



# Blockchain and Its Principal Applications: Regulatory Implications

For ADB, Manila

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# Topics Today

1. **Blockchain** – what it is and how it works
2. **Distributed Ledger Technology (DLT)** – What it is and how it works
3. **Why blockchain and DLT are usually used together**
4. **Public and private (permissionless and permissioned) blockchains**
5. **Advantages and disadvantages of Blockchain and DLT**
6. **Bitcoin blockchain vs Ethereum blockchain**
7. **Why one shouldn't regulate technology but should regulate its applications**
8. **Applications of Blockchain and DLT**
  1. Cryptocurrencies or cryptoassets?
  2. Central bank digital currencies (CBDCs) and Sweden as a case study
  3. Smart contracts
  4. Provenance registers – from heart medicines to tuna fish
  5. Initial Coin Offerings (ICOs)
9. **Regulatory implications for cryptoassets, CBDCs and ICOs**

# Prologue

I have chosen to address the foundational level of all cryptocurrencies and ICOs issued to date, and all smart contracts being developed – which is the blockchain software on which they run.

I have done this because, in my experience, fuzzy understandings of what blockchains can and can't do well, and how they work, invariably leads to misunderstandings about how cryptos and ICOs and smart contracts work, and how secure they may be.

# Definitions of DLT and Blockchain

**A DLT is simply a decentralized database that is managed by various participants.** A DLT is a consensus of replicated, shared, and synchronized digital data spread across multiple sites, countries, or institutions. There is no central administrator or centralized data storage.

**A Blockchain is a software application that comprises a continuously growing list of records, called *blocks*, which are linked and secured (ie. *chained*) together using cryptography.** Each block typically contains a cryptographic hash of the previous block, a timestamp, and transaction data. Data in a block cannot be altered without changing all subsequent blocks.



# Definitions of ICOs, Cryptocurrencies & Smart Contracts

**ICO** -- An ICO is a fundraising activity in which a platform's proprietary tokens are offered in exchange for other assets, most often established cryptocurrencies (but can be for cash). Tokens are typically offered and managed on a blockchain running on the cloud. Often called a TGE (token generation event).

**Cryptocurrency** - A digital representation of value not issued by a central bank or public authority and not necessarily attached to a fiat currency, but used by natural or legal persons as a means of exchange and can be transferred, stored or traded electronically. (Opinion of the European Central Bank, 12 October 2016)

A **smart contract** is an agreement the execution of which is automated, usually through a computer running code that has translated legal prose into an executable program. This program has control over the physical or digital objects needed to effect execution. (An early example is a soft drink vending machine). It is debatable whether smart contracts are actually contracts at all since they do not manifest a legal relationship but merely execute it. Perhaps better to think of them as a part of a contract.

# Blockchain and DLT are separate innovations that work very well together

You can readily run a blockchain on a single centralised ledger, and you can have a distributed ledger not running a blockchain (though you'd need some other technique to keep the different ledgers consistent and secure).

Blockchain and DLT go very well together, like bacon and eggs, vodka and caviar, or red wine and life. But they are separate innovations and thinking of them like this, aids conceptual understanding.

**Warning** – few authors make this distinction – most use BC and DLT interchangeably to refer to the two working in tandem,

But then again much that is written about this space is WRONG.

They work well together as DLT allows the removal of a 'middle man' clipping the ticket and blockchain provides the data security and 'immutability' for a system to run without such a central administrator

# Advantages of blockchain

1. **Major cost savings** – with intermediaries eliminated, transaction costs (financial or otherwise) would be greatly reduced with potential cost savings helping customers.
2. **Used for anything of value** – conceptually can be used by every single industry, as a medium to transfer or record anything of value. Commercial and public sector (e.g. the Delaware initiative).
3. **Security and immutability** – distributed and “chained” nature makes it potentially immune to unauthorised access. A hacker would have to attack and vary the entire blockchain to tamper with data. This lowers compliance and infrastructure costs.
4. **Groundwork for smart contracts** – contracts autonomously adjudicating matters based on the agreed terms and automatically enforcing decisions upon contracted parties without human input.

# Disadvantages of blockchain

1. **Data storage constraints** – all data must be stored on every full node on the network indefinitely. As the number of users and the blockchain grows, so do storage requirements.
2. **Energy consumption** – storage requirements and for, public blockchains, complex computation of proof-of-work validation mechanisms create high energy demands. (Far less so with private systems)
3. **Demanding initial costs** – software, infrastructure and personnel can be expensive to acquire. Software must typically be developed specifically to fit the company's operations.
4. **Integration with legacy systems** – to incorporate a blockchain-based system, existing systems must be overhauled. Integrating legacy systems and blockchain-based systems may be very difficult. (**Much easier to do from scratch**). Eg. ASX overhaul.

# Blockchain has the world agog because ...

Because it can underpin and facilitate –

1. Smart contracts that offer so much promise
2. Letters of credit / documentary credits – CBA and Wells Fargo have executed a proof of concept transaction involving shipment, and payment for, cotton from Texas to China.
3. Cryptocurrencies – that are very well adapted to facilitate remittances – a massive problem in the Pacific.
4. Corporate governance solutions – some Delaware companies have already floated by offering their shares on blockchain (and Delaware has legislated to facilitate this). This is potentially a fabulous solution to all the problems of intermediated security systems in the US.

# The first application of blockchain was in Bitcoin

- The Bitcoin blockchain has never been hacked, which is utterly remarkable given there are thousands of attempted hacks per day.
- But there are two vital points to be made here –
  1. All humans may be created equal, but not all blockchains are!
  2. The Bitcoin blockchain is too expensive (in terms of electricity) and too slow for many commercial applications.
- The slowness and expense stems from its public/permissionless nature
- Private/permissioned blockchains can operate far faster and without undue electricity use.
- Financial markets (like the ASX), bank clearing and settlement procedures, trade finance blockchain platforms, etc will all be private.

