What would be the consequences of a "sudden stop" UK current account reversal?*

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As the UK-government's negotiations with the EU over possible trade deals continue to suggest Brexit will deliver a meaningful break from current relationships, it is worth considering the implications this may have for the UK current account and international financing of UK-borrowing. This note follows the classical macroeconomic trade literature in analysing the joint behaviour of the current account and real exchange rate to show that a UK current account reversal (however this arises) is likely to be associated with a real exchange rate depreciation of around 22%, while the UK terms of trade deteriorate by around 8%. I firstly present the latest data on the UK current account, before introducing a simple established framework which embeds the relationship between the UK current account and its real exchange rate. I conclude with some simple back-of-the-envelope comparative static calculations to highlight how a UK current account reversal may be associated with a substantial UK real exchange rate depreciation.

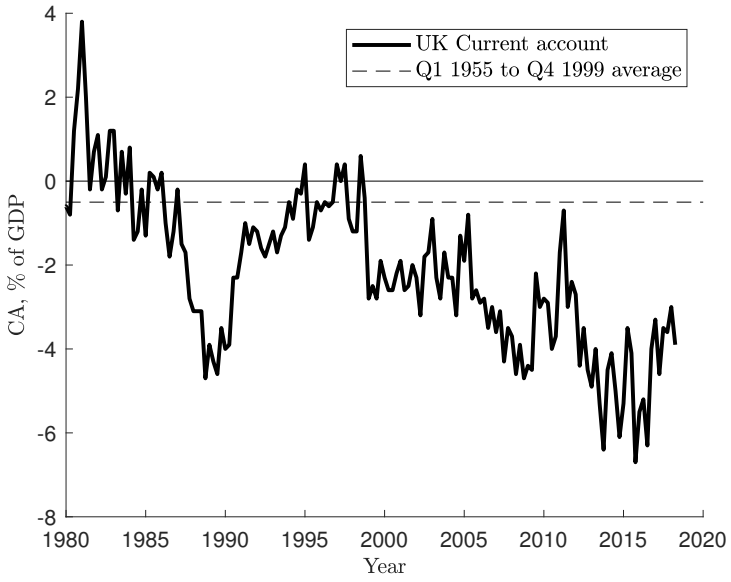
1 The UK Current Account

Since the middle of the 1980s, the UK current account, shown in Figure 1, has persistently, been negative, indicating that the UK is reliant on borrowing from the rest of the world to finance domestic consumption and investment. Although a negative current account does not,

*The usual disclaimer applies. In this instance, the calibration is mine but the ideas really belong to Obstfeld and Rogoff. Email: ddgw2@cam.ac.uk.

in itself, indicate an unsustainable position, the persistence of this deficit and the widening since the global financial crisis have often been viewed as key risks to domestic financial stability. Indeed, the Bank of England's Financial Policy Committee (FPC) has frequently highlighted this position as a key risk in their biannual review of financial stability, which details how the UK external financing position has increasingly become dependent on foreign capital inflows to support domestic consumption and investment (e.g. see Bank of England (2018)).

Figure 1: UK Current Account

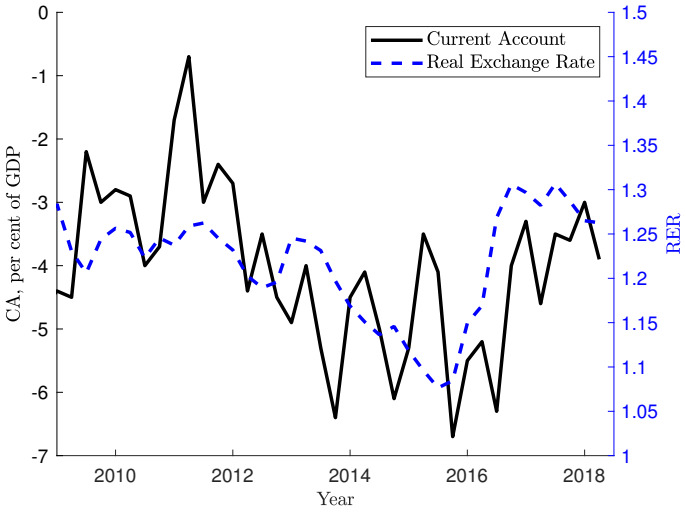


Source: ONS.

