Lesson 43: RegTech and Compliance

Module 4: Traditional Digital Finance

Digital Finance Course

2025

Learning Objectives

- Understand RegTech scope and technology applications
- Analyze Basel III capital and liquidity requirements
- Examine IFRS 9 expected credit loss implementation
- Evaluate regulatory reporting automation (EMIR, MiFID II)
- Assess AML/KYC technology and transaction monitoring

RegTech Definition and Scope

RegTech Definition:
Use of technology (especially information technology) to enhance regulatory processes, compliance, and reporting.

Key Drivers:

- Post-2008 regulatory explosion (Dodd-Frank, MiFID II, EMIR)
- Rising compliance costs (10-15% of bank operating costs)
- Manual processes prone to errors and delays
- Regulatory demands for real-time reporting
- Availability of AI/ML, cloud, and big data tools

RegTech Applications:

1. **Regulatory Reporting:** Automated data extraction and submission
2. **Risk Management:** Real-time risk analytics and stress testing
3. **Compliance:** Policy enforcement and monitoring
4. **Identity Management:** KYC/AML automation
5. **Transaction Monitoring:** Fraud and market abuse detection
6. **Regulatory Intelligence:** Track and interpret rule changes

Market Size:

- Global RegTech market: $12B (2023), projected $50B+ by 2030
- 20-30% CAGR driven by regulatory complexity

Clear definitions are essential for understanding complex technical concepts.

RegTech Technology Stack

Core Technologies:

- **Machine Learning:** AML pattern detection, risk scoring
- **Natural Language Processing:** Regulatory text parsing, contract analysis
- **Robotic Process Automation (RPA):** Data extraction from legacy systems
- **Cloud Computing:** Scalable infrastructure, vendor solutions
- **Blockchain:** Immutable audit trails, shared KYC utilities
- **Big Data:** Transaction monitoring across terabytes

Leading RegTech Vendors:

- **Compliance:** ComplyAdvantage, Chainalysis, Elliptic
- **Regulatory Reporting:** Wolters Kluwer, Moody's Analytics, ABIDE Financial
- **KYC/AML:** Refinitiv World-Check, LexisNexis, Trulioo
- **Transaction Monitoring:** NICE Actimize, SAS, Feedzai
- **Risk Analytics:** Axiom, Quantexa, Ayasdi

Build vs Buy:

- Large banks: Hybrid (build core, buy specialized)
- Regional banks: Primarily vendor solutions
- Fintechs: Cloud-native RegTech-as-a-Service

Key concepts from this slide inform practical applications in finance.

Basel III Overview

Historical Context:

- **Basel I (1988):** Simple risk weights by asset class
- **Basel II (2004):** Internal models, three pillars
- **Basel III (2010):** Post-crisis reforms
- **Basel III Finalization (2017):** Output floor, standardized approach revisions

Three Pillars:

1. **Minimum Capital:** CET1, Tier 1, Total Capital ratios
2. **Supervisory Review:** Stress testing, Pillar 2 add-ons
3. **Market Discipline:** Public disclosure requirements

Capital Adequacy Ratios:

- **CET1 Ratio:** $\geq$ 4.5% (Core equity / RWA)
- **Tier 1 Ratio:** $\geq$ 6% (CET1 + AT1 / RWA)
- **Total Capital Ratio:** $\geq$ 8% (Tier 1 + Tier 2 / RWA)
- **Capital Conservation Buffer:** 2.5% above minimums
- **Countercyclical Buffer:** 0-2.5% (jurisdiction-specific)
- **G-SIB Surcharge:** 1-3.5% for systemically important banks

Effective CET1 Requirement (G-SIB):

$$4.5\% + 2.5\% + 1\% + 2.5\% = 10.5\% \text{ CET1}$$

(Minimum + Conservation + Countercyclical + G-SIB)

Risk-Weighted Assets (RWA) Calculation

Credit Risk RWA:
Standardized Approach:

- Fixed risk weights by exposure class
- AAA-AA: 20%, A+/A: 50%, BBB+/BBB-: 100%
- Residential mortgages: 35% (low LTV)
- Corporate: 100% (unrated)
- Sovereign: 0% (OECD), 100% (others)