# So let's look at a blockchain in operation

- This is the Ethereum blockchain, graphically depicted, as operating in real time

<http://ethviewer.live>

- A few things:
  1. Most recently formed block is in the top left
  2. Note how quickly blocks are formed and validated – this is not the Bitcoin world of a block, on average, every 10 minutes.
  3. Note the existence of “Uncle blocks” – for which miners receive some remuneration – again unlike Bitcoin
  4. **All these miners acting today as if no liability attaches, but ...**

# Orphan and uncle blocks

When multiple miners produce blocks at identical or very close times, only one will ultimately be part of the blockchain. The others are “orphans” and with Bitcoin, worthless. On Ethereum these are “**uncles**” and attract a small reward.

# Anticipatory Regulation

## Don't regulate technology -- regulate its applications

Blockchain is the operating tech for smart contracts, cryptocurrencies and ICOs.

Consumers don't interact with blockchain, but with these applications of it.

In one sense blockchain is like a ultra-secure filing cabinet with multiple locks on it. And we've never seen the need for a 'filing cabinet law'. There are of course laws requiring safe keeping and custody of documents and records. But such laws don't, and shouldn't, specify how the records should be kept safe.

**A regulator could seek to regulate technology but doing so will inevitably limit future innovation – the changes that are coming CANNOT be foreseen or predicted.** A law that is not technology neutral is not fit for purpose as it will have unpredictable negative consequences in time.

Plus there is a second reason not to regulate technology – it is devilishly difficult to do well.

# Examples of how not to do it

Arizona has passed an Act to give validity to records stored on blockchain, to signatures validated by blockchain and to uphold the validity of smart contracts.

Why bother? Lots of work being done on smart contracts in Australia, and no one doubts their validity if they meet the requirements for a contract. This is probably a jurisdiction trying to make itself appear innovative and attractive to tech companies. Yet, ironically, this law will frustrate tech company business.

"BLOCKCHAIN TECHNOLOGY" MEANS DISTRIBUTED LEDGER TECHNOLOGY THAT USES A DISTRIBUTED, DECENTRALIZED, SHARED AND REPLICATED LEDGER, WHICH MAY BE PUBLIC OR PRIVATE, PERMISSIONED OR PERMISSIONLESS, OR DRIVEN BY TOKENIZED CRYPTO ECONOMICS OR TOKENLESS. THE DATA ON THE LEDGER IS PROTECTED WITH CRYPTOGRAPHY, IS IMMUTABLE AND AUDITABLE AND PROVIDES AN UNCENSORED TRUTH."

Problems:

1. 'immutable' – maybe after 10 or 12 blocks, maybe
2. 'uncensored truth' -- GIGO
3. Order of concepts backwards.

# California – much better but not perfect

California has passed an Act to establish a working group to report on all matters blockchain. The Act states: **“blockchain” means a mathematically secured, chronological, and decentralized ledger or database.**

**Anticipatory regulation at least in common law jurisdictions seems to be more often a case of jurisdiction advertising rather than needed reform.**

It may be the case in civil law jurisdictions that some permissive statutes – statues that say it is okay to use blockchains, or smart contracts, or whatever -- may be necessary as sometimes civilian lawyers seek express permission before authorising certain commercial conduct. The need for this will be inversely proportional to the sophistication of the jurisdiction.

# Applications of Blockchain and DLT

**There are five principal applications of BC and DLT**

1. Cryptocurrencies
2. Central bank digital currencies (CBDCs) and Sweden as a case study
3. Smart contracts
4. Provenance registers – from heart medicines to tuna fish
5. Initial Coin Offerings (ICOs)

# 1. Cryptocurrencies

Bitcoin invented in 2008 but 5 years passed before any significant demand arose.

Even today, beyond payment for illegal activities, there is still no real use case for Bitcoin. It is more like a commodity than a currency. It is a medium of exchange, but expensive one to use. It is a poor unit of account, a poor standard of value for deferred payment, and a poor store of value. Hence **cryptoasset** is a better term than cryptocurrency. Currencies inflate with the growth of the economy they serve – cryptoassets don't -- the quantity of Bitcoin is fixed.

What we have had with Bitcoin is a bubble, and bubbles feed on themselves, until they don't!

Some people are highly attracted to the idea of money that governments can't seize as in Cyprus, or devalue by high inflation. But this is a minor source of demand.

Speculative profits, and illegal payments, have been the main sources of demand for cryptos.

## 2. Central bank digital currencies (CBDCs)

CBDCs are cryptos issued by a central bank.

So typically denominated in the nation's currency and thus serving very well as a medium of exchange, store of value and unit of account.

So far many nations are preparing to issue CBDCs but no credible countries have. (The firm that sponsors my chair was working on four last time I asked).

England, Canada, Sweden, China, etc are all preparing.

Many central banks feel they need to be ready to issue a CBDC if a major competitor economy does so – as otherwise payments action (and the associated information) will move offshore.

This is especially so if smart contracts become common in trade finance – as smart contracts work far better with blockchain-based currencies than fiat currencies

# CBDCs

CBDCs probably won't need to run on DLT – central banks don't give rise to trust issues. A single centralised ledger would do the job.

Indeed, CBDCs in one sense can be thought of as each citizen potentially have an account at the central bank.

Today only major commercial banks and a few int'l org'ns have access to central bank money.

## **This is a seachange!**

Everyone assumes that central banks will make their returns lower than commercial banks, to keep the commercial banks in business.