In industrialised countries, persistent and substantial current account deficits are prone to reversal after reaching the bellwether magnitude of around 5% of GDP. A real exchange rate depreciation of between 10% to 20% is usually associated with this deficit reversal.[1] So far, the UK experience appears to be consistent with this rule-of-thumb. After reaching a trough of -6.7% of GDP in Q4 2015, the UK's current account deficit has since almost halved, while the effective real exchange rate has depreciated by around 16%, shown in Figure 2, more than unwinding the appreciation which took place over three years, starting in 2013.

[1] See: Freund (2005).

Figure 2: UK Current Account



Sources: ONS and Bank of England.

Despite this recent retrenchment, a substantial current account deficit remains in both absolute terms (-3.9% of GDP in Q2 2018) and relative to historical norms (an average of -0.5% of GDP between Q1 1955 and Q4 1999). Thus, given these data trends, the plausibility of a further current account reversal, and the conjunction with ongoing Brexit negations, this is an opportune time to re-evaluate the plausible implications of such a reversal, in particular for future movements in the real exchange rate. Of course, many factors may ultimately push the UK current account deficit towards a more normal trajectory which is not to say that such a reversal is likely to occur in the near term, nor that reversal would be either caused entirely by the outcome of the Brexit negotiation process. Whatever economic theory tells us – the ability of UK households, firms and government to continually finance domestic consumption and investment with foreign borrowing depends on a complex interplay between economic and political considerations. In practice, I suppose the UK current account suddenly closes from its initial 3.9% deficit and examine the associated real exchange rate movements.

2 Simple Framework for the CA & RER Relationship

The theoretical links between the current account and real exchange rate are well-established in economic theory. The essence of this note is to replicate results by Obstfeld and Rogoff (2000, 2007) who focused on implications for the US real exchange rate and suggested that

closing of a US current account deficit of similar magnitude (-6%) could be associated with a large real exchange rate depreciation of as much as 30%. Their calculation relies upon a simple, tractable partial model of the economy and this section of the note presents their derivations.

In this model, suppose there are two countries, the UK and the Rest of the World (RoW). Each country has a tradable goods and non-tradable services sector, while the level of total output is assumed fixed.[2] In aggregate, the household sector of each country is assumed to consume a bundle of goods and services, C, which combines traded goods, C_T and non-traded services C_N. Moreover, within the tradable goods component, consumption may be further divided into that of domestic origin, C_H, and tradable goods consumption imported from abroad, C_F. Together, these aggregate and tradable consumption bundles are given as:

$$C = \left[\gamma^{1/\theta} C_T^{\frac{\theta-1}{\theta}} + (1-\gamma)^{1/\theta} C_N^{\frac{\theta-1}{\theta}}\right]^{\frac{\theta}{\theta-1}}, \quad \text{and} \quad C_T = \left[\alpha^{1/\eta} C_H^{\frac{\eta-1}{\eta}} + (1-\alpha)^{1/\eta} C_F^{\frac{\eta-1}{\eta}}\right]^{\frac{\eta}{\eta-1}}.$$

The parameters θ and η represent elasticities, while γ and α may be used to determine expenditure shares for each component of household consumption. In particular, the empirical fact that consumers in the UK spend more of their income on domestically produced goods, than foreign ones (home bias) is captured in the parameter α. These consumption bundles are associated with price indices, given as:

$$P = \left[\gamma P_T^{1-\theta} + (1-\gamma) P_N^{1-\theta}\right]^{\frac{1}{1-\theta}}, \quad \text{and} \quad P_T = \left[\alpha P_H^{1-\eta} + (1-\alpha) P_F^{1-\eta}\right]^{\frac{1}{1-\eta}},$$

whose explicit functional form is one reason for the chosen consumption aggregation. A similar set of consumption bundles is assumed to hold in the Rest of the World, with RoW variables denoted with an asterisk.