IRB Approach (Internal Ratings-Based):

$$\text{RWA} = K \times 12.5 \times \text{EAD}$$

where K = capital requirement function of PD, LGD, M
$K =$
$[\text{LGD} \times N(\sqrt{\frac{1}{1-R}} N^{-1}(\text{PD}) + \sqrt{\frac{R}{1-R}} N^{-1}(0.999)) - \text{PD} \times \text{LGD}] \times (1 + (M - 2.5)b)$

where R = correlation, M = maturity

Market Risk RWA:

- Standardized Approach (SA): Sensitivity-based
- Internal Models Approach (IMA): Expected Shortfall
- FRTB (Fundamental Review): RWA = 12.5 × Capital

Operational Risk RWA (Standardized):

$$\text{OR Capital} = \text{BIC} \times \text{ILM}$$

where BIC = Business Indicator Component, ILM = Internal Loss Multiplier

Output Floor (Basel III Finalization):

$$\text{RWA}_{IRB} \geq 72.5\% \times \text{RWA}_{Standardized}$$

Limits internal model benefit, effective January 2023 (phased to 2028)

Liquidity Requirements: LCR and NSFR

Liquidity Coverage Ratio (LCR):

$$\text{LCR} = \frac{\text{High-Quality Liquid Assets}}{\text{Net Cash Outflows (30-day stress)}} \geq 100\%$$

HQLA Categories:

- **Level 1:** Cash, central bank reserves, sovereign debt (0% haircut)
- **Level 2A:** High-quality corporate/covered bonds (15% haircut)
- **Level 2B:** Lower-rated corporates, equities (50% haircut)
- **Cap:** Level 2 max 40% of HQLA, Level 2B max 15%

Net Cash Outflows:

- Retail deposits: 3-10% runoff (stable to less stable)
- Wholesale deposits: 25-100% runoff
- Committed facilities: 30-100% drawdown
- Derivatives collateral calls

Net Stable Funding Ratio (NSFR):

$$\text{NSFR} = \frac{\text{Available Stable Funding}}{\text{Required Stable Funding}} \geq 100\%$$

ASF Factors (by liability type):

- Equity, long-term debt (¿1 year): 100%
- Stable retail deposits: 95%
- Less stable retail, SME deposits: 90%
- Wholesale deposits (¡1 year): 50%
- Short-term wholesale (¡6 months): 0%

RSF Factors (by asset type):

- Cash, reserves: 0%
- Sovereign bonds (¡ 6m maturity): 5%
- High-quality bonds: 10-15%
- Residential mortgages: 65%
- Corporate loans, other assets: 85-100%

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IFRS 9 Overview and ECL Model

Key Changes from IAS 39:

- **Incurred Loss → Expected Loss:** Forward-looking provisioning
- **3-Stage Model:** Based on credit deterioration
- **Lifetime ECL:** For Stage 2 and 3 assets
- **Effective Date:** January 1, 2018 (EU/IFRS jurisdictions)

Three-Stage Classification:

1. **Stage 1 (Performing):** 12-month ECL
   - No significant credit deterioration since origination
   - Interest revenue on gross carrying amount
2. **Stage 2 (Underperforming):** Lifetime ECL
   - Significant increase in credit risk (SICR)
   - Not yet credit-impaired
   - Interest on gross carrying amount

3. Stage 3 (Non-Performing): Lifetime ECL

- Credit-impaired (objective evidence of default)
- Typically 90+ days past due
- Interest on net carrying amount (after provisions)

ECL Formula:

$$\text{ECL} = \text{PD} \times \text{LGD} \times \text{EAD}$$

Stage 1: 12-month PD
Stage 2/3: Lifetime PD (sum over maturity)

$$\text{Lifetime ECL} = \sum_{t=1}^{T} \text{PD}_t \times \text{LGD}_t \times \text{EAD}_t \times \text{DF}_t$$

where DF_t = discount factor, T = contractual maturity

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SICR Criteria and Implementation

Significant Increase in Credit Risk (SICR):
Quantitative Triggers:

