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LUXEMBOURG

FINANCIAL SYSTEM STABILITY ASSESSMENT

May 2017

This Financial System Stability Assessment on Luxembourg was prepared by a staff team of the International Monetary Fund. It is based on the information available at the time it was completed in April 2017.

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April 17, 2017

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Prepared By
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This report is based on the work of the Financial Sector Assessment Program (FSAP) mission that visited Luxembourg and Frankfurt during September 12–27 and November 29–December 14, 2016. The FSAP findings were discussed with the authorities during the Article IV consultation mission in March 2017.

- The FSAP team was led by Peter Breuer and included Bradley Jones (deputy mission chief), Richard Berkhout, Antoine Bouveret, Jana Gieck Bricco, Giovanni Cucinotta, Ender Emre, Ziya Gorpe, Cyril Pouvelle, Nadine Schwarz, Thierry Tressel, and Froukelien Wendt (all IMF staff), as well as Michael Deasy, David Scott, Richard Stobo (external experts) with assistance from Christie Chea (IMF). The mission met with the Minister of Finance, the Governor of the Banque centrale du Luxembourg (BCL), the Directeur Général of the Commission de Surveillance du Secteur Financier (CSSF), the Directeur Général of the Commission aux Assurances (CAA) and their staffs, and representatives of the European Central Bank (ECB), the European Systemic Risk Board and the Single Resolution Board. The mission also met with representatives of banks, investment firms, insurance companies, other financial institutions, industry associations, as well as auditors, accountants, and lawyers.

- FSAPs assess the stability of the financial system as a whole and not that of individual institutions. They are intended to help countries identify key sources of systemic risk in the financial sector and implement policies to enhance its resilience to shocks and contagion. Certain categories of risk affecting financial institutions, such as operational or legal risk, or risk related to fraud, are not covered in FSAPs.

- Luxembourg is deemed by the Fund to have a systemically important financial sector and the stability assessment under this FSAP is part of bilateral surveillance under Article IV of the Fund's Articles of Agreement.

- This report was prepared by Messrs. Peter Breuer and Bradley Jones, with inputs from the Luxembourg FSAP team members. The report draws on six Technical Notes and one Detailed Assessment Report.

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Glossary

AIFs	Alternative Investment Fund
ACRC	Audit, Compliance and Risk Management Committee
AGM	Annual General Meeting
AIFMD	Alternative Investment Fund Managers Directive
AIFMs	Alternative Investment Fund Managers
AMA	Advanced Measurement Approach
AML/CFT	Anti-Money Laundering/Combating the Financing of Terrorism
ASL	Automated Securities Lending Programme
ASL+	Automated Securities Lending Plus Programme
AuM	Assets Under Management
Bafin	Bundesanstalt für Finanzdienstleistungsaufsicht
BCL	Banque centrale du Luxembourg
BCP	Basel Core Principles
BRRD	Banking Recovery and Resolution Directive
BU	Bottom-Up
Buba	Bundesbank
CAA	Commissariat aux Assurances
CBL	Clearstream Banking Luxembourg S.A.
CCB	Countercyclical Buffer
CCPs	Central Counterparties
CDPI	Conseil de Protection des Déposants et des Investisseurs
CEMT	Credit Exposure Management Tool
CEO	Chief Executive Officer
CIU	Collective Investment Undertaking
CoBM	Commercial Bank Money
CPSS	Committee on Payment and Settlement Systems
CNAV	Constant Net Asset Value
CRD	Capital Requirements Directive
CRCC	Clearstream Risk and Compliance Committee
CRO	Chief Risk Officer
CRR	Capital Requirements Regulation
CRS	Comité du Risque Systémique
CSDR	Central Securities Depositories Regulation
CSDs	Central Securities Depositories
CSSF	Commission de Surveillance du Secteur Financier
DAR	Detailed Assessment Report
DBAG	Deutsche Börse AG

DGSD	Deposit Guarantee Scheme Directive
DRP	Disaster Recovery Plan
DVP	Delivery versus Payment
EB	Executive Board
EBA	European Banking Authority
EBIT	Earnings Before Interest and Tax
ECP	Euro Commercial Paper
EIOPA	European Insurance and Occupational Pensions Authority
ESMA	European Securities and Market Authority
ELA	Emergency Liquidity Assistance
EM	Emerging Markets
EOF	Eligible Own Funds
ESRB	European Systemic Risk Board
EU	European Union
FATF	Financial Action Task Force
FGDL	Fonds de Garantie des Dépôts Luxembourg
FMIs	Financial Market Infrastructures
FMSA	Federal Agency for Financial Market Stabilisation
FSAP	Financial Sector Assessment Program
FSSA	Financial Sector Stability Assessment
FX	Foreign Exchange
GBP	Great Britain Pound
GMF	Global Macro-Financial Model
GTC	CBL's General Terms and Conditions
HQLA	High Quality Liquid Assets
HY	High Yield
IAIS	International Association of the Insurance Supervisors
ICPs	Insurance Core Principles
ICSD	International Central Securities Depository
IOSCO	International Organization of Securities Commissions
IRR	Internal Rules and Regulations
ISIN	International Securities Identification Number
IT	Information Technology
iTOF	Intraday Technical Overdraft Facility
KPI	Key Performance Indicator
KRI	Key Risk Indicator
KYC	Know Your Customer
LCR	Liquidity Coverage Ratio
LMTs	Liquidity Management Tools
LTV	Loan-To-Value
LSIs	Less Significant Institutions

MMFs	Money Market Funds
MOU	Memorandum of Understanding
MREL	Minimum Requirements for Own funds and Eligible Liabilities
NAV	Net Asset Value
NCA	National Competent Authority
NRA	National Risk Assessment
NSFR	Net Stable Funding Ratio
OFIs	Other Financial Intermediaries
O-SIIs	Other Systemically Important Institutions
OTC	Over-the-Counter
PFMI	Principles for Financial Market Infrastructures
PFS	Professional of the Financial Sector
RAIFs	Reserved alternative investment funds
RAM	Risk Assessment Matrix
RTGS	Real-Time Gross Settlement
RTO	Recovery Time Objective
SAP	Systemanalyse und Programmentwicklung system
SB	Supervisory Board
SD	Settlement Day
SI	Significant Institution
SLA	Service Level Agreement
SRB	Single Resolution Board
SRF	Single Resolution Fund
SRM	Single Resolution Mechanism
SSM	Single Supervisory Mechanism
SSS	Securities Settlement Systems
STeM	Stress Testing Matrix
STP	Straight Through Processing
TNA	Total Net Assets
TP	Top-Down
UCITS	Undertakings for Collective Investment in Transferable Securities
UCF	Unconfirmed Funds Facility
VaR	Value at Risk

EXECUTIVE SUMMARY

Financial soundness indicators for Luxembourg's financial system, which plays a key role in the intermediation of financial capital, have remained relatively robust in recent years. Rising asset prices and inflows have seen the investment fund industry enjoy strong growth in assets under management, while exposure to liquid assets has remained steady. The banking sector, where a relatively large share of liquidity and revenues derive from private banking and fund management activities, has maintained high levels of profitability, capital, liquidity, and asset quality. The insurance industry, which is relatively less exposed to guaranteed products than regional peers, has adjusted to the new regulatory regime, maintaining high profitability and capitalization levels. Complementing reforms at the European level, the national authorities have pursued a domestic reform agenda in recent years, including the adoption of key recommendations from the 2011 FSAP and a strengthening of the Anti-Money Laundering/Combating the Financing of Terrorism regime.

Nevertheless, the defining structural characteristics of the financial system—size and interconnectedness—as well as elevated real estate valuations, give rise to potential vulnerabilities. First, as many Luxembourg foreign bank subsidiaries aggregate liquidity from investment fund and wealth management operations and 'upstream' it to their parents abroad, they may be exposed to maturity and currency transformation at the parent level—where exposures can be large (relative to subsidiaries capital) and oversight by the Luxembourg authorities may be limited where parents are not regulated under the Single Supervisory Mechanism. Second, should investment fund liquidity buffers struggle to accommodate large redemption shocks, asset fire sales and a drawdown of local bank deposits could occur (though operational deposits have been broadly stable in past stress periods). Third, a shock to Clearstream, which has a central role in worldwide securities depositary and settlement services, could disrupt numerous institutions and markets it serves. Fourth, after a strong run up in prices and easing in lending standards, the real estate market, to which domestically-oriented banks are most exposed, poses the main home-grown vulnerability.

An assessment of the financial system's ability to withstand severe but plausible shocks suggests a good deal of resilience, albeit with some risks. High starting levels of capital allow most banks to absorb a large shock in the adverse stress test scenario, while retaining substantial buffers. Bank liquidity displays broad resilience, though some banks could be exposed to wholesale funding drying up or foreign exchange (FX) funding stresses. This should be closely monitored, and the merits of a foreign currency liquidity requirement at the group level should be examined. Insurance stress test results indicate that strong initial levels of capital and low guaranteed product exposure offer insulation against market shocks. Money market fund liquidity and solvency risk appears muted, though continued monitoring of liquidity and concentration risk among select bond funds is warranted. Spillover analysis confirms material cross-border exposures for banks and investment funds, underscoring the need for ongoing vigilance.

The system of prudential oversight in Luxembourg seems to function well, though several cross-cutting themes warrant attention. A continued pivot towards risk-based supervision and further increase in resources for entities engaged in financial stability oversight would be consistent

with rising industry assets and regulatory demands. A formal framework should be introduced to govern the relationship between the government and banks with state involvement. The operational independence of the Commission de Surveillance du Secteur Financier (CSSF) and Commissariat aux Assurances (CAA) should be enshrined in law. The intensity of engagement with supervisors in countries where Luxembourg's investment funds and banks are most active should also be raised.

The new macroprudential policy framework appears to be working well in practice and could be strengthened further. The institutional framework could be enhanced by removing the potential inaction bias arising from unanimous decision making; enshrining in law the lead role of the Banque centrale du Luxembourg (BCL); and awarding it formal powers to issue recommendations. Surveillance of real estate and bank-investment fund vulnerabilities is appropriate, and closing related data gaps is a priority. The instrument toolkit should be expanded to include borrower-based limits, as further macroprudential tightening may be required.

Additional measures could also help mitigate remaining gaps in banking supervision. More frequent on-site inspections, particularly for subsidiaries availing of the waiver to large exposure limits for intragroup transactions, should be introduced, and banks should be required to periodically demonstrate their continued eligibility for the waiver. The authorities are encouraged to harmonize data reporting standards (as intended), and remain vigilant in their monitoring of real estate vulnerabilities.

The regulation and supervision of investment funds and insurers is prudent but could be strengthened. To mitigate liquidity-related vulnerabilities among investment funds, the CSSF should issue industry guidance on liquidity management tools and liquidity stress testing modalities, and develop internal stress testing capacity. Other priorities include increasing the frequency of on-site inspections; introducing comprehensive inspections; engaging with regulators in jurisdictions where delegated activities are prominent; ensuring custodian banks are independent of funds for which they have oversight functions; and issuing guidance on fund directorships. In the insurance sector, introducing a revised early warning system and increasing resources are priorities.

Clearstream (CBL) is assessed as broadly observing international standards for safe and efficient settlement and custody of securities transactions, though further risk mitigation measures are warranted. Priorities relate to reducing CBL's deposit exposure to select commercial banks (preferably through direct links with Central Securities Depositories and central banks), tightening collateralization arrangements, and further investment in a more distant data center.

The Single Resolution Mechanism and transposition of relevant European directives have reconfigured Luxembourg's bank resolution framework. While the authorities now have adequate legal powers to resolve failing banks, more work is required to finalize credible resolution plans. Efforts to operationalize bail-in should be complemented by developing the sale of business and bridge bank resolution tools, and by ensuring adequate liquidity funding in resolution. Policies to address intragroup exposures and the transfer of custodian functions in recovery and resolution should be addressed. Additional contingent FX funding arrangements should be pursued to complement the BCL's emergency liquidity assistance facility.

KEY RECOMMENDATIONS

Table 1. Luxembourg: FSAP Update 2017: Key Recommendations

Recommendations	Agency	Time
General / cross-cutting		
1. Continue resource allocation toward risk-based supervision at BCL, CSSF and CAA (¶25)	BCL, CSSF, CAA	NT
2. Increase engagement with supervision and resolution authorities in countries where Luxembourg's LSIs and investment funds conduct significant activities (¶25, 30, 33)	CSSF	NT
3. Enshrine in legislation the operational independence of the CSSF and CAA, and introduce (CAA, CAA) or update (BCL) board member codes of conduct (¶25, 30, 39)	MoF, BCL, CAA, CSSF	NT
Risk Analysis		
4. Examine merits of a regulatory LCR requirement in FX at the group level and step up monitoring of related FX liquidity risk (¶17, 31)	EC, ECB	MT
5. Provide industry guidance on liquidity stress test modalities and liquidity management tools for investment funds, and develop internal liquidity stress testing capacity (¶21, 34)	CSSF	NT
Macroprudential Policy		
6. Strengthen the institutional framework in order to increase the willingness to act (¶26)	MoF, CRS	MT
7. Expand the macroprudential policy toolkit to include borrower based lending limits (¶27)	MoF, CRS	I
8. Continue to strengthen risk-based monitoring of the residential real estate market and bank-investment fund interlinkages, and close remaining related data gaps (¶28)	CRS, BCL, CSSF	I
Banking Regulation and Supervision		
9. Increase the intensity of supervision over intra-group exposures, with banks required to demonstrate continued eligibility in their use of large exposure limit waivers (¶9, 24, 30)	CSSF	NT
10. Continue monitoring ability of banks to absorb a real estate market price decline (¶10, 30)	CSSF, ECB	C
11. Increase frequency of on-site inspections of subsidiaries of SIs (¶30)	CSSF, ECB	C
12. Harmonize data reporting standards for loan-to-value and debt-to-income ratios (¶30)	CSSF, ECB	I
Investment Fund Regulation and Supervision		
13. Strengthen guidance on substance in the context of delegated activities and actively engage with regulators in jurisdictions where such activities are prominent (¶33)	CSSF	NT
14. Issue guidance on the holdings of directorships of funds and their managers (¶33)	CSSF	NT
15. Assess whether safeguards to ensure depositary independence are adequate (¶35)	CSSF	NT
Insurance Regulation and Supervision		
16. Implement revised early warning system under Solvency II regime (¶39)	CAA	NT
Financial Market Infrastructure Oversight		
17. Reduce CBL's exposure to commercial banks vis-à-vis CSDs and central banks (¶41)	CSSF, BCL	NT
18. Require establishment of third data center and conduct a full failover test (¶41)	CSSF, BCL	NT
AML/CFT		
19. Ensure the 2016/2017 national risk assessment focus adequately on TCSP risks (¶45)	MoF	I
Contingency Planning and Financial Safety Nets		
20. Develop policies on intragroup exposures and the transfer of custodian functions in recovery and resolution (¶47)	CSSF, SRB, ECB	I
21. Agree on the roles and responsibilities in dealing with a system-wide crisis (¶53)	MoF	NT
22. Finalize the operational modalities of emergency liquidity assistance provision (¶52)	BCL	MT

Agencies: BCL = Banque centrale du Luxembourg; CRS = Comité du Risque Systémique; CSSF = Commission de Surveillance du Secteur Financier; ECB = European Central Bank; MoF = Ministry of Finance; MoJ = Ministry of Justice, SRB = Single Resolution Board. Time Frame: C = continuous; I (immediate) = within one year; NT (near term) = 1–3 years; MT (medium term) = 3–5 years.

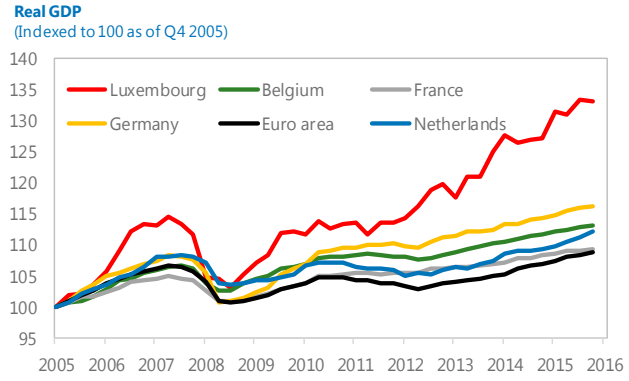
MACROFINANCIAL SETTING

A. Background

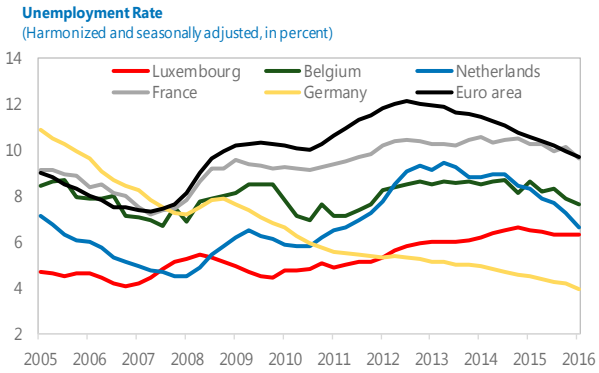
1. The Luxembourg financial system has expanded significantly in recent decades to play a key role in the intermediation of global capital. Deep-rooted traditions of fiscal prudence, predictable regulation, a skilled multilingual labor force, and political and social stability have helped turn Luxembourg into a financial center of worldwide importance. The industry directly accounts for one quarter of GDP, 18 percent of tax revenues and 12 percent of employment.

2. Diversity and cross-border expertise in financial services provision has helped Luxembourg's small open economy enjoy a robust recovery from the global financial crisis. With financial services exports and investment rebounding strongly, the level of real GDP surpassed the pre-crisis peak in 2011, and has continued rising strongly since (Table 2; Figure 1). Unemployment and inflation have remained relatively low and stable. The strong increase in residential real estate prices has outpaced income growth, reflected in an increase of household debt (to moderate levels; Figure 1). The fiscal position remains among the strongest in Europe, underpinning Luxembourg's long-held AAA credit rating.

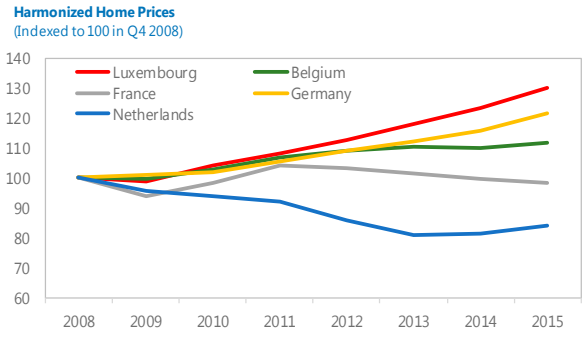
Figure 1. Luxembourg: Macroeconomic and Macrofinancial Context



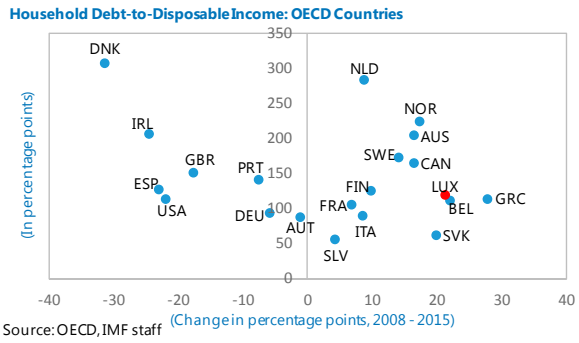
Source: Haver Analytics



Source: Haver Analytics



Source: Haver Analytics and IMF Staff calculations



Source: OECD, IMF staff
Notes: See glossary for country acronyms

Table 2. Luxembourg: Selected Economic Indicators, 2014–22

	2014	2015	2016 Est.	2017	2018	2019	2020	2021	2022
				Projections					
Real Economy (percent change)									
Gross domestic product	4.7	3.5	4.0	3.7	3.5	3.3	3.1	3.1	3.0
Total domestic demand	3.7	2.4	2.5	4.5	3.7	3.1	2.9	2.9	2.8
Private consumption	2.7	1.8	2.0	6.2	4.3	3.9	3.3	3.1	3.0
Public consumption	-0.1	2.3	4.0	3.4	2.8	2.2	2.2	2.7	2.6
Gross investment	8.9	3.3	1.9	2.7	3.3	2.7	3.0	2.8	2.6
Foreign balance 1/	2.0	1.7	2.3	1.0	1.0	1.1	1.1	1.1	1.0
Exports of goods and nonfactor services	12.1	12.8	4.2	5.0	4.1	4.2	4.3	4.3	4.1
Imports of goods and nonfactor services	13.1	14.0	3.7	5.3	4.3	4.3	4.4	4.4	4.2
Labor Market (thousands, unless indicated)									
Resident labor force	258.0	262.6	267.0	272.1	277.3	282.5	287.9	293.4	299.0
Unemployed	18.3	17.9	17.0	16.1	15.9	15.8	15.9	16.0	15.9
(Percent of total labor force)	7.1	6.8	6.4	5.9	5.7	5.6	5.5	5.4	5.3
Resident employment	239.6	244.7	251.8	256.0	261.4	266.8	272.0	277.4	283.0
(Percent change)	2.4	2.1	2.9	1.7	2.1	2.1	2.0	2.0	2.0
Cross-border workers (net)	156.3	161.6	166.9	172.1	176.4	180.2	184.0	187.7	191.5
Total employment	395.9	406.4	418.7	428.1	437.7	447.0	456.0	465.1	474.5
(Percent change)	2.6	2.6	3.0	2.2	2.3	2.1	2.0	2.0	2.0
Prices and costs (percent change)									
GDP deflator	1.5	0.4	0.9	1.3	1.5	1.7	1.9	2.0	2.0
CPI (harmonized), p.a.	0.7	0.1	0.1	1.4	1.3	1.7	1.9	2.0	2.0
CPI core (harmonized), p.a.	1.3	1.7	1.0	1.2	1.5	1.7	1.9	2.1	2.0
CPI (national definition), p.a.	0.6	0.5	0.4	1.3	1.4	1.7	1.9	2.0	2.0
Wage growth 2/	2.6	0.9	0.7	2.5	2.2	2.5	2.5	2.5	2.5
Nominal unit labor costs 2/	0.6	0.0	-0.2	1.0	0.9	1.3	1.4	1.4	1.6
Public finances (percent of GDP)									
General government revenues	43.8	43.7	43.1	41.8	41.4	41.0	41.0	40.9	40.8
General government expenditures	42.3	42.1	41.4	41.5	41.3	41.1	41.0	40.9	40.8
General government balance	1.5	1.6	1.7	0.3	0.1	0.0	0.0	0.0	0.0
General government structural balance	1.3	1.5	1.5	0.2	0.0	-0.2	0.0	0.0	0.0
General government gross debt	22.7	22.1	22.6	23.2	23.5	23.2	23.0	22.8	22.9
Balance of Payments (percent of GDP)									
Current account	5.1	5.2	4.8	5.1	5.1	5.4	5.5	5.6	5.8
Balance on goods	-0.5	-5.1	-3.8	-3.7	-3.7	-3.4	-3.4	-3.3	-3.0
Balance on services	33.7	39.7	38.0	37.1	37.2	37.3	37.3	37.4	37.4
Net factor income	-29.0	-31.1	-31.2	-30.0	-30.2	-30.2	-30.1	-30.1	-30.3
Balance on current transfers	0.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Exchange rates, period averages									
U.S. dollar per euro	1.33	1.11	1.11	...	...	...	...	...	...
(Percent change)	0.1	-16.5	-0.3	...	...	...	...	...	...
Nominal effective rate (2010=100)	100.5	97.0	98.9	...	...	...	...	...	...
(Percent change)	0.3	-3.5	2.0	...	...	...	...	...	...
Real effective rate (CPI based; 2010=100)	100.3	96.6	97.9	...	...	...	...	...	...
(Percent change)	-0.4	-3.7	1.4	...	...	...	...	...	...
Credit growth and interest rates									
Nonfinancial private sector credit (eop, percent change) 3/	4.9	15.7	5.7	5.1	3.9	3.4	2.7	2.8	2.6
Government bond yield, annual average (percent)	1.3	0.4	0.2	...	...	...	...	...	...
Memorandum items: Land area = 2,586 sq. km; population in 2016 = 576,000; GDP per head = €90,400									
GDP (billions of euro)	49.3	51.2	53.7	56.5	59.3	62.4	65.5	68.8	72.3
Output gap (percent deviation from potential)	0.4	0.2	0.3	0.3	0.3	0.3	0.1	0.1	0.0
Potential output growth	3.5	3.8	3.8	3.7	3.5	3.3	3.3	3.1	3.1

