

Study on Cryptocurrency and Blockchain in India: Technological Promise, Market Adoption, and Regulatory Ambiguity

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Abstract:

Everyone seems to have an opinion on cryptocurrency these days, but ask five different people, and you will get five different answers. This paper tries to cut through some of that noise. It examines how cryptocurrency and blockchain technology actually work, the various types of coins in circulation, why many Indians have taken an interest in cryptocurrency, and why the government and the RBI continually change their stance on how to handle it. The paper is not meant to be a technical deep-dive; the intention of this paper is simply to make sense of where things stand today, what the numbers are actually saying, and what is a reasonably sensible way forward for the cryptocurrency market.

Keywords: Cryptocurrency, Blockchain, RBI, Regulation, Bitcoin, Digital Currency, India

Introduction

Over the centuries, Money has changed shape many times. We have moved from simple barter trading and metal coins to paper notes and, nowadays, to the instant digital transfers most of us use every single day. Cryptocurrency is the next step in that story; except this time the “bank” isn’t a bank at all. Instead of one institution keeping the master record of all transactions, i.e., who owns what, thousands of computers around the world are involved, and each computers hold a copy, and they all have to agree before anything gets added. This is the basic idea behind blockchain, and Bitcoin was launched in 2009 by the anonymous figure named Satoshi Nakamoto, who was the first real-world proof that the concept could work. In India, people got interested in crypto after demonetisation in 2016, when people were suddenly a lot more curious about new investment avenues and about other alternatives to cash. Since then, the story has been one of enthusiasm but followed by caution; Indian government positions have actually been fairly straightforward throughout the drama. They genuinely like the underlying blockchain technology and want to use it, but they remain deeply wary of private cryptocurrencies operating outside the Reserve Bank's control.

Crypto and Blockchain

Strip away the jargon, and a cryptocurrency is digital money secured by cryptography, the same branch of maths used to scramble and unscramble secret codes. There’s no central authority printing it or deciding

who gets how much. Every transaction gets recorded on a blockchain, which is essentially a chain of linked digital blocks, each one carrying forward the closing balance of the one before it.

As these records are copied by many computers at once, altering even one transaction would mean it would stop matching everywhere else, so this process makes tampering very difficult. Bitcoin is the best-known example, which is capped at 21 million coins and currently commands roughly half the crypto market. Ethereum follows next and is less focused on being “money” and is more focused on letting developers build smart contracts, little pieces of code that execute automatically once certain conditions are met. Beyond these two sit dozens of others, Litecoin, Ripple, Stellar, and the list keeps growing every year.

The pie chart below gives a rough sense of how lopsided the crypto market really is. Bitcoin and Ethereum together still account for close to two-thirds of it, with everything else, from Litecoin to lesser-known tokens most people have never heard of, fighting over what remains.

