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ARTICLE

Legal Dynamism

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Shortly after the start of the French Revolution, Thomas Jefferson wrote a now famous letter to James Madison. He argued that no society could make a perpetual constitution, or indeed a perpetual law, that binds future generations. Every law ought to expire after nineteen years. Jefferson's argument rested on the view that it is fundamentally unjust for people in the present to create laws for those in the future, but his argument is also appealing from a purely pragmatic perspective. As the state of the world changes, laws become outdated, and forcing future generations to abide by outdated laws is unjust and inefficient.

Today, the law appears to be at the cusp of its own revolution. Longer than most other disciplines, it has resisted technical transformation. Increasingly, however, computational approaches are finding their way into the creation and implementation of law and the field of computational law is rapidly expanding. One of the most exciting promises of computational law is the idea of legal dynamism: the concept that a law, by means of computational tools, can be expressed not as a static rule statement but rather as a dynamic object that includes system performance goals, metrics for success, and the ability to adapt the law in response to its performance.

Speed limits provide a simple illustration of the difference between static and dynamic laws. "You may drive up to 80 kilometers per hour on this road" is the type of static rule statement we are all familiar with. A dynamic speed limit might be expressed as:

Objective: Minimize road accidents on this highway

Metrics for success: (1) Number of accidents per day, (2) average journey time

Range of acceptable interventions: Speed limits between 70km/h and 100km/h

A dynamic speed limit would be varied in response to road conditions to minimize accidents while also minimizing average journey times. Speed limits may be higher during the day or when the roads are less busy; they could be lower when going around a bend and higher on straight sections. The speed limit under any given set of conditions would be set based on evidence of driving accidents and, as more data is collected, may be updated. Legal dynamism is not a panacea: constantly changing speed limits would certainly confuse drivers. But as the law is expected to govern an increasing number of computational systems (which may one day include cars!), ongoing optimization of laws seems less far-fetched.

Digital asset regulation presents an obvious opportunity for dynamic regulation. In a recent article, we explored how central bank digital currencies (CBDCs) provide an opportunity for lawmakers to embed the objectives of anti-money laundering (AML) directly into the design of digital currencies. "AML by Design" aims to create a currency that is inherently resistant to money laundering. We point out that design choices that aim to curb money laundering should not be viewed as a one-time exercise but instead, should be updated in response to data collected on the digital currency. Here, we hope to explore legal dynamism further through the example of AML for digital assets.

The foundations of legal dynamism

The image of laws as algorithms goes back to at least the 1980s when the application of expert systems to legal reasoning was first explored. Whether applied by a machine learning system or a human, legal algorithms rely on inputs from society and produce outputs that affect social behavior and that are intended to produce social outcomes. As such, it appears that legal algorithms are akin to other human-machine systems and so the law may benefit from insights from the general study of these systems. Various design frameworks for human-machine systems have been proposed, many of which focus on the importance of measuring system performance and iterative redesign. In our view, these frameworks can also be applied to the design of legal systems.

A basic design framework consists of five components:

1. Specification of system performance goals

A law exists to achieve social behavior. In many instances, it will be clear what the desired social behavior is: avoiding road deaths or deterring money laundering. Even in simple cases, there will be important secondary objects: maximize average highway speeds or minimize compliance costs. Democratic discourse is required to determine these goals and their relative importance. Like all the steps in this list, the specification of performance goals is not a one-time exercise. Deploying a legal algorithm can reveal unintended consequences that require the definition of new

performance goals. For example, AML regulation can undermine financial inclusion by creating barriers for minority communities such as those relying on remittance payments.

Measurement and evaluation criteria

Performance goals must be measurable, ideally in real-time and at a low cost. Just as the definition of goals requires social buy-in so too does the definition of evaluation criteria. For example, one could measure financial inclusion by determining the percentage of a population with access to a financial system, but this metric would not reveal minority populations that are systematically excluded from the financial system.

2. Testing

Before launching a new legal algorithm, it must be tested. The idea of experimentally testing new policies is already gaining traction. The Nobel Prize-winning work by Duflo, Banerjee, and Kremer provides one such example. The researchers leveraged random control trials to measure the effectiveness of various social interventions in the real world to identify approaches that reliably promote economic development. Another model for experimentation is represented by the Uniform Law Commission (ULC), a 130-year-old nonprofit network that receives support from all U.S. states to draft uniform legal codes, such as the widely adopted Uniform Commercial Code. State legislatures modify and implement the ULC's proposals to suit their priorities and needs. The result is a natural national experiment that has successfully weathered two world wars, the great depression, and the rise of digitization. In our view, regulatory testing could go further still to include systematic pilot launches of proposed laws in representative samples of consenting communities to gather data on real-world performance.

3. Robust adaptive system design

The usefulness of metrics is not limited to testing but also extends to the ongoing improvement of legal algorithms. Complex regulatory systems ought to be sufficiently modular to permit issues to be traced back to specific sub-modules. Ongoing measurement of system performance allows these modules to be continuously improved. An important aspect of regulation is stability and thus the space for possible changes must be well-defined and broadly agreed upon.