I assume that the Law of One Price (LOOP) holds in each of the tradable goods markets, such that the price consumers pay in the UK and the Rest of the World for goods traded on international markets is the same, after accounting for the nominal exchange rate. However, due to preference differences, the LOOP does not hold for the tradable goods sector in aggregate.[3] Moreover, by explicitly defining the real exchange rate, Q, as the relative price level in

[2] UK output as a share of the world total remains fixed.

[3] In particular this is a function of the home bias assumption, with $\alpha \neq \alpha^*$.

the RoW, compared to the UK (when expressed in the same currency units):

$$Q = \frac{\mathcal{E}P^*}{P},$$

where $\mathcal{E}$ is the nominal exchange rate between the UK and RoW, a relationship may be derived such that:

$$Q = \underbrace{\left[\frac{(1-\alpha^*)+\alpha^*\mathcal{T}^{1-\eta}}{\alpha+(1-\alpha)\mathcal{T}^{1-\eta}}\right]^{\frac{1}{1-\eta}}}_{\text{Rel. price of traded goods}} \quad \underbrace{\left[\frac{\gamma+(1-\gamma)x^{*,1-\theta}}{\gamma+(1-\gamma)x^{1-\theta}}\right]^{\frac{1}{1-\theta}}}_{\text{Ratio of rel. price of non-traded services}}, \tag{1}$$

where $\mathcal{T} \equiv \frac{P_F}{P_H}$ are the UK terms of trade, while $x \equiv (P_N/P_T)$ and $x^* \equiv (P_N^*/P_T^*)$ represent price ratios. This relationship states that the real exchange rate depends critically on two terms. As the relative price of traded goods between countries increases, the UK's terms of trade deteriorate, and the real exchange rate depreciates. As the real exchange rate compares aggregate price levels across countries, a second effect may arise through movements in the relative price of non-traded services to traded goods in either country.

Since the consumption aggregators, above, imply a constant elasticity of demand for each of the goods (Home tradables, Foreign tradables, Home non-tradables and Foreign non-tradables), demand may be combined with the market clearing conditions to generate four relationships which must always hold in equilibrium. In expenditure terms these are given as:

$$P_H Y_H = \alpha\Big(\frac{P_H}{P_T}\Big)^{1-\eta} P_T C_T + (1-\alpha^*)\Big(\frac{P_H}{\mathcal{E}P_T^*}\Big)^{1-\eta}\mathcal{E}P_T^* C_T^*,$$

$$P_F Y_F^* = (1-\alpha)\Big(\frac{P_F}{P_T}\Big)^{1-\eta} P_T C_T + \alpha^*\Big(\frac{P_F}{\mathcal{E}P_T^*}\Big)^{-\eta}\mathcal{E}P_T^* C_T^*,$$

$$P_N Y_N = (1-\gamma)\Big(\frac{P_N}{P}\Big)^{1-\theta} PC,$$

$$\mathcal{E}P_N^* Y_N^* = (1-\gamma)\Big(\frac{P_N^*}{P^*}\Big)^{1-\theta}\mathcal{E}P^* C^*.$$

