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THE IMPACT OF BASEL III ON TRADE FINANCE:
THE POTENTIAL UNINTENDED CONSEQUENCES OF THE LEVERAGE
RATIO

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Leverage Ratio

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Abstract

Trade finance, particularly in the form of short-term, self-liquidating letters of credit and the like, has received relatively favourable treatment regarding capital adequacy and liquidity under Basel III, the new international prudential framework. However, concerns have been expressed over the potential" unintended consequences" of applying the newly created leverage ratio to these instruments, notably for developing countries' trade. This paper offers a relatively simple model approach showing the conditions under which the initially proposed 100% leverage tax on non-leveraged activities such as letters of credit would reduce their natural attractiveness relative to higher-risk, less collateralized assets, which may stand in the balance sheet of banks. Under these conditions, the model shows that leverage ratio may nullify in part the effect of the low capital ratio that is commensurate to the low risk of such instruments. The decision by the Basel committee on 12 January 2014 to reduce the leverage ratio seems to be justified by the analytical framework developed in this paper.

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1

1 Executive Summary

The Basel III framework strengthens prudential requirements on banks with a view to achieving a safer financial system. New guidelines on capital, liquidity, maturity and leverage aim at reducing the incentives for building-up high-risk, highly leveraged banks assets responsible for the 2008-09 dislocation of the global financial system. As a low risk, highly collateralized assets, traditional forms of trade finance, such as letters of credit and other self-liquidating commitments to pay with a very small loss record, are clearly not the target of the re-regulation exercise. Instead, policy-makers are mindful of the need to minimize any possible unintended consequences of the new framework. Still, concerns have been expressed over the potential impact of the supplementary leverage ratio on the supply of letters of credit and other short term, self-liquidating instruments (Auboin, 2010)[1].

In BIS (2011), the Basel Committee on Banking Supervision (BCBS) has been offering an answer to these concerns, but decided not to change the decision to subject to a 100% leverage tax the letters of credit and other trade finance instrument standing off-the-balance sheet of banks. The trade and trade finance industries have made the point that letters of credit and the like, one of the oldest forms of trade financing, were not a source of leverage for financial institutions (ICC, 2013). In its regulation implementing the Basel III guidelines, the European Union, following an approach supported by the European Commission, approved by the Council of Ministers in May 2012 and endorsed by the European Parliament in late 2013, decided to reduce the leverage tax on such products, recognizing the importance of trade finance for growth. As other Members of the Basel Committee favoured the approach of the European Union, the Basel Committee reconsidered its guidelines on leverage for trade assets on 12 January 2014[2].

The interest of policy-makers in this matter is justified by the facts that: a large share of trade credit is still taking the form of securitized letters of credit; there is a causal relationship between the availability of trade credit and trade flows; developing countries (albeit not only) are intensive users of this form of secured way of financing trade.

One of the difficulties in this normative debate is to evaluate the economic impact of a regulatory measure that will be in effect implemented in 2018 at the latest, but for which data have to be gathered by banks in 2014. The measure is hence not yet in place, and has to be analysed a priori, with a proper analytical framework. The question as to whether the leverage ratio for letters of credit require a 100% or a 20% CCF rate has to be analysed with a proper analytical framework. This paper addressed this challenge. It designed an analytical framework helping to single out a particular albeit key measure of the Basel III package, in order to discuss its potential impact.

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[1]A comprehensive description of the Basel III Leverage and supplementary leverage ratios, and its rationale, is offered by Ojo (2013)

[2]http://www.bis.org/press/p140112a.htm

Hence it highlights that the Basel Committee seems to have adopted the right approach in its decision on 12 January 2014.