But what happens in a crisis of confidence?

Imagine the mother of all bank runs that could happen if individual Australians had the option of depositing their savings with the RBA – and doing so instantly.

# CBDCs 'issued'

So far only Venezuela has issued a CBDC in the form of its **Petro** – a strange hybrid creature, tied to the value of oil, issued in an ICO (and thus in limited quantities) and which didn't work.

The Marshall Islands has passed the legislation required to issue its **SOV** but has not issued the CBDC. The Marshalls use USD but it seems the country sees an ICO of SOVs as a potential capital raising measure. The idea, once issued, is that two currencies would circulate in the Marshall Islands.

The SOV was built by an Israeli software firm that kindly agreed to do so for the mere fee of one-half of all SOVs issued!

I have offered to provide the same service to the RBA for only 10% of the price!

# Sweden as a CBDC case study

Last year Sweden's central bank produced an excellent report on CBDCs – I recommend it.

Cash is in steep decline in Sweden. Over 60% of bank branches no longer stock it.

The central bank estimates Sweden may well be cashless by 2023.

But the state has been involved in the issuance of currency – the means of exchange – in the geographic region today known as Sweden for over 650 years!

This could have changed in under five years!

All means of exchange could be privately issued – credit cards, debit cards, bank transfers, etc.

The undertone of the report is that the Central Bank is unlikely to let this happen.

### 3. Smart contracts

Smart contracts are typically parts of contracts (in a legal sense) written in code.

The best so far reduce part of the contract to code, and leave part in words.

Phillips Lighting example.

‘Soon’ smart contracts should be able to confirm that (i) one party has title, (ii) certain conditions precedent to transfer of the title and other terms have been met (such as payment, delivery of goods, etc), and (iii) transfer the title.

All automatically.

That is a pretty good description of what a lot of commercial lawyers spend their lives doing.

Smart contracts could equally well perform the back office functions in banks supporting trading desks by clearing and settling the trades -- Banco Santander estimates this could save up to \$20 billion p.a. globally – other estimates go as high as \$100 bn.

## 4. Provenance registers

There is a lot of activity in this space.

Blockchain coupled to a quick read tag offers improved record-keeping

It allows consumers to click on the tag and read where and when the produce was planted, what chemicals were used on it, how it was shipped, etc etc

A big issue for the Chinese market where quality is a real issue – this is one of Australia and NZ's comparative agricultural advantages – clean and green. AgriDigital is a major Australian provenance register and commodity platform.

Blockchain when it is self-contained on the cloud – such as with a crypto or an ICO – can be very robust and resilient. For instance, despite 1,000s of attempted hacks a day – the BitCoin blockchain has never been hacked.

(As opposed to the exchanges that facilitate its use!)

But once blockchain has to interact with the real world, as in a provenance register – one still has the GIGO problem!

## 5. Initial coin offerings (ICOs)

**An ICO is an offering of a bundle of rights, typically recorded and managed on a blockchain; in return most often for cryptocurrency, which itself exists and is managed on a blockchain.**

So an ICO is a creature of blockchain – if the blockchain runs on the cloud it only ‘touches down’ wherever the cloud server happens to be.

Poorly named – Often not “Initial”. In over 50% of our cases a secondary capital raising.

Never a “Coin” as we commonly think of them.

Always an “Offering”

But the title resonates – IPOs are legitimate, often profitable, and well understood.

**Even though ICOs often share none of these 3 factors.**

# ICOs

The offering is of a range of rights, initially called coins, more often now called **tokens** which can represent a :

- a licence to use certain software or participate in a community (a ‘usage token’)
- a right to some cryptocurrency (a ‘currency token’)
- a share of a cash flow generated by an asset (an ‘equity token’).

ICOs now often called ‘token generation events’.

ICOs are in part a scam and in part a response to a failure in financial markets.

Angel and VC investors take a huge chunk of equity in return for financing innovative risky ventures. ICOs are often for such projects. So either these would not have been funded any other way, OR have had to give away much of the business to get funding.

ICOs seem to offer a new way to raise funds, and seem to tap new pools of capital. (which causes me to wonder how legitimate much of it is).



# A word on the ‘culture’ behind ICOs

Many ICOs are issued by techies with little background in finance. For someone seeking to build a blockchain-based application, they are a natural way to seek funding.

Many are issued by people with anarcho-capitalist ideas. Some ICOs literally state “As these coins are offered on the cloud, and our ICO exists on the cloud and not in any country, this ICO is not subject to the laws of any country”.

This culture matters – as it explains the way many, perhaps most, whitepapers are written.

***These are marketing documents, not disclosure documents. I rarely, if ever, read the word “risk” in a whitepaper.***

However, this is changing, as with maturation of the market, more and more ICOs are being drafted by securities lawyers and registered.

# Buyer Beware: Hundreds of Bitcoin Wannabes Show Hallmarks of Fraud (May 17, 2018)

- WSJ reviewed documents for 1,450 ICOs – found 271 ICOs (more than \$1 billion of investor money) with red flags, including:
  - plagiarized investor documents
  - promises of guaranteed returns
  - missing or fake executive teams
- 111 repeated entire sections word-for-word from documents of other ICOs.
- 121 didn't name a single employee and several listed team members who don't exist.
- More than 24 promised returns (as high as 1,354%) without any risk.
- 5 contained team photos pulled from stock photography websites.
- Numerous ICOs went dark after amassing millions from investors, including Denaro (\$8.3 million), PlexCorps (\$15 million), LoopX (\$4.5 million)



# Paragon

Paragon is a provenance register for cannabis – “seed-to-sale” – the idea is that it will allow buyers to know with certainty the origins of the cannabis, even the direction of the slope on which it was grown! Terroir for pot!