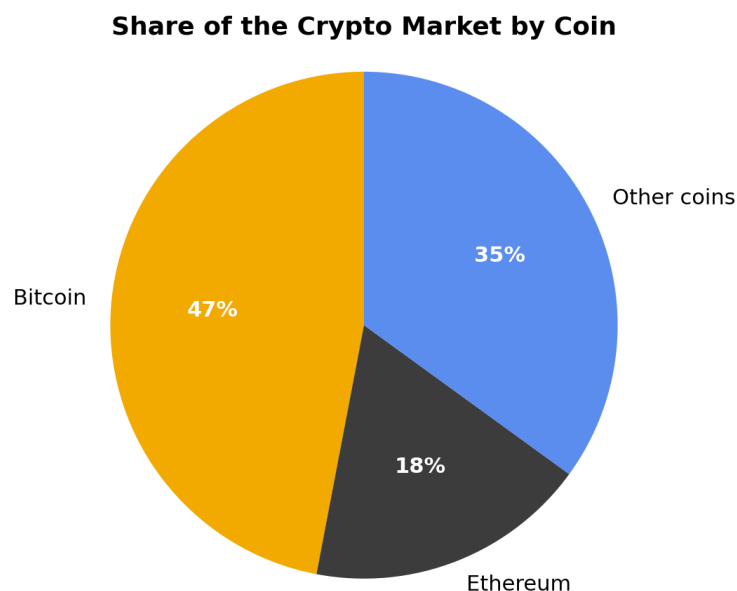


Fig. 1: Share of the global crypto market, by coin

Distinctive Features of Major Cryptocurrencies

Bitcoin might be the common name that comes up at the minds of each investor, but it is nowhere near the only cryptocurrency around. Depending on which website one checks, there are somewhere between four and five thousand of them floating about, though realistically, only a handful matter in terms of actual value. Bitcoin Cash broke away from the original Bitcoin in 2017 and largely allowed faster processing through a bigger block size. Litecoin, put together in 2011 by a former Google engineer named Charlie Lee, was built to settle transactions faster and cheaper than Bitcoin, and people fondly call it silver to Bitcoin’s gold. Ripple, on the other hand, does not really work like the rest of the crypto; it is not built on a blockchain in the classic sense at all, and its target audience is less the retail investor and more the banks and large institutions that need to move money across borders quickly. Stellar, set up by one of Ripple’s own co-founders, chases a fairly similar goal, though it is more concentrated on developing economies where people do not have easy access to formal banking. Then there is NEO, developed by China, going head-to-head with Ethereum on smart contracts, and Cardano, started by one of Ethereum’s own co-

founders, which likes to describe itself as more “scientific” and peer-reviewed in how it is built. Then IOTA, having been designed for the Internet of Things rather than finance, and it does away with the usual block-and-chain structure in favour of something its own creators call the Tangle. None of these newer coins has come anywhere close to dethroning Bitcoin or Ethereum, but the sheer number of them tells us how much experimentation is still going on under the surface.

Cryptocurrency Mining and Blockchain Forks

New coins are not printed the way rupee notes are; they are "mined", a word that has stuck around even though nobody is actually digging up anything physical. What really happens is that computers race each other to solve a fairly gruelling mathematical puzzle, and whichever one gets there first earns the right to add the next block to the chain, along with a reward in freshly created coins. It sounds rather exciting when described like that, but in practice, it is an expensive, power-hungry business. Serious mining needs serious computing hardware and burns through a startling amount of electricity, which happens to be one of the more legitimate complaints people have about Bitcoin specifically. As the total Bitcoin supply edges closer to its 21-million ceiling, the reward for successfully mining a block keeps getting cut in half every few years, so the economics of mining are forever shifting under the feet of the people doing it. Every once in a while, the community behind a particular cryptocurrency falls out over how the underlying software ought to work, and this is what leads to a "fork". A soft fork is the more civilised version, where the update remains backward-compatible and everybody more or less carries on together. A hard fork is a confusing affair altogether, as the old and new versions of the software simply stop understanding each other, and the blockchain splits cleanly into two separate coins from that point onwards. This is exactly how Bitcoin Cash was born out of Bitcoin, and how Ethereum Classic came out of Ethereum, after a chunk of the community refused to accept a change that the rest of the network had already signed off on.

Interest of Indian Investors in Cryptocurrency

A few things explain the pull. First, no middleman is taking a cut, which makes transfers cheaper and, in theory, faster. Second, it isn't tied to any one country's economy, so during global shocks like the COVID-19 pandemic, when traditional markets wobbled, Bitcoin held up surprisingly well and even attracted investors looking for a hedge. Third, and perhaps most simply, people don't like feeling left out of something that keeps making headlines, and crypto has certainly made plenty of those. That said, there's a catch. Transactions can't be reversed, buyers and sellers rarely know each other, and losing your wallet's private key means that money is gone for good. The same anonymity that appeals to ordinary investors also makes crypto attractive for money laundering.

To get a slightly more grounded sense of how Indians themselves feel about all this, it helps to look at some survey data collected on investor sentiment. The picture that emerges is not one of blind enthusiasm, nor of outright rejection, but something in between.