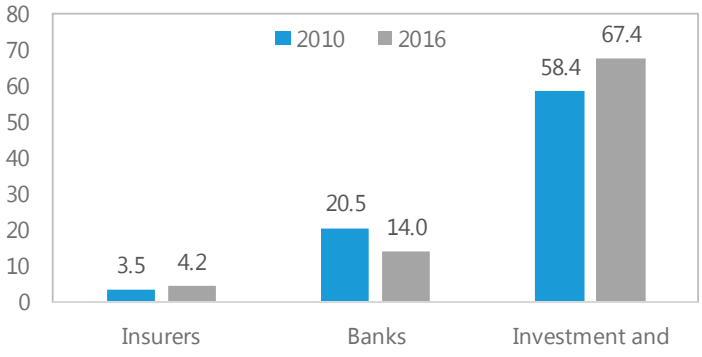
Sources: Luxembourg authorities; IMF staff estimates and projections.
1/ Contribution to GDP growth.
2/ Overall economy.
3/ Including a reclassification of investment companies from financial to non-financial institutions

3. Luxembourg's financial landscape has been reshaped by reforms at both the European[1] and domestic level in recent years, and the national authorities have adopted key recommendations from the 2011 FSAP (Annex I). The Finance Ministry is no longer responsible for granting or revoking banking licenses; the CSSF has shed its industry promotional role; its resources have been bolstered; and there has been a significant increase in the use of sanctioning powers. A new macroprudential policy regime, spearheaded by the Comité du Risque Systémique (CRS), has been introduced to safeguard macrofinancial stability. The BCL, which monitors system-wide bank liquidity (the ECB and the CSSF are the competent authorities for individual bank liquidity supervision), has strengthened its financial stability department in response to its de facto lead surveillance role in the CRS. The CAA has also increased resources to assist with the implementation of Solvency II.

B. Luxembourg Financial System Structure and Trends

4. The defining features of Luxembourg's financial system remain its size and interconnectedness, though recent changes in industry composition have also been notable. The financial system is principally comprised of investment and money market fund industry assets under management (AuM of €3.6 trillion, 67 times GDP), bank assets (€764 billion, 14 times GDP), insurance industry assets (€219 billion, 4 times GDP), and financial market infrastructures (FMIs) that settle payments and securities transactions (Figure 2 and Table 3). Luxembourg also records a large residual category of 'other financial intermediaries' (OFI) in its flow of funds.[2] The rising importance of Luxembourg's nonbank financial industry over recent years—bank assets have declined by more than one-fifth from the onset of the global financial crisis while investment fund AuM have expanded strongly—reflects various factors, not limited to consolidation and business model adjustments in the regional banking landscape, and broad market trends (i.e. higher asset prices) conducive to Luxembourg's investment industry.

Figure 2. Luxembourg: Key Components of the Luxembourg Financial System



Source: IMF Staff, BCL, and ECB.
Notes: Insurance figures based on end-2015 data

[1] See European Commission, "Financial Reforms and their Progress." available at: https://ec.europa.eu/info/business-economy-euro/banking-and-finance/financial-reforms-and-their-progress_en.

[2] Analysis by the authorities suggests the 'OFI residual' comprises mainly pass-through special purpose vehicles established by holding companies owned by nonfinancial groups. As such, they do not fall under the purview of Luxembourg's financial regulators.

Table 3. Luxembourg: Structure of the Luxembourg Financial System

	Latest Available Data (2016)		
	Number of institutions	Total assets (€ billions)	Multiples of GDP
Banks*	142	763.7	14.0
by legal form:			
Private	95	484.0	9.1
Domestic-majority owned	3	9.7	0.2
Foreign-majority owned	92	474.2	8.9
Majority state-owned	2	45.3	0.8
Branches of foreign banks	45	234.4	4.4
by functional business model (main groups):			
Private banking	42	166.8	3.1
Corporate finance	30	160.9	2.9
Custodian banking	25	115.8	2.1
Retail and commercial banking	14	131.5	2.4
by geographical business orientation:			
Domestically oriented	11	127.7	2.3
Internationally oriented	131	636.0	11.6
Insurance companies**	292	219.0	4.2
Life	43	160.4	3.1
Non-life	32	12.2	0.2
Reinsurance	217	46.3	0.9
Money market funds***	167	290.6	5.4
Investment funds (entities)***	14,065	3,350.0	62.0
Pension funds**	14	1.5	0.0

* As of December 2016 (Source: BCL)
** As of December 2015 (Source: CAA, BCL)
*** As of November 2016 (Source: CSSF)
Investment funds refer to Undertakings for Collective Investment and Specialized Investment Funds
Sources: BCL, CSSF, and CAA.

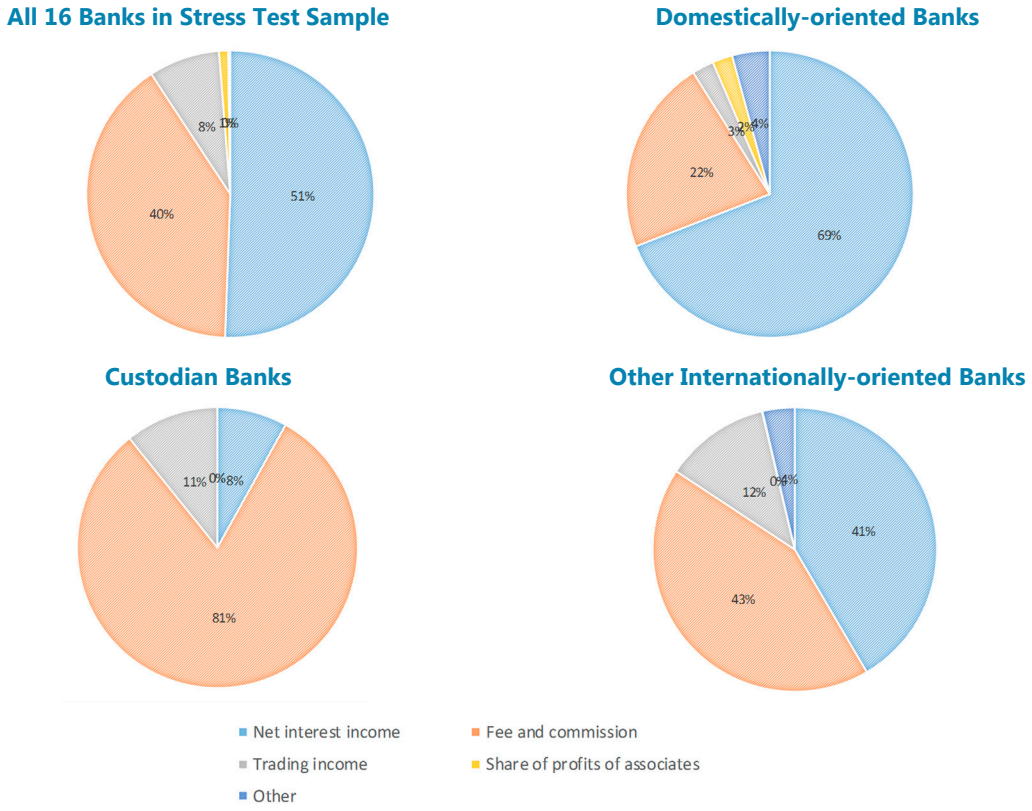
5. The activities of Luxembourg banks are distinguished by their international or domestic orientation. The majority of banking sector activities in Luxembourg are internationally-oriented (Table 3), including depositary services for investment funds, private wealth management, and intragroup liquidity management services (Figure 3). Internationally-oriented banks are typically deposit-rich and thus net providers of liquidity to their parents. A small number of domestically-oriented banks (17 percent of industry-wide assets) focus principally on mortgage underwriting and retail and commercial banking, among which, the government has minority ownership stakes in three, in addition to the state-owned bank.

Table 4. Luxembourg: Composition of Luxembourg Bank Assets and Liabilities
(in percent of total, December 2016)

Assets		Liabilities	
Luxembourg	29.6	Luxembourg	34.2
Germany	12.3	Germany	12.3
France	11.7	France	7.2
United Kingdom	8.1	Switzerland	5.8
United States	4.5	United Kingdom	4.3
Italy	4.4	Italy	1.7
Switzerland	3.7	Ireland	1.6
Netherlands	3.3	China	1.5
Belgium	2.2	Belgium	1.4
China	1.9	Singapore	1
Ireland	1.2	United States	0.9
Spain	1.2	Sweden	0.8
Other	15.9	Other	27.3

Source: BCL.
Notes: Top 12 destinations, based on all counterparties, including investment funds.

Figure 3. Luxembourg: Bank Profit Sources
(in percent of pre-tax profit, as of June 2016)

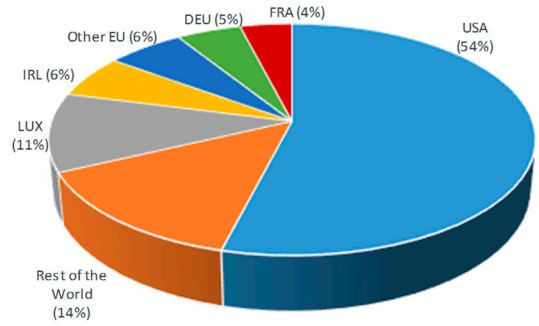


Sources: ECB and SNL Financial.

6. Nonbank financial institutions are similarly outward facing, with investment funds and insurers experiencing robust AuM growth since the last FSAP on account of valuation effects and new inflows. Investment fund AuM have doubled since the spring of 2010 (Figure 4), and are diversified by asset class and geography (only 7 percent of exposures are domestic; Figure 5). Investment fund units (liabilities) are sold globally, a result of Luxembourg's well-developed distribution platform and established branding under the Undertakings for Collective Investment in Transferable Securities (UCITS) regime. Luxembourg-domiciled funds typically delegate key functions such as portfolio and risk management abroad, while retaining ultimate oversight responsibilities. In the insurance industry, life insurers are predominant, accounting for 85 percent of assets and two-thirds of premiums (Figure 6; Table 3). Unit-linked investment products have become an increasingly prominent business for life insurers (71 percent of technical provisions), reflecting Luxembourg's related expertise.

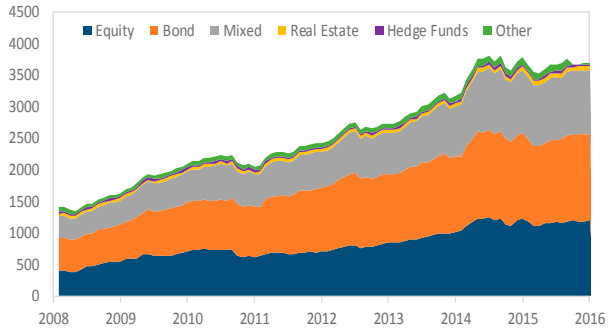
Figure 4. Luxembourg: Investment Fund Assets Domiciled in Luxembourg

Share of Worldwide Investment Fund Assets under Management
(Country of Fund Domicile)



Sources: EFAMA, ECB, and IMF staff.

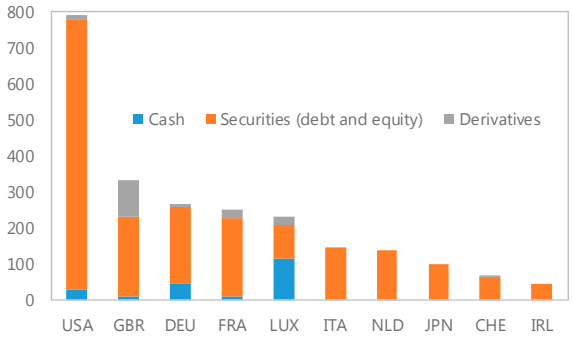
Investment Fund Assets in Luxembourg, by Asset Class
(in billions of euros)



Source: BCL.

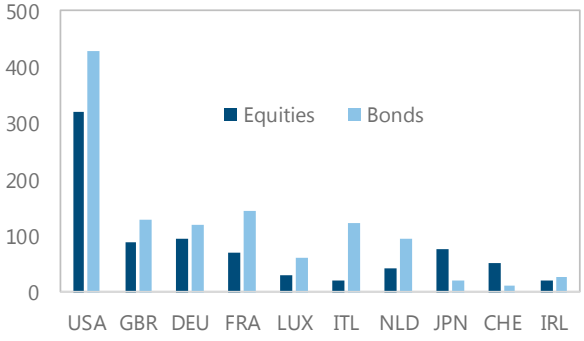
Figure 5. Luxembourg: Investment Fund Exposures by Country

Investment Fund Country Exposure
(in billions of euros)



Sources: BCL, and IMF staff.
Notes: Figures for derivates based on notional exposures. See glossary for country acronyms.

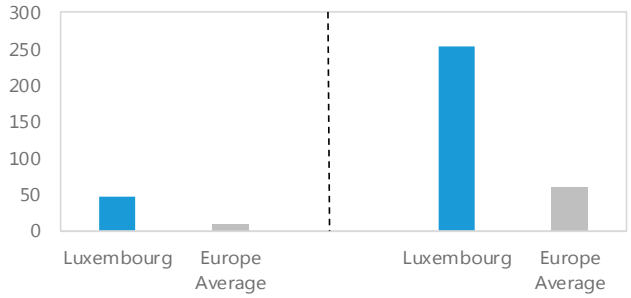
Investment Fund Country Exposure, by Security Type
(in billions of euros)



Sources: BCL, and IMF staff.
Notes: See glossary for country acronyms.

Figure 6. Luxembourg: Insurance Industry: Premiums and Assets

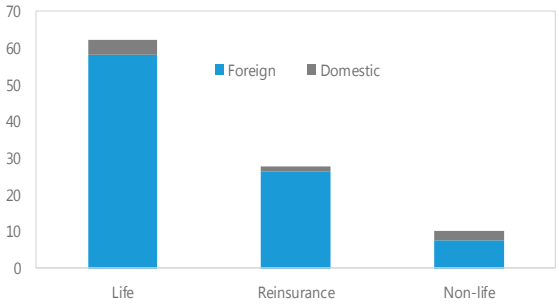
Insurance Premiums
(share of GDP, in percent)



Insurance Investment Activities
(share of GDP, in percent)

Source: Insurance Europe, Sigma.
Notes: European average includes EU plus Iceland, Norway, Liechtenstein, Switzerland, and Turkey.

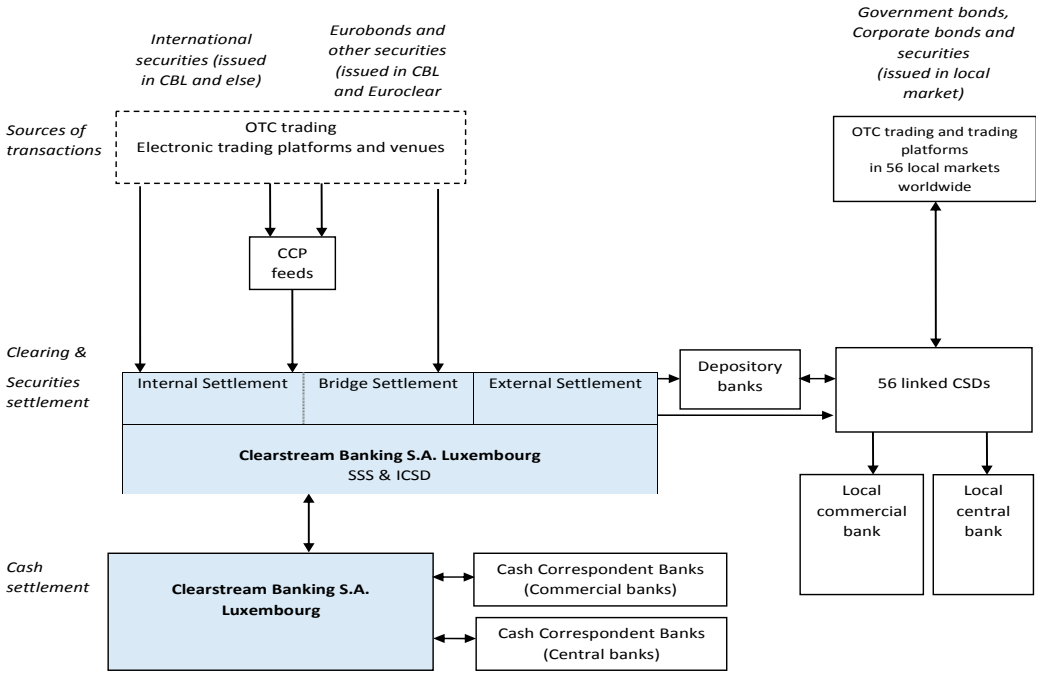
Share of Luxembourg Insurance Premiums by Origin of Insured Risk
(in percent)



Source: CAA.

7. Luxembourg is also home to a globally systemic FMI, Clearstream Banking S.A., Luxembourg (CBL). As one of the world's largest international central securities depositories (ICSDs), CBL facilitates the settlement and custody of securities globally. It accounted for a daily average settlement value of €480 billion in 2015, with the value of securities held in accounts with CSDs around €6 trillion. CBL's international orientation is also evident in its servicing of more than 50 foreign markets and 60 central banks, and through its links to three large central counterparties (CCPs) in the European Union (EU; Figure 7).

Figure 7. Luxembourg: Clearstream Luxembourg and the FMI Ecosystem



8. Luxembourg's financial soundness metrics have remained relatively robust in recent years. Bank profitability, capital, liquidity and asset quality has been high (Table 5; Figure 8). Net interest margin compression has been relatively less problematic for Luxembourg banks due in part to the fee and commission income derived from private banking and fund management activities (Figure 3). Across money market funds and the expanding investment fund industry, liquid asset holdings have remained broadly steady (Figure 9). The Luxembourg insurance industry has stayed profitable and well capitalized (Figure 10), reflecting a relatively modest asset-liability duration mismatch and the relatively modest exposure of life insurers to guaranteed rate products.

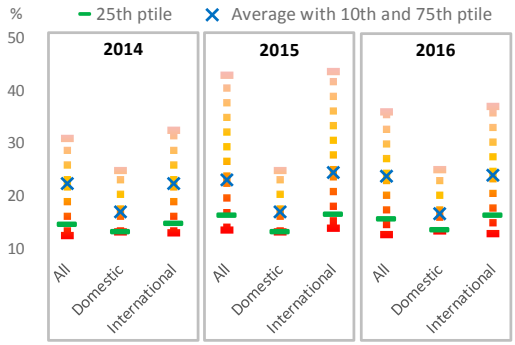
Table 5. Luxembourg: Bank Financial Soundness Indicators (All Banks)
(all figures in percent)

		2009	2010	2011	2012	2013	2014	2015	2016Q3
Capital Adequacy									
	Regulatory capital to risk-weighted assets	19	17	16	19	21	20	22	23
	Regulatory Tier 1 capital to risk-weighted assets	17	15	14	17	18	19	21	23
	Capital to assets	6	5	5	6	6	6	7	8
Profitability And Efficiency									
	Return on assets	0.6	0.7	0.3	0.6	0.6	0.7	0.8	0.7
	Return on equity	12	13	5	10	10	12	11	10
	Interest margin to gross income	37	31	34	31	29	27	27	27
	Trading income to total income	6.0	-1.0	-9.0	-1.0	3.0	1.0	2.0	1.0
	Noninterest expenses to gross income	56	64	74	65	65	66	67	69
	Personnel expenses to noninterest expenses	39	36	35	33	33	31	29	28
Asset Quality And Structure									
	Residential real estate loans to total loans	3.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0
	Household debt to GDP	50.0	49.0	54.0	55.0	55.0	60.0	59.0	62.0
	Nonperforming loans to total gross loans	0.7	0.2	0.4	0.2	0.2	n.a.	n.a.	n.a.
	Sectoral distribution of loans (in percent of total loans)								
	Residents	23	22	25	23	21	21	27	30
	Deposit Takers	10	7	5	5	5	5	4	4
	Central Bank	2	2	8	7	5	3	10	13
	Other Financial Corporations	5	6	5	4	4	4	4	4
	General Government	0	1	0	1	1	1	1	1
	Nonfinancial Corporations	3	2	2	2	3	3	3	4
	Other Domestic Sectors	3	4	4	4	5	5	5	5
	Non Residents	77	78	75	77	79	79	73	70
Liquidity									
	Liquid assets to total assets	56	56	59	58	60	60	58	n.a.
	Liquid assets to short-term liabilities	65	66	69	69	70	70	67	n.a.
	Customer deposits to total (non interbank) loans	138	131	119	129	147	154	144	118
Foreign Exchange									
	Foreign currrency denominated loans to total loans	28	30	29	31	34	36	36	37
	Foreign currency denominated liabilities to total liabilities	29	33	32	34	35	36	40	40
	Net open foreign exchange to capital	-1	0	2	0	0	n.a.	n.a.	n.a.