It is also ParagonSpace – a co-working space.

And Paragon coin – which was the price and means of admission to all the benefits of Paragon and allegedly at least not able to be used to pay for your pot – as that would be illegal.

# The CEO of Paragon

Ms Jessica Versteeg, CEO of Paragon, was quoted in the WSJ article as saying, “Paragon is dedicated to staying compliant with all applicable laws, and endeavored to do so throughout the entire ICO process.”

Sounds good right? Sophisticated language. The approach we want!

But the WSJ also noted Ms Versteeg had been Miss Iowa 2014.

This got me thinking. So being a **good scholar** I did some research, and quickly turned up 38 images of Ms Versteeg.

They were in the US magazine, Sports Illustrated – but not the famous Swimsuit issue!

# The CEO of Paragon



# The Outcome

Paragon raised \$12 million in 2017.

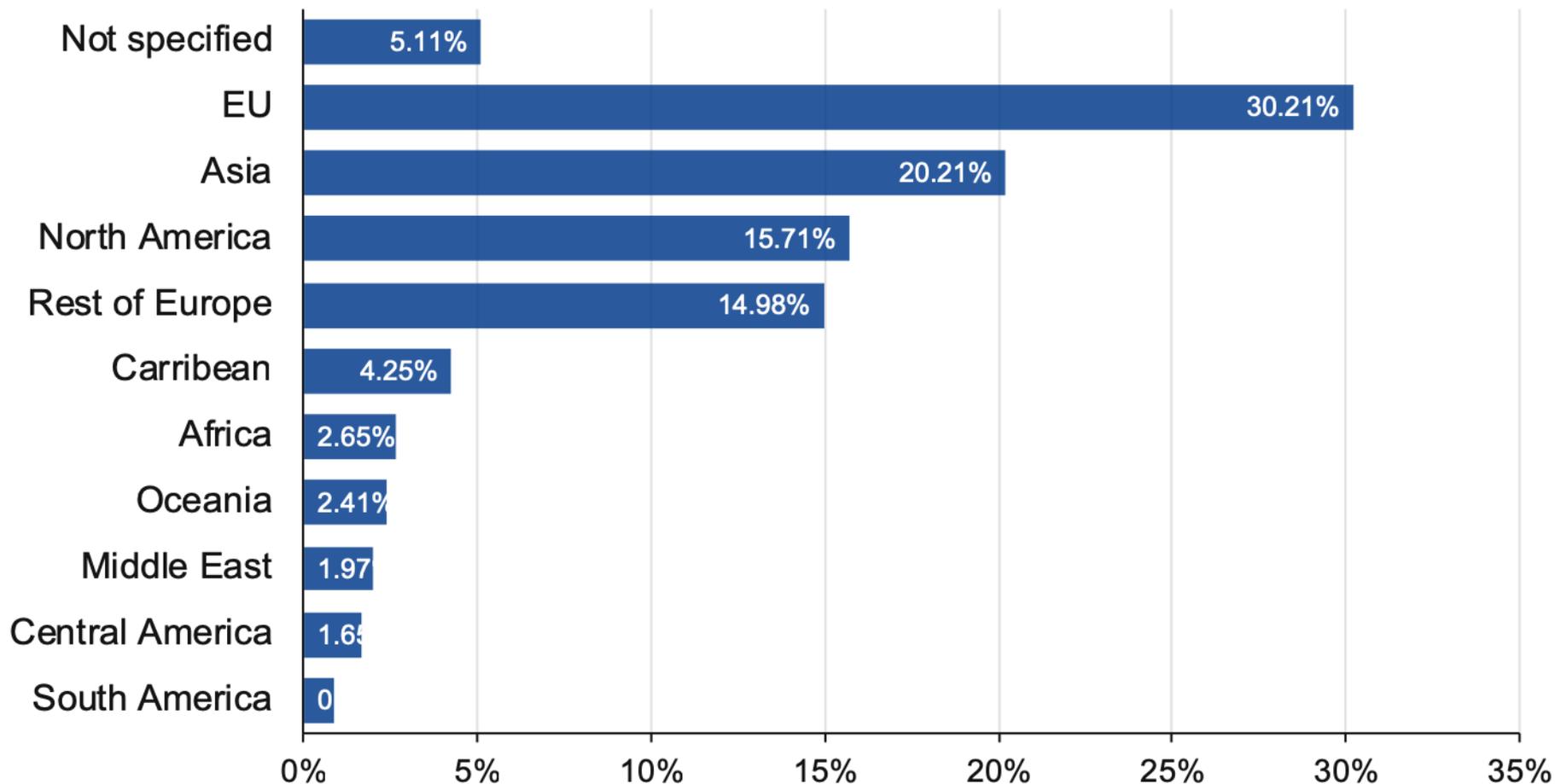
Late last year the SEC ordered it to return all the money, plus interest, to investors, and levied a \$250,000 fine on it. The SEC didn't allege fraud, but it found the offering of Paragon Coins was an unregistered offering of securities.

Munchee decision of SEC – the token held to be a security not because it offered dividend-like returns – but because the marketing material suggested possible capital gains from holding it.