The literature offered only limited leads as to how this could be achieved. Several papers address, in general, the impact of prudential cost (at best reduced to the capital cost) on asset allocation, the balance between marginal cost and revenues of assets in the balance sheet, and the cost of credit. No paper proposed a methodology to assess the impact of one measure in the relative choice of assets on and off-the-balance sheet. Zicchino (2006) describes the mechanisms under which the capital-to-asset ratio in the risk-weighted asset system of Basel II had contributed to pro-cyclical lending during the period of application of the framework. His simple model shows how banks maximize their net worth by choosing the loan return, level of deposits, investment in trade securities and capital subject to cash-flow constraints, loan demand, financial constrain and balance-sheet identity. He demonstrated arithmetically that the optimal level of capital held by banks is (a) a negative function of the expected marginal cost of external funds (b) a positive function of the expected demand for loans (which itself is a function of existing economic conditions) (c) a negative function of the expected marginal cost of loans (d) a positive function of the volatility of loan demand (e) a negative function of the elasticity of the loan demand (bigger elasticity implying less monopoly power), and (f) a positive function of the regulatory capital.

Another interesting approach was developed by Blum (1999), who considered that capital adequacy ratios increased banks riskiness. The point was that, as raising equity was quite costly, particularly in an intemporal model in which the value of capital is higher tomorrow than today, hence the only possibility to increase equity tomorrow was to increase risk today. He showed that an increase in capital regulation can raise the marginal return on risk. The rationale in linked to the fact that under binding regulation, equity tomorrow is more valuable to the bank than it is today. In a regime of binding capital requirements, the amount that can be invested in the risky but profitable asset is restricted to a multiple of the value of equity. This implies that an additional unit of equity leads to an additional investment larger than one unit in the risky asset. Due to this leverage effect, equity is more valuable to a regulated bank. A bank facing binding capital rules has therefore a higher incentive to increase equity tomorrow. However, if a bank finds it prohibitively costly to raise additional equity in the capital market ore is unable to do so, the only way to increase the amount of equity is to increase risk today.

Finally, Elliott and Al (2012) have examined the impact of increased capital requirement on lending rates (loan cost). They found that the total net additional cost of funding new capital requirement was quite modest in most financial markets, not the least because many financial institutions held ex ante target minimum ratio (for common equity) well above the regulatory requirements.

While useful, though, none of these papers in themselves help us answer the central question of this paper, ie how the imposition of a leverage ratio on trade finance would change the incentive in using it. Part of the reason is that previous papers do not deal with off-balance sheet commitments, which have increased, taking advantage of the loopholes of Basel II. The creation of a leverage ratio to off-balance sheet commitments, under Basel III, is hence a central piece of the new Basel III framework. It is precisely aimed at avoiding the accumulation of toxic assets off the balance sheet of banks, particularly when it aims at circumventing the capital charge on assets. It is therefore understood that the leverage ratio, for good reasons, is aimed at reducing the attractiveness of such commitments. It is also well understood that the application of a leverage ratio at a 100% CCF from a 3% threshold, is not equivalent to multiplying by five the 20% CCF applied for capital purposed to letters of credit. It is nonetheless likely to be a (substantial) increase in the cost of prudential regulation for this particular category of products, in absolute and relative terms.

Section II offers more background on the prudential treatment of letters of credit as a safe way to finance trade, while Section III offers a simple model describing the relative loss of attractiveness of these instruments relative to other ones.

2   Background on the prudential treatment of short-term trade finance

2.1   The capital ratio

Traditionally, short term, structured trade finance has received preferred capital treatment on the part of national and international regulators, as well as by international financial agencies in the treatment of trade finance claims, on grounds that trade finance was one of the safest, most collateralized, and self-liquidating forms of trade finance. This was notably reflected in the low credit conversion factor (CCF) determined under the Basel I framework for the capitalization of such instruments as self-liquidating letters of credit, bank acceptances and other short term collateralized commitments to pay. For letters of credit and other self-liquidating trade instrument, the CCF was set at 20%, i.e. five times lower than any on-balance sheet loan (all loans standing into the balance sheet are capitalized at 100% of their face value, i.e. at a 100% CCF).