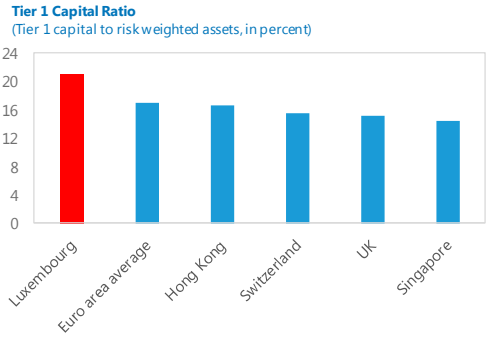
Source: BCL.

Figure 8. Luxembourg: Bank Financial Soundness Indicators

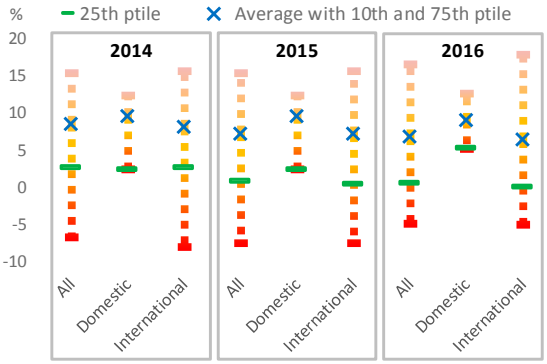
Luxembourg Banking Sector: Capital
(Tier 1 capital)



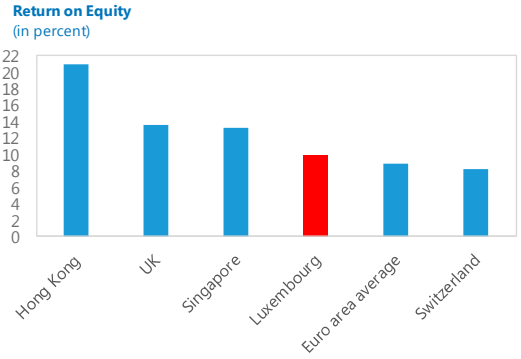
Luxembourg vs. Peers: Capital



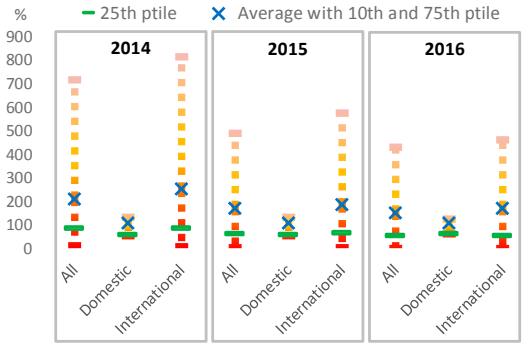
Luxembourg Banking Sector: Profitability
(Return on Equity)



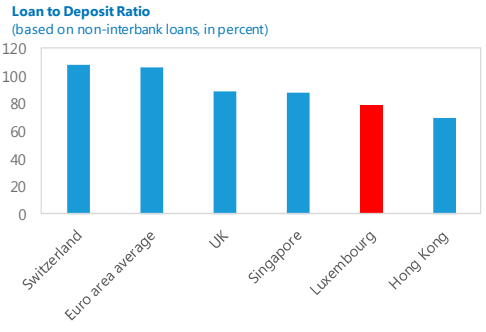
Luxembourg vs. Peers: Profitability



Luxembourg Banking Sector: Liquidity Transformation
(deposit to loan ratio)



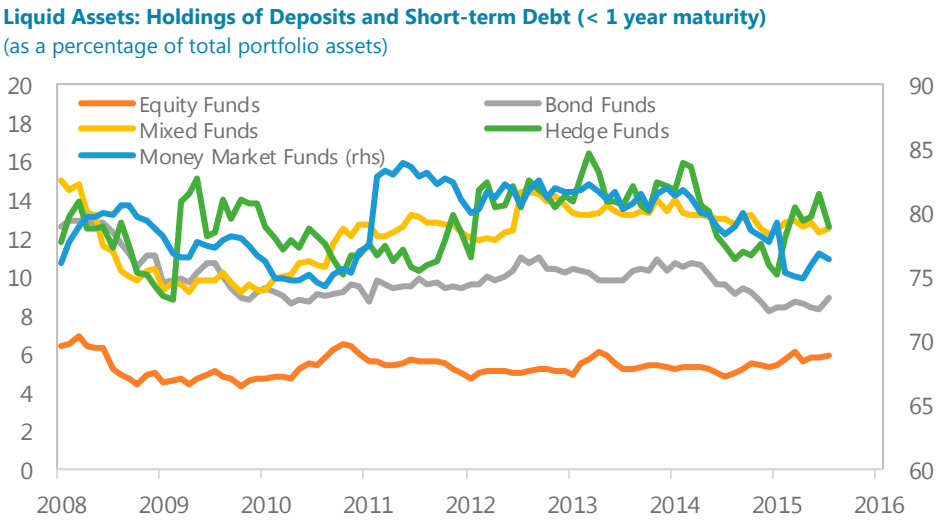
Luxembourg vs. Peers: Liquidity Transformation



Sources: BCL, CSSF, and IMF.

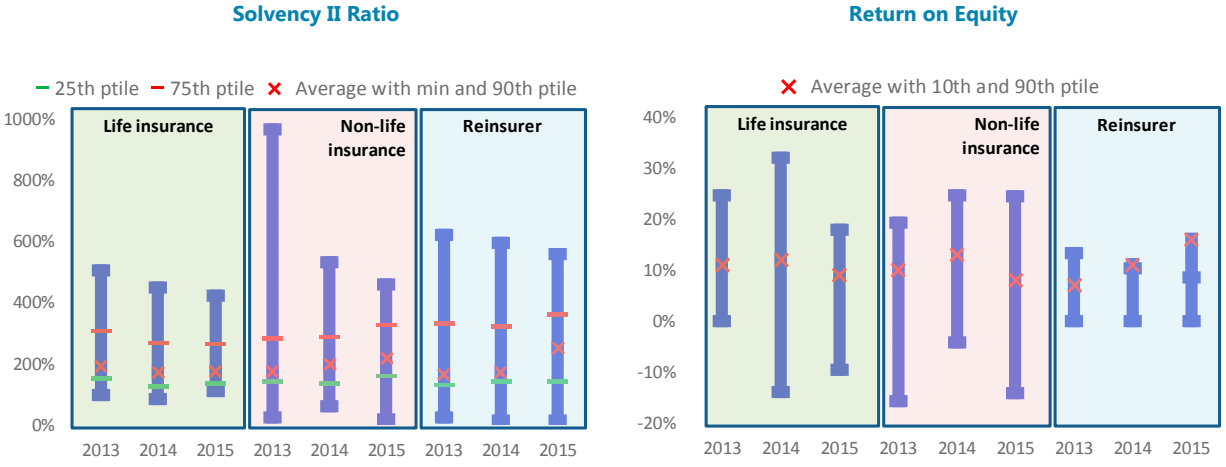
Notes: Luxembourg bank time series data in left panels are updated as of Q2 2016. Cross country comparisons in right panels are based on latest available data between Q4 2015 and Q2 2016. In the international comparisons, data displayed for Luxembourg banks include all banks (domestic and internationally oriented).

Figure 9. Luxembourg: Investment and Money Market Funds: Liquid Asset Holdings



Sources: BCL and IMF staff.

Figure 10. Luxembourg: The Insurance Industry: Capital and Profitability



Source: CAA.

C. Vulnerabilities

9. Nevertheless, the unique structure—i.e. sheer size and interconnectedness—of Luxembourg's financial system gives rise to potential vulnerabilities (Figure 11):

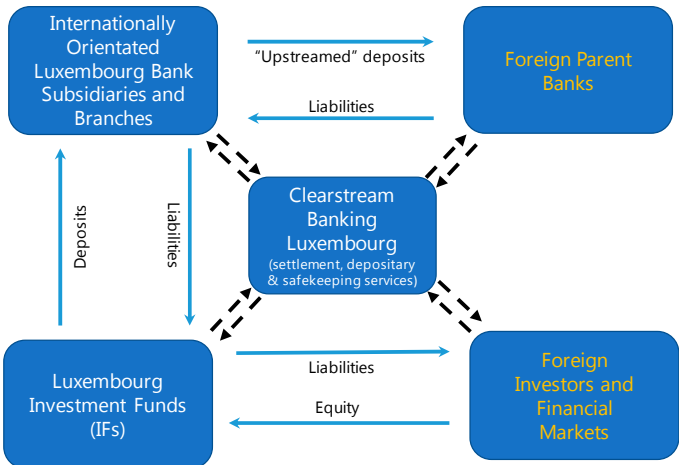
- ***Banks***—Deposits accumulated from private wealth management and investment fund activities are frequently 'upstreamed' to foreign parents where centralized treasury management functions are performed. Luxembourg subsidiaries may thereby be exposed to maturity and currency transformation risk at the parent level, where oversight by

Luxembourg authorities may be limited (this risk materialized during the global financial crisis, since which time mitigants have been introduced).[3] Some 35 percent of Luxembourg bank assets comprise intragroup claims (77 percent of which now fall under ECB supervision; Figure 12), and Luxembourg bank exposures to intragroup entities (principally EU parents) often amount to several times their capital.[4] These characteristics, along with large holdings of zero-weighted sovereign bonds, help explain the relatively low risk density (ratio of risk-weighted to total assets) in Luxembourg (31 vis-à-vis 39 percent euro area average).

- ***Investment Funds***—should investment funds have inadequate liquid asset holdings and liquidity management tools (LMTs) prove ineffective, an unexpectedly large redemption shock could result in a drawdown of bank deposits (Figure 13, Table 6) and fire sales in markets where such funds account for a large share of tradeable securities.[5]

- ***FMIs***—a shock to the functioning of CBL could disrupt the vast number of international institutions and markets it serves. This could leave participants unable to access or trade some or all of the securities held in CBL, resulting in credit and liquidity pressures with potentially significant repercussions for the international financial system.

Figure 11. Interconnectedness: The Luxembourg and Global Financial Systems



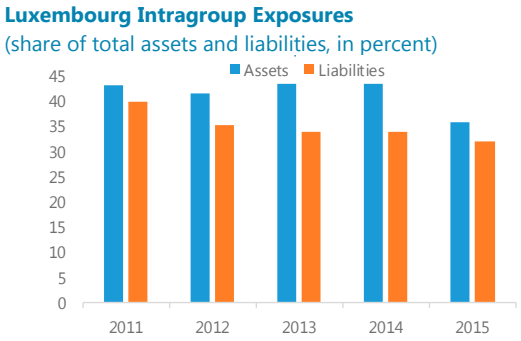
Source: IMF.
Notes: White (yellow) text denotes domestically (foreign) domiciled entities. Private wealth management activities are subsumed in the internationally oriented Luxembourg banks. The central position of Clearstream simply aids in the visual interpretation of system flows (i.e. it is not meant to imply an outsized role for Clearstream relative to other components of the financial system).

[3] See the 2011 Luxembourg FSSA. Recent mitigants include the introduction of the Single Supervisory Mechanism (SSM), which provides for strengthened supervision at the consolidated level, and high quality liquid asset requirements under Basel III's liquid coverage ratio (LCR).

[4] These exposures are permissible for banks availing of a waiver to the EU-wide single counterparty exposure limit of 25 percent of bank capital.

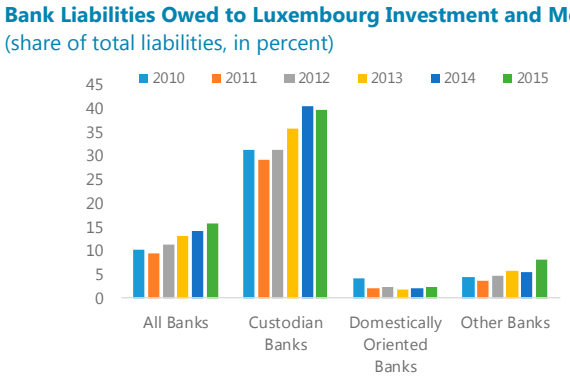
[5] This would primarily include but need not be limited to operational deposits (such as those held for clearing, custody, and cash management) as defined per Article 27 of the EU's Delegated Regulation 2015/61.

Figure 12. Luxembourg: Bank Intragroup Exposures



Source: BCL.

Figure 13. Luxembourg: Bank Liabilities Accounted for by Investment and Money Market Funds



Source: CSSF and BCL.

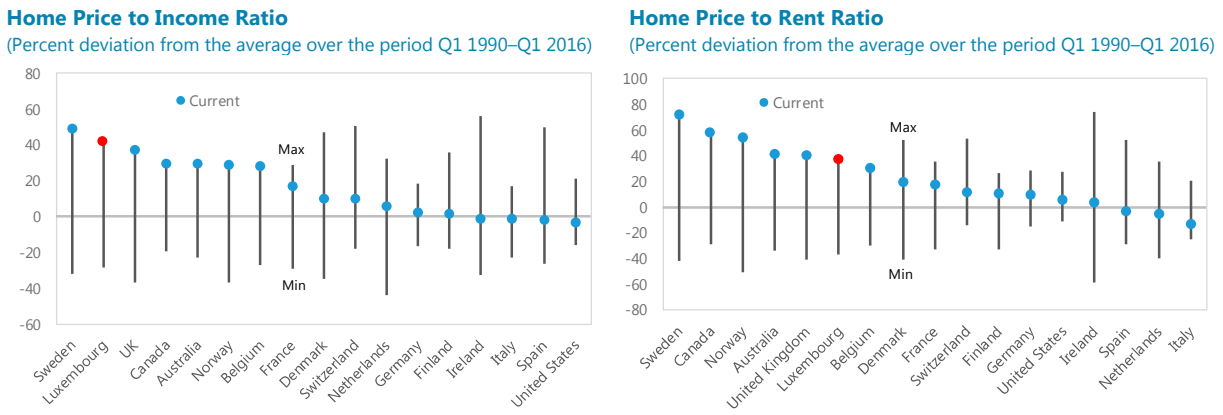
Table 6. Luxembourg: Investment Fund Exposures to Banks

	Banks in Luxembourg (€ billions)	Banks abroad (€ billions)
Investment funds' assets	104	691
of which:		
Debt securities	1	330
Stocks	0	72
Derivatives	1	134
Deposits & loans	101	155
Investment funds' liabilities	8	175
of which:		
Derivatives	2	126

Source: BCL statistical reporting form S.521 and investment fund reporting.
Note: Exposures to Luxembourg banks are taken from S.251. Exposures to banks abroad are the residual of investment fund total global exposures to banks. Asset exposures include deposits, loans, equity instruments, debt instruments, and derivatives. Liabilities include loans, short sales, and derivatives.

10. The main domestically-originated vulnerability relates to residential real estate developments, to which a small number of domestically-oriented banks (and the government through its bank ownership stakes) are exposed. Following a marginal decline in 2009, real home prices have since risen 22 percent while real disposable income has been flat, thus impairing affordability with potential implications for debt servicing capacity (Figure 14; Box 1). Mortgage lending standards have eased of late, evidenced by an uptick in the share of high loan-to-value (LTV) mortgages, and household indebtedness has increased (Figure 1). Floating rate mortgages also raise the issue of borrower interest rate risk.[6] Balanced against these vulnerabilities, however, are several factors—a constrained supply response, a modest share of mortgages in domestically-oriented bank assets (16 percent), the low (52 percent) industry-wide loan-to-value (LTV) ratio, below average household indebtedness,[7] and high household net worth (financial assets exceed household debt by 2.4 times).

Figure 14. Luxembourg; Residential Real Estate Market Affordability Measures



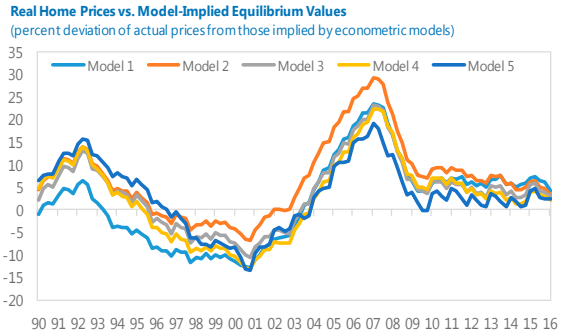
Source: IMF staff.

[6] In November 2016, the European Stability Risk Board (ESRB) issued a risk warning to Luxembourg (and seven other EU countries), highlighting medium term vulnerabilities related to rising property prices and household indebtedness: https://www.esrb.europa.eu/news/pr/date/2016/html/pr161128.en.html.

[7] At 120 percent, Luxembourg's household debt-to-income ratio is 0.4 standard deviations below the OECD average (146 percent). See also Figure 1.

Box 1. Is the Residential Real Estate Market in Line with Fundamentals?

Luxembourg's steadily rising real estate prices have raised questions as to whether such gains have been consistent with underlying fundamentals. Results from the estimation of a number of models (following Igan and Loungani, 2012) of annual real house price growth over the period 1981Q1–2015Q4 do not, however, point to a significant misalignment of prices with fundamentals, although housing affordability has deteriorated (Figure 14). While real house prices appeared overvalued prior to the global financial crisis, their evolution since has been more consistent with fundamentals. In spite of flat disposable income over recent years, the low interest rate environment has strengthened borrowing capacity, supply responses have been muted, and robust population growth has spurred demand. Nevertheless, model results suggest an unexpected shock to these fundamental drivers—such as population and income growth reversing due to a downturn in the financial services industry—could impart significant downward pressure on real estate valuations.



Source: IMF Staff

Dependent var: yoy real house price growth	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Log (Price to Income ratio) (t-4)			-0.0381	-0.0732	-0.0761	-0.0698
Disposable income growth (t-1)	0.691***	0.825***	0.878***	0.791***	0.588**	0.511**
Real mortgage rate (t-1)		-0.278	-0.593	-0.522	-0.502	-0.266
Population growth (t-1)				1.930	2.277	3.034**
Mortgage credit growth (t-1)					0.330**	0.350**
Dummy euro (1998-1999)	0.0388***	0.0407***	0.0357***	0.0288**	0.0471***	0.0492***
Constant	0.0269***	0.0353***	0.0548**	0.0358	0.0209	
F test	185.88	91.82	55.45	45.07	44.1	62.16
Observations	140	140	140	140	140	140

*** p<0.01, ** p<0.05, * p<0.1

Note: model estimated with a newey west estimator with 4 lags.