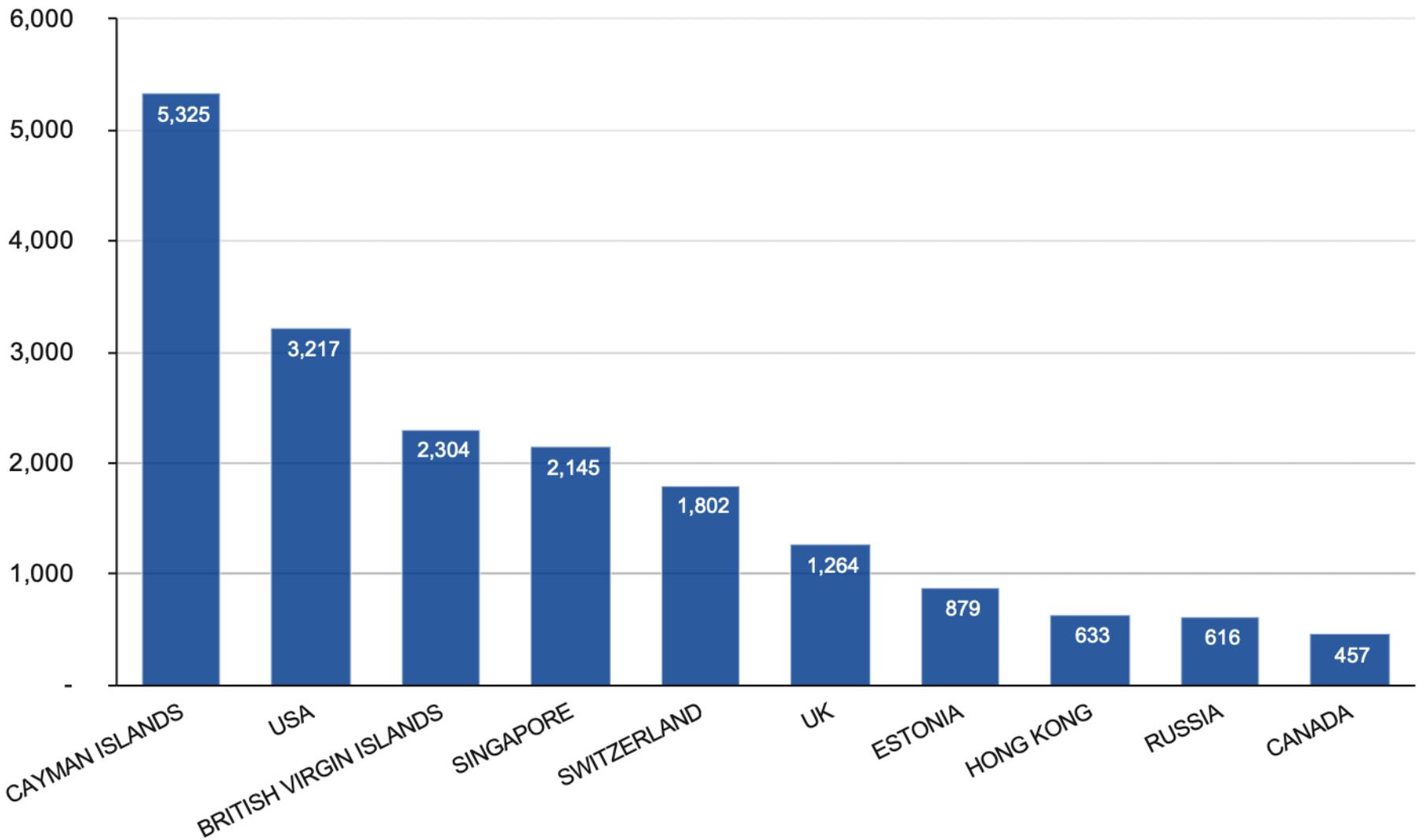
Today Paragon Coin trades at 12 cents -- less than 3% of its offering price.

# Volume, Geographic spread

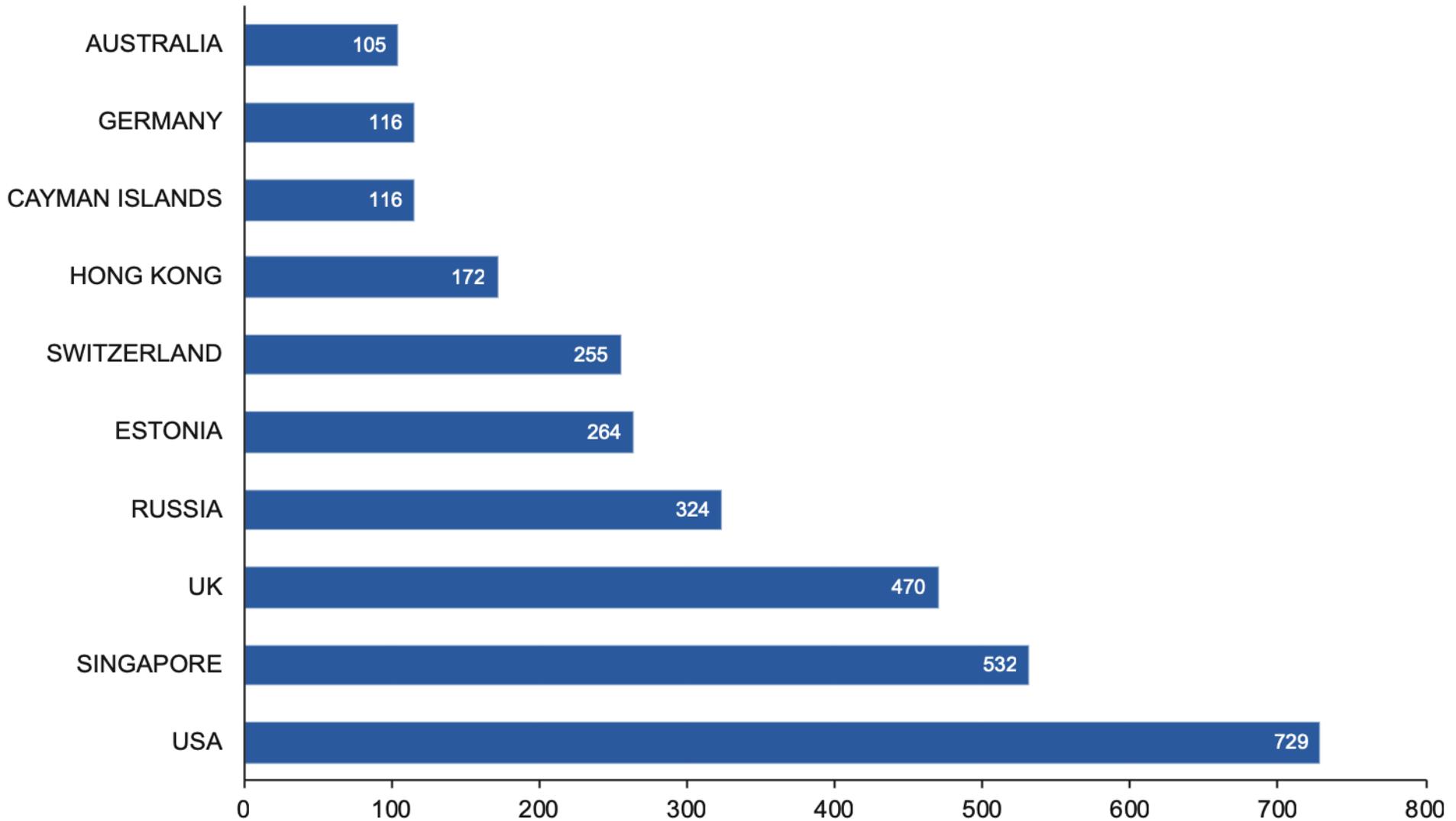
## ICOs' region of origin (by %)