Assuming $\{Y_H, Y_F^*, Y_N, Y_N^*, C, C^*\}$ are exogenous, these equations may then be combined

with equations determining the UK and RoW current account:

$$CA = iB + \mathcal{E}P_H^* C_H^* - P_F C_F = P_H Y_H + iB - P_T C_T,$$

$$\mathcal{E}CA^* = \mathcal{E}P_F^* Y_F^* - iB - \mathcal{E}P_T^* C_T^* = -CA.$$

where i is the nominal interest rate paid on the existing stock of UK financial assets, B, and the final equality ensures that UK borrowing is met with lending from the RoW. Together this suggests the system:

$$P_H Y_H = \alpha\Big(\frac{P_H}{P_T}\Big)^{1-\eta}(P_H Y_H + iB - CA) + (1-\alpha^*)\Big(\frac{P_H}{\mathcal{E}P_T^*}\Big)^{1-\eta}(P_F Y_F^* - iB + CA),$$

$$P_F Y_F^* = (1-\alpha)\Big(\frac{P_F}{P_T}\Big)^{1-\eta}(P_H Y_H + iB - CA) + \alpha^*\Big(\frac{P_F}{\mathcal{E}P_T^*}\Big)^{-\eta}(P_F Y_F^* - iB + CA),$$

$$P_N Y_N = \frac{1-\gamma}{\gamma}\Big(\frac{P_N}{P_T}\Big)^{1-\theta}(P_H Y_H + iB - CA),$$

$$\mathcal{E}P_N^* Y_N^* = \frac{1-\gamma}{\gamma}\Big(\frac{P_N^*}{P_T^*}\Big)^{1-\theta}(P_F Y_F^* - iB + CA).$$

Hence, given the assumption of exogenous endowments, a UK current account reversal will lead to *reallocation* of consumption both between the traded goods produced by each country and between traded goods non-traded services, solely as a result of the associated *relative price movements* in a comparative static exercise. This presents us with a recipe to determine the associated relative price movements with a UK current account reversal.

To associate a change in the real exchange rate, Q, with a given change in the UK current account, CA, three variables are required: the change in the UK terms of trade, $\mathcal{T}$, and the change in the traded-to-non-traded price ratios, NTT and NTT^*. Therefore, these three variables of interest may be determined using only three of the four independent market clearing conditions, given above. Namely, the equilibrium in the UK traded goods market may be used to infer and impact on the UK terms of trade, $\mathcal{T}$, while the non-traded goods markets for both the UK and RoW may then be used to infer the relative price impacts. These

three equations are rewritten to aid the calibration procedure:

$$1 = \frac{\alpha(1 + ib - ca)}{\alpha + (1-\alpha)\mathcal{T}^{1-\eta}} + \frac{(1-\alpha^*)(\mathcal{T}/\sigma_T - ib + ca)}{\alpha^*\mathcal{T}^{1-\eta} + (1-\alpha^*)}, \tag{2}$$

$$\sigma_N = \Big(\frac{1-\gamma}{\gamma}\Big)\frac{NTT^{-\theta}(1 + ib - ca)}{[\alpha + (1-\alpha)\mathcal{T}^{1-\eta}]^{\frac{1}{1-\eta}}}, \tag{3}$$

$$\sigma_N^* = \Big(\frac{1-\gamma}{\gamma}\Big)\frac{NTT^{*,-\theta}[1 - (ib - ca)\sigma_T/\mathcal{T}]}{[\alpha^* + (1-\alpha^*)\mathcal{T}^{-(1-\eta)}]^{\frac{1}{1-\eta}}}, \tag{4}$$

where $ca \equiv CA/(P_H Y_H)$, $b \equiv B/(P_H Y_H)$, $\sigma_T \equiv Y_H/Y_F$, $\sigma_N \equiv Y_N/Y_H$ and $\sigma_N^* \equiv Y_N^*/Y_F^*$. Finally, when these changes have been computed, associated movements in the real exchange rate may be obtained using equation 1.

3 Back-of-the-Envelope Calculations

Having outlined the three equations which consistently describe the relationship between the UK current account and real exchange rate, I now turn to the primary comparative static exercise of interest. This considers an exogenous change in the real exchange rate, and considers which value of the terms of trade and non-traded-to-traded price ratios in the UK and RoW are consistent with this change (i.e. delivering the required change in the composition of consumption). In a second step, these are combined, using equation 1, to determine the associated change in the real exchange rate. As such, all other parameters must be predetermined exogenously.