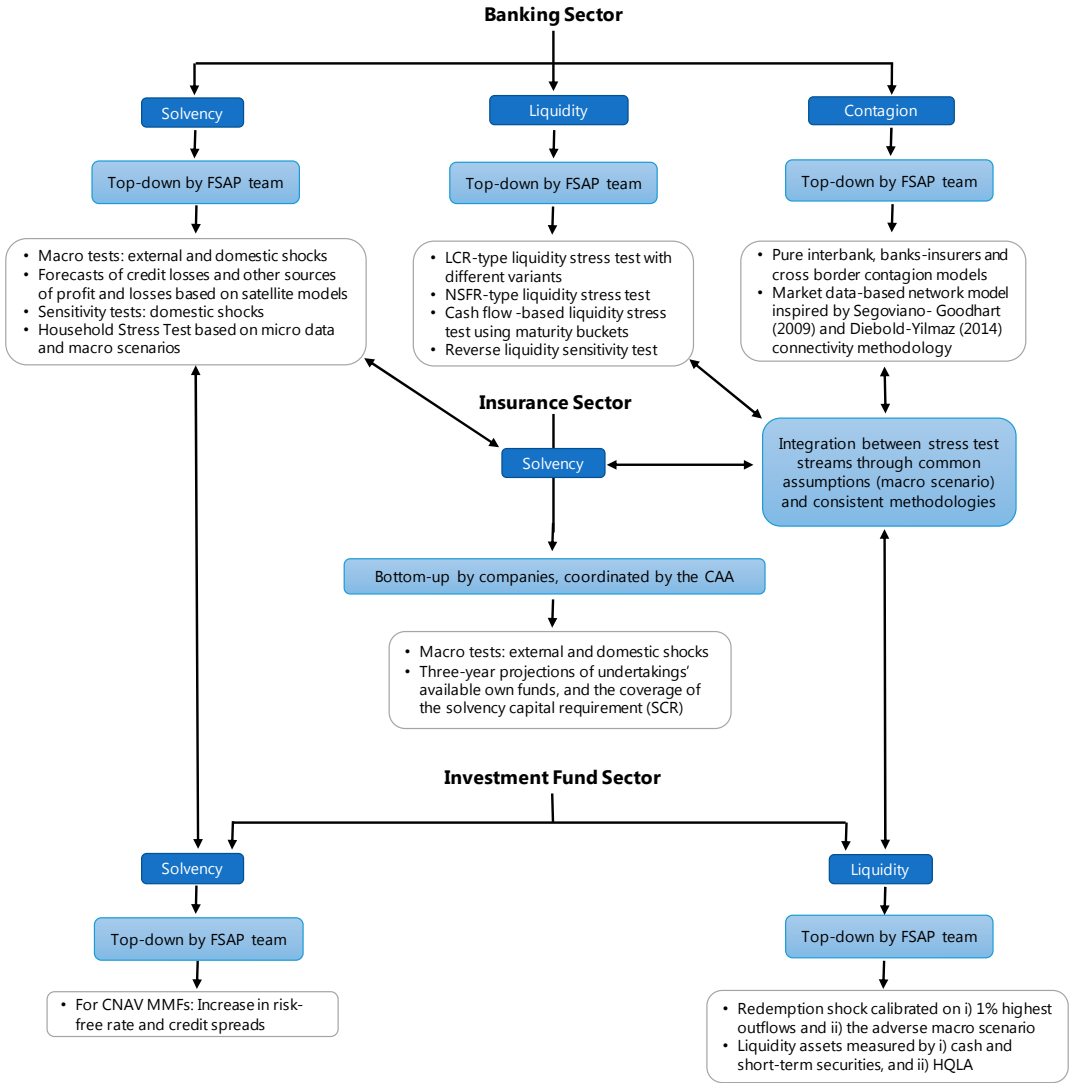
RISKS, RESILIENCE AND SPILLOVERS

11. The principal risks faced by Luxembourg's small open economy and internationally-oriented financial system relate to interruptions to real and financial cross-border flows, and second round effects for real estate and domestically-oriented banks. As outlined in the Risk Assessment Matrix (RAM, Annex II), an acute external shock whereby financial market risk premia rise sharply and the Euro area relapses back into recession constitutes the primary risk.[8] Earlier

[8] More diffuse though related risks relate to long-term business model challenges, and protracted uncertainty (and declining confidence) associated with political risk in advanced economies, including post-Brexit arrangements and the rising threat of protectionism (RAM; Annex II). However, given the acute shock scenario would be more severe and is more parsimonious to calibrate, this constitutes the focus of the stress test analysis. For details, see the Technical Note: 'Risk Analysis.'

described vulnerabilities could see a seizure in cross-border flows lead to strains in Luxembourg's internationally-oriented banks (liquidity and solvency stress), investment funds (liquidity stress) and insurers (solvency stress). Second round effects would be felt domestically through a downturn in the residential real estate market, adversely impacting household net worth and consumption, and profitability and possibly capital at domestically-oriented banks. It is in this context that stress test and spillover analysis assesses the resilience of Luxembourg's financial system (Figure 15). [9]

Figure 15. Luxembourg: Summary of Luxembourg FSAP Stress Test Sectoral Coverage



Source: IMF.

[9] Given their interconnections and exposure to common shocks, a unique feature of the exercise was to integrate the bank and investment fund stress tests, for instance through: application of a common adverse shock scenario; the transmission of an investment fund redemption shock to bank deposits; spillover analysis utilizing market-based data for bank and investment fund stress; and network analysis of intersectoral balance sheet exposures.

A. Stability Risks and Resilience

Bank Solvency and Liquidity Stress Tests

12. Capital resilience in the banking system was assessed through "top-down" macro-financial stress tests. Coverage included 16 banks (15 significant institutions (SIs) directly supervised by the ECB and one less significant institution (LSI)), accounting for 73 percent of industry assets.

13. Stress tests were based on fully-fledged macroeconomic scenarios comprising a baseline and one severe but plausible adverse scenario spanning a three-year period (to 2019) where:

- **The baseline scenario** is based on the October 2016 World Economic Outlook projections;
- **The adverse scenario** features a V-shaped GDP profile with a cumulative decline larger than that experienced following the global financial crisis (Figure 16 and 17). This outcome derives from a combination of external and domestic shocks (a surge in global financial market volatility, a renewed euro area recession, and spillover to the housing market; see RAM) transmitted through the IMF Global Macro-Financial Model. The result is a 1.5 percent per annum decline in GDP averaged over 2017–2019, leading to a cumulative deviation of 14.7 percentage points with respect to the baseline (equivalent to a 2 standard deviation shock).

Figure 16. Luxembourg: Real GDP in the Adverse Scenario

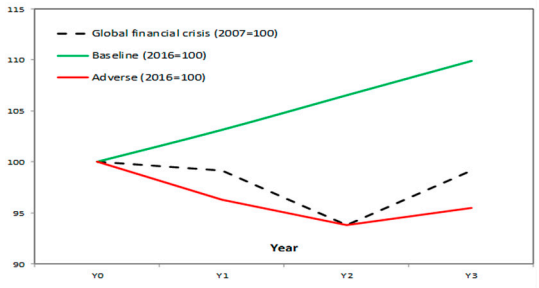
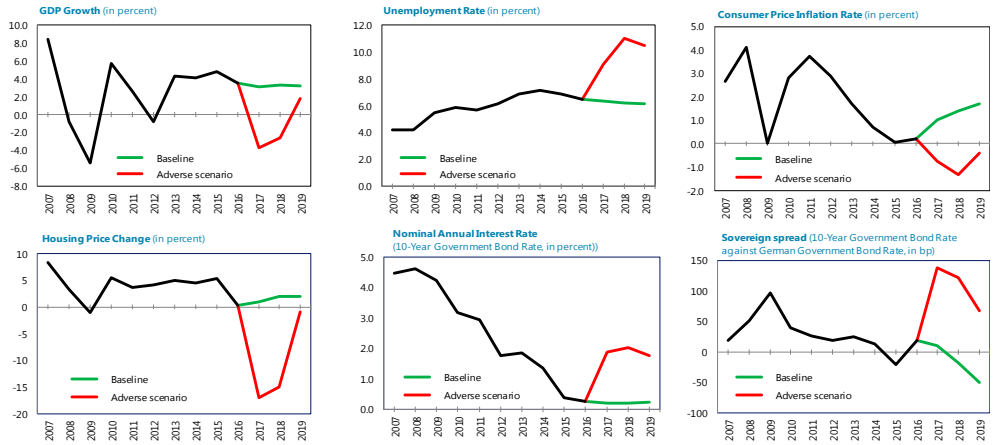


Figure 17. Luxembourg: FSAP Stress Test Macro Projections



Sources: WEO, national sources, and IMF staff estimates.

14. Stress test results suggest system-wide bank capital would display a good deal of resilience in the face of severe but plausible shocks, with some select risks. High starting levels of capital allow the banking system to absorb a large adverse shock while retaining substantial buffers (Figure 18). Real estate vulnerabilities are mitigated by high levels of collateralization and the modest share of mortgages in bank assets. Based on fully-loaded Basel III regulatory requirements, the ratio of Common Equity Tier 1 capital to total risk-weighted assets (CET1 ratio) would decline over three years from 18.6 percent to 15.1 percent. One bank would experience a decline in capital below the CET1 hurdle rate, with three banks (comprising less than 10 percent of industry assets) experiencing a decline in capital below the capital adequacy ratio hurdle,[10] by 0.1 and 0.8 percent of GDP respectively. The system-wide leverage ratio (Tier 1 capital to total assets) would decline from 5.9 to 5 percent, with six banks experiencing a decline below the 3 percent hurdle rate in 2019 (after which time it becomes binding) by an amount equivalent to 1.6 percent of GDP.[11]

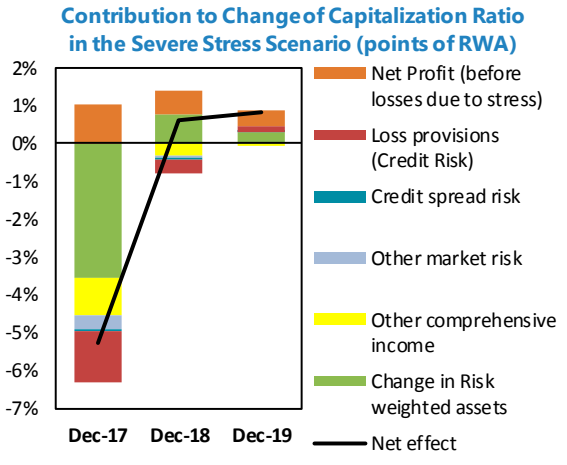
15. Owing to methodological differences, these results differ from those based on banks' own estimates in an exercise recently coordinated by the EBA, ECB, and national authorities. A lack of historical credit loss data meant credit risk benchmarks were conservatively based on the recent Ireland financial crisis. Additionally, risk mitigants including economic hedges and financial guarantees were not incorporated as their granular characteristics could not be assessed and they could not be harmoniously applied. Growth assumptions for RWA under the adverse scenario also exceeded those estimated by the authorities and banks in recent stress tests.

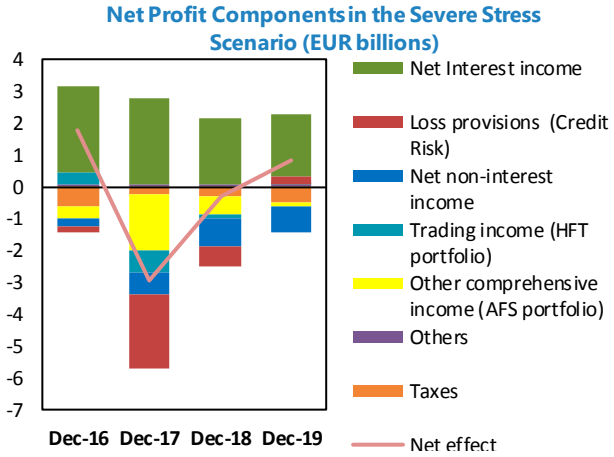
[10] The CAR declines by 3.6 percentage points to 15.8 percent in 2019 from 19.4 percent in 2016.

[11] This result reflects in part the aforementioned low risk density of Luxembourg banks.

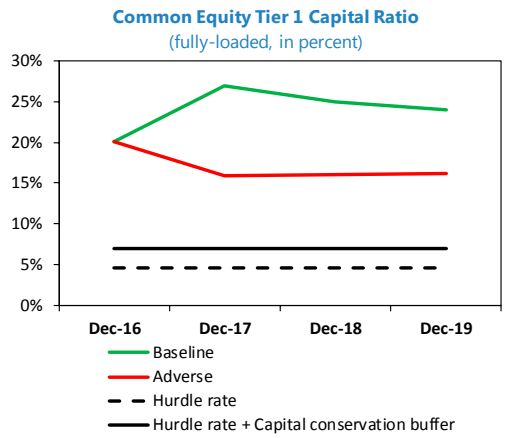
Figure 18. Luxembourg: Results of Top-Down Bank Solvency Stress Tests

All Banks: Contributions to Net Profit and Change in Capitalization Ratio

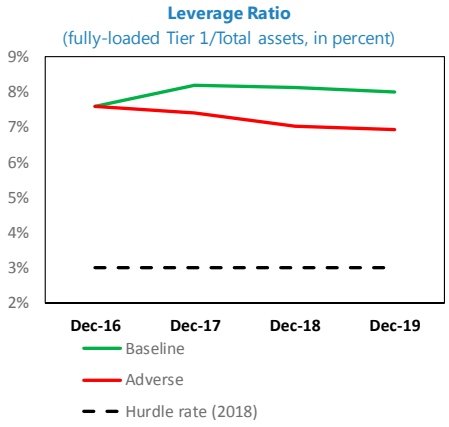




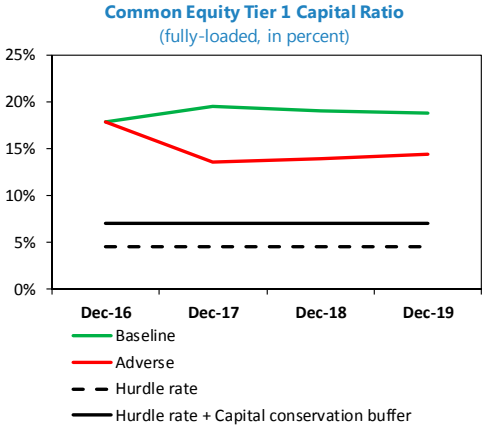
Domestically-oriented banks: Capital



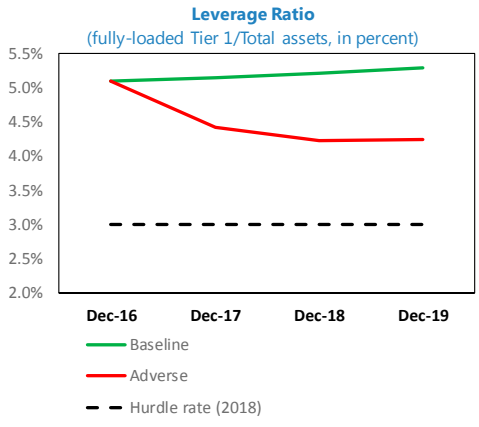
Domestically-oriented banks: Leverage



Internationally-oriented banks: Capital



Internationally-oriented banks: Leverage



Source: IMF staff calculations.

16. With respect to concentration risk, sensitivity tests reveal that some Luxembourg banks could be vulnerable to the simultaneous default of their largest nonfinancial corporate exposures.[12] The simultaneous default of the five largest exposures would, after application of exemptions and credit risk mitigation,[13] lead three banks to be undercapitalized by 1.6 percent of GDP with regard to the Tier 1 capital ratio hurdle of 6 percent.

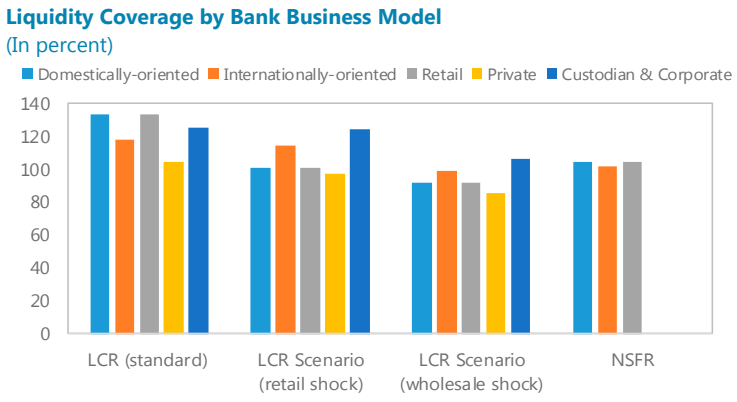
17. Stress tests confirm the general strength in bank liquidity, though intragroup treasury activities could contribute to liquidity mismatches in a highly stressed scenario:

- *Liquidity coverage ratio (LCR)*—Under the standard scenario, all banks comfortably meet the 80 percent LCR requirement currently effective (Figure 19, Table 7), and all but 4 of the 16 banks in the sample meet the 100 percent LCR requirement effective January 2018 (first column, Table 7). Separate retail and wholesale deposit withdrawal scenarios, which layer stress onto the (already stressed) LCR, show that 4 and 7 banks respectively would struggle to maintain an LCR above the 100 percent requirement. Shortfalls in the LCR in USD terms, which is non-binding but reported by banks, reflect subsidiaries' reliance on their parent to manage FX assets on their behalf.

- *Net stable funding ratio (NSFR)*[14]—6 out of 8 banks pass the 100 percent NSFR threshold ahead of its January 2018 implementation, with modest shortfalls in the remaining two.

- *Cashflow analysis*—6 out of 8 banks would face funding gaps over a seven-day shock, though all but one of the affected banks hold sufficient central bank eligible securities to cover such a shortfall (final column, Table 7).

Figure 19. Luxembourg: Bank Liquidity Coverage



Sources: Luxembourg authorities and IMF staff calculations.

[12] See also Section C.

[13] Exempted exposures refer to non-financial corporates benefitting from an explicit state guarantee. Banks hold most of their credit risk mitigation measures in the form of financial collateral, debt instruments and third party financial guarantees.

[14] Data availability issues meant the NFSR and cashflow analysis could only be conducted on 8 (rather than 16) banks.

Table 7. Luxembourg: Bank Liquidity Stress Test Results

	LCR Stress Test Scenarios						NSFR Stress Test	Cash-Flow Stress Test	
	LCR Standard	LCR Retail	LCR Wholesale	LCR FX (USD)	LCR FX (EUR)	LCR FX (GBP)	NSFR	Outflows (before CC 2/)	Outflows (after CC 2/)
System-wide Liq. ratio (%)	109.4%	107.6%	96.3%	16.7%	161.8%	9.8%	101.1%	-	-
Liquidity shortfall 1/									
EUR billion	3.5	1.9	7.2	12.7	0.3	1.3	8.9	18.9	0.7
% GDP	6.4%	3.4%	13.1%	23.2%	0.6%	2.4%	16.2%	34.6%	1.3%
in % of banks' assets in sample	0.8%	0.4%	1.6%	3.5%	0.1%	0.4%	4.3%	9.2%	0.4%
short/out of sample	4 out of 16	4 out of 16	7 out of 16	11 out of 12	1 out of 8	4 out of 8	2 out of 8	6 out of 8	1 out of 8

Sources: Luxembourg authorities and IMF staff calculations
Note: 1/ Liquidity shortfall is the amount required so that the Liq. Ratio in each bank in the system be equal to or above 100 percent; the ratio effective as of January 2018.
2/ CC=Counterbalancing capacity

Nonbank Stress Tests

Household Solvency Stress Tests

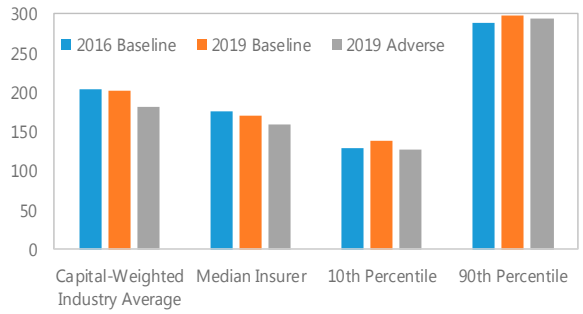
18. Households' solvency would be adversely impacted by a drop in income and house prices and a rise in the unemployment rate, but the share of households in default would remain modest. Utilizing micro-level household data, a stress test assessed the sensitivity of household balance sheets to the earlier described adverse macro-financial shock. The exercise points to an increase in household debt default probabilities from 2.5 to 6.4 percent (a multiplier of 2.6). The low share of households in default reflects numerous factors: many households either do not hold or have repaid part of their mortgage; high household net worth; and the large holdings of liquid assets which could be used in times of stress for debt service payments.

Insurance Solvency Stress Tests

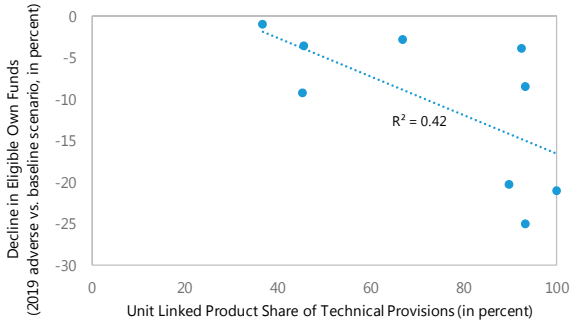
19. The Luxembourg insurance sector displays resilience to market shocks (consistent with the findings of the 2011 FSAP), despite a notable decline in Eligible Own Funds (EOF). This is the result of a bottom-up solvency stress test (coordinated by the CAA) covering 10 life insurers and one reinsurer, both accounting for roughly three quarters of the respective markets. While aggregate EOF declines by 27 percent in the third year of the adverse scenario, each insurer in the sample would maintain its capital well above the 100 percent Solvency II requirement (Figure 20). Cross-sectionally, insurers with a relatively larger share of unit-linked business are more severely hit than peers, reflecting their exposure to reduced AuM-related fee income.

Figure 20. Luxembourg: Insurance Capital and Eligible Own Funds in the Adverse Scenario

Solvency II Capital Ratio: Distribution by Insurer
(in percent)



Stress Test Induced Decline in Eligible Own Funds for Life Insurers



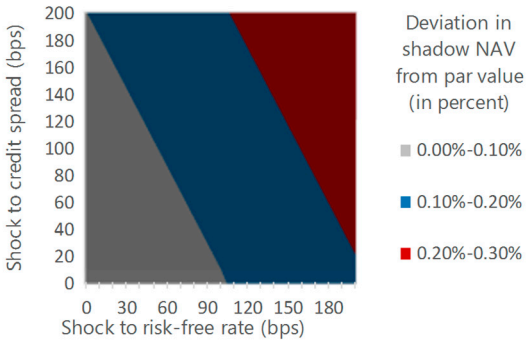
Source: CAA.

Money Market Fund 'Solvency' Stress Tests

20. Stress tests and sensitivity analysis reveal that a very large increase in risk-free interest rates and credit spreads would be needed to 'break the buck' (a measure of solvency risk) in Luxembourg's Constant Net Asset Valuation (CNAV) money market fund (MMF) industry. For instance, based on a sample of 5 CNAV funds (accounting for 75 percent of CNAV MMF AuM), the combination of a 130 basis point shock to risk-free interest rates and a 150 basis point widening in credit spreads would be required for the shadow NAV (fully reflecting market fluctuations) to deviate substantially (by 0.2 percent or more) from par value (Figure 21, left panel). Market risks are mitigated by large holdings of cash and short duration, high quality assets (Figure 21, right panel).

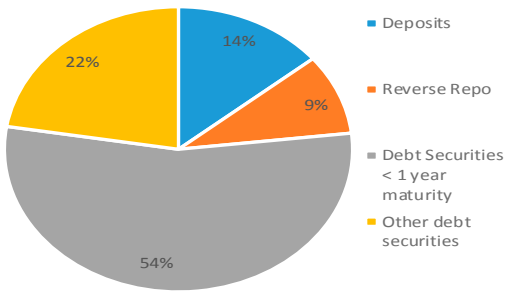
Figure 21. Luxembourg; CNAV Money Market Fund Portfolios

Solvency Risk



Sources: CSSF, BCL, and IMF staff estimates.