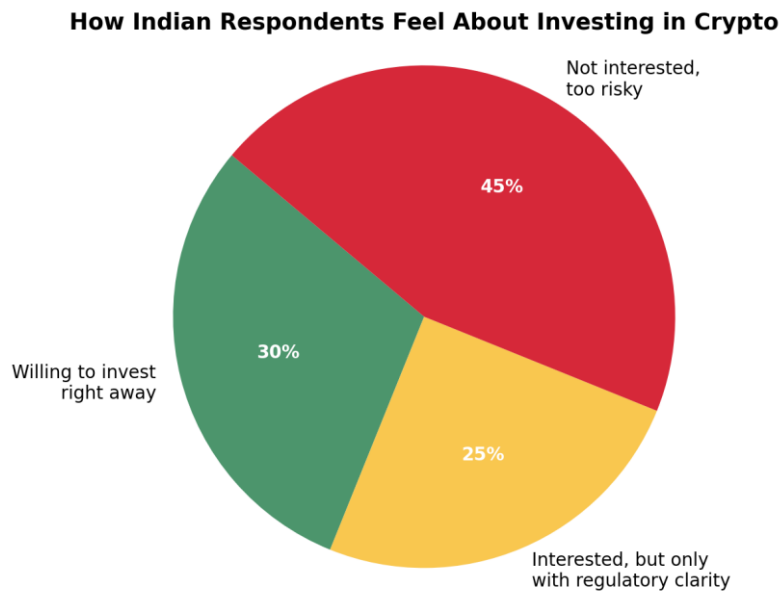


Fig. 2: Investor sentiment towards cryptocurrency among survey respondents

Roughly three in ten respondents said they would be willing to put money into crypto without waiting for anything further from the government, while about a quarter said they would consider it, but only once there was proper regulatory clarity. The remaining share, and this is the largest single group, said they would rather stay away entirely, citing the risk involved. Read together, this suggests that the appetite for crypto in India is real, but it is an appetite that is being held back mainly by uncertainty rather than by outright disinterest.

Cryptocurrency Regulations in India

India's relationship with crypto has been anything but smooth. The RBI first expressed unease around 2013, then in 2018 went further and barred banks from servicing crypto-related businesses altogether. That ban was not liked by the investors, and in 2020, the Supreme Court struck it down in the Internet and Mobile Association of India case, ruling the restriction disproportionate given that RBI couldn't point to any actual harm caused to regulated entities. Since then, things have stayed in a grey zone. There's no law banning crypto outright, so owning and trading it is legal, but it isn't legal tender either, meaning you can't walk into a shop and pay with Bitcoin. A government-appointed committee recommended banning private cryptocurrencies while allowing only an official digital currency, and a bill along those lines has been discussed without becoming law. Meanwhile, the RBI has been quietly working on its own central bank digital currency, under the working name "Lakshmi", which would put India in similar company to China, already some way ahead with its digital yuan, signalling that officials are far more comfortable with a state-controlled digital rupee than with decentralised alternatives.

Applications of Blockchain Technology in India

Interestingly, even as the government hesitates on crypto, it has been fairly enthusiastic about blockchain itself. Andhra Pradesh has used it for land records, ICICI has tested it for cross-border remittances, and NITI Aayog's India Chain project explored using it across government services. The technology's real

strength, tamper-resistant record keeping, has obvious uses in banking, insurance, supply chains and healthcare, well beyond just powering currencies.

The appeal for banking and insurance becomes fairly obvious once the buzzwords are set aside: a shared, tamper-resistant ledger cuts down on reconciliation headaches, speeds up trade settlement, and takes some of the manual drudgery out of regulatory reporting. Insurers have been exploring it to verify claims and catch fraud earlier than they otherwise might. In the public sector, digital identity and customer onboarding stand out as the more obvious use cases, since a blockchain-based identity record can, at least in theory, be verified instantly rather than being checked from scratch by every institution a person happens to deal with over a lifetime. Telecom companies have looked at it as a way to cut down roaming fraud, and even the retail sector has shown some interest in using it to store warranty and receipt records, if only to reduce the endless disputes over lost paperwork.

None of this has moved anywhere near as fast as the early enthusiasm suggested it might, but the general direction is not hard to read. The job market backs this up rather nicely. As the bar chart below shows, blockchain-related job postings in India are heavily concentrated around Bengaluru, with Mumbai, Hyderabad, Pune and Chennai making up most of the rest, and demand has been climbing steadily since around 2017.