Box 1 illustrates the way the capital charge was calculated under the Basel I framework.
The use of CCF values of 20% was widely regarded at the time as recognition of the low risk of lending on trade and transactions related contingencies in comparison to other forms of lending products. Trade-related contingencies are contingent liabilities that arise from trade-related obligations underpinned by the movement of goods or the provision of services and evidenced by commercial contracts which document the arrangement between the buyer and the seller. Hence,

trade-related contingencies are hardly speculative in nature. In providing for such facilities, the banks are simple intermediaries between the parties, i.e. the buyer and the seller, and are offering a service providing for risk mitigation and transaction structuring for the counterparties[3].

Under the Basel II and III frameworks, the 20% credit conversion factor was maintained for short-term self-liquidating letters of credit arising from the movement of goods" (e.g. documentary credits collateralized by the underlying shipment, to be applied to both issuing band confirming banks). However, one provision of Basel II reduced the positive incidence of the low CCF, by requiring that, unless permitted otherwise by their local regulators, bank capitalize letters of credit and the like for a full year, even though the maturity of such instruments is actually lower. This issue was addressed in the context of the G-20 dialogue that took place in 2011 between the WTO and World Bank, on the one hand, and the Basel Committee on Banking Supervision (BCBS), on the other, to improve common understanding of trade finance, and identify any possible unintended consequences of prudential regulation. Under such dialogue, prudential regulators have been able to improve their grasp on the workings of trade finance and to verify, thanks to the data collected by the International Chamber of Commerce (ICC) under the pilot trade finance register, the low-risk character and absence of leverage of the industry. The aggregate data initially delivered by ICC covered 9 major international banks, over 5 million transactions, and revealed less than 1,150 defaults (0.02%). It also revealed that the average tenor of a letter of credit was around 95 days. Since then, the trade finance register has continued to expand, with a total of 21 banks able in 2013 to provide data for a total of 15 million transactions (covering 5 years and USD 3.5 trillion in trade transaction value). The 2013 register reveals that the default rate on letters of credit is unchanged, at 0.02%. Since over 50% of the loss is recovered through the sale of the underlying merchandise, the total loss rates on these products is 0.01% or less[4].

2.2 The specific case of the leverage ratio

Another key aspect concerned the future implementation of the leverage ratio on letters of credit and the like, which according to Basel III rules issued in 2011, should be subject to a non-risk based 100% credit conversion factor for the purpose of calculating this ratio. To be noted is the

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[3]A letter of credit provides an irrevocable guarantee to the exporter that, should the goods and/or services be delivered to the importer according to contractual terms, and in presence of compliant documents, that it will be paid by the bank that issued that letter of credit (the bank of the importer). The letter of credit also provides assurances to the importer, in particular that of receiving the goods and/or services ordered, in line with the compliant documentation, and under any contractual terms set out in the purchase agreement. The obligation of the issuing bank to pay the beneficiary of the letter of credit, most generally the exporter, is hence contingent on the exporter delivering the merchandise as detailed in the letter of credit, but also in accordance with all the other requirements specified in the documented credit. The documentation required in a letter of credit depends on the level of complexity of the transaction and the degree of security that the two parties wish to have on the transaction: security of payment, security and transparency regarding the description of the goods, security regarding the clearance of customs, transportation process and delivery on time, and other kinds of risks related to the transactions.

[4]More details on the trade register is available at: http://www.iccwbo.org/products-and-services/trade-facilitation/banking-commission-market-intelligence/

fact that the 100% CCF for calculating the capital charge is not to be confused with the 100% CCF for the purpose of the calculation of the leverage ratio. According to Basel III guidelines, the 100% leverage tax would only apply from a threshold of 3% of capital, upwards. The formula allowing for the calculation of the leverage ratio can be visualized as in Figure 1 in the Appendix:

There is here undisputed support to the argument that the recent financial crisis was caused by an excess of leverage in banks, and that the concentration off-balance sheets of toxic assets, often aggregated in "special vehicles", has been one the reasons behind the blindness of banks' managements regarding the actual deterioration of their institutions' net worth. It is also not disputed that the "packaging" of such asset-backed securities aimed at minimizing capital requirements for such assets. The leverage ratio is therefore a positive measure to avoid the concentration of toxic assets off-the-balance sheets of financial institutions, feeding distrust and fostering irresponsibility among the successive holders of such assets.

