

Automated Decision Support for Financial Regulatory/Policy Compliance, using Textual Rulelog

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Financial Regulatory/Policy Compliance: Business Case and Advantages of our Approach

Problem: Current methods are expensive and unwieldy, often inaccurate

- Stakes are high: 2008 global financial crisis cost institutions \$100+ Billion

Solution Approach – using Textual Rulelog software technology:

- Encode regulations and related info as semantic rules and ontologies
- Fully, robustly automate run-time decisions and related querying
- Provide understandable full explanations in English
 - *Proof*: Electronic audit trail, with provenance
- Handles increasing complexity of real-world challenges
 - Data integration, system integration
 - Conflicting policies, special cases, exceptions
 - What-if scenarios to analyze impact of new regulations and policies

Business Benefits – compared to currently deployed methods:

- More Accurate
- More Cost Effective – less labor; subject matter experts in closer loop
- More Agile – faster to update
- More Overall Effectiveness: less exposure to risk of non-compliance

Technological Challenges

- Regulations and associated policies are:
 - frequently very complicated in both logical substance and English syntax
 - full of meta-information
 - rife with important exception cases requiring defeasibility
 - voluminous, continually increasing, ever changing
- Compliance decisions often:
 - are high stakes, e.g., \$Millions in costs or penalties, *per decision*
 - must be made in near real time
 - require full audit trails and provenance (legal evidence)
- A variety of enterprise data, not just transactions, need to be integrated
- It's previously been hard for subject matter experts (SME's) to understand the implemented rules and reasoning well enough to be involved closely in developing, testing, and debugging them

Technological Approach

- Based on Textual Rulelog, implemented in our Ergo Suite™ platform (Ergo)
 - Ergo = Reasoner + Studio (IDE). Java API → flexible enterprise deployment.
- Very high logical expressiveness: higher-order, defeasibility, quantifiers, head disjunction, meta knowledge, probabilistic
- Connectors import & tightly integrate knowledge from: RDF, OWL, other forms
- Efficient, scalable reasoning: near-real-time decisions and fast edit-test cycle
 - Many performance optimizations: compilation, transformation, cacheing, indexing, subgoal re-ordering. Restraint bounded rationality → poly-time.
 - Millions of complex inferences on ordinary PC. In-memory + DB hookups.

Technological Approach (II)

- Fully detailed user-navigable explanations in English, understandable by SME's
- Integrates tightly some English natural language capabilities for authoring rules and generating answers with explanations (text interpretation & generation)
- *Textual terminology*: English *phrase* \leftrightarrow logical *term*; word \leftrightarrow functor
- Methodology for authoring of rules starting from regulation/policy documents:
 1. English *source* sentences are *articulated* \rightarrow English *encoding* sentences
 - clearer, syntactically more self-contained, include background
 2. Each encoding sentence is *encoded* \rightarrow a Rulelog rule in Ergo syntax
- Ontology mappings are specified by rules

Case Study

- “FIBO Rules” proof-of-concept by Enterprise Data Management Council (EDMC)
 - a leading financial-sector international industry-government consortium
- Conceived at FIBO Summit held June 2013 at SemTechBiz SJ conference
- Regulation W from US Federal Reserve was chosen as a challenge regulation
 - Banking participants said: significant complexity and industry urgency
- PoC goal: demonstrate how a representative subset of RegW could be effectively automated using Textual Rulelog, while also leveraging the EDMC/OMG Financial Industry Business Ontology (FIBO)
- One of us (B. Grosf) acted as technical lead for the PoC
- PoC duration: ~13 months. We then further continued/extended the PoC work.



Demo of Ergo Suite for Compliance Automation: US Federal Reserve Regulation W

- EDM Council Financial Industry Consortium
Proof of Concept – **successful and touted pilot**
 - Enterprise Data Management Council (Trade Assoc.)
 - Coherent Knowledge Systems (USA, Technology)
 - SRI International (USA, Technology)
 - Wells Fargo (Financial Services)
 - Governance, Risk and Compliance Technology Centre (Ireland, Technology)
- Reg W regulates and limits \$ amount of transactions that can occur between banks and their affiliates. Designed to limit risks to each bank and to financial system.
- Must answer 3 key aspects:
 1. *Is the transaction's counterparty an affiliate of the bank?*
 2. *Is the transaction contemplated a covered transaction?*
 3. *Is the amount of the transaction permitted ?*

Determining Whether Regulation W Applies

Two initial questions need to be answered in determining whether a transaction is subject to Regulation W. The first is whether the transaction is between a bank and an "affiliate" of the bank. The second is whether the transaction is a "covered transaction."

Affiliate Definition. Regulation W applies to covered transactions between a bank and an affiliate of the bank.

The definition of an affiliate for purposes of Regulation W is set forth in section 223.2. The definition is broad, and includes:

- Any company that controls the bank;
- Any company that is controlled by a company that controls the bank;
- Any company that is controlled, directly or indirectly, by trust or otherwise, by or for the benefit of shareholders who beneficially or otherwise control, directly or indirectly, by trust or otherwise, the bank or any company that controls the bank;
- Any company in which a majority of its directors, trustees, or general partners (or individuals exercising similar functions) constitute a majority of the persons holding any such office with the bank or any company that controls the bank;
- Any company, including a real estate investment trust, that is sponsored and advised on a contractual basis by the bank or an affiliate of the bank;
- Any registered investment company for which the bank or any affiliate of the bank serves as an investment adviser;
- Any unregistered investment fund for which the bank or any affiliate of the bank serves as an investment adviser, if the bank and its affiliates own or control in the aggregate more than 5 percent of any class of voting securities or more than 5 percent of the equity capital of the fund¹;

The Starting Point - Text of Regulation W

Results of Case Study

- PoC very successfully reached goal. Dramatic business benefits of our approach:
 - Higher accuracy of answers/decisions
 - Lower cost, greater agility, higher reusability, more SME participation
 - Greater scope of automation, including SME-understandable explanations
- Underlying technical benefits in expressiveness, authoring, and explanations
- Quite positive feedback from financial IT industry audiences (webinar, conf.'s)

DEMO goes here

Importance and Impact of our approach

Business Benefits – compared to currently deployed methods:

- More Accurate
 - More Cost Effective – less labor; subject matter experts in closer loop
 - More Agile – faster to update
 - More Overall Effectiveness: less exposure to risk of non-compliance
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- Realistic promise to increase productivity by at least several percent, i.e., reduce cost and risk of financial regulatory/policy compliance
 - Over the next decade or two that would be worth many \$Billions to global economy and individual institutions
 - Increased systemic stability would have many non-economic benefits too
 - Radically increased transparency can significantly improve governance and reduce exploitative gaming, in writing and enforcing of regulations themselves

THANK YOU