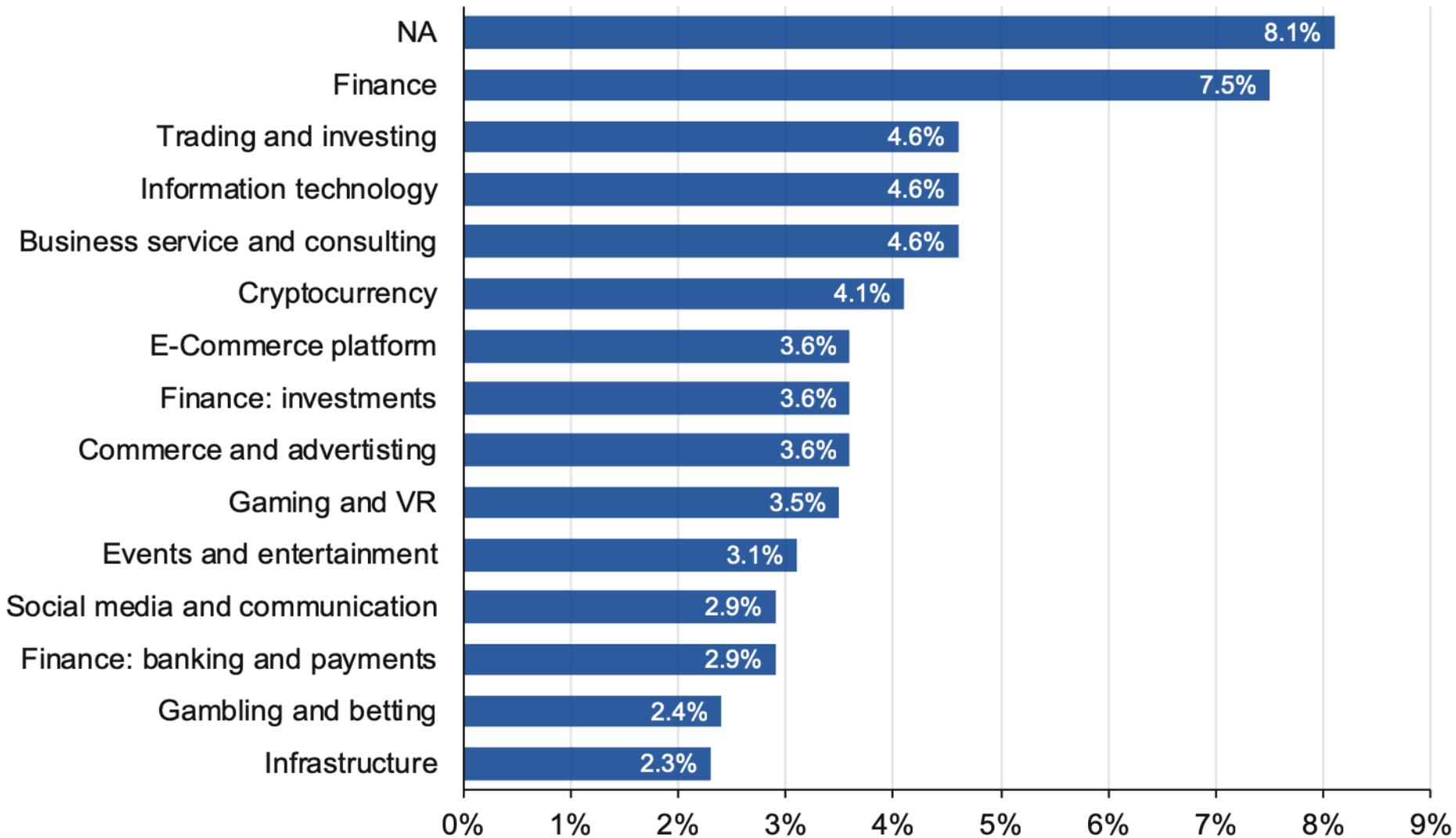
# Top 10 ICO jurisdictions (by millions of USD raised)



# Top 10 ICO jurisdictions (by number of ICOs)



# ICOs by industry



# Regulatory Implications of cryptoassets, CBDCs, and ICOs

Virtually no countries treat cryptos as money.