Though, one argument defended by the WTO since the proposal of such measure has been the absence of leverage involved in short term trade finance transactions, due to the one-to-one relationship with merchandise trade[5]. Moreover, contingent trade finance obligations, such as letters of credit, are off the balance sheet essentially for process reasons. The WTO acknowledged, though, that the dialogue with Basel Committee Members should be fact-based, and had to be fed by data collected by the industry. From this point of view, the WTO has strongly encouraged commercial banks to feed in the ICC trade finance registry, which constitutes a true public good, and is taken very seriously by the Basel Committee. It is also acknowledged in this paper that the leverage ratio is not yet in application. The collection of data for its application would only commence in 2015. It has finally been noted by the WTO that under the CRD IV regulation, the European Union is planning to set the credit conversion factor for the calculation of the leverage ratio at rates of 20% and 50% for contingent trade finance instruments, i.e. at a lower level than planned by the Basel Committee (100%). It is also indicated that in assessing the leverage ratio for short term and export (long term) trade finance, the EU would look at its impact on trade finance and export credit provision, so that it does not hinder global export growth. On the contrary, the US authorities have not only decided to apply the 100% CCF for the leverage ratio but also to add a supplementary measure of leverage for systemically important banks.

In its Decision on 25 October 2011, the Basel Committee has already largely answered some of the concerns pertaining to the application of a leverage ratio to short term contingent trade products. The Basel Committee argues in particular that[6]:

- it would not change the CCF for calculating the leverage ratio because this calculation was

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[5]See in particular WTO Working Paper 2010-09, " International Regulation and Treatment of Trade Finance: What Are the Issues?".

[6]

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intentionally designed to be simple and not risk-based;

- the leverage ratio applied only from a 3% capital threshold;

- the leverage ratio was subject to a flat 100% CCF, except for one category of assets, i.e., commitments that are unconditionally cancellable by a bank without prior notice. This exception does not include trade finance products, such as letters of credit, which are irrevocable binding commitments for the bank and cannot be cancelled without prior agreement of the beneficiary.

The introduction of an exception to the flat 100% leverage ratio was somewhat of a surprise to the trading community in the sense that part of the argument for applying the leverage ratio to trade finance was to avoid creating a "hole" into the net, i.e. creating exception that would endanger the rule by weakening it. From a conceptual point of view, the fact of treating "cancellable" commitments, such as credit card commitments, better than trade finance (which are non-cancellable) can be discussed at some length. Loss given default data on trade finance indicate a 0.01% chance of letters of credit falling into the balance sheet only when the obligor fails to pay. While data is not immediately available, in the light of the recent financial crisis it could easily be argued that, even if they are cancellable within 24 hours, credit card commitments (off the balance sheet) of banks have put banks' balance sheets at a bigger risk than trade finance commitments. In its decision on 12 January 2014, the Basel Committee reversed its decision of 2011. The 2014 decision indicates that "for short term letters of credit arising from the movement of goods, a 20% CCF will be applied to both issuing and confirming banks". The question raised in this paper is what is best for trade finance: a 100% or a 20% CCF?

2.3 The leverage ratio and the relative attractiveness of trade finance

Still, the main argument that can be opposed to the leverage ratio applying to off-balance sheets letters of credit and other self-liquidating instrument is that it changes the relative attractiveness of these low-risk (hence low-capital based) and low remuneration instruments which greatly contribute to the security of trade.

The change in relative attractiveness is against on-balance sheet lending, be it trade-related such as supply chain trade overdrafts (i.e. a change is relative attractiveness between on-balance sheet and off-balance sheet products) and/or any other type of other on-balance sheet lending (i.e. this time a change in relative attractiveness between trade and non-trade lending).

