Lesson 43: RegTech and Compliance

Module 4: Traditional Digital Finance

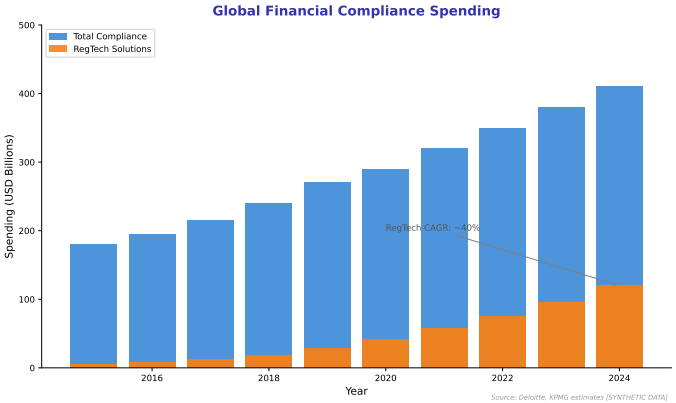
Digital Finance Course

2025

Learning Objectives

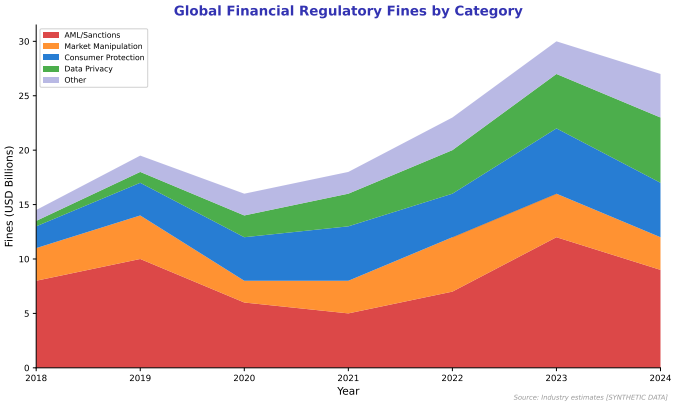
- Understand RegTech scope and technology applications
- Analyze Basel III capital and liquidity requirements
- Examine IFRS 9 expected credit loss implementation
- Evaluate regulatory reporting automation (EMIR, MiFID II)
- Assess AML/KYC technology and transaction monitoring

Compliance Cost Trends



Compliance costs have grown substantially post-financial crisis.

Regulatory Fines and Penalties



Regulatory fines for non-compliance can reach billions of dollars.

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 = $12.5 \times$ 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

Key concepts from this slide inform practical applications in finance.

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)

Key concepts from this slide inform practical applications in finance.

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:

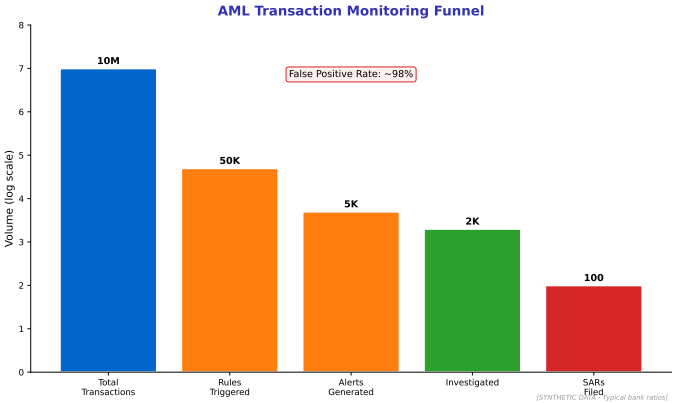
- All SRO members and broker-dealers
- Report customer and proprietary orders
- Lifecycle: receipt, routing, execution, allocation
- Timestamps: Millisecond granularity

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)

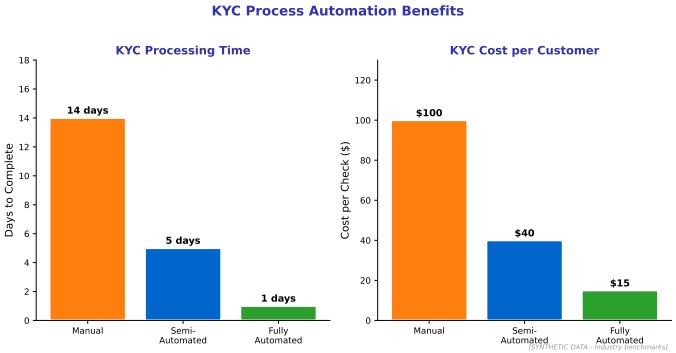
Key concepts from this slide inform practical applications in finance.

AML Transaction Monitoring



Transaction monitoring systems screen billions of transactions for suspicious patterns.

KYC Process Workflow



KYC processes balance customer onboarding speed with risk management.

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)

Key concepts from this slide inform practical applications in finance.

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

Key concepts from this slide inform practical applications in finance.

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