance* **48**, 291–313.
- Jakab, Z. & Kumhof, M. (2019), Banks are not intermediaries of loanable funds - facts, theory and evidence, techreport 761, Bank of England.
- Kalemlı-Özcan, Ş. & Kwak, J. H. (2020), ‘Capital flows and leverage’, *Annual Review of Economics* **12**(1), 833–846.
- Koepke, R. (2018), ‘What drives capital flows to emerging markets? a survey of the empirical literature’, *Journal of Economic Surveys* **33**(2), 516–540.
- Lavoie, M. (2014), *Post-Keynesian Economics: New Foundations*, Edward Elgar, Cheltenham; Northampton, MA.
- Lavoie, M. (2015a), ‘The eurozone crisis: A balance-of-payments problem or a crisis due to a flawed monetary design?’, *International Journal of Political Economy* **44**(2), 157–160.
- Lavoie, M. (2015b), ‘The eurozone: Similarities to and differences from keynes’s plan’, *International Journal of Political Economy* **44**(1), 3–17.
- McLeay, M., Radia, A. & Thomas, R. (2014), ‘Money creation in the modern economy’, *Bank of England Quarterly Bulletin* **Q1**(2014 Q1).
- Obstfeld, M. (2012), ‘Does the current account still matter?’, *American Economic Review* **102**(3), 1–23.
- Obstfeld, M., Shambaugh, J. C. & Taylor, A. M. (2005), ‘The trilemma in history: Tradeoffs among exchange rates, monetary policies, and capital mobility’, *Review of Economics and Statistics* **87**(3), 423–438.
- Passari, E. & Rey, H. (2015), ‘Financial flows and the international monetary system’, *The Economic Journal* **125**(584), 675–698.
- Rey, H. (2015), Dilemma not trilemma: The global financial cycle and monetary policy independence, NBER Working Paper 21162.
- Shin, H. S. (2012), ‘Global banking glut and loan risk premium’, *IMF Economic Review* **60**(2), 155–192.
- Whelan, K. (2014), ‘TARGET2 and central bank balance sheets’, *Economic Policy* **29**(77), 79–137.