- Absolute change in PD (e.g., +200 bps)
- Relative change in PD (e.g., 2x origination PD)
- 30+ days past due (rebuttable backstop)
- Internal rating downgrade (3+ notches)

Qualitative Indicators:

- Forbearance or restructuring
- Watchlist/early warning flags
- Significant financial difficulty
- Covenant breaches
- Macroeconomic deterioration in sector

Implementation Challenges:

- **Data Requirements:** Origination PD, lifetime PD curves
- **Model Development:** PD, LGD, EAD models for each portfolio
- **Forward-Looking Information:** Macroeconomic scenarios
- **Systems:** Calculate ECL for millions of exposures
- **Governance:** SICR criteria approval and monitoring

Technology Solutions:

- **Moody's Analytics:** CreditLens, RiskCalc
- **SAS:** Expected Credit Loss solution
- **Wolters Kluwer:** OneSumX for Finance, Risk & Regulatory Reporting
- **Oracle:** IFRS 9 ECL module (OFSAA)

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Macroeconomic Scenarios and Probability Weighting

Forward-Looking Scenarios:
IFRS 9 requires incorporating reasonable and supportable macroeconomic forecasts.

Typical Scenario Framework:

- **Base Case (50-60% weight):** Consensus forecast (GDP, unemployment, property prices)
- **Upside (15-25% weight):** Optimistic economic conditions
- **Downside (15-30% weight):** Recession or stress scenario

Key Macroeconomic Variables:

- GDP growth
- Unemployment rate
- Interest rates (policy rate, term structure)
- Property prices (residential, commercial)
- Equity indices
- Commodity prices (for relevant sectors)

Probability-Weighted ECL:

$$\text{ECL} = \sum_{i=1}^{n} p_i \times \text{ECL}_i$$

where p_i = scenario probability, ECL_i = ECL under scenario i

Example (Mortgage Portfolio):

Scenario	Prob.	ECL (bps)
Upside	20%	15
Base	60%	30
Downside	20%	80
Weighted ECL		**36 bps**

COVID-19 Impact (2020):

- Banks increased downside weights to 30-50%
- ECL provisions doubled or tripled
- Subsequent releases as economies recovered (2021-2022)

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EMIR Trade Reporting

European Market Infrastructure Regulation (EMIR):
Objectives:

- Increase derivatives market transparency
- Reduce systemic risk via central clearing
- Standardize OTC derivatives

Reporting Obligations:

- **Scope:** All derivatives (OTC and exchange-traded)
- **Counterparties:** Both sides report (or delegate to Trade Repository)
- **Timing:** T+1 (next working day)
- **Trade Repositories:** DTCC, Regis-TR, UnaVista, etc.

Reporting Fields (EMIR REFIT):

- 203 fields per trade (effective 2024)
- Counterparty identifiers (LEI mandatory)
- Trade economics (notional, price, maturity)
- Collateral and margin details
- Valuation and lifecycle events (novations, compressions)

Technology Challenges:

- Data extraction from multiple systems
- LEI management and validation
- Reconciliation between counterparties (UTI matching)
- Error handling and resubmissions
- Regulatory feedback and breaks

Industry-wide reconciliation break rate: 5-15% of trades (falling over time)

Key concepts from this slide inform practical applications in finance.

MiFID II Reporting and Transaction Monitoring

MiFID II Transaction Reporting:
Scope:

- All transactions in financial instruments (equities, bonds, derivatives)
- Executed on EU venues or by EU firms
- Reported to national competent authorities (NCAs)

Reporting Timeline:

- **T+1:** Next working day by end-of-day
- **Real-Time:** Pre/post-trade transparency (lit venues)

Data Fields (65+ fields):

- Instrument identifiers (ISIN, MIC, CFI)
- Client identifiers (national ID, LEI)
- Execution details (price, quantity, timestamp)
- Flags (waiver, algo, short selling, commodities derivative)

Best Execution Reporting (RTS 27/28):

- **RTS 27:** Venues publish execution quality statistics
- **RTS 28:** Firms disclose top 5 venues by asset class
- Quarterly publication requirement