The logic of letters of credit and the like being more attractive than outright, in-balance sheet lending is the difference in risk involved. As indicated earlier, letters of credit and the like are secured contingent obligations which are accepted by banks against control over the merchandise,

the latter being at least of equivalent value to the loan obligations. Data from the ICC registry indicate that the merchandise helps banks recover their assets in 60% of defaults. One strong element of security in the system is the fact that, historically, one can re-sell the traded merchandise at the contracted price or at least with little discount. This is different from real-estate based assets which underlying collateral value may be more volatile, as reflected in the recent financial crisis. Hence, the 20% CCF granted for capitalization purpose seems to be justified in comparison to other trade-related loans which do not imply a control over the merchandise, and which do not provide as much documentation (such as the description of financials, customs and shipping documentation, etc.) about the risk involved in dealing with the counterparty. Overdraft financing for companies, whereby the banks manages the flows of payables and receivables on an-going basis, is closer to regular, liquidity management risk for corporates, for any other purposes, and may carry more risk for the bank than the transaction-based structures underlying the letters of credit. This explains that on-balance sheet lending is subject to higher capital (and liquidity) requirements for short term trade commitment of possibly the same maturity.

The question of the attractiveness of structured trade finance relative to in-balance sheet trade-related lending cannot be analysed as for any normal available substitutes. The reality of trade finance is that managing open-account; in-balance sheet lending - hence taking care of liquidity management on behalf of firms involved in international trade requires sophisticated roll-over as well as re-financing management. This is not the case in most developing countries, in which money market re-financing may not be as deep as in developed countries, access to foreign currency with the market or the central bank more difficult, and in which collateral or capital is much harder to find with client companies to which they lend or provide liquidity. In other words, the propensity to use merchandise-based collateralized lending (or even cash-collateralized, in commodity trade), is higher in developing countries than in countries with very sophisticated financial markets and techniques.

3   The Model

In this model we want to show in a very simple way the problem of the bank that has to choose how much to invest in different assets in the presence of two constraints: a capital ratio and a leverage ratio. The goal of the bank is to maximize its final net worth. At the beginning of the period assets have to equal liabilities. Liabilities are represented by deposits (D) and capital issued by the bank (K). Assets are represented by the loans issued by the bank to finance different projects. We distinguish between "in-balance sheet" and "off-balance sheet" assets: the former have to be always backed up by capital, the latter do not necessarily. [7]

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[7]With the introduction in Basel III of capital and leverage requirements also all the off-balance sheet items have to be backed up by capital.

In order to simplify the analysis as much as possible, we assume that the bank holds only two assets. An "in-balance" asset finances project A and an "off-balance" asset that finances project B (asset B can be interpreted as a letter of credit). Project A has a return R_A is normally distributed with mean μ_A and variance σ_A^2. Then there is the second project B, whose return R_B is normally distributed with mean μ_B and variance σ_B^2. In this simple world the following identity has to hold:

$$X_A = D + K, \tag{1}$$

where X_A are the holdings of the in-balance sheet asset.

We follow the banking literature [8] and we assume that capital is more costly than deposits. There are several reasons that justify this assumption: differences in the tax treatment of interest payments and dividends, the presence of transaction costs, asymmetric information, deposit insurance and the different maturity that typically characterise capital and deposits. In our model this implies that the interest paid by deposits, R_D, is smaller than the cost of capital, R_K. Net worth at the end of the period includes also the returns from the holdings of off-balance sheet asset B, and is

$$K_1 = X_A R_A + X_B R_B - R_D D - R_K K. \tag{2}$$

Now let's focus our attention on the capital ratio: This constraint implies that the ratio of capital over risk-weighted assets has to be equal to a certain value that here we call γ and that is 8% in Basel III:

$$\frac{K}{X_A + \alpha X_B} = \gamma. \tag{3}$$

The parameter $\alpha < 1$ states that asset B is less risky than A and has a conversion factor that is lower than 100%.