3.1 Calibration

The model calibration procedure closely follows that set out in Obstfeld and Rogoff (2007), as shown in Panel A of Table 1. Using data from the ONS, and $P_H Y_H/(P_H Y_H + P_N Y_N) \approx 0.25$, suggests the initial -3.9% of GDP current account deficit may be expressed as a deficit-to-*tradables* ratio of $CA/P_H Y_H = -0.156$. Similarly the ONS calculates UK net international investment position (NIIP) as -17.6% of GDP, which translates into a value of $b = -0.719$ when expressed as a fraction of UK-tradable goods output. The nominal interest rate is taken to be 6%, which is consistent with empirical evidence from Jordà et al. (2017) who undertake an

extensive exercise to measure the rate of return across a number of assets for 16 industrialised countries.[4] Varying this parameter does not substantially alter the quantitative results. In the final difference between the current calibration and the baseline calibration in Obstfeld and Rogoff (2007), the UK's expenditure share of the global goods trade, $\frac{P_H Y_H}{P_H Y_H + P_F Y_F^*}$, is set to match the UK's share of global GDP, with the 1980-2017 average at 3.1% is taken from the IMF's WEO.[5] For convenience, Panel B of Table 1 shows parameters with consistent values across studies (elasticities, home bias and the income share spend on tradable goods).

Table 1: Exogenous Quantities and Parameters

A. Different Parameters	Target	Calibration	Source	US 2006
Current account	$CA/GDP = -3.9\%$	$ca = -0.156$	ONS	$ca = -0.2$
Net foreign assets	$B/GDP = -17.9\%$	$b = -0.719$	ONS	$b = -0.8$
Nominal interest rate		$i = 0.06$	Jordà et al. (2017)	$i = 0.05$
Rel. size of H tradables	$P_H Y_H/[P_H Y_H + P_F Y_F^*] = 3.1\%$	$\sigma_T = 0.031$	IMF	$\sigma_T = 0.22$

B. Consistent Parameters	Target	Calibration	Source
Rel. size of H non-tradables	$Y_N/Y_H = 1$	$\sigma_N = \sigma_N^* = 1$	Obstfeld and Rogoff (2007)
Tradables share of income		$\gamma = 0.25$	Literature
Tradables elasticity		$\eta = 2$	Literature
Non-tradables elasticity		$\theta = 1$	Literature
Home bias (H)		$\alpha = 0.7$	Literature
Home bias (F)		$\alpha^* = 0.925$	Literature

Sources: Obstfeld and Rogoff (2007) and own calculations. Notes: The column US 2006 compares parameters used to those in Obstfeld and Rogoff (2007) for the US economy in 2006.

3.2 Results

The results of this exercise are shown in Table 2, where the benchmark case is outlined in the first row. This shows that a UK current account reversal would be associated with a terms of trade deterioration of 7.9% and a real exchange rate depreciation of 22.2%. The UK current account reversal is also associated with a strong relative price movement within the UK, as the relative price of non-traded services (compared to traded goods) falls by 22.9%. Consumption therefore shifts away from traded goods towards non-traded services as the UK current account closes. In an accounting sense, the terms of trade movement explains 4.9pp

[4] In fact, in our endowment economy, the value of i in the model should correspond to the value of $r + \pi - g \approx 6.2\%$ in the data, where g is the output growth rate and π represents inflation.

[5] An alternative measure may also be derived from WTO data, where the 1980-2013 average suggests the UK represents around 4.9% of world trade. Switching measures leaves does not substantially alter the quantitative results.

of the change in the real exchange rate, while relative price movements (across both sectors and countries) comprise the remainder.