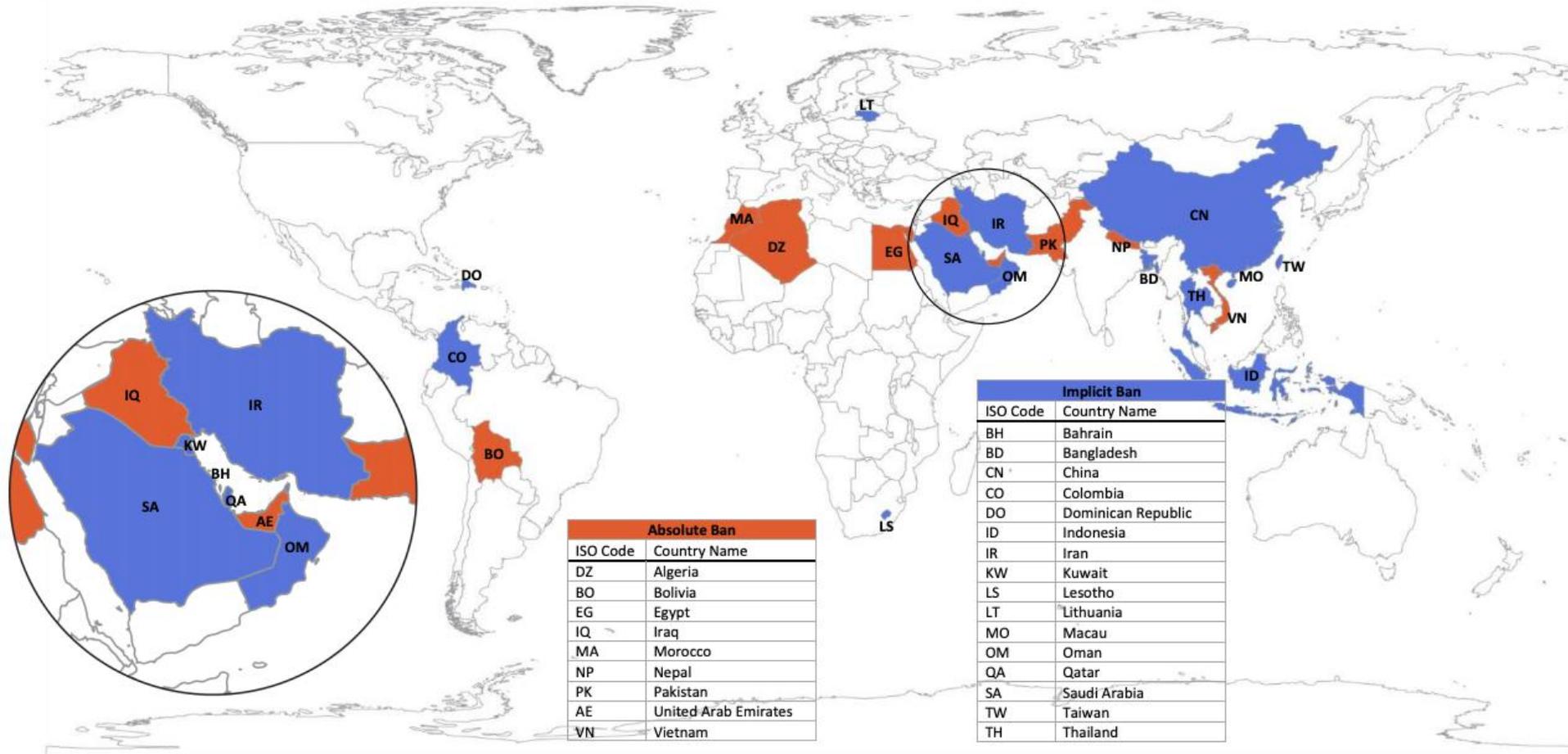
Most, like Australia, treat it as a commodity. So nearly everywhere, buying something with crypto is a barter-like transaction.

This also means profits on the sale of crypto are subject to capital gains tax.

Up until 2017 GST (our VAT) was also charged on crypto transactions, but is not any longer.

Credible CBDCs don't yet exist, so this waits to be seen, but presumably a CBDC is simply the existing national currency in another form.

# Global legal status of cryptocurrencies



Source: Law Library of Congress, *Legal Status of Cryptocurrencies*



# Regulation of ICOs

**A taxonomy – how to think about, classify and regulate ICOs**

**Currency Tokens** – a token reflects a right in another currency, either crypto or otherwise (**often will be a derivative or a MIS**).

**Equity Tokens** -- represent the right to share in a cash-flow derived from an asset other than a currency (**often will be a security**).

**Utility token** -- grants usage rights to holder (e.g. preferential access, software license etc.) (unless marketed by offering capital gains, **will often lie beyond the purview of financial regulation**).

Note -- Frequently primitive and immature documentation but certainly not always! Market is maturing (and moving towards the US as it does).