Additionally there is the leverage ratio, defined as

$$\frac{K}{X_A + \beta X_B} = \xi, \tag{4}$$

where $\beta \leq 1$ is another conversion factor used for asset B, when ξ equals 3% in Basel III. Here the point that we want to make is that the same asset is treated differently in the two ratios. Generally we assume that $\beta \geq \alpha$, and in what follows we look at two limit cases: $\beta = \alpha$ and $\beta = 1$. Moving from the assumption in which α is a conversion factor that truthfully reflects the riskiness of the asset, we first look at the case in which the factor α is applied in the two constraints, and then we look at the case that we observe in Basel III, where in the leverage ratio a higher conversion factor is used.

By equating equations (3) and (4), we can express the holdings of asset A, X_A, as function of

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[8]Myers and Majluf (1984) and Berger, Herring and Szego (1995)

the ones of asset B, X_B

$$X_A = \frac{\beta\xi - \gamma\alpha}{\gamma - \xi} X_B, \tag{5}$$

where the holdings of X_A are a function of the relative cost of the capital and leverage, γ and ξ, subject to values of α and β that describe the conversion factors used for asset B in the two constraints. Whenever the product $\beta\xi$ increases relatively to $\alpha\gamma$, we observe a positive correlation between the holdings of the two assets. When it decreases, we observe a negative correlation instead.

This result is reflected in the value of equilibrium capital. Using either equation (3) or equation (4), we can express the initial capital as a function of X_B as well

$$K = \gamma\xi \frac{(\beta - \alpha)}{\gamma - \xi} X_B. \tag{6}$$

Consistently with what we found in equation (5), whenever β is larger than α the value of capital is positive. In the opposite case, it becomes negative. In other words, if there is a positive correlation between asset A and asset B holdings, the bank needs to finance its assets with additional capital. If instead the correlation between the holdings of the two assets is negative, this is to say that the bank is financing its investment in one asset by selling the other one. Hence the bank is internally financing its investment and the need for capital is reduced.

The bank maximizes a mean-variance utility function whose argument is future net capital that includes both the returns from in-balance and off-balance assets:

$$K_1 = R_A X_A + R_B X_B - R_D D - R_K K, \tag{7}$$

where, using the identity in (1), we define also deposits as a function of X_B. The first order condition coming from the maximization problem defines the optimal holdings of asset B and is

$$X_B = \frac{\mu_A \frac{\beta\xi - \gamma\alpha}{\gamma - \xi} + \mu_B - R_D \left((1 - \gamma)\frac{\beta\xi - \gamma\alpha}{\gamma - \xi} - \gamma\alpha\right) - R_K \gamma \frac{\beta - \alpha}{\gamma - \xi}}{\frac{(\beta\xi - \gamma\alpha)^2}{(\gamma - \xi)^2}\sigma_A^2 + \sigma_B^2}. \tag{8}$$

According to equation (8), the optimal holdings of asset B are an inverse function of the volatilities of the two returns and depend on four other factors: the expected value of the returns on the two assets, the cost of deposits and the cost of capital. The way these factors affect the holdings of asset B depends on the correlation between X_A and X_B, which can be either positive or negative. When the correlation is positive, the holdings of X_B are increasing in line with the expected return on X_A, μ_A. In that case, it is also decreasing with the cost of capital, R_K, and of deposits, R_D. When the correlation is negative, the holdings of asset B decrease with the expected value of the return on asset A, μ_A. In that case, it increases with the cost of deposits, and to a lesser extent, with that of capital; as one asset finances the other the bank needs less capital.

In what follows we compare two interesting cases, one still hypothetical and one that is observed in reality . In the first case we assume that $\beta = \alpha$, i.e., the same conversion factor is used for the capital and the leverage ratios. In the second case, we look at what happens when $\beta = 1$, i.e., when the asset B is treated as an asset that is as risky as asset A in the leverage ratio.