Market Abuse Detection:

- Suspicious Transaction and Order Reports (STORs)
- Algorithmic trading flags and identifiers
- High-frequency trading (HFT) identification
- Order book reconstruction for surveillance

Vendor Solutions:

- FCA's GRID (regulatory data platform)
- Cappitech, ABIDE Financial, Primatics
- Managed reporting services (outsourced compliance)

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US Regulatory Reporting (Dodd-Frank)

Dodd-Frank Swap Data Reporting:
Reporting Entities:

- Swap Dealers (SDs) and Major Swap Participants (MSPs)
- Report to Swap Data Repositories (SDRs)
- DTCC (credit, equity, rates), CME (commodities, FX)

Real-Time Public Dissemination:

- Block trades: 15-minute delay
- Non-block: Real-time (as soon as technologically practicable)
- Capped dissemination to protect counterparty identity

CFTC Part 45 Reporting:

- Primary Economic Terms (PET)
- Continuation data (valuation, collateral)
- Lifecycle events (assignments, terminations)

CAT (Consolidated Audit Trail):
Objectives:

- Track all equity and options orders across US markets
- Reconstruct market events for surveillance
- Detect market manipulation and insider trading

Reporting Requirements:

- All SRO members and broker-dealers
- Report customer and proprietary orders
- Lifecycle: receipt, routing, execution, allocation
- Timestamps: Millisecond granularity

Implementation Challenges:

- 58 billion records per day (estimated)
- Data privacy concerns (customer PII)
- Cybersecurity of centralized database
- Delayed go-live (originally 2017, phased 2020-2024)

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KYC and Customer Due Diligence

KYC Requirements (FATF, EU 4AMLD/5AMLD):
Customer Identification:

- Full name, date of birth, address
- Government-issued ID verification
- Beneficial ownership (25%+ threshold)
- Source of funds and wealth

Risk-Based Approach:

- **Simplified Due Diligence (SDD):** Low-risk customers (e.g., domestic individuals, small balances)
- **Customer Due Diligence (CDD):** Standard risk
- **Enhanced Due Diligence (EDD):** High-risk (PEPs, high-risk jurisdictions, correspondent banking)

Technology Solutions:

- **Digital Identity Verification:** Jumio, Onfido, Trulioo
  - Document scanning and OCR
  - Facial recognition and liveness detection
  - Biometric authentication
- **Screening Databases:**
  - Sanctions lists (OFAC, UN, EU)
  - PEP databases (Politically Exposed Persons)
  - Adverse media screening
  - Refinitiv World-Check, Dow Jones Risk & Compliance
- **Utility Models:**
  - Shared KYC platforms (e.g., SWIFT KYC Registry)
  - Reduce duplication across institutions
  - Blockchain-based KYC consortia (pilot stage)

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Transaction Monitoring and AML

AML Transaction Monitoring:
Typologies Detected:

- **Structuring (Smurfing):** Multiple small deposits under reporting threshold
- **Rapid Movement:** Funds in and out within short period
- **Round-Tripping:** Circular fund flows
- **Layering:** Complex web of transactions to obscure origin
- **High-Risk Jurisdictions:** Transfers to/from sanctioned countries
- **Unusual Patterns:** Deviations from customer profile

Rule-Based Systems:

- Threshold-based alerts (e.g., cash deposit ¿ $10k)
- Velocity rules (e.g., 5+ wire transfers in 24 hours)
- High false positive rates: 95-99% of alerts

Machine Learning Approaches:

- **Supervised Learning:** Train on historical SAR filings
- **Unsupervised Learning:** Anomaly detection (clustering, autoencoders)
- **Network Analysis:** Graph algorithms to detect suspicious networks
- **NLP:** Adverse media and document analysis

Benefits of ML:

- Reduce false positives by 30-70%
- Detect novel typologies (zero-day AML)
- Prioritize high-risk alerts for investigators
- Adapt to evolving criminal tactics

Regulatory Acceptance:

- UK FCA: Supportive but requires explainability
- US FinCEN: Pilot programs encouraged
- Model validation and governance critical

AI and ML are transforming financial services through automation and prediction.