Average MMF portfolio composition
(as a percentage, in billions of euros)



Sources: CSSF, BCL, and IMF staff estimates.

Notes: This analysis follows the methodology in IMF (2016b). Data and results are aggregated as an asset-weighted average of the 5 largest CNAV MMFs. All individual funds produced qualitatively similar results as the asset-weighted average. The shadow NAV refers to the NAV if market fluctuations were reflected directly in the NAV.

Investment Fund and MMF Liquidity Stress Tests

21. Funds exposed to asset classes with lower liquidity/higher credit risk are more vulnerable to severe but plausible redemption shocks (Table 8). Redemption shocks based on past experience (historical approach) and on macro-financial outcomes from the aforementioned adverse scenario (forward-looking simulation) are compared to fund liquidity buffers for a variety of funds covering significant portions of AuM.[15, 16] Around 70 percent of HY funds would face a shortfall in the historical and forward-looking scenarios. EM, mixed and other bond funds encounter problems only under the (conservative) assumption that liquidity comprises cash and short-term debt. Liquidity risk in MMFs appears muted.

Table 8. Luxembourg: Money Market and Investment Fund Liquidity Stress Tests

Fund Type:	Historical Redemption Approach			Forward-looking Redemption Approach		
	Redemption shock (1st percentile net outflow)	% of funds with shortfall:		*Redemption shock (simulated)*	% of funds with shortfall:	
	(share of TNA)	Cash and Short-term debt	HQLA	*(share of TNA)*	Cash and Short-term debt	HQLA
Short Term CNAV	*19%*	0%	^	*		
Short Term VNAV	*23%*	0%	^	*		
Other MMFs	*18%*	0%	^	*		
EM	*18%*	71%	2%	*9%*	50%	0%
HY	*19%*	78%	75%	*11%*	66%	69%
Mixed funds	*9%*	28%	5%	**	**	**
Other bond funds	*18%*	52%	8%	*6%*	30%	0%

Source: BCL, CSSF, IMF Staff calculations

Notes: Italicized figures in white depict the average redemption shock for each fund (as a share of total net assets, TNA).

Figures in gray panels depict the percentage of funds in the sample unable to cover a redemption shock

^ The HQLA measure is not applicable for MMFs

* Estimated model is not significant

** Under the adverse forward-looking scenario, mixed funds experience net inflows

22. In the absence of adequate liquid security holdings and effective liquidity management tools (LMTs), select bond funds may need to draw on bank deposits. In the forward-looking adverse scenario, in which all funds are simultaneously subjected to a severe redemption shock, outflows amount to 20–24 percent of investment fund bank deposits in the sample (equivalent to €4.9–5.3 billion).[17] Across the sample of depositary banks, these outflows

[15] See European Systemic Risk Board (2016).

[16] See ESMA (2015).

[17] The range depends on whether projected inflows from mixed funds are included. These inflows are an empirical regularity captured by the redemption model, reflecting the diversity in Luxembourg funds where some experience inflows while others experience outflows.

would amount to 3 percent of total deposits, or 4 to 10 percent of wholesale or operational deposits respectively.[18]

23. Caveats and context are important in the interpretation of these results. The tests assume managers cannot avail of LMTs, and embed restrictive assumptions on the ability of funds to liquidate long-term securities. This is most notable for HY funds, where manager surveys recently introduced by the CSSF point to a more benign assessment of liquidity risk. (Note also that HY fund AuM account for only 5 percent of Luxembourg's investment industry). Data limitations also require the assumption that the entire liquidity shortfall is borne by a single depositary bank in Luxembourg, while in practice fund deposits are typically spread across several banks in and outside Luxembourg.

B. Spillover and Contagion Analysis

24. Network analysis and other modelling of supervisory and market data confirm that while there is limited interconnectedness across banks and insurers domestically, it is high across borders.

- *At the domestic level, the interconnectedness within and across banks and insurers seems limited.*[19] Aggregate indices of contagion and vulnerability (based on balance sheet data) record benign readings (Figure 22). For instance, failure of the entity with the highest contagion index causes losses of less than 0.5 percent of counterparties' capital. Market data-based analysis suggests Luxembourg banks are not strongly interconnected (excepting Bank 2 and 4; Figure 23).

- *By contrast, at the cross-border level, quantitative analysis confirms a high degree of interconnectedness for Luxembourg-domiciled banks and investment funds* (Figure 24):[20]

    - **Banks**. Based on gross original exposures (before credit risk mitigation) and under standard model assumptions,[21] an unexpected increase in the defaulted share of cross-border claims through the failure of a parent poses a threat to the capital of Luxembourg subsidiaries, reflecting large intra-group exposures (Figure 25, diagonal cells). Vulnerability and contagion risk emanating from foreign parents emanates more prominently through credit rather than funding channels (blue columns, Figure 26).

[18] Recent internal analysis by the CSSF suggests a more benign outcome under different assumptions. Note also these results pertain only to a sample of depositary banks (for which relevant data was available) comprising 9.3 percent of system wide bank deposits.

[19] The link between fund redemption shocks and bank deposits was discussed in paragraph 22.

[20] Associated policy implications are discussed below under Prudential Oversight, building on IMF (2016a).

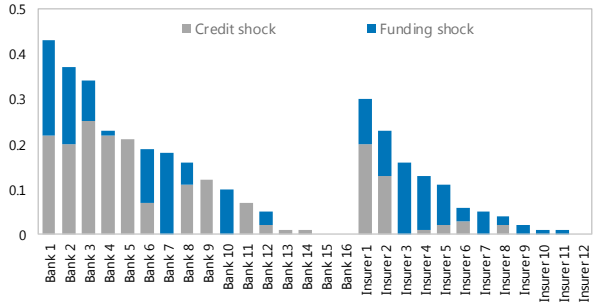
[21] Assumptions include: a loss-given default of 40 percent; funding shortfall of 35 percent; and a discount for asset firesales of 50 percent. Results should be interpreted with caution as underlying data are based on gross (rather than net) exposures.

- **Investment funds**. Luxembourg-domiciled investment funds appear interconnected with select global banks and EM bond markets. Mixed and bond funds are connected with U.S. and UK banks, evidenced by their central location in the global network (red/orange nodes, Figure 27). This likely reflects exposure to common factors. Additionally, some fixed income investment funds have large and concentrated holdings in select frontier/EM bond markets (beyond those dictated by capitalization-weighted benchmarks). Exposure to a single sovereign issuer is around 30 percent of assets for a number of funds (Figure 28),[22] and collectively, Luxembourg bond funds hold more than 10 percent of outstanding tradable debt in six frontier/EM bond markets (Figure 29).[23] Luxembourg funds could therefore act as a conduit of shocks for these markets.

Figure 22. Luxembourg: Indices of Domestic Contagion and Vulnerability—Balance Sheet Analysis

Contagion Index

(percentage of Tier 1 Capital)

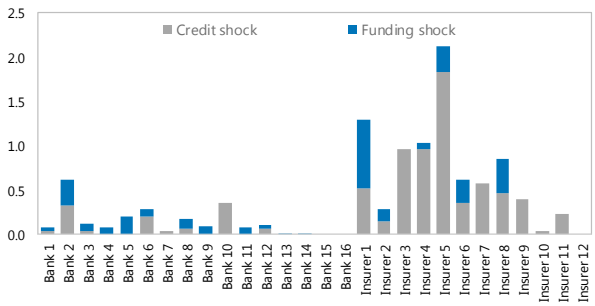


Source: IMF staff.

Notes: Based on balance sheet data examined in the Espinosa-Vega and Sole (2011) model. The Contagion Index represents the average loss experienced by each entity (expressed as a percentage of their Tier 1 capital) due to the triggered failure of one entity. For example, the failure of Bank 1 results in the average loss to other entities of just 0.4 percent of capital.

Vulnerability Index

(percentage of Tier 1 Capital)



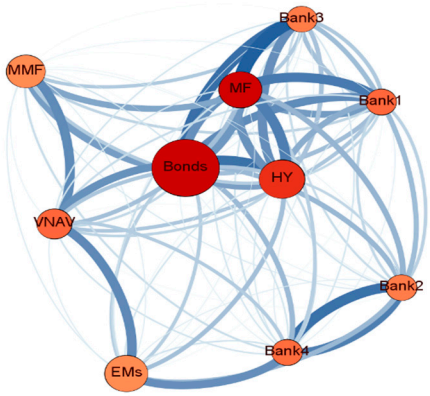
Source: IMF staff.

Notes: Based on balance sheet data examined in the Espinosa-Vega and Sole (2011) model. The Vulnerability Index represents the average loss experienced by each entity (expressed as a percentage of its Tier 1 capital) across individually triggered failures of all other entities. For example, Insurer 5 suffers an average hit to capital of 2 percent across individually triggered failures of all other entities (i.e. 27 independent failures).

[22] UCITS fund exposures to a single issuer are capped at 5 percent, though this cap is waved for sovereign issuers.

[23] Frontier markets could well be more susceptible to liquidity risk than EMs.

Figure 23. Luxembourg: Domestic Network Model—Market Data Analysis[1/ 2/]

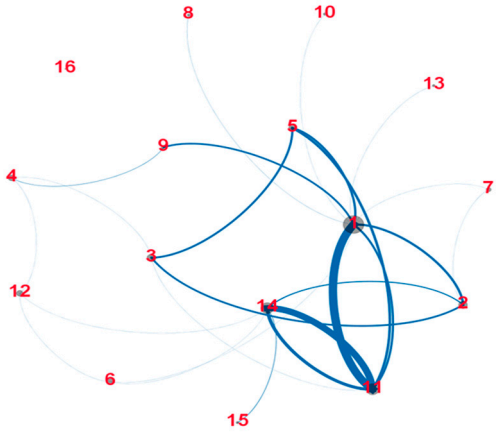


1/ Results based on market data employed in the Diebold and Yilmaz (2014) model.
2/ Edge thickness and darkness shows the strength of the pairwise relationship, depicted as the 12-month forecast variance of entity *i* due to shocks from entity *j*. The underlying error-variance decomposition matrix was calculated using probability of distress data (PoD). PoDs for Luxembourg banks were derived using bond spreads, and for investment funds, derived from marked-to-market return data. Node size indicates total asset size, color of nodes indicates "total connectedness to others" with dark red indicating connections with other entities in the sample. Node location is derived using ForceAtlas2 algorithm in which nodes repel each other, but strength of edges (i.e. connections) is attracting the nodes to each other.

Sources: Datastream and Bloomberg for bank data; Luxemburg authorities for investment fund data; and IMF staff calculations.

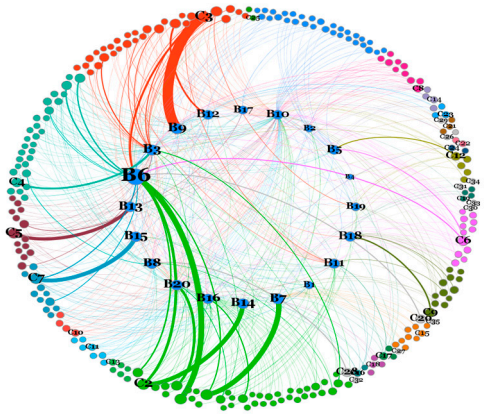
Figure 24. Luxembourg: Domestic vs. Cross-border Network of Financial Institutions

Domestic interbank network



Note: the line thickness indicates degree of exposure in relation to capital. Results based on supervisory data.

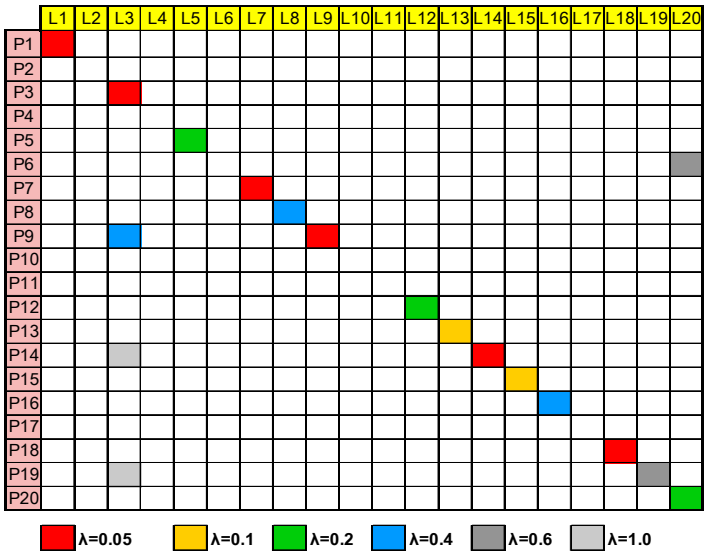
Cross-border network



Note: Luxembourg banks are in the inner circle with their counterparties on the outer circle. Countries are designated by different colors. The sizes of the nodes are proportional to the number of connections for a given entity and the line thickness indicates degree of exposure in relation to capital. Results based on supervisory data.

Figure 25. Luxembourg: Network Analysis of Gross Intragroup and Cross-border Bank Exposures—Balance Sheet Analysis

Luxembourg bank subsidiaries' failures induced by foreign parents (diagonal cells) and other foreign banks (off diagonal cells) at different loss-given-default assumptions

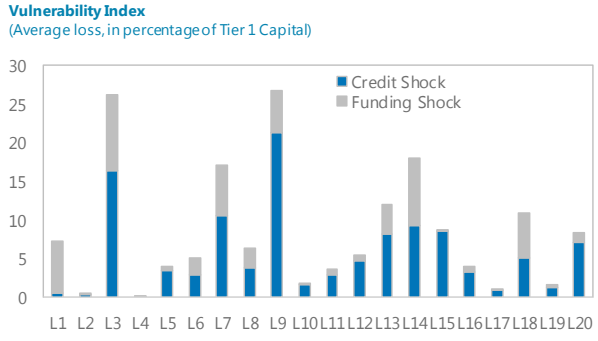


Note: Colors indicate the loss-given-default rate (λ) at which the failure of a foreign parent or other foreign bank (P1, P2, etc.) would result in the insolvency of a Luxembourg bank subsidiary (L1, L2, etc.). Cells highlighted along the diagonal (off-diagonal) refer to Luxembourg bank subsidiaries and their foreign parents (other banks). For instance, the L1 – P1 cell depicted in red refers to the situation where a Luxembourg subsidiary would have its capital position impaired by the failure of its parent assuming a loss-given-default rate of 5 percent.

Figure 26. Luxembourg: Indices of Contagion and Vulnerability—Balance Sheet Analysis

Vulnerability Index

(average loss in percentage of bank capital)

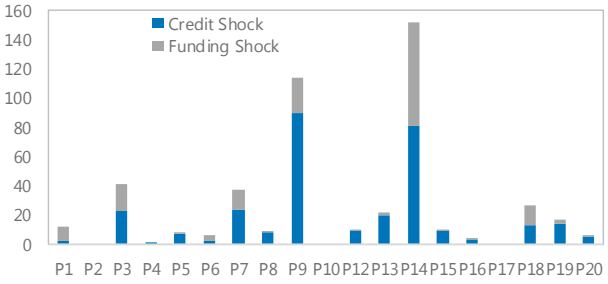


Source: IMF staff.

Note: See notes to Figure 22. For example, Bank 3 suffers an average hit to capital of around 25 percent across individually triggered failures of all parent entities.

Contagion Index

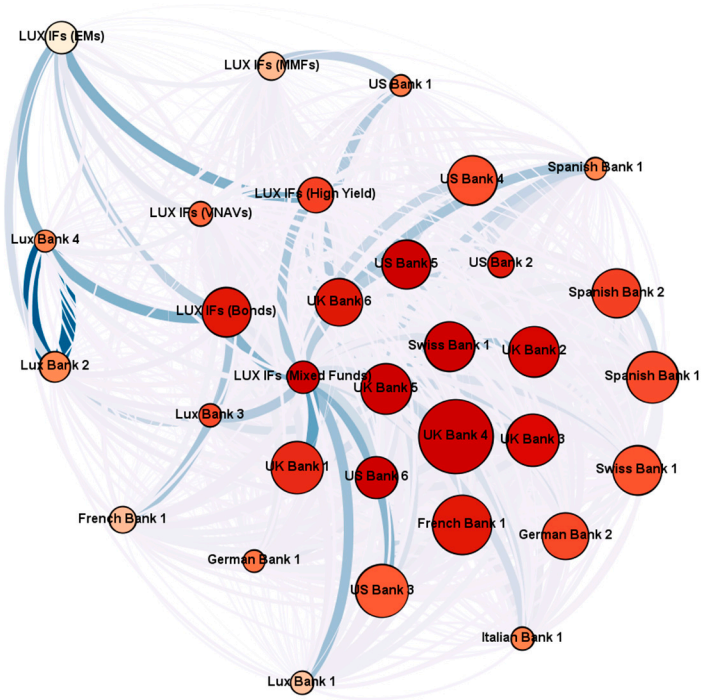
(impact of average induced loss on other banks)



Source: IMF staff.

Note: See notes to Figure 22. For example, the failure of Parent of Bank 9 results in the average loss to other entities of above 100 percent of their capital.

Figure 27. Luxembourg: Global Network Model—Market Data Analysis 1/ 2/

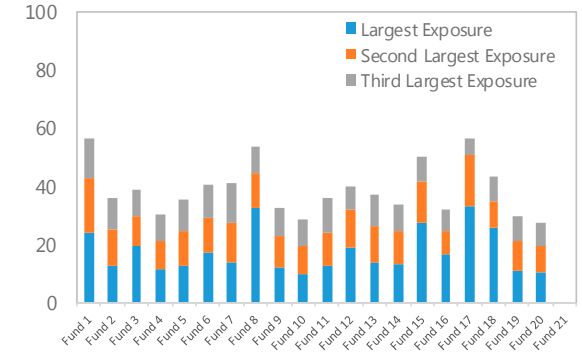


1/ Results based on market data employed in the Diebold and Yilmaz (2014) model.
2/ Edge thickness and darkness shows the strength of the pairwise relationship, depicted as the 12-month forecast variance of entity *i* due to shocks from entity *j*. The underlying error-variance decomposition matrix was calculated using probability of distress data (PoD). PoDs for banks were derived using credit spreads, and for investment funds, derived from marked-to-market return data. Node size indicates total asset size, color of nodes indicates "total connectedness to others" with dark red indicating stronger connections with other entities. Node location is derived using ForceAtlas2 algorithm in which nodes repel each other, but strength of edges (i.e. connections) is attracting the nodes to each other.
Sources: Datastream and Bloomberg for bank data; Luxemburg authorities for investment fund data; and IMF staff calculations.

Figure 28. Luxembourg: Concentration Risk and Common Exposures in Luxembourg Bond Funds

EM bond funds: concentration of holdings

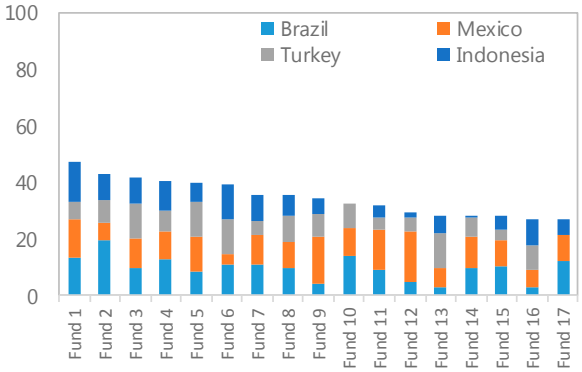
Portfolio Exposure to Single Issuers
(as a percent of total net assets)



Sources: BCL and IMF Staff calculations.

EM bond funds: common exposures

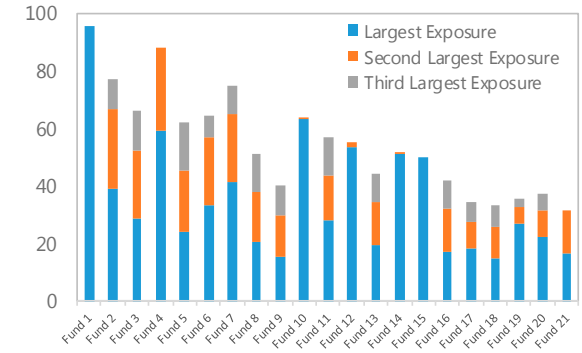
Portfolio Exposure to Common Issuers
(as a percent of total net assets)



Sources: BCL and IMF Staff calculations.

General bond funds: concentration of holdings

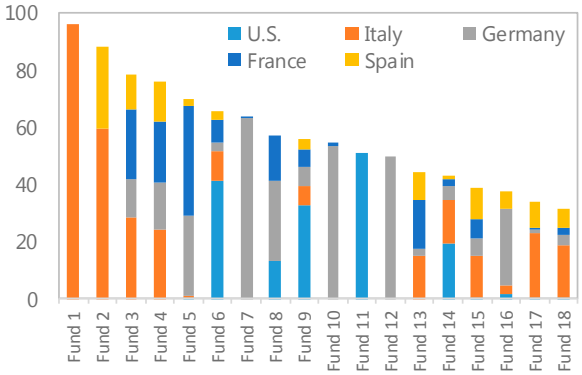
Portfolio Exposure to Single Issuers
(as a percent of total net assets)



Sources: BCL and IMF Staff calculations.