3.1 $\beta = \alpha$

When $\beta = \alpha$, there is a negative relationship between the holdings of the two assets, as shown in equation (9), which we can derive using equation (5):

$$X_A = -\alpha X_B. \tag{9}$$

Whenever the bank is investing in one of the two assets, it is selling the other one. Through the selling of one asset, the bank internally finances itself and does not need to issue any initial capital to back up its investments.

$$K = 0. \tag{10}$$

The optimal holdings of asset B become:

$$X_B = \frac{-\alpha\mu_A + \mu_B + R_D\alpha}{\sigma_B^2 + \alpha^2\sigma_A^2}. \tag{11}$$

They are inversely related to the weighted sum of return A and return B volatilities. They increase with asset B expected return μ_B and decrease with asset A expected return μ_A. X_B is positively related to the cost of deposits R_D because the off-balance asset B does not need to be backed up by deposits. Given that X_A and X_B are negatively correlated, an increase in X_B reduces X_A and, with it, the need for deposits. As the cost of deposits R_D increases, the bank substitutes asset A with asset B. More precisely, as we can see from equation (11), a marginal increase in X_B reduces X_A by α. This implies a lower need for deposits that is proportional to α. As R_D increases, it is optimal for the bank to reduce its holdings of asset A and increase those of asset B. Finally, given that there is no need for initial capital, the cost of capital does not appear in the expression.

We can apply to equation ((11)) current market conditions in which the cost of deposits R_D is very close to zero. In such a situation the bank would be induced to hold positive amounts of asset B whenever $\mu_B > \alpha\mu_A$. Given that in Basel III the value for α is 0.2, this condition would mean that X_B would be positive so long as the average return on asset A is not five times larger than the average return on asset B. In reality asset A returns are not five times larger than asset B returns. Therefore our model predicts that a bank would increase its holdings of the off-balance asset and reduce its holdings of the in-balance asset, in the scenario that we are considering here.

3.2 $\beta = 1$

In this second case there is a positive relationship between asset A and asset B holdings:

$$X_A = \frac{\xi - \gamma\alpha}{\gamma - \xi}X_B \tag{12}$$

and the initial capital expressed as a function of X_B is positive and equals:

$$K = \gamma\frac{(1 - \alpha)\xi}{\gamma - \xi}X_B. \tag{13}$$

Differently from before, in order to respect the two constraints the bank has to hold at the same time a long position in both assets. This means that in this case a positive initial capital is necessary, in order to satisfy the two requirements. The optimal holdings of the off-balance assets are:

$$X_B = \frac{\mu_A\frac{\xi - \gamma\alpha}{\gamma - \xi} + \mu_B - R_D\left((1 - \gamma)\frac{\xi - \gamma\alpha}{\gamma - \xi} - \gamma\alpha\right) - R_K\gamma\frac{1 - \alpha}{\gamma - \xi}}{\left(\sigma_B^2 + \alpha^2\sigma_A^2\frac{(\xi - \gamma\alpha)^2}{(\gamma - \xi)^2}\right)}. \tag{14}$$

As before, the optimal holdings of X_B are inversely related to a weighted sum of the volatilities of the two returns. They are, this time, increasing in both expected returns μ_A and μ_B in a way that is proportional to the correlation between X_A and X_B described in (12) . X_B is now decreasing in both the cost of deposits and the cost of capital. Given (12), a long position in the off-balance asset implies a long position also in the in-balance asset and, therefore, an increase in the costs associated to initial capital and deposits.

In this second scenario our model predicts positive holdings of the two assets. More specifically, comparing the findings of the two extreme cases that we analysed, as the value of the conversion factor β increases from α to 1, we observe a reduction in the optimal holdings of asset B and an increase in the optimal holdings of asset A. The value of X_B in equation (11) is larger than in equation (14), while X_A is larger in equation (12) rather than in equation (9).

