Chinese Geopolitical Strategy and Bitcoin
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Summary of Findings
This paper is an investigation of the theory, historical practice, and future prospects of currency manipulation as an instrument of coercion, and its effectiveness on crypto-currencies. The findings are:

1. Exchange rates can be manipulated by foreign powers.
2. Currency manipulation has been used as an instrument of warfare.
3. Bitcoin is not likely to be destroyed by China for either geostrategic purposes or money laundering.
4. Bitcoin may be at risk of a Chinese attack to stem money capital flight.

The paper itself will be structured to discuss the threats to bitcoin, why currency coercion is theoretically worthwhile, whether currency coercion is possible, a historical example of it, the present and future cost of a 51% attack on bitcoin, and then which motives, if any, are ones China would act upon.

Background
Both proponents and skeptics of the viability of bitcoin have identified economic and technical obstacles to wider adoption. Issues concerning selfish-mining, collusive behavior, confirmation times, user-unfriendliness, and further concerns encompass some of the technical problems preventing wider adoption. A segment of policy-makers and economists have identified other potential economic concerns that could hamper the wider adoption of bitcoin. The inflexible supply of bitcoins, a feature to many enthusiastic adopters of bitcoin, is a bug to many economists who believe an elastic monetary supply is an essential tool for mitigating financial panics. Its status as a deflationary currency to some is instrumental to its success, and to others its ultimate flaw.

Beyond the reasons enumerated above, there could be strictly political threats to the further success of bitcoin. Actors endogenous to the bitcoin ecosystem: miners, wallets, and exchanges, can intentionally or unintentionally undermine the system. An underexplored threat to bitcoin is the threat posed by exogenous actors, namely states that are have malicious intent towards bitcoin as a currency.

The state has a number of tools at its disposal to undermine trust in bitcoin. It can seek to discourage acquisition and use of bitcoin through legal hurdles and restrictions. China has already forbidden commercial banks from accepting bitcoin in transactions and censors publicity of bitcoin events[1].

States could also, in principle, invest in the requisite power and computational infrastructure to directly undermine bitcoin through a 51% attack. A 51% attack enables an attacker with over 50% of the hashing power of the network to double-spend transactions, block confirmations of transactions, and acquire all new blocks on the blockchain over a sufficient

[1] "China Now Controls Bitcoin (and That's Just the Beginning)." CCN Financial Bitcoin Cryptocurrency News.

time-scale[2]. While this attack doesn't allow for the attacker to reverse prior transactions or directly empty the bitcoin wallets of users, a successful 51% attack will likely disrupt the payment network significantly, and undermine trust in bitcoin as a medium of exchange. This makes understanding if there are state motives for undermining bitcoin important, as states are one of the few actors with the resources to sink into a 51% attack without expecting value from the mined bitcoins in the attack.

China has a number of characteristics that makes it an ideal country to begin an investigation into the intersection of geopolitical strategy and bitcoin. Most obviously, it is one of the largest economies in the world. China is the second largest economy in the world, only lagging the US in real Gross Domestic Product (the value of annual domestic production in a nation). This is important, because if undermining bitcoin were unaffordable to the Chinese government, the only other country with the resources to undermine the network would be the US. This would suggest a 51% attack is unaffordable to nearly every actor on the planet, and would make bitcoin a more trustworthy store of value for savers.

China shares potential motives for undermining bitcoin with both Great Powers and developing countries. Capital flight is a concern for China, as it is for other middle-income countries like Argentina, and more recently Greece. China keeps another foot closer to traditional Great Power motives. China is big enough to have geopolitical interests covering Asia, and arguably has global interests as well. China has potentially both domestic and international motives for manipulating bitcoin to pursue its interests.

Currency manipulation as a tool of warfare

Currency manipulation competes with three other forms of more visible forms of economic coercion states have at their disposal: aid, trade, and finance.

According to Jonathan Kirshner, author of *Currency and Coercion*, currency is superior to these forms of economic coercion due to its "efficiency" and effectiveness. Efficiency is used to mean the level of control the government has deploying a weapon of economic warfare. The Executive branch has the least control over the deployment and effectiveness of trade sanctions. There are two reasons for the relative inefficiency of trade sanctions against geopolitical rivals. In representative democracies, sanctions typically originate in the legislative branch. Since trade sanctions apply to specific goods and services, the sanctions invariably harm an industry that organizes as a special interest in the legislature. Feedback from special interests dilutes the effectiveness of the sanction itself. Even once sanctions are applied, its impact on the target may be cushioned by private industry substituting sanctioned goods and changing supply chains to countries friendlier to the target. Aid and finance sanctions are less evadable than trade sanctions, but are still subject to domestic pressure by special interest groups.

Currency coercion avoids both traps. Since currencies are under the control of the central bank, and costs and benefits of exchange rates are dispersed around the economy. There is much less domestic pressure to temper sanctions to appease a domestic special interest group. The bite of a devalued currency is also nearly impossible to avoid. A weaker currency

[2] "Weaknesses"-Bitcoin wiki.

influences the prices of a huge basket of goods, and currencies can't (easily) be substituted for other currencies when prices change[3].

Equilibrium

Currency coercion appears to be a theoretically effective tool for economic warfare-stipulating countries can actually have a malicious impact on exchange rates. If markets tend to equilibrate to a natural exchange rate, efforts by states to destabilize rival currencies would be fruitless. Conversely, if exchange rates show high levels of empirical volatility, and don't appear to have a theoretical equilibrium, then there is room for state currency coercion.