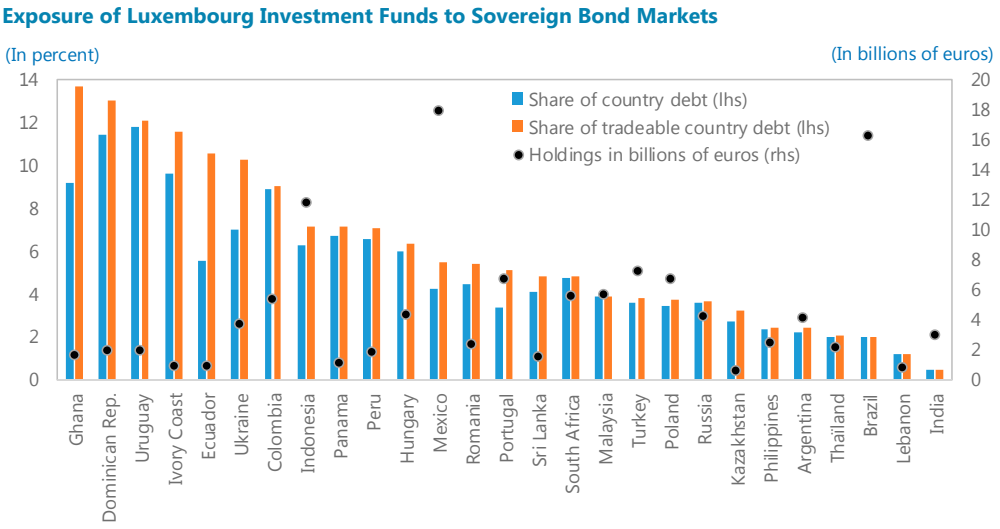
General bond funds: common exposures

Portfolio Exposure to Common Issuers
(as a percent of total net assets)



Sources: BCL and IMF Staff calculations.

Figure 29. Luxembourg: Investment Fund Ownership Share of Sovereign Debt Markets



Sources: BLC, Bloomberg LP, and IMF staff.

PRUDENTIAL OVERSIGHT

A. General and Cross Cutting Themes

25. Though Luxembourg's system of prudential oversight appears to function well, several cross-cutting themes warrant attention.

- *Risk-based supervision and resources.* A continued pivot towards risk-based supervision and a further related increase in resources for the CSSF, CAA, and BCL (where planned capital increases should also proceed), would allow these agencies to more easily meet the demands imposed by new regulation and an enlarged financial system.

- *Governance.* A formal framework should be agreed to govern the relationship between the government and banks with state involvement to ensure it is kept at arm's length and that the relevant banks are free to operate on commercial terms. Additionally, while the mission encountered no evidence of political or industry interference, the operational independence and accountability of the CSSF and CAA should be enshrined in law (as recommended by international standards) in order to safeguard financial stability well into the future. CSSF and CAA board members should also be bound by codes of conduct, in line with best practice (the concurrent updating of the BCL's code of conduct would be welcome in this regard).

- *International engagement*. Luxembourg authorities should increase the intensity of engagement with supervisors in countries where Luxembourg's financial institutions, particularly investment funds, are most active. [24]

- *Dampening residual risks.* More consideration should be given to the imposition of supervisory measures that go beyond the minimum prescribed by European legislation, where justified by the idiosyncrasies of Luxembourg's banking and investment industry, and where compatible with the EU Single Rule Book.[25] The authorities should also take the initiative to reinforce the oversight of nonbank holding companies of banks to improve risk monitoring, while continuing to advocate for a coordinated approach at the European level.[26]

B. Macroprudential Policy Framework

26. The macroprudential policy framework introduced in 2015 is working well in practice, though some elements could be strengthened.[27] The institutional framework could be enhanced by revoking the unanimity voting requirement in the CRS to eliminate the potential inaction bias arising from each agency's veto power.[28] The independence of each member would also strengthen the functioning of the CRS. [29] Additional measures could further strengthen the new policy framework, including by: enshrining in law the BCL's de facto lead role in financial stability analysis; publishing the BCL's risk reports and dashboard to increase transparency and accountability; and awarding the BCL powers to make formal policy recommendations to the CRS.

27. A macroprudential toolkit for the real estate market is in place and the authorities have demonstrated a willingness to deploy it, but the operational capacity of the CRS can be strengthened. Measures enacted have included, since 2012, higher risk weights where loan-to-value ratios exceed 80 percent; stricter stress test requirements for IRB bank mortgage books; pillar II capital add-ons; and a higher risk weight floor for IRB bank exposures to domestic real estate. In December 2016, the authorities also transposed the EU Mortgage Credit Directive into law, thereby strengthening consumer information requirements and obligations to assess creditworthiness. Further macroprudential tightening may be required should real estate price growth continue to

[24] The prudential discussion hereafter offers examples.

[25] The prudential discussion hereafter offers examples.

[26] See the 2017 Article IV Staff Report.

[27] For more details, see the Technical Note: 'Macroprudential Policy Framework.'

[28] For discussion of best practices regarding voting arrangements, see IMF-FSB-BIS (2016) and IMF (2013). In its opinion on the second draft law of the CRS, the ECB also noted that the unanimity voting arrangement of the CRS could cause a risk of policy paralysis (https://www.ecb.europa.eu/ecb/legal/pdf/en_con_2014_46_f.sign.pdf).

[29] The Ministry of Finance chairs the CRS and continues to chair the non-executive boards of the CSSF and CAA. In the case of the CSSF's Executive Board, the government may make proposals to the Grand Duke regarding the dismissal of the Executive Board if a fundamental disagreement arises between it and the government concerning policy and execution of the CSSF's remit. Such a structure could have implications for the operational independence of the CSSF in the future, insofar as it could influence the members of the Executive Board's willingness to make unpopular decisions if they believed it could result in their dismissal.

outpace that of incomes, and lending standards continue to ease. In this regard, operational capacity would be enhanced by providing a legal basis for borrower-based macroprudential tools, notably, limits on loan-to-value and debt-service-to-income.

28. The monitoring of systemic risks by the BCL and CSSF is appropriately focused on real estate vulnerabilities and bank-investment fund linkages, but closing related remaining data gaps is a priority. Real estate-related data gaps span both the residential market (including the rental market and on the loan-to-value distribution across borrowers and banks) and the commercial market (for which there is no data besides a survey undertaken by a commercial firm every five years). Bank-investment fund surveillance has made good progress,[30] but is still hampered by data gaps regarding individual investment fund exposures to depository banks, with data typically gathered at the asset management company level. The authorities are also encouraged to continue recent efforts to deepen their analysis of investment fund liquidity risk, the use of synthetic leverage and securities financing transactions, and the concentration and categorization of beneficial investors.

C. Banking Regulation and Supervision

29. Banking regulation and supervision in Luxembourg has been strengthened in recent years. The authorities have transposed into national law the EU Capital Requirements Directive (CRD IV). Following the introduction of the SSM in 2014, 61 of the 140 banks in Luxembourg are now supervised by the ECB, either as SIs or as subsidiaries or branches of foreign SIs, representing 77 percent of Luxembourg bank assets. The ECB has also replaced Luxembourg's Finance Minister as the body responsible for bank licensing. Against this background, a risk-based examination of the regulatory and supervisory approach to identifying and mitigating vulnerabilities was undertaken, using as a reference the 2012 Basel Core Principles (BCP) for Effective Banking Supervision.

30. Notwithstanding recent advances, a number of additional measures could help to safeguard banking system stability.[31] As the CSSF's board is answerable to the Minister and includes industry representatives,[32] the operational independence and accountability of the CSSF should be enshrined in law, as recommended by the BCP. More frequent on-site inspections, particularly for foreign subsidiaries availing of the waiver to large exposure limits for intragroup transactions, should be put in place, and banks should be required to periodically prove their continued eligibility for the waiver. [33] Continued monitoring of mortgage lending standards is

[30] See BCL (2015).

[31] See the Technical Note 'Banking Regulation and Supervision.'

[32] The CSSF Board, which is chaired by the Director of the Treasury, has seven members: four are appointed by the Minister responsible for the CSSF, with three appointed on a proposal from the companies and persons subject to supervision. A Board so constituted could have implications for the operational independence of the CSSF given that it determines CSSF's annual budget and gives its opinion on the level of fees that regulated entities may be charged.

[33] This assessment pertains both to LSIs, and to the infrequency of on-site inspections of Luxembourg subsidiaries of SIs based in other euro area jurisdictions.

warranted, and data reporting standards for loan-to-value and debt-service-to-income ratios should be harmonized across banks. The BCL should also work closely with the ECB to ensure households are included in the euro area credit registry initiative, particularly given the recent uptick in household indebtedness.

31. Liquidity stress test results suggest risks relating to short term funding and foreign currency arrangements with parent groups should be addressed.[34] Banks should lengthen the maturity of unsecured funding beyond seven-days. Additionally, implementation of an FX LCR framework at the group level would help manage the risk of FX-related liquidity mismatches for Luxembourg subsidiaries. Furthermore, the authorities should work with the EBA to close liquidity reporting gaps and expand harmonized EU bank reporting.

D. Investment Fund Regulation and Supervision

32. The CSSF applies a strong and comprehensive regulatory and supervisory framework to the investment fund industry. Following recommendations in the 2011 FSAP, the CSSF has bolstered its resources devoted to fund management oversight and gives due priority to its monitoring and oversight of the sizable UCITS sector.

33. Nevertheless, delegation practices and the concentration of fund directorships merit increased attention. Guidance on the 'substantial presence' threshold would be welcome given the extent to which Luxembourg funds avail of delegated activities such as portfolio and risk management, and the CSSF should take steps to engage more actively with regulators in the jurisdiction where delegated activities are frequently performed. Additionally, the CSSF should review data on fund directorships held by individuals and issue guidance on limits accordingly, framed in terms of aggregate time commitments.

34. The authorities should issue guidance on the use of LMTs and the modalities of liquidity stress tests—focused initially on fixed income funds—and develop liquidity stress testing capacity. The CSSF should leverage its extensive experience with LMTs in conducting an assessment of their effectiveness to inform industry guidance. To strengthen surveillance and management of system-wide liquidity risk (beyond that provided by existing tools including the new UCITS risk reports), the CSSF should provide industry guidance on the modalities of liquidity stress tests (e.g., frequency, fund coverage, scenarios), and develop system-wide stress testing capacity, consistent with recent Financial Stability Board (FSB) and European Systemic Risk Board guidance.

35. The CSSF should assess the impact of changes on depositary independence introduced under UCITS V, and identify whether risks remain. Appropriate safeguards should be introduced to address any residual concerns. Luxembourg benefits from a large and diverse depositary sector, which gives greater scope for intra-group depositary arrangements to be adjusted if necessary.

[34] As many Luxembourg banks are subsidiaries of foreign parents, their reliance on market-based wholesale funding is typically lower than would otherwise be the case.

36. While the CSSF's supervisory approach is sound, enhancements to its inspection program and better data access would further improve the effectiveness of risk-based supervision. Efforts should be made to further increase the number of thematic on-site inspections, and to introduce comprehensive on-site inspections as another element of the supervisory toolkit.

37. Analysis of nonbank financing and special purpose vehicles should continue. The BCL is encouraged to continue its analysis of the OFI sector and examine whether some entities should be brought under the regulatory perimeter. The authorities are also encouraged to fully participate in international fora on nonbank finance, including initiatives led by the FSB.

E. Insurance Regulation and Supervision

38. The CAA has worked diligently to ensure the insurance industry has adjusted smoothly to the introduction of Solvency II. The FSAP assessed the CAA's regulatory and supervisory compliance with selected Insurance Core Principles (ICPs) drawn up by the International Association of the Insurance Supervisors (IAIS), notably those concerned with cooperation with other supervisory jurisdictions, risk management, internal controls, and supervisory review reporting.

39. Luxembourg's supervisory framework demonstrates an adequate level of consistency with IAIS standards, though the CAA's resources and governance arrangements could be enhanced. The CAA is an active participant in supervisory colleges owing to the international orientation of Luxembourg insurers. However even after a recent uptick in resources, the CAA has a modest staff of about 40 to oversee nearly 300 insurance companies with assets approaching €220 billion. A revised early warning system, calibrated to new Solvency II parameters, should be prioritized (as planned) once the requisite data become available. Additionally, the CAA's governance structure would benefit from: (i) subjecting board members to a formal code of conduct; (ii) having board activities periodically reviewed by an independent committee; and (iii) limiting the government's power to dismiss the Executive Committee, thus safeguarding the CAA's operational independence.

F. Financial Markets Infrastructure—Clearstream Banking Luxembourg

40. An assessment of CBL's risk management practices and supervisory treatment against the CPSS-IOSCO Principles for Financial Market Infrastructures (PFMI) reveals it to be in broad observance. CBL offers a relatively safe and efficient system for the settlement and custody of securities transactions. Luxembourg's implementation of European directives provides a solid statutory basis for netting, finality of settlement, and securities lending. CBL uses an effective risk management framework to manage operational and liquidity risks, has developed a comprehensive business continuity plan, and has in place a detailed counterparty default management framework. CBL's oversight and supervision is conducted prudently by the BCL and CSSF.

41. Nevertheless, further emphasis on risk mitigation is recommended. Priorities include:

- *Reducing the large deposit-based exposure of CBL to a small number of commercial banks*—this could be mitigated through an increase in the number of contracted banks, or the establishment of direct links with local CSDs and central banks, where possible.

- *Tightening collateralizing arrangements*—though CBL has a process for managing credit risks (exposure limits, partial collateralization), residual risks could be mitigated with full collateralization and applying (independently validated) haircuts to cash collateral.

- *Strengthening operational risk management*—while contingency plans and back-up facilities are in place to assist operational recovery, the close proximity of such facilities, coupled with CBL's systemic importance, warrant investment in a third (more distant) data center. A full failover test is also advised, to assess the efficacy with which remote locations can assume critical operations.

- *Enhancing supervisory cooperation arrangements*—although interagency cooperation functions well domestically, formalizing modalities between the BCL and CSSF would support efficiency and accountability. The authorities should also engage with international colleagues when conducting their assessment of CBL against the PFMI. Cooperation between the Belgian and Luxembourg authorities with respect to Euroclear Bank should also be strengthened as planned.

42. Related, and notwithstanding effective national level supervision, the sheer scale and scope of its activities suggest CBL should be designated as a SI under SSM supervision, alongside Belgium's Euroclear Bank.[35] Although harmonization of national supervisory approaches is expected to increase with the implementation of the EU CSD Regulation, this does not address CBL as a bank. SSM-level supervision would ensure a level playing field and better facilitate monitoring of cross-border group level spillover risks, a prudent objective given the systemic importance of both ICSDs.

G. Anti-Money Laundering and Combating Financing of Terrorism

43. Luxembourg has strengthened its anti-money laundering and combating the financing of terrorism (AML/CFT) regime since the 2010 mutual evaluation. Notably, as of January 1, 2017, aggravated tax evasion and tax fraud constitute predicate offenses to money laundering (ML). Earlier progress includes strengthening the ML offense and the licensing and supervision of financial institutions, increasing mutual legal assistance in CFT efforts, and dematerializing bearer shares. Luxembourg is currently conducting its first national risk assessment (NRA) and seeking to increase transparency of beneficial ownership information. AML/CFT supervision of the financial and nonfinancial sectors has been strengthened, though remains relatively weak with respect to lawyers.

44. The government's push for tax transparency constitutes material progress. Luxembourg is amongst the first countries to implement the OECDs Common Reporting Standard,

[35] This recommendation was also made in the 2013 Euro area FSAP.

which should greatly facilitate the exchange of information between tax administrations. The number of suspicious transaction reports and the exchange of financial information with foreign counterparts have increased over recent years.

45. Challenges remain, and the authorities have indicated their firm commitment to address them. Key priorities include: (i) ensuring that the ongoing NRA adequately focuses on risks related to trust and company services providers across all relevant professions; (ii) provide guidance on the identification of suspicions of tax crimes and related ML to reporting entities not supervised by the CSSF; (iii) further intensifying AML/CFT monitoring of lawyers; and (iv) continuing to ensure resources for risk-based AML/CFT supervision of the financial sector remain sufficient.

CRISIS RESOLUTION AND SAFETY NETS

46. The landscape for crisis management in Luxembourg has changed significantly since the 2011 FSAP. As a participant in the Banking Union, the CSSF shares intervention and recovery planning competencies with the ECB, and resolution competences with the Single Resolution Board (SRB). By transposing the Bank Recovery and Resolution Directive (BRRD) and Deposit Guarantee Scheme Directive (DGSD) in late 2015, the authorities introduced a new resolution framework and public deposit insurance scheme. The Resolution Board and the Depositor Protection Council were established within the CSSF to carry out resolution work and administer the deposit insurance scheme respectively. Nevertheless, a further increase in staffing would better equip the CSSF's new Resolution Department.

47. Recovery planning is advanced while resolution planning is at an early stage. Both would benefit from additional guidance from the ECB and SRB along various lines. Guidance on the identification of critical functions (e.g., custodian functions) and the treatment of large intragroup exposures would enhance recovery plans. Guidance on the use of the sale of business and bridge bank tools would help strengthen resolution plans, including in developing fall-back resolution strategies where bail-in is the preferred strategy. Under SRB policy, resolution planners cannot contemplate the use of the Single Resolution Fund (SRF) in their plans—and thus plans do not address how the SRF access requirements would be met; the policy should be reconsidered. The goal should be to establish credible and feasible resolution plans for the most important Luxembourg banks as soon as possible.

48. Particular characteristics of the Luxembourg financial system present challenges that resolution planning authorities should address. Ambiguities include whether excluding investment fund bank deposits from the scope of bail-in would give rise to "No Creditor Worse Off" claims should other creditors in the same creditor hierarchy class be bailed-in. Ensuring the continuity of custodial functions through the sale of business tool may necessitate advance preparations in order to overcome the operational challenges in selling such business lines. Bail-in of the large intragroup (typically foreign parent) claims held by Luxembourg subsidiaries may adversely affect their viability. These issues should be factored into resolution plans.

49. There is scope for improvement in cross-border cooperation. The recent conversion of several Luxembourg subsidiaries into branches raises questions as to how member states hosting branches that are not "significant branches" but that provide "critical functions" can be engaged in reviewing group-wide recovery and resolution plans. With respect to third country relations, there is a need for the SRB to continue, and the CSSF to seek, to establish cooperation arrangements with relevant resolution authorities.

50. The insolvency regime applying to banks should be strengthened to complement the newly established bank resolution regime. The introduction of explicit asset and liability transfer powers during winding-up proceedings may help achieve an orderly liquidation with reduced costs to the Fonds de Garantie des Dépôts Luxembourg. Additionally, the creditor hierarchy in Luxembourg is determined by different laws, making it difficult to interpret. The authorities are assessing these rules and could leverage the recent Commission proposal to harmonize aspects of creditor hierarchy across the EU.

51. New deposit insurance arrangements are in place but should be supported with back-up funding. They target a fund balance twice that required in EU legislation, and the timetable for rapid payouts is advanced. However, no backstop funding arrangements are in place and should be pursued swiftly, with the private sector where possible. As a last resort, public funding in compliance with State Aid rules may be necessary.

52. While a contingent framework is in place for the provision of ELA, efforts to operationalize it quickly when needed should continue. BCL has access to foreign exchange from market sources and the Bank for International Settlements, but has no bilateral foreign exchange swap arrangements with relevant central banks. It should continue examining additional contingent foreign exchange funding arrangements, possibly by collaborating with the ECB. Additionally, the terms and conditions of state guarantees for the extension of ELA should be determined.

53. Arrangements for the management of a system-wide financial crisis should be put in place. The MoF should take the lead to streamline and clarify the modalities of coordination arrangements between domestic authorities and the SRB and ECB. Contingency plans should be developed and tested via crisis simulation exercises.