4 Findings

The model allows to determine the conditions for the optimal holding of two assets, one in-balance sheet and one off-balance sheet, subject to the two requirements imposed by BaselIII: a capital ratio and a leverage ratio. The holdings of off-balance sheet asset that in the model we call B can be expressed as a function of the holdings of in-balance sheet asset, A in the model. The parameter values of the two assets (such as the cost of capital, relative return on each assets, etc) will determine whether the correlation between the holdings of the two assets is positive or negative.

One key parameter is the conversion factor β that is applied to asset B for the purpose of capitalization and for the purpose of calculating the leverage ratio . This parameter determines the relative attractiveness of asset B relative to asset A. We have considered two extreme scenarios: one in which the conversion factors for the in-balance sheet asset A and for the off-balance sheet asset B are the same; ($\beta = \alpha$), and one in which the conversion factor used in the leverage ratio for asset B is equal to 100%, ie well above that of the used for the capital ratio.

If the CCF applied to the capital and leverage ratios of asset B are the same, thus the model predicts that the holding of asset B is likely to be inversely related to that of asset A. This means that if the CCF for a letter of credit standing off the balance sheet was equally of 20% for capital and for leverage purposes, thus investors would be induced to consider the two assets as substitutes. A numerical exercise shows that actually they would choose asset B instead of asset A (an on-balance sheet loan). However, in the second case, if the CCF for the calculation of the leverage ratio were to be 100% (five times higher than the CCF for capital), the two assets would be considered as complementary. In such a situation a bank would hold the two assets at the same time.

If we compare the results obtained under the two extreme cases we get that as the conversion factor associated to the off-balance sheet asset goes from α to 1, we observe a gradual reduction in the holdings of asset B and an increase in the holdings of asset A.

The conclusion of this would be that, in order to maintain the attractiveness of off-balance sheet assets and in order to avoid their substitution with more risky assets, it is necessary to define in both the capital and the leverage ratios, conversion factors that reflect the low degree of risk associated to these assets.

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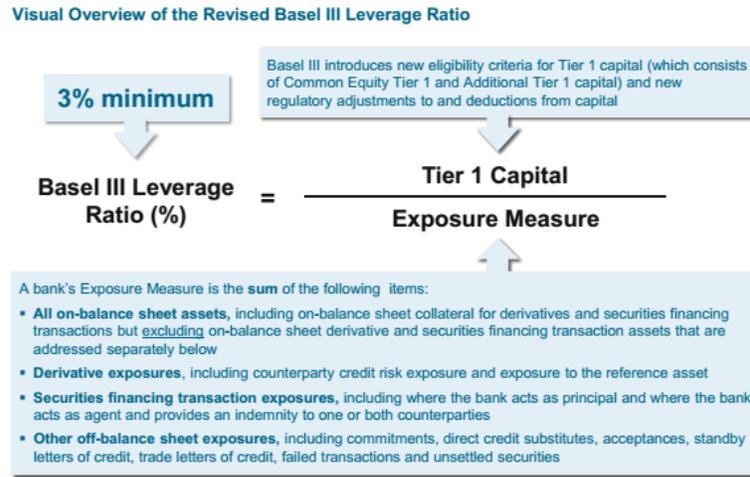
5   Figures

Figure 1: Endogenous vs Exogenous Signal and Monetary Noise with Productivity shock

Box 1: Simple Credit Conversion Factor Example for "short-term, self-liquidating trade related contingencies" under the Standardized Approach of Basel I

- Unrated LC: US$ 1,000,000
- Application of a risk-weight of 100%
- Capital requirement of 8%: US$ 1,000,000 * 8% = US$ 80,000
- CCF of 20%: US$ 80,000 * 20% = US$ 16,000 in total capital to set aside

Source: WTO Document WT/WGTDF/W/42

Figure 2: Endogenous vs Exogenous Signal and Monetary Noise with Productivity shock

Source: Davis Polk, 'Basel III Leverage Ratio: US Proposes American Add-On, Basel Committee Proposes Important, Denominator Changes", page 7, July 19 2013.