# Financial law: Equity tokens

- Will be “securities” in some jurisdictions → Registration & prospectus obligation
- SEC in *Munchee Inc.*: Assessment of economic realities underlying transaction required for determining status as security
- **Investor portfolio management:** Tokens may be financial instruments if “equivalent to shares” – cash flow + some influence
- **Collective investment:** MIS (i.e. raise capital from number of investors, with a view to investing for benefit of investors)?
- **Derivative:** if coin derives value from “underlying asset” → Req. AFSL
- **AML/CTF** will apply in many countries

# Our database reveals --

## Poor quality of whitepapers

- 18% only provide technical information – indeed a technical description of the underlying technology, and something about its potential uses and benefits, is about the only consistent feature of whitepapers
- Grossly inadequate information about initiators in almost 50% of whitepapers, with no info at all in over 30% of cases
- No description of financial circumstances in almost 25%
- In 32% no information on applicable law

Profound information asymmetry means this investment capital is often being misallocated

Further consequence -- **Impact of private law liability severely limited**

# HoweyCoins



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## PRE-ICO SALE IS LIVE

**15% BONUS ENDS IN**

**14 : 22 : 25 : 08**

Day(s)

Hours(s)

Minute(s)

Second(s)

**TOKEN SALE!**

[Learn More](#)



# HoweyCoins

## **DON'T MISS THIS EXCLUSIVE OPPORTUNITY TO PARTICIPATE IN HOWEYCOINS TRAVEL NETWORK NOW!**

Combining the two most growth-oriented segments of the digital economy – blockchain technology and travel, HoweyCoin is the newest and only coin offering that captures the magic of coin trading profits AND the excitement and guaranteed returns of the travel industry. HoweyCoins will partner with all segments of the travel industry (air, hotel, car rental, and luxury segments), earning coins you can trade for profit instead of points. Massive potential upside benefits like:

- HoweyCoins are officially registered with the U.S. government;
- HoweyCoins will trade on an SEC-compliant exchange where you can buy and sell them for profit;
- HoweyCoins can be used with existing points programs;
- HoweyCoins can be exchanged for cryptocurrencies and cash;
- HoweyCoins can be spent at any participating airline or hotel;
- HoweyCoins can also be redeemed for merchandise.

# HoweyCoins

## ICO – HOWEYCOINS

If You Responded To An Investment Offer Like This, You Could Have Been Scammed – HoweyCoins Are Completely Fake!



Welcome to Investor.gov, the Securities and Exchange Commission's site designed for individual investors. We've recently seen fraudsters pretending to be involved in blockchain technology, initial coin offerings, and crypto-currencies – when really they are simply operating scams designed to take investors' hard-earned money. We created the bogus HoweyCoins.com site as an educational tool to alert investors to possible fraud involving digital assets like crypto-currencies and coin offerings.

Fortunately, frauds like these often have a number of “red flags” that can help you tell if the so-called “investment opportunity” is really a scam. Our bogus site is a mash-up of a number of different things we've seen – any particular fraud may be harder to spot than the red flags here. Here are some of the signs of fraud that are on the HoweyCoins site – we hope reviewing these may help you recognize a real fraud in the future!

### RED FLAG: CLAIMS OF HIGH, GUARANTEED RETURNS

- ▶ “HoweyCoins is the newest and only coin offering that captures the magic of coin trading profits AND the excitement and guaranteed returns.”
- ▶ We anticipate OVER 1% daily returns, with DOUBLE 2% returns on Tier 1 investors in pre-ICO stage secured purchases.
- ▶ We also forecast a minimum growth rate of between 7% to 15% annualized, making HoweyCoins attractive for long-term investment. In addition, HoweyCoins can serve as a GUARANTEED hedge against inflation and market loss.

Every investment carries some degree of risk, which is reflected in the rate of return you can expect to receive. High returns entail high risks, possibly including a total loss on the investments. Most fraudsters spend a lot of time trying to convince investors that extremely high returns are “guaranteed” or “can't miss.”

# Part Five - Conclusions

Blockchain running on distributed ledgers is potentially transformative, but the use cases which will succeed are presently unsettled.

If I were a gambling man, I'd put my money on (i) bank back office clearing and settlement, (ii) securities issuance and registration, (iii) securities clearance and settlement on exchanges, (iv) land titles registries, and (v) trade and trade finance transactions, as among the more likely applications of some form of blockchain technology.

Cryptocurrencies have few legitimate use cases beyond remittances – which they should revolutionise.

CBDCs will be implemented I suspect. Watch China and Sweden.

ICOs have been in part a scam, and in part a response to the market failure by which financial systems very poorly serve ultra-innovative companies, SMEs and individuals.

## Lead Papers in Our Series

- Zetsche, Buckley, Arner & Fohr, "The ICO Gold Rush: It's a Scam, It's a Bubble, It's a Super Challenge for Regulators", forthcoming (2019) *Harvard International Law Jnl.*
- Didenko & Buckley, "The Evolution of Currency: From Cash to Cryptos to Sovereign Digital Currencies", forthcoming (2019) *Fordham International Law Journal*
- Arner, Zetsche, Buckley & Barberis, "The Identity Challenge in Finance: From Analogue Identity to Digitized Identification to Digital KYC Utilities", (2019) Vol 20 (1) *European Business Organisation Law Review*, 55-80.
- Zetsche, Buckley, Arner, & Barberis, "From FinTech to TechFin: The Regulatory Challenges of Data-Driven Finance", (2018) Vol 14 (2) *New York University Journal of Law & Business*, 393-446
- Zetsche, Buckley, Arner & Barberis, "Regulating a Revolution: From Regulatory Sandboxes to Smart Regulation", (2017) (1) *Fordham Jnl of Corp & Fin'al Law* 31-103
- D Zetsche, Buckley & Arner, "The Distributed Liability of Distributed Ledgers: Legal Risks of Blockchain", (2018) 4 *University of Illinois Law Review*, 1361-1406.
- Arner, Barberis & Buckley, "The Evolution of FinTech: A New Post Crisis Paradigm?", (2016) *Georgetown Journal of International Law*, 1271-1319.



Thank you.

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