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Annex I. Implementation Status of Key 2011 FSAP Recommendations

Recommendations	Status Context	Assessment
Overall financial sector oversight		
Revise the CSSF's mission and corporate governance structure so as to grant it full-operational independence, including reducing the influence of Government and industry representatives.	Some changes have been introduced (e.g., the ECB is now responsible for the granting and withdrawal of banking licenses, in place of the Ministry of Finance) but the basic governance structure remains in place.	Partially achieved
Delete the reference in legislation to a promotional role for the CSSF in respect of the financial sector.	The relevant clause has been deleted from the law.	Achieved
Continue to increase resources and skills for the supervision of banks and investment funds.	Staff numbers have been significantly increased but on-site resources are still inadequate.	In progress
Banking regulation and supervision		
The CSSF should assume responsibility for bank licensing (in place of the Minister of Finance).	The ECB is now responsible for bank licensing.	Achieved
Ensure intra-group lending is conducted under arms' length conditions.	A rule to this effect was introduced in 2015.	Achieved
Ensure reporting of on-site findings are not long-delayed (due to staff deployment and the process of escalation in the CSSF hierarchy).	There have been improvements in this area but some delays are still being experienced.	In progress
Replace existing normative circulars by enforceable regulations.	The use of enforceable regulations has been introduced.	Achieved
Implement more formal sanctioning powers in the area of corrective actions, moving away from heavy reliance on moral suasion.	There has been a significant increase in the implementation of sanctioning powers.	Achieved

Recommendations	Status Context	Assessment
Securities market/investment fund regulation and supervision		
Enhance the duties of investment fund depositaries.	Since 2011, the investment fund depositary regime has been progressively enhanced, first in relation to alternative investment funds (AIFs) and more recently in relation to UCITS, thereby covering the entire range of Luxembourg collective investment schemes. In relation to AIFs, the regime has been enhanced by the introduction of the EU Alternative Investment Fund Managers Directive and related secondary legislation. With respect to UCITS funds, there have been two key steps: first, the adoption in 2014 of CSSF Circular 14/587 on organizational duties applicable to UCITS depositaries (replaced by CSSF Circular 16/644 in 2016); and, secondly, through the transposition into Luxembourg law of the EU UCITS V Directive	Achieved
Clarify the investment fund shareholder/ownership rights.	In 2011 the CSSF implemented measures aimed at further clarifying investment fund shareholder and ownership rights. Those measures were designed to ensure greater understanding among investors of their rights and obligations in scenarios where the distributor of a CIU (or any other intermediary in a holding chain) is registered by the fund's registrar in the fund's shareholder register.	Achieved

Recommendations	Status Context	Assessment
Macroprudential framework		
Clearly segregate the microprudential role of the CSSF and the macroprudential role of the BCL.	Clarity has been introduced through the adoption of CRD IV/CRR, and the creation of the CRS.	Achieved
Crisis management and bank resolution		
Strengthen the deposit insurance scheme through ex ante funding, speedier and automatic payments, the use of funds for bank restructuring, and improved governance.	The national transposition of the DGSD transformed the private ex post financed deposit guarantee scheme into a public ex ante financed scheme. The Luxembourg DGS has a final target level of 1.6 percent of covered deposits, twice the level required in the DGSD, and the first 0.8 percent are to be collected by end 2018, ahead of the 2024 DGSD deadline. Luxembourg already requires a covered deposits pay out within 7 working days, which is the 2024 DGSD target payout period.	In progress
Strengthen the bank resolution framework, including by providing for earlier control of problem banks and enhanced resolution tools.	The provisions of the BRRD involving a new range of resolution tools were transposed into domestic law. The requirements for recovery planning provide the authorities additional mechanisms by which to intervene in problem banks.	Achieved
Formalize a multipartite domestic framework providing for specific operational procedures to facilitate crisis prevention and decisive, quick and early intervention.	A Systemic Risk Board was established in April 2015. Its composition ensures close cooperation between its members (i.e. the government, the BCL, the CSSF and the CAA). Its aim is to help safeguard the stability of the Luxembourg financial system by strengthening the resilience of the financial system and decreasing the	Achieved

Recommendations	Status Context	Assessment
	build-up of systemic risks. In addition, the composition of the Resolution Board and of the Depositor and Investor Protection Board of the CSSF comprises high level officials from the CSSF, the BCL and the Ministry of Finance and thus further fosters a coordinated approach by all concerned authorities.	
Financial market infrastructures		
Finalize contingency plans to ensure the continuity of Luxembourg's ICSD, including arrangements to move participants' positions to a solvent intermediary and to continue core functions.	Legislation has been drafted on resolution of banks (Directive 2014/59 of the European Parliament and of the Council of 15 May 2014), but there is no EU legislation yet in relation to ICSDs. CBL has drafted a recovery plan, and authorities have started to develop a resolution plan. The Luxembourg ICSD belongs to a German holding group which is supervised on a consolidated basis by the German banking supervisor. It is the responsibility of the German group level resolution authority to establish, together with the Luxembourg resolution authority (CSSF) a group resolution plan for the Clearstream Group.	In progress

Annex II. Risk Assessment Matrix (RAM)

Source of risks	Relative likelihood and transmission channels	Impact if realized
Sharp rise in financial market risk premia and renewed Euro area recession.	**Medium** Cross-border financial intermediation would contract abruptly, increasing the risk that liquidity 'upstreamed' from Luxembourg bank subsidiaries to parents abroad could be trapped. An unexpectedly large and synchronized redemption shock experienced by investment funds could result in asset fire sales in international markets and a drawdown of local bank deposits. A shock to international financial markets could also result in operational stresses at Clearstream (CBL), leave international financial market participants unable to access or trade some or all of the securities held in CBL.	**High** The internationally-oriented financial industry could encounter liquidity stress and experience a substantial hit to profitability should the shock be sustained, thus leading to reduced employment, economic activity and fiscal revenues in Luxembourg.
Protracted uncertainty associated with political fragmentation in advanced economies, including uncertainty associated with post-Brexit arrangements, and the rising threat of protectionism and economic isolationism in Europe and the United States.	**Medium** Protectionism and economic isolationism would detrimentally impact the trade and financial flows that contribute to the openness of the Luxembourg economy. The new Brexit arrangements could lessen London's appeal as a financial center, as UK-based banks and investment funds could lose their "passporting" rights to the rest of the EU. Luxembourg's investment funds have large exposures to US capital markets.	**Medium** A negative outcome from upcoming elections would have substantial effects on financial flows and economic confidence. Luxembourg's small open economy and internationally-oriented financial system mean that it will be adversely impacted by any interruption to the free movement of capital and services. However, the departure of the UK from the EU may also result in some financial activity relocating to Luxembourg.

Downturn in Luxembourg's residential housing market following a substantial earlier increase in valuations, easing in mortgage lending standards and increase in household indebtedness.	**Medium** Domestically-oriented banks are the principal mortgage originators in Luxembourg and thus would be most exposed to an increase in non-performing mortgages and possible hit to bank capital. Household net worth would also decline, impacting consumption.	**Medium** A hit to profitability and possibly capital at domestically-oriented banks could trigger a tightening in domestic lending conditions. A capital shortfall in a domestically-oriented bank in which the state holds a key ownership stake could see the realization of a contingent liability for the government. Negative wealth effects in the household sector could result in a second-round impact on the
Structural outflows from the financial system initiated by an adverse hit to bank and investment fund operating conditions. Institutions struggle to adapt to rising regulatory demands (including changes to international taxation rules and standards for cross border activities) and innovative technologies (including Fintech).	**Medium** A prolonged period of problematic operating business conditions for Luxembourg's banks and investment funds could result in a shrinkage in financial system assets. A large share of fiscal revenues also depend on cross border operations.	**High** One quarter of Luxembourg's GDP i directly generated by the financial sector, with additional contributions from ancillary professions (law, technology, etc.). An important component of the tax base could also be eroded.

Annex III. Stress Testing Matrix (STeM)

Domain		Assumptions
		Top-down by FSAP Team
Banking Sector: Solvency Risk		
1. Institutional Perimeter	Institutions included	• 16 banks
	Market share	• 73 percent of the banking sector's assets • 94 percent of residential mortgage loans • 68 percent of exposures to foreign banks
	Data and baseline date	• Publically-available and supervisory data • Baseline date: June 2016 • Bank consolidated level data for banks having their headquarters in Luxembourg and sub-consolidated level data for the subsidiaries of foreign banks • Market-data
2. Channels of Risk Propagation	Methodology	• Satellite models developed by the FSAP team • Balance sheet-based approach • Market data-based approaches
	Satellite models for macro-financial linkages	• Models for credit losses, pre-impairment income, credit growth; expert judgment • Models to integrate solvency-funding interactions • Methodology to calculate sovereign risk • Methodology to calculate losses from bonds and money market instruments (sovereign and other issuers). Haircuts are calculated based on a modified duration approach • Net fee income and commission income projected based on assumptions on investment funds' business volume and redemptions
	Stress test horizon	• 3-years (2017–2019)
3. Tail shocks	Scenario analysis	• The TD exercise was based on a baseline macroeconomic scenario and an adverse scenario, assessing the impact on the entire portfolio including the loans and the trading book • The TD analysis covered three main sources of risk: domestic real estate, exposures to parent companies and investment funds and sovereign risks • Variables in the scenarios included domestic macro-financial variables (e.g., GDP, inflation, unemployment, growth in investment fund assets), and GDP for key trading partners, interest rates, exchange rates and real estate prices • In the adverse scenario, the GDP growth rate declines to -3.7, -2.6 and +1.8 percent, in 2017, 2018 and 2019 respectively • The output gap would be larger than the one experienced during the last financial crisis. A set of market shocks, including large and sudden changes in interest rates and exchange rates, is calibrated to magnitudes close to those observed in 2008/2009

Domain		Assumptions
		Top-down by FSAP Team
	Sensitivity analysis	• Sensitivity analyses was conducted in the TD exercises, evaluating *domestic* shocks. • In particular, the analysis evaluated households' balance sheet sensitivity to macroeconomic shocks, including increases in borrowing costs, declines in income and in residential house prices, rising unemployment rates, and a combination of these shocks. Direct effects of interest rate shocks; direct effects of exchange rate shocks; a decline in the prices of sovereign bonds; and failure of the largest to 10 largest corporate exposures were estimated as well.
4.Risks and Buffers	Risks/ factors assessed	• Credit risk on the banking book and trading book; • Market risk and bond losses: direct effects of interest rate shocks; direct effects of exchange rate shocks; shocks to sovereign bond yields.
	Behavioral adjustments	• Balance sheet grows with nominal GDP. • Dividends are paid out by banks that remain adequately capitalized throughout the stress.
5. Regulatory and Market-Based Standards and Parameters	Calibration of risk parameters	• Through the cycle and Point-in-time for credit risk parameters or proxies
	Regulatory/ accounting and market-based standards	• National regulation • Basel II IRB approach + Basel III
6. Reporting Format for Results	Output presentation	• System-wide capital shortfall • Number of banks and percentage of banking assets in the system that fall below certain ratios.
Banking Sector: Liquidity Risk		
		Top-down by Authorities and FSAP team jointly
1. Institutional Perimeter	Institutions included	• 16 banks for the LCR analysis and eight for the NSFR and cash-flow analysis
	Market share	• 45 to 73 percent of banking sector's assets
	Data and baseline date	• Latest data: September 2016 for LCR and June 2016 for NSFR and cash flow analysis Source: supervisory data • Scope of consolidation: perimeter of individual banks
2. Channels of Risk Propagation	Methodology	• Basel III-LCR and NSFR type proxies • Cash-flow based liquidity stress test using maturity buckets by banks • Liquidity test in foreign currencies
3. Risks and Buffers	Risks	• Funding liquidity (liquidity outflows) • Market liquidity (price shocks)

Domain		Assumptions
		Top-down by FSAP Team
	Buffers	• Counterbalancing capacity • Central bank facilities
4. Tail shocks	Size of the shock	• Run-off rates calculated following historical events, or IMF expert judgment and LCR/NSFR rates • Bank run and dry up of wholesale funding markets, taking into account haircuts to liquid assets
5. Regulatory and Market-Based Standards and Parameters	Regulatory standards	• Basel III standards (revision as of January 2013). See Committee on Banking Supervision (2013), "Basel III: The Liquidity Coverage Ratio and liquidity monitoring tools," Basel, January 2013 • European Commission Delegated Act
6. Reporting Format for Results	Output presentation	• Liquidity gap by bank, and aggregated • Survival period in days by bank, number of banks that can still meet their obligations
Banking Sector: Contagion Risk		
1. Institutional Perimeter	Institutions included	• 16 banks • 12 insurance companies • 5 investment fund groups covering 75 percent of the total net assets for HY, EM bond funds, VNAVs and MMFs; 54 percent for mixed funds; 32 percent for bond funds
	Market share	• 73 percent of total banking system assets
	Data and baseline date	• Latest data: June 2016 • Source: supervisory and market data • Scope of consolidation: perimeter of individual institutions or sectoral indexes • Possible use of indexes
2. Channels of Risk Propagation	Methodology	• Balance sheet and off balance sheet based financial metrics • Network interbank model by Espinosa-Vega and Solé (2010) • Diebold-Yilmaz variance decomposition connectedness methodology • CIMDO/SyRIN approach (Goodhart and Segoviano, 2009).
3. Tail shocks	Size of the shock	• Pure contagion: default of institutions • Spillover index and transmission
4. Reporting Format for Results	Output presentation	• Number of undercapitalized and failed institutions, and their shares of assets in the system • Evolution and direction of spillovers within the network
Investment Funds: Liquidity Risk		
Domain		Top-Down by FSAP team
1. Institutional Perimeter	Institutions included	• 191 investment funds (all but 1 are UCITS funds): 42 EM bond funds; 32 HY bond funds; 40 mixed funds (investing at least 70 percent of their assets into fixed income instruments); 50 largest bond funds; 5 CNAVs short term MMFs (3 of which are in USD, 1 in EUR, 1 in GBP); 7 VNAV short term MMFs, 15 MMFs

Domain		Assumptions
		Top-down by FSAP Team
	Market share	• 75 percent of the total net assets for HY, EM bond funds, CNAVs, VNAVs and MMFs • 54 percent for mixed funds • 32 percent for bond funds
	Data and baseline date	• Latest data: March 2016 • Source: supervisory data
2. Channels of Risk Propagation	Methodology	• Liquidity measures by i) cash and short-term debt securities (residual maturity less than one year) and ii) cash and high quality liquid assets
3. Risks and Buffers	Risks	• Funding liquidity (liquidity outflows) and inability to sell assets to cope with redemptions
	Buffers	• Liquidity buffers • Credit facilities and Liquidity Management Tools
4. Tail shocks	Size of the shock	• Monthly Redemption shock equal to the 1th percentile of historical net flows observed over 2007–2016 • Redemption shock estimated from an econometric model relating funds flows to macrofinancial variables (including the ones used in the bank macroeconomic scenario)
5. Regulatory and Market-Based Standards and Parameters	Regulatory standards	• European Commission Directive 2010/43/EU Article 45(3): • "*Where appropriate, management companies shall conduct stress tests which enable the assessment of the liquidity risk of the UCITS under exceptional circumstances*"
6. Reporting Format for Results	Output presentation	• Redemption coverage ratio by investment fund and liquidity shortfall • Number of funds and share of funds that cannot meet their obligations
Investment Funds: Solvency Risk		
Domain		Top-Down by FSAP team
1. Institutional Perimeter	Institutions included	• 5 CNAVs short term MMFs
	Market share	• 75 percent of the total net assets for short term CNAVs MMFs
	Data and baseline date	• Latest data: March 2016 • Source: supervisory data
2. Channels of Risk Propagation	Methodology	• Increase in risk free rates and credit spreads that would result in deviations between shadow Net Asset Value (NAV) and Constant Net Asset Value
3. Risks and Buffers	Risks	• Inability to maintain Constant NAV
	Buffers	• Liquidity buffers • High credit quality and short duration assets

Domain		Assumptions
		Top-down by FSAP Team
4. Tail shocks	Size of the shock	• Sensitivity analysis with shocks to risk free rates and credit spreads ranging from 10 to 200 basis points.
5. Regulatory and Market-Based Standards and Parameters	Regulatory standards	• According to the IMMFA Code of Practice, drat MMF Regulation and the Ireland FSAP analysis, escalation procedures should exist for deviation between the published price and the shadow NAV above 20 basis points.
6. Reporting Format for Results	Output presentation	• Deviations between constant NAV and shadow NAV • Number of funds and share of funds that can still meet their obligations
Insurance Sector: Solvency Risk		
Domain		Bottom-up by Authorities (CAA)
		• Bottom-up by companies under the guidance and supervision of the Luxembourg authorities
1. Institutional Perimeter	Institutions included	• 10 life insurance companies and one re-insurer
	Market share	• 71.5 percent of the Luxembourg insurance market in terms of gross life technical provisions
	Data and baseline date	• Supervisory data • Baseline date: June 2016
2. Channels of Risk Propagation	Methodology	• Analysis was based on Solvency II requirements using the infrastructure developed by the Luxembourg Commission aux Assurances and/or the EIOPA
	Stress test horizon	• 2017–2019
3. Tail shocks	Scenario analysis	• Macro scenarios included a baseline and an adverse scenario in line with the banking sector stress test
4.Risks and Buffers	Risks/ factors assessed	• Credit risk and market risk
5. Reporting Format for Results	Output presentation	• Three-year projections of undertakings' available own funds • The coverage of the solvency capital requirement (SCR) Capital adequacy ratios with and without the "long-term guarantee package"

Annex IV. Report on the Observance of Standards and Codes (ROSC)—Summary Assessments of CPSS-IOSCO Principles for Financial Market Infrastructures: Clearstream Banking Luxembourg

A. Introduction

This Report on the Observance of Standards and Codes (ROSC) summarizes the findings and recommendations of the assessment Clearstream Banking Luxembourg (CBL) based on the CPSS-IOSCO Principles for FMIs (PFMI). The assessment was undertaken in the context of the IMF's Financial Sector Assessment Program (FSAP) to Luxembourg in December 2016. The assessor was Froukelien Wendt of the IMF's Monetary and Capital Markets Department. The assessor would like to thank the Banque centrale du Luxembourg (BCL), the Commission de Surveillance du Secteur Financier (CSSF), CBL and other financial institutions for the excellent cooperation and hospitality.

The objective of the assessment was to identify potential risks related to CBL that may have implications for financial stability in Luxembourg and abroad. While CBL contributes to maintaining and promoting financial stability and economic growth, it may also concentrate risk as a consequence of its central position in global financial markets. Appropriate management of its credit, operational and other risks is essential, as its failure could precipitate financial shocks or act as a major channel through which shocks are transmitted across international financial markets and institutions.

The scope of the assessment includes CBL and its authorities. CBL is assessed against all relevant principles for securities settlement systems (SSS) and Central Securities Depositories (CSDs) of the PFMI, which are Principles 1–5, 7–13, and 15–23. The BCL and the CSSF are assessed in their capacity as overseer and supervisor of CBL, using the five responsibilities for authorities of the PFMI. CBL was earlier assessed as part of the Luxembourg FSAP in 2011.

B. Information and Methodology Used for Assessment

This assessment is based on different sources of information. The BCL and CSSF provided the IMF with an assessment of CBL against the PFMI and a self-assessment against the five responsibilities. These assessments have been a major input to the report. In addition, the assessor took into account responses of the authorities to a dedicated questionnaire as well as relevant EU directives, national laws, regulations, rules and procedures governing the systems, and other available material. The assessment benefited from discussions with the authorities, CBL, the ECB, banks, and other market participants.

Ratings are determined based on the methodology described in the CPSS-IOSCO Disclosure Framework and Assessment Methodology (December 2012). This methodology prescribes that ratings are built on the gravity and urgency of the need to remedy the issues of concern identified during the assessment. The ratings reflects the assessors' judgment regarding the type or impact of the risks and other issues associated with each identified gap or shortcoming. Plans for

improvements are noted in the assessment report, where appropriate, but have not influenced judgments about observance of the principles. The ratings are assigned to reflect conditions at the time of the assessment. The cutoff date for the information to be considered as part of this FSAP was set at December 10, 2016.

C. Main Findings

CBL is a large securities settlement system that is highly interconnected with global securities markets and as such considered to be systemically important. The average daily settlement value of CBL was €480 billion in 2015. CBL delivers its services to an international customer base, comprising more than 1,400 financial institutions, including banks, supranationals, central banks and broker/dealers and central securities depositories (CSDs), with clients from over 110 countries. Among its member base are the largest banks in the world, as well as financial institutions considered to be globally systemically important. CBL currently maintains links to 56 markets with settlement in over 40 currencies. Among its clients are central banks and central counterparties (CCPs). The value of securities held on accounts with CBL is approximately €6 trillion.

CBL contributes to the safety and efficiency of financial markets, but also concentrates systemic risk due to its central position. A failure in the functioning of CBL would entail a major disruption to the markets it serves, and could entail financial losses for its participants. Participants would not be able to access or trade some or all of the securities for which CBL acts as an international central securities depositary (ICSD). There may be spillover effects on multiple markets, for example, by affecting the financing activities of banks and corporations and reducing the availability of secured credit. Other financial market infrastructures (FMIs), for example CCPs, may lose access to their financial buffers, or may be indirectly impacted because their participants are not able to provide the CCP with collateral held at CBL.

The assessment of CBL's risk management practices against the CPSS-IOSCO Principles for Financial Market Infrastructures (PFMI) reveals that a range of principles are found to be in broad observance (8 out of 21). Settlement activities in Luxembourg are governed by a consistent set of laws, regulations, and contractual arrangements that form a sound legal foundation. Luxembourg's implementation of European directives also provides a solid statutory basis for netting, finality of settlement, and securities lending, consistent with other member states. CBL uses a comprehensive risk management framework to manage operational, business and liquidity risks, and has developed a business continuity plan. CBL also has in place a detailed default management framework with defined rules and procedures to manage a participant default. Nevertheless, there are certain issues of concern that need to be addressed.

A key priority is to reduce the dependencies of CBL on commercial banks in its daily operations. There are important dependencies on a limited number of depository and cash correspondent banks, in particular for the U.S. and UK markets, that could be more actively mitigated through an increase in the number of contracted banks, or, where possible, the establishment of direct links with local CSDs and central banks.

Additionally, all credit exposures should be fully collateralized. CBL is exposed to credit risk through its offering of uncommitted credit lines (mostly secured) and securities lending. Though CBL manages these credit risks through limits, collateralization, and stress testing, currently not all exposures are fully collateralized as the executive board can extend uncollateralized credit to individual participants. The advancement of income payments and certain features of the Bridge with Euroclear Bank may create further uncovered exposures. The collateral policy of CBL should be improved by applying haircuts to cash collateral, including foreign currencies, and ex ante collateral concentration measures. Also, the haircut model should be subject to independent validations to ensure they are sufficiently robust.

The independence of the risk management function should be strengthened to ensure that public interests are properly addressed. The chief risk officer (CRO) of CBL should be responsible only for risk management and not for operational activities. Also, the Clearstream Holding A.G. board committee on risk management should be chaired by an independent board member. CBL's dependence on parent funding of Deutsche Börse AG needs to be explicitly recognized and managed, given its relevance for CBL's recovery plan.

The systemic importance of CBL calls for further measures in operational risk management. Business continuity plans and back-up facilities are in place to allow for timely recovery of operations and completion of settlement processes. Operations can switch between CBL's two datacenters without data loss in case of an emergency and this procedure is tested regularly. However, the close proximity of the data centers combined with CBL's systemic importance justify the need for a third (more distant) data center as a contingency against extreme circumstances in which both are impacted simultaneously. CBL has conducted a partial, but not full, failover test where operations are concurrently assumed by remote sites. It is therefore not clear as to whether or how swiftly these locations can assume all critical operations conducted in Luxembourg.

The oversight and supervision of CBL is conducted prudently by the Banque centrale du Luxembourg (BCL) and the Commission de Surveillance du Secteur Financier (CSSF). Oversight and supervision are based on a clear and transparent legal framework. The CSSF supervises CBL as a bank and has no specific requirements for CBL as a CSD. The implementation of the EU CSD Regulation (CSDR) and related regulatory technical standards is expected to strengthen the application of the PFMI in the day-to-day supervision of CBL. The resources of the authorities are considered sufficient for the time being, although additional resources may be needed in the future to address increased regulatory responsibilities. Under the respective laws the authorities have powers to obtain relevant and comprehensive information in a timely manner and enforce corrective action. Although BCL's reliance on moral suasion works well in in this area, enforcement powers could be further strengthened through the adoption of a general legal sanctioning power in its organic law.

The authorities are encouraged to strengthen their cooperation arrangements at both the domestic and international level. Formalizing the modalities of cooperation between the BCL and CSSF in relation to their supervisory activities for CSDs would be a welcome step, through a Memorandum of Understanding (MoU) and ex ante arrangements in relation to crisis management.