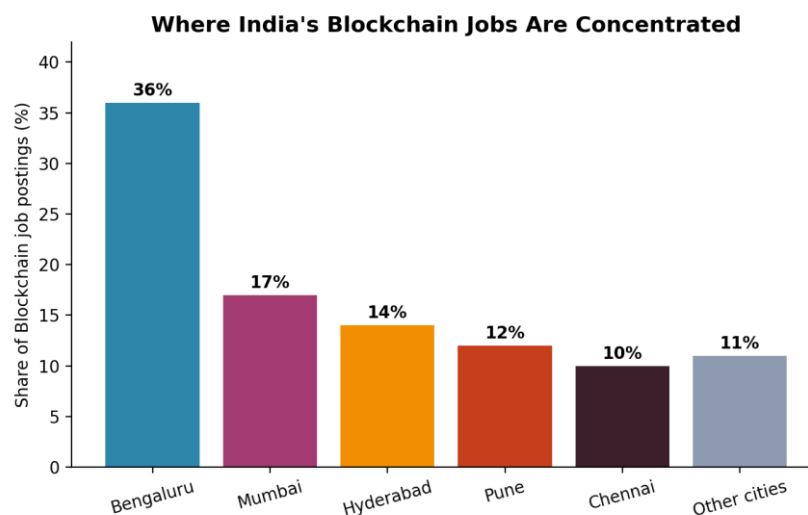


Fig. 3: Distribution of blockchain-related job postings across Indian cities

That distribution, more than any government press release, is probably the clearest sign that Indian industry sees blockchain as something more than a fad, even while cryptocurrency itself continues to make regulators distinctly nervous.

Risks and Challenges of Cryptocurrency

It would be a bit dishonest to spend this much time on crypto's promise without being equally upfront about its downsides, because there are enough of them to warrant real caution. The very absence of a middleman that makes crypto so appealing also means there is nobody to call when something goes wrong. Transactions, once sent, cannot be reversed, so a mistaken transfer or a scam payment is, for all practical purposes, gone forever. Losing the private key to a wallet produces much the same result; there is no "forgot password" link to click, and certainly no branch manager to plead one's case to. Prices are also

notoriously volatile, capable of swinging by double-digit percentages within the space of a single day, which makes crypto a rather uncomfortable place to park money one genuinely cannot afford to lose. Taxation, too, remains something of a grey area. India's income tax law has never spelt out in plain terms how gains from crypto should be treated, though the tax department has certainly not ruled out treating them as capital gains, the exact classification depending on how long the asset was held. And then there is the environmental side of things: mining, particularly for Bitcoin, consumes an eye-watering amount of electricity, enough that certain estimates place its energy footprint on par with that of a mid-sized country, which sits rather awkwardly alongside India's own climate commitments. None of this is reason enough to dismiss crypto altogether, but it is exactly the sort of thing a sensible regulatory framework should be built around, rather than being left to chance the way things stand today.

Conclusion

Put all of this together, and cryptocurrency in India comes across as a strange, half-finished sort of story. It is legal to hold, yet not legal to spend at the local shop, and millions of Indians have already put real, hard-earned money into it, even though there is still no rulebook worth the name protecting that money. Blockchain, the technology sitting underneath all of this, has meanwhile earned itself a far warmer welcome, quietly working its way into banking, insurance, land records and much else besides, almost as if the government has decided it rather likes the engine, while still being suspicious of where the car might eventually be driven.

Banning crypto outright at this stage would probably do more harm than good, if only because a market of this size rarely vanishes just because a law says it must; it tends to slip underground instead, and that helps absolutely nobody, least of all the ordinary investor trying to do things properly. Equally, carrying on exactly as things are, stuck in a grey zone with no consumer protection and no tax clarity, is hardly a responsible option either. What India genuinely needs is neither a flat "yes" nor a flat "no", but a sensible set of ground rules, the kind that lets honest investors and legitimate businesses plan with some confidence, while keeping the door firmly shut on the fraud and money laundering that give this entire space such a poor name. At this point, the real question is not whether cryptocurrency can somehow be wished away, because it plainly cannot be. The real question is whether India chooses to actively shape where this technology goes from here, or simply continues reacting to decisions being made everywhere else in the world.

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