Sanctions Screening and Trade Surveillance

Sanctions Screening:
Screening Points:

- **Onboarding:** Customer and beneficiary names
- **Real-Time Payments:** SWIFT messages, wire transfers
- **Trade Finance:** Parties in LC and documentary collections
- **Securities:** Issuer and counterparty screening

Sanctions Lists:

- **OFAC (US):** SDN list (6000+ entities), sectoral sanctions
- **UN:** Security Council consolidated list
- **EU:** CFSP sanctions, national lists
- **Others:** UK HMT, Canada, Australia

Fuzzy Matching:

- Name variations, transliterations, typos
- Phonetic algorithms (Soundex, Metaphone)
- Machine learning name-matching engines

Trade Surveillance (Market Abuse):
Surveillance Patterns:

- **Insider Trading:** Abnormal trading before announcements
- **Market Manipulation:** Spoofing, layering, wash trades
- **Front-Running:** Broker trades ahead of client orders
- **Pump and Dump:** Artificially inflate price, sell at peak

Technology Solutions:

- **NICE Actimize:** Cross-asset surveillance
- **SAS:** AML and trade surveillance
- **IPC Connexus:** Voice and eComms surveillance
- **Behavox:** AI-driven conduct risk monitoring

Data Inputs:

- Order and trade data (CAT, blue sheets)
- Communications (emails, chats, voice)
- Employee trading (personal account dealing)
- Market announcements and news

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SupTech and Machine-Readable Regulation

SupTech (Supervisory Technology):
Use of technology by regulators to enhance supervision and surveillance.

Applications:

- **Data Analytics:** Identify outliers and systemic risks
- **Virtual Assistants:** Chatbots for regulated entity queries
- **Real-Time Monitoring:** Dashboards of market activity
- **Network Analysis:** Systemic risk mapping (inter-bank exposures)
- **NLP:** Analyze disclosure documents at scale

Examples:

- **FCA (UK):** Data and Analytics Hub for market surveillance
- **MAS (Singapore):** SupTech initiatives (API-based data collection)
- **ESMA (EU):** FIRDS (Financial Instruments Reference Data System)

Machine-Readable Regulation:
Concept:

- Translate regulatory rules into code
- Automate compliance checks via smart contracts or rule engines
- Reduce interpretation ambiguity

Initiatives:

- **BIS Innovation Hub:** Project Genesis (machine-executable regulations)
- **FCA Digital Regulatory Reporting:** Pilot with 5 banks (2021-2023)
- **ACPR (France):** Regulatory data dictionary

Challenges:

- Principles-based regulation hard to codify
- Legal liability for automated decisions
- Maintenance as regulations evolve
- Standardization across jurisdictions

Regulatory frameworks shape adoption patterns and industry structure.

Summary and Key Takeaways

RegTech Overview:

- Technology-driven regulatory compliance
- Global market: $12B (2023) to $50B+ (2030)
- Core tech: ML, NLP, RPA, cloud, blockchain

Basel III:

- CET1 minimum 4.5% + buffers (effective 10-13%)
- RWA calculation: Standardized vs IRB
- Liquidity: LCR (30-day) and NSFR (1-year) both $\geq$ 100%
- FRTB: Expected Shortfall replaces VaR

IFRS 9:

- 3-stage model: 12-month ECL (Stage 1), Lifetime ECL (Stage 2/3)
- SICR triggers: PD changes, 30 DPD, rating downgrades
- Probability-weighted macroeconomic scenarios

Regulatory Reporting:

- EMIR: Derivatives reporting (203 fields, T+1)
- MiFID II: Transaction reporting (65+ fields, T+1)
- Dodd-Frank: Swap data to SDRs, CAT for equities

AML/KYC:

- Digital ID verification (Jumio, Onfido)
- Sanctions screening: OFAC, UN, EU lists
- Transaction monitoring: ML reduces false positives 30-70%
- Trade surveillance: Detect spoofing, insider trading

Emerging Trends:

- SupTech: Regulators using tech for supervision
- Machine-readable regulation: Rules as code
- Cloud-native RegTech-as-a-Service