Although interagency cooperation functions well in practice, a formal agreement would support transparency, accountability, and in times of crisis, efficiency. The authorities should also consult international authorities and central banks as part of their assessment of CBL against the PFMI. Finally, the existing cooperation between the Belgian and Luxembourg authorities with respect to the link with Euroclear Bank needs to be formalized and enhanced as planned, with the involvement of the ECB. This would facilitate coordination in the requirements imposed on the two ICSDs and allow for parallel implementation of risk measures in both entities.

Notwithstanding the effective supervision at the national level, there is a strong case that CBL be designated as a Significant Institution (SI) under the Single Supervisory Mechanism (SSM) supervision alongside Belgium's Euroclear Bank.[1] Both ICSDs are highly relevant for global financial stability, and a consistent implementation of supervisory requirements would also yield harmonization benefits, thus ensuring a level playing field. Although the harmonization of national supervisory approaches is expected to increase with the implementation of the EU CSD Regulation, there is still ample room to increase harmonization through SSM supervision. Similarly, the CBL should be under the remit of the Single Resolution Board (SRB).

Table 1. Luxembourg: CBL Summary Compliance with the CPSS-IOSCO Principles for FMIs—ROSC

Principle	Comments
1. Legal basis	
Legal risk within CBL is mitigated through a sound and enforceable legal basis for its settlement, custody and banking activities. The settlement activities in Luxembourg are governed by a consistent set of laws, regulations, and contractual arrangements that form a sound legal foundation for settlement and custody activities. Luxembourg's implementation of European directives provides a firm statutory foundation for finality, netting, and securities lending, consistent with the other member states. Collateral arrangements are governed by a sound legal framework. Both securities and payment transfers, when finalized, are protected from the ordinary operation of Luxembourg insolvency law. CBL identifies and mitigates risks arising from its activities in various jurisdictions through legal opinions.	
2. Governance	
CBL's governance arrangements are comprehensive, but the independence of the risk management function should be strengthened. The roles and responsibilities of CBL's supervisory and executive boards are clearly described and publicly disclosed. CBL has established a board committee covering audit and risk management issues, which is chaired by an independent board member, the Audit Compliance and Risk Management Committee (ACRC). The CRO is responsible for the risk management of CBL. However, the independence of the risk management function can be further improved. The CRO should be responsible only for risk management and not for operational activities. As most risk management issues are discussed in the Clearstream Risk and Compliance Committee (CRCC) at Clearstream Holding level (and not at the ACRC at CBL level), the CRCC should be chaired by an independent board member. Also, all risk management models should be subject to an independent validation by technical experts, including the haircut calculation model. CBL can further improve its governance by conducting a regular review of the performance of its supervisory board (SB).	

[1] See the 2013 Euro area FSAP for a similar recommendation.

Table 1. Luxembourg: CBL Summary Compliance with the CPSS-IOSCO Principles for FMIs—ROSC (continued)

Principle	Comments
3. Framework for the comprehensive management of risks	
CBL has in place risk management policies, procedures and systems that enable it to identify, monitor and manage risks. Within this framework the coverage of credit risk could be enhanced. CBL has an effective risk management framework in place through the use of key risk indicators (KRIs) for the management of operational and business risks. The risk management function is also involved in the calculation of financial buffers in line with Basel capital model requirements and liquidity stress tests. Risk management, in the areas of credit, liquidity and market risks, could be further enhanced, for example, through the development of KRIs in these areas and ensuring that risk models are subject to an independent validation by technical experts. CBL should more actively manage its dependencies on commercial entities. CBL is able to assess and mitigate risks from different stakeholders, in particular from banks that fulfil multiple roles (participant, depository bank, CCB, liquidity provider, investment bank). There are important dependencies, however, on a limited number of depository banks and CCBs, in particular in the US and UK market, that could be more actively mitigated through an increase in the number of depositories, or, where possible, establishing direct links with the CSDs and central banks. CBL has a comprehensive recovery plan, which heavily relies on DBAG financial support in extreme but plausible circumstances. This dependency could be more explicitly recognized and managed.	
4. Credit risk	
CBL has a framework in place to identify, monitor and manage credit risks, which needs modifications to ensure full collateralization of credit exposures. CBL offers uncommitted credit lines (mostly secured) and securities lending. It also places funds held by its participants in its books. As a bank, CBL is subject to regulatory limits on its exposures and must maintain its solvency and liquidity ratios above the mandatory threshold. Not all exposures are, however, fully collateralized as the executive board (EB) of CBL can decide to extend uncollateralized credit to individual participants. Also, credit losses may occur through the advancement of income payments in case the issuer and investor fail simultaneously. Uncovered exposures may also occur as part of the transactions settled through the bridge with Euroclear Bank. CBL should take measures to further mitigate risks stemming from these credit exposures. CBL is also encouraged to invest, as planned, in a credit risk management tool that will, on a fully automatic basis, collect and display all credit exposures resulting from entities that fulfil multiple roles (participants, depositories, CCBs and investment banks). This reduces the risks related to manual comparisons, such as human errors or delays.	
5. Collateral	
The use of collateral to limit credit exposures is subject to a collateral policy covering haircuts and concentration limits. The securities of participants, held at accounts in the CBL system, are used as collateral to cover exposures resulting from their use of credit lines and securities lending facilities. CBL has defined collateral eligibility criteria and applies conservative haircuts to securities collateral, however, haircuts are not applied to cash collateral due to technical limitations of the collateral system. The collateral arrangements do not explicitly take into account potential pro-cyclical adjustments, which may exacerbate financial instability in crisis situations. Furthermore, tools to monitor and limit concentration can be further strengthened and applied ex ante. As previously mentioned, the haircut model should be subject to independent validation by technical experts to ensure it is sufficiently robust.	

Table 1. Luxembourg: CBL Summary Compliance with the CPSS-IOSCO Principles for FMIs—ROSC (continued)

Principle	Comments
6. Margin	
Not applicable	
7. Liquidity risk	
CBL has a comprehensive and generally sound risk management framework in place to manage liquidity risk from its participants, cash correspondent banks, liquidity providers, and depository banks in various currencies. It holds sufficient liquid resources in euros and U.S. dollars and is able to obtain liquidity in other currencies through reverse repo contracts with a range of counterparts. CBL conducts a number of different stress tests daily, monthly and quarterly to assess the liquidity impact of several scenarios, including the default of the two participants with the largest exposures. The results of the stress tests are compared with the available liquid resources in euros and U.S. dollars. CBL is encouraged to diversify its CCB base for GBP and other larger currencies and continue discussions with relevant central banks to obtain direct access. CBL should also prepare contingency plans to manage a crisis event in which it cannot access FX markets to obtain liquidity in GBP and other currencies.	
8. Settlement finality	
Internal settlements are final under the CBL securities settlement system rules. Internal instructions that have settled in the CBL settlement system are final in accordance with the CBL rules. The Payment Services Law provides the statutory basis for the finality arrangements. Settlements over the bridge with Euroclear Bank are final after completion of the checking process by the receiving ICSD during day time, and after completion of the verification process by the delivering ICSD during night time. External settlements are final according to local market rules and practices.	
9. Money settlements	
Money settlements are conducted in commercial bank money via the cash accounts in CBL's systems. For internal settlement, settlement in central bank money is not considered practical as (i) CBL settles more than 40 currencies and (ii) many of its clients do not have access to central bank money in these currencies. Money settlements take place at the cash accounts at CBL (i.e. in commercial bank money). CBL's cash accounts are funded through CCBs, which in most cases are commercial banks. CCBs are supervised banks that comply with a range of criteria as defined by CBL. CBL is monitoring its risks towards CCBs on an ongoing basis, including the concentration of exposures. For external settlement CBL uses a combination of commercial and central bank money. For outbound links CBL uses depository banks/CCBs to fund settlements in local markets. CCBs execute payments and may provide CBL with free and mostly unsecured intra-day liquidity facilities, as well as overnight credit if need be. For some markets the accounts are funded through central banks. The use of central banks in this regard is expected to increase with the full migration to T2S. Nevertheless, in many markets exposures are very concentrated in only a few CCBs. This exposes CBL to credit, liquidity and operational risks in case the CCB would default. Risks are particularly significant in the U.S. and U.K. markets. CBL is therefore encouraged to continue diversifying its CCB base in these markets and generally strive for direct access to local CSDs and central banks where possible (see also Principle 3).	

Table 1. Luxembourg: CBL Summary Compliance with the CPSS-IOSCO Principles for FMIs—ROSC (continued)	
Principle	**Comments**
10. Physical deliveries	
Physical delivery is nearly non-existent. Nevertheless, CBL has arrangements in place for physical delivery. CBL's Governing Documents state its obligations with respect to the delivery of physical deliveries. Also, CBL has identified the risks and cost related to storage and delivery of physical instruments.	
11. Central securities depositories	
Securities in the systems of CBL are immobilized and held in book-entry form. CBL has arrangements in place to secure the integrity of securities issues. CBL segregates its own assets from assets belonging to its participants. In addition, participants should segregate their own assets from the assets of their clients. In order to be able to distinguish between proprietary and third party assets CBL requires its participants to indicate whether the assets are proprietary or client assets and maintains a list with this information. For some types of participants CBL requires participants to rely on a segregated account structure for CBL own risk management purposes. CBL requires from all its depositories a strict segregation between these depositories' own assets and the latter's client assets. CBL further reduces risks by not permitting overdrafts of securities accounts and daily reconciliation for all its securities accounts.	
12. Exchange-of-value settlement systems	
Principal risk is eliminated through the use of a DVP mechanism that ensures that none of the counterparties is able to own both the cash and the securities for a certain time. CBL uses a DVP model 1 mechanism, meaning that the settlement of the cash and securities leg take place on a trade-by-trade (gross) basis with the settlement of securities conditioned upon the final settlement of the cash and vice versa. Securities are earmarked and blocked in the pre-settlement run on the value date.	
13. Participant-default rules and procedures	
CBL has an effective default management framework with defined rules and procedures to manage a participant default and should test these with external stakeholders. The default of a participant may cause losses to CBL and other participants through credit and securities lending. CBL has therefore developed default rules and procedures to manage a participant default in an orderly manner. CBL has appropriate discretionary power to implement these rules. CBL tests its default procedures on an annual basis, mainly with internal stakeholders. The tests include the participation of all relevant hierarchical levels within the organization. There is limited involvement of external stakeholders in the testing, such as supervisory authorities, Euroclear Bank, depository banks or CCBs.	
14. Segregation and portability	
Not applicable	
15. General business risk	
CBL has in place robust arrangements to manage and control general business risks. CBL has sufficient resources available to cover at least six months of operating expenses through capital as the difference between the total volume of own funds and the amount of own funds needed for satisfying the CRR/CRD requirements is sufficient for this purpose.	

Table 1. Luxembourg: CBL Summary Compliance with the CPSS-IOSCO Principles for FMIs—ROSC (continued)

Principle	Comments
16. Custody and investment risks	
CBL has a well laid-out custody and investment policy. CBL prudently manages the custody and investment risks related to its participants' and own assets. It keeps the assets at supervised and regulated entities and ensures it has prompt access to the assets when required. Custodian and investment banks are incorporated in the aggregated credit risk monitoring. CBL's investment policy is publicly disclosed.	
17. Operational risk	
CBL has in place appropriate systems, policies, procedures, and controls to mitigate operational risk which are reviewed, tested and audited periodically. Operational risks are reviewed through an annual top-down approach and an annual bottom-up risk self-assessment exercise. The system is reliable and secure, and has adequate, scalable capacity, and future capacity needs are regularly reviewed. CBL is actively involved in enhancing its cyber resilience. Nevertheless, business continuity management should be strengthened. Contingency plans and back-up facilities are in place to allow for timely recovery of operations and completion of the settlement process. Two data centers are in close proximity. Operations can switch between both sites without data loss in case of a contingency. There is, however, no third data center. Given the systemic importance of CBL, the establishment of a third datacenter is warranted and should be pursued to manage extreme circumstances where both datacenters in Luxembourg are impacted. Additionally, CBL has not conducted a full failover test. Although the failover of parts of the critical operations has been tested, no full test has been conducted. It is therefore unclear as to whether and how swiftly other locations can take over all critical operations conducted in Luxembourg.	
18. Access and participation requirements	
CBL has risk-based and publicly disclosed criteria for participation. These are stipulated in its Customer Handbook. In addition, CBL has defined criteria for granting its participants access to credit lines and other services. The access criteria are risk-based but still grant CBL's EB substantial discretion to admit or decline participants. The implementation of the CSDR and its accompanying regulatory technical standards are expected to further impose requirements on the formulation of CBL's access criteria.	
19. Tiered participation arrangements	
CBL is not able to identify indirect clients. It has not developed tools to identify monitor and mitigate risks from indirect participant in order to reduce potential exposures towards them that may negatively impact CBL.	
20. FMI links	
Risks related to links can be further mitigated. CBL is linked to Euroclear Bank via the Bridge. In addition, it is linked to 56 local CSDs worldwide, often through depository banks and CCBs.Remaining risks should be further mitigated. First, with regard to the bridge, CBL, should continue working on the mitigation of uncollateralized credit risks that may occur as part of the current settlement practices. Also, reconciliation of securities accounts for Bridge settlements happens on a weekly and monthly basis, which should be done on a daily basis. Finally, the moment of finality for outbound links can be more clearly disclosed in the Creation Link Guides.	

Table 1. Luxembourg: CBL Summary Compliance with the CPSS-IOSCO Principles for FMIs—ROSC (concluded)	
Principle	**Comments**
21. Efficiency and effectiveness	
CBL's products and services cater for requirements of various participants and the market. CBL is efficient and effective in meeting the requirements of its participants and the markets it serves through timely processing of transactions, maintenance of sufficient financial resources to minimize market disruptions in the event of a member default and minimizing systems downtime.	
22. Communication procedures and standards	
CBL uses the relevant international communication procedures and standards in order to facilitate efficient settlement of cross-border transactions. Where necessary, it uses proprietary applications or message converters to translate between proprietary messages and SWIFT messages.	
23. Disclosure of rules, key procedures, and market data	
CBL has clear and comprehensive rules and procedures and provides sufficient information to participants enabling them to have an accurate understanding of the risks. Fees and other material costs for participants are publicly disclosed, as well as all relevant rules and key procedures. CBL has completed the CPSS-IOSCO Disclosure framework for FMIs.	
24. Disclosure of market data by trade repositories	
Not applicable	

Table 2. Luxembourg: Authorities' Summary Compliance with the CPSS-IOSCO Responsibilities—ROSC	
Recommendation	**Comments**
A. Regulation, supervision, and oversight of FMIs	
FMIs in Luxembourg are subject to appropriate and effective oversight and supervision by the BCL and CSSF respectively. BCL's powers for the oversight of FMIs are derived from the BCL Act. CSSF's supervision of FMIs, as credit institution (including CBL) or as professional depository of financial instruments, is based on the CSSF Act. In addition, CBL is subject to liquidity supervision by the BCL, based on the BCL Act. The relevant laws are publicly disclosed.	
B. Regulatory, supervisory, and oversight powers and resources	
The powers and resources of the authorities are considered sufficient. Under the respective laws the authorities have powers to obtain relevant and comprehensive information in a timely manner and enforce corrective action. Both authorities employ sufficient staff resources to fulfill their responsibilities, although additional resources may be needed in the future to address increased supervisory responsibilities. BCL mainly relies on moral suasion in its oversight and liquidity supervision to induce changes or enforce corrective actions. While the available tools in this area have been effective in the past to appropriately induce changes, BCL's enforcement power could be further strengthened with a general legal sanctioning power in its organic law.	

Table 2. Luxembourg: Authorities' Summary Compliance with the CPSS-IOSCO Responsibilities—ROSC (concluded)

Recommendation	Comments
C. Disclosure of policies with respect to FMIs	
BCL's policies are reflected in regulations, which are publicly disclosed. The authorities' objectives and roles are defined in the BCL and CSSF laws. In addition, the BCL Oversight Regulation and the BCL Liquidity Regulation specify BCL's approach. These regulations are available on BCL's website. The CSSF has no specific policies dedicated to SSS but relies on expert judgement. The implementation of the CSDR, in particular the regulatory technical standards will provide for dedicated requirements for CSDs.	
D. Application of the principles for FMIs	
Authorities have adopted the PFMI. The BCL takes the lead in assessments of FMIs against the PFMI. For CBL the CSSF contributes to the assessment as well. Authorities may further integrate the PFMI in their day to day supervision, as well as additional guidance of CPMI and IOSCO, for example on recovery planning, critical service providers and cyber resilience of FMIs. It is recommended to apply a two-year assessment cycle of FMIs against the PFMI as suggested in the CPMI-IOSCO Disclosure Framework and Assessment Methodology report of December 2012. The planned implementation of the CSDR, which generally reflects the PFMI, may possibly facilitate this integration through the regulatory technical standards that largely reflect the PFMI.	
E. Cooperation with other authorities	
The authorities are encouraged to improve their cooperation arrangements, both domestically and internationally. It is recommended to formalize the cooperation between the BCL and CSSF in relation to their supervisory activities for the four CSDs, through a Memorandum of Understanding. Although the authorities currently cooperate well, the agreement would support transparency and accountability. Ex ante arrangements to manage a crisis should also be developed by both authorities. With regard to foreign authorities and central banks, the BCL and CSSF should consult those as part of their assessments of CBL. Also, the existing cooperation between the Belgian and Luxembourg authorities will benefit from further formalization in a MoU, as planned, with the involvement of the ECB. This would enable the coordination of requirements towards the two ICSDs and allow for parallel implementation of risk measures in both entities. Finally, it is important that the CBL and Euroclear Bank are included in the SSM supervision as significant institution and be included in the SRB list. As both ICSDs are highly relevant to global financial stability, the supervisory approach should be further harmonized by a consistent implementation of supervisory requirements. This will contribute to the stability of both ICSDs and ensure a level playing field. Although the supervisory approaches are expected to be further harmonized with the implementation of the CSDR, this does not address CBL as a bank and does not ensure a fully harmonized implementation of measures. It is therefore recommended that both entities will be subject to direct supervision by the ECB-SSM, beyond the current status of Less Significant Institution (LSI). Similarly, for resolution planning CBL should be under the remit of the SRB instead of the FMSA.	

D. Recommended Actions Regarding CBL

Recommended Actions to Improve Compliance with the CPSS-IOSCO Principles and the Safety and Efficiency of the Financial Market Infrastructure	
Reference Principle	**Recommended Action**
2. Governance	• The CRO should not manage a business unit in addition to the risk management function. The risk management committee at Holding level should be chaired by an independent board member (CRCC). • Reduce CBL's dependencies on commercial banks, through the use of additional depositories, CCBs and direct links with CSDs and central banks where possible. • Adopt procedures to regularly review the performance of the SB.
3. Framework for comprehensive management of risks	• Risk management of credit risks to be enhanced, for example, through the development of KRIs for these areas. • Identify dependency on parent funding of DBAG in extreme but plausible circumstances, for example, in recovery planning.
4. Credit risk	• Fully collateralize all credit exposures. • CBL is encouraged to invest, as planned, in a fully automated credit risk management control system.
5. Collateral	• Apply haircuts to cash collateral. • Include provisions in policy on how to address pro-cyclicality. • Apply a more rigorous concentration policy by applying the concentration limits on an ex ante basis. • Subject the haircut model to an independent validation by technical experts.
7. Liquidity risk	• Diversify the CCB base for GBP, USD and other larger currencies and continue discussions with relevant central banks and CSDs to obtain direct access. • Prepare contingency plans to manage a crisis event in which it cannot access FX markets to obtain liquidity in GBP and other currencies.
9. Money settlement	• Continue seeking opening a direct account in central banks.
13. Default management procedures	• Include relevant external stakeholders, in particular authorities, Euroclear Bank and the most relevant depository banks and CCBs, in the default management tests.
17. Operational risk	• Conduct a full failover test. • Invest in a third data site at a location with a significantly different risk-profile than other datacenters.
19. Tiered participation	• Develop tools to identify monitor and mitigate risks from indirect participants to reduce potential exposures of direct participants that may negatively impact CBL.
20. FMI Links	• Conduct daily reconciliations. • Increase transparency in relation to the moment of settlement finality through Creation Link Guides for local markets.

E. Recommended Actions Authorities

Recommended Actions to Improve Compliance with the CPSS-IOSCO Responsibilities and the Safety and Efficiency of the Financial Market Infrastructure	
Reference Responsibility	**Recommended Action**
B. Powers and resources	• BCL's enforcement power could be further strengthened with a general legal sanctioning power in its organic law.
D. Adoption of the PFMI	• Authorities may integrate the PFMI in their day to day supervision. It is recommended to apply a two-year assessment cycle.
E. Cooperation with other authorities	• It is recommended to conclude a national MoU between the BCL and CSSF that covers cooperation and coordination arrangements in normal and crisis times. • Consult relevant foreign authorities and central banks during assessment of CBL against the PFMI. • Finalize and sign the planned MoU with the Belgian authorities, and the ECB as observer. • Recognize the two ICSDs as significant institutions within the SSM. • Bring CBL under the remit of the SRB.

F. Authorities' Response to the Assessment

The Banque centrale du Luxembourg (BCL) and the Commission de Surveillance du Secteur Financier (CSSF) welcome the IMF assessment of Clearstream Banking SA, as financial market infrastructure, against the CPMI/IOSCO Principles for Financial Market Infrastructures. The BCL and the CSSF also appreciate the detailed assessment of the Luxembourg authorities against the CPMI/IOSCO Responsibilities for authorities.

The BCL and the CSSF take note of the observations and conclusions of the IMF assessment of Clearstream Banking SA and will thoroughly consider the recommended actions suggested by the IMF in this respect. In addition, the BCL and the CSSF will give due consideration to the observations made by the IMF with regard to the Responsibilities for authorities.

We are of the opinion that the IMF has performed a thorough and comprehensive assessment and would like to thank the IMF assessor for the constructive and interactive approach.