4. Continuous auditing

Even after the initial testing phase, an adaptive system requires system performance to be measured continuously. For complex systems, it is likely that auditing will require collaboration between various stakeholders and corresponding incentives to measure performance as well as convenient methods for information

to be collected and evaluated by bodies capable of modifying the legal algorithm. As with performance goals and metrics, auditing procedures are likely to require updating, especially in adversarial contexts — such as money laundering — where wrongdoers will actively avoid being noticed.

5. Suspicious transaction reporting

Dynamic laws ought not to be confused with open-ended laws. In contrast to static laws like speed limits, open-ended regulation delegates the implementation details of regulation often to entities that will be subject to sanctions if their implementation is later deemed subpar. The result of such schemes can be a focus on process over performance. The reporting requirements for suspicious transactions to curb money laundering provide an excellent example of this failure mode.

While each nation passes its own anti-money laundering (AML) regulation, the Financial Action Task Force (FATF) sets international standards that have been widely implemented around the world. With regard to suspicious transaction reporting, FATF recommends that financial institutions be required to report a transaction when they have a suspicion that it relates to criminal activity. Similar to the FATF requirement, the U.S. Bank Secrecy Act requires banks to report transactions over $5,000 that appear to relate to illegal activities or that do not fit a particular customer's usual behavior.

Although the purpose of suspicious transaction reporting is reasonably narrow and well-defined, the reporting requirements are vague and process-oriented. The result is an incentive for financial institutions to overreport, given that underreporting can lead to sanctions and regulators bear the cost of reporting. This overreporting leads to high costs for both the private sector and the public sector.

Dynamic Suspicious transaction reporting

Suspicious transaction reporting (STR) provides an obvious use case for dynamic rulemaking. In particular, the regulation of cryptocurrencies by means of a dynamic process is attractive as it can be implemented automatically (e.g., via smart contracts) without requiring humans to be on the constant lookout for updates. As outlined above, dynamic STR regulations would be based on performance goals and require ongoing auditing to iteratively redesign the regulatory approach.

The primary system performance goal for transaction reporting is fairly easy to articulate: the goal is to report all transactions that are related to criminal activity. The secondary goals are more complex: over-reporting should be minimized, the cost of reporting should be low, reporting should not be biased against certain groups, and so on. Transaction reporting, and anti-money laundering more broadly, are in tension with other important regulatory objectives like financial inclusion, privacy,

and compliance cost. The system performance goals should be defined to account for these tensions and to identify acceptable trade-offs.

Defining performance metrics in the money laundering context can be challenging as criminals actively avoid being caught. This means that the number of false negatives (transactions that are in fact criminal but go unreported) is hard to ascertain. It is important for metrics to be easy and inexpensive to evaluate, otherwise system performance will not be measured regularly. Metrics for success might include benchmark tasks that check whether a certain type of behavior is reported. Similarly, if law enforcement apprehends a criminal organization, the organization's transactions can be used to test the model. Simpler metrics might include the fraction of reports that lead to the identification of criminal behavior. Ultimately, defining the correct set of metrics will be an ongoing task.

There are thousands of crypto assets, most provide full visibility into transaction data (with the notable exception of privacy chains like ZCash and tumblers like Tornado Cash) and many are associated with vibrant online communities. These two features, visibility into transaction data and online communities, can aid with the initial testing of dynamic STR on a sample of transactions before launching new STR approaches in the wider community.

The current system design for transaction reporting makes each financial institution individually responsible for reporting transactions it is aware of. In practice, most people use multiple financial services and transact across networks. Criminals can use this common behavior to obscure their own transactions. A superior system design may therefore encourage collaboration between financial institutions by creating methods for data to be shared between networks. This type of collaboration would reduce the incentives to overreport and facilitate system updates which are hard to implement when each institution has discretion over its reporting process. Advances in computational approaches may even make such collaboration possible without requiring sensitive data to be shared.

A dynamic transaction reporting framework would be focused on performance rather than process. As such, the performance of the system would be monitored to assess (1) how well the system is detecting money laundering (primary objective), and (2) the degree to which the system minimizes negative externalities (secondary objectives). Although transaction data is often visible in a cryptocurrency context, it is likely that additional data, which resides with exchanges and other institutions, would need to be part of the auditing process (for example, to monitor financial inclusion). As described, it is critical that the insights from auditing are, in fact, actionable. To this end, an entity must be empowered to modify the reporting scheme in response to the data gathered. This entity need not be a regulatory body but could

be a consortium of financial institutions mandated with the implementation of transaction reporting.

While the promise of legal dynamism is multifaceted, the governance of cryptocurrency systems represents an early opportunity to pilot new approaches to lawmaking that seek to optimally address regulatory objectives through evidence-based iterative design.

An initial testbed for legal dynamism

233 years ago, Jefferson called on us to reexamine laws in every generation. Advances in computational law allow us to do so in real-time. With this new ability, we have the opportunity to rethink how we define laws — as dynamic systems rather than as static rules. Computational systems, like cryptocurrencies, lend themselves to dynamic regulation as they are inherently quantifiable and can accommodate updatable regulatory interventions. As the number, complexity, and diversity of computational systems grow, we predict that legal dynamism will be an increasingly valuable regulatory tool. In the meantime, we look forward to exploring the host of critical open questions presented by legal dynamism, ranging from technical implementation details to the procedural safeguards required to ensure fair dynamic rulemaking.

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