Table 2: Results

θ	η	$\hat{\mathcal{T}}$	$\hat{x}$	$\hat{x}^*$	$\hat{Q}$
1	2	7.9	-22.9	1.7	22.2
1	3	4.1	-21.2	1.2	18.5
2	2	7.9	-11.4	0.9	11.0
2	3	4.1	-10.6	0.6	8.5
0.5	2	7.9	-45.8	3.5	49.4
1	1000	0	-19.0	0.6	14.7

Notes: Table shows the percentage change in the UK terms of trade, $\hat{\mathcal{T}}$, and the relative price of non-traded goods in the UK and RoW, $\hat{x}$ and $\hat{x}^*$, alongside the percentage movement in the UK real exchange rate, $\hat{Q}$, that are consistent with a sudden reversal of the UK current account. A range of plausable elasticity parameters are explored.

Further cases are also considered, by varying the elasticity parameters. These highlight the importance of elasticities in determining the relationship between price and quantity adjustments. Higher elasticity values (such that goods are more substitutable with one another) show a smaller change in relative prices may be associated with a current account rebalancing while lower values (which indicate households have difficulty in substituting between products) are associated with larger relative price movements.

This may be demonstrated by the case presented in the final row. This considers a scenario where the terms of trade are virtually unchanged. The change in the real exchange rate in this case is lower than the benchmark value signifying that the terms of trade have a reinforcing mechanism, increasing the required real exchange rate adjustment in a given setting.

3.3 Caveats

The exercise presented here obviously, and necessarily, abstracts form a vast amount of potential influences on the relationship between the UK current account and real exchange rate. The analysis is intended as a back-of-the-envelope calculation, to provide a range of plausible estimates, and hopefully provoke discussion, of the likely path for the UK real exchange rate in the medium term. Further work should also account for two key drawbacks of this analysis.

Firstly the assumption of fixed endowments precludes any endogenous adjustments along the quantity dimension. In the short-tern, if the scenario is indeed a "sudden stop" this drawback is likely to be small. Yet, as the duration of any adjustment period increases, quantity variation may mitigate the necessity of relative price movements, resulting in a smaller estimate for the associated impact of a current account reversal on the real exchange rate. The implication of this assumption is the notion that real exchange rate adjustment - which must ultimately be determined by general equilibrium effects accounting for any impact on production - may not adequately capture the welfare considerations of the net wealth transfer which arises as a result of the current account reversal. However Corsetti et al. (2013) show how, for a given current account adjustment, the impact on welfare relevant variables (consumption and employment) differs remarkably little even after accounting for endogenous output adjustment.

Additionally the analysis presented above assumed markets function "normally" even in the event of a "sudden stop" current account reversal. In reality, a reduction in market liquidity during times of market stress may result in greater-than-anticipated movements in the real exchange rate being necessary to deliver the require price responses.

4 Conclusion

In this short note, I rediscover the influential Obstfeld and Rogoff (2000, 2007) framework for analysing the association between current account and real exchange rate movement. Applying this to the current UK conjuncture, I show that a sudden UK current account reversal, an increasingly likely prospect, would conceivably be associated with a (further) real exchange rate depreciation of around 22% from current levels and a terms of trade deterioration of around 8%.

References

Bank of England (2018). Financial Stability Report (June, 2018).

Corsetti, G., P. Martin, and P. Pesenti (2013). Varieties and the Transfer Problem. *Journal of International Economics 89*(1), 1–12.

Freund, C. (2005). Current Account Adjustment in Industrial Countries. *Journal of International Money and Finance 24*(8), 1278–1298.

Jordà, Ò., K. Knoll, D. Kuvshinov, M. Schularick, and A. M. Taylor (2017). The Rate of Return on Everything, 1870-2015. *Mimeo*, 1870–201.

Obstfeld, M. and K. S. Rogoff (2000). Perspectives on OECD Economic Integration: Implications for US Current Account Adjustment. *Federal Reserve Bank of Kansas City, Global Economic Integration: Opportunities and Challenges*.

Obstfeld, M. and K. S. Rogoff (2007). The Unsustainable US Current Account Position Revisited. In R. Clarida (Ed.), *G7 Current Account Imbalances: Sustainability and Adjustment*. Chicago, IL: University of Chicago Press.