Milton Freidman believed currency speculation was stabilizing because speculators would put upward pressure on prices when an exchange rate was below fundamental equilibrium exchange rates, and visa versa when a currency exceeded its fundamental exchange rate[4]. Models of fundamental exchange rates have ranged from the FEER model pioneered by Williamson, based off of the balance of payments between two countries, and models based on expectations of GDP growth and inflation. In principle, neither of these expectations should wildly swing if markets behaved consistently with theory and actors were rational[5].

The history of exchange rates belies Freidman's prediction of relative stability in the post-Bretton-Woods era. Below are a few illustrative examples of exchange rate volatility. Note that the large swings in exchange rates are not necessarily in and of themselves "irrational". Indeed, many of them are responses to negative information about the future fundamentals of an economy. Devaluations above 50% suggest either prior exchange rate were significantly overvalued relative to "fundamental exchange rates" or the bottomed out valuation significantly undervalues the currency.

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[3] Kirshner, Jonathan. *Currency and Coercion: The Political Economy of International Monetary Power*. P. 28-29

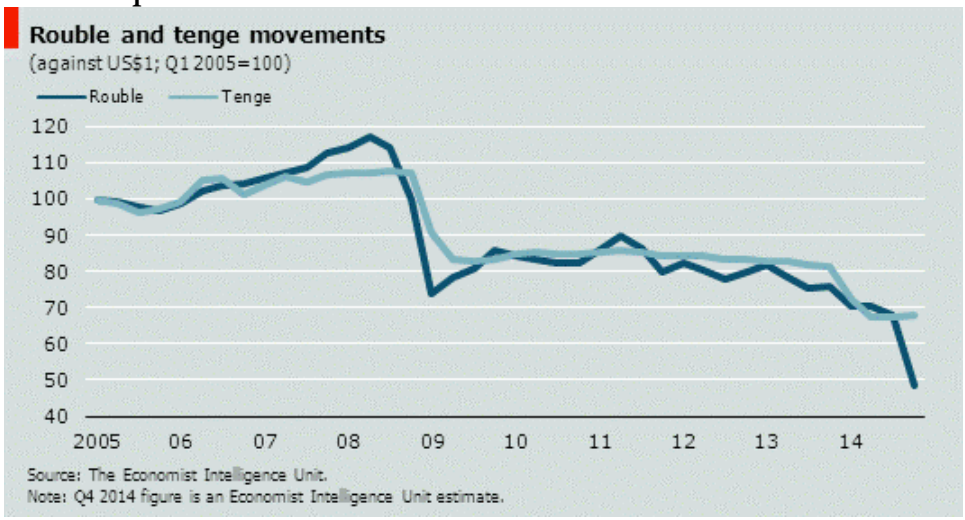
[4] "Milton Friedman on Exchange Rate Policy #3." The Market Monetarist.

[5] Clark, Peter, and Ronald MacDonald. "Exchange Rates and Fundamental: A Methodological Comparison of BEERS and FEERS."

1997 East Asian Financial Crisis: Relevant Exchange Rates

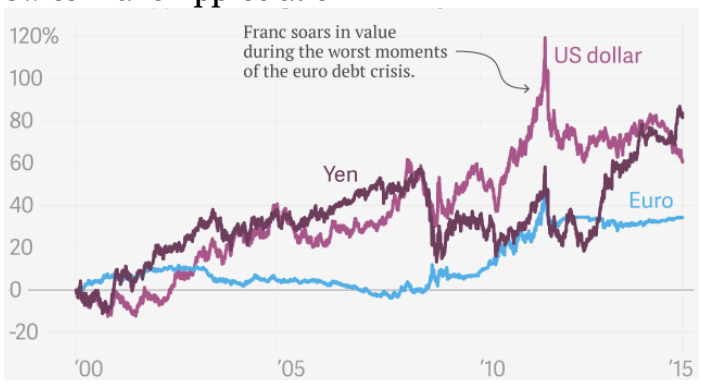
Source: The Economist

Ruble Depreciation



Source: The Economist

Swiss Franc Appreciation



Source: QZ

Volatility suggests the market may not be able to absorb large sell-offs of currency by a state looking to undermine the currency of the state it is selling. In fact, markets may view the sell-off as an indicator of future sell-offs and reinforce the attack on the currency.

Historical example of strategic currency manipulation

Nigerian Civil War

The Eastern province of Biafra, a populous province in Nigeria, declared independence in 1967. The Civil War that followed was bloody. The central government blockaded oil exports and cut off food from the rebelling province. However, the Nigerian army was poorly trained and only had 7,000 men. Nigeria was in no position to wage a war of attrition. To cripple the finances of Biafra, the central government decided to make a new currency. Since Biafra had not taken steps to create its own currency, it was still dependent on Nigerian currency for daily economic activity. In 1968, the Nigerian central government unveiled a new currency and announced it would be unconvertible with old currency in 19 days. Individuals were allowed to convert 30 Nigerian pounds and businesses 600 Nigerian pounds to the new currency. Ending the legality and convertibility of the old currency was disastrous for Biafra. The exchange rate of the old currency for foreign exchange collapsed on the black market, wiping out the value of Biafran reserves. The rebels lost 30 million Nigerian pounds, bankrupting them. After the war, Biafran General Alexander Madiebo credited the currency switch with striking a grievous blow against the rebellion. This case illustrates the potential value of undermining an enemy's currency, and how a successful attack on bitcoin could potentially cripple an economy dependent on it for transactions[6].

Methodology

This paper evaluates three motivations for a 51% attack on bitcoin. Motivations considered include external geostrategic motivations against a foreign power dependent on bitcoin and internal motivations to prevent money laundering or capital flight. To measure the amount a country would be willing to invest in order to cripple the use of bitcoin for the activities described above, I will look at historical data to piece together the percentage of GDP other countries were willing to invest in order to achieve similar objectives at different points of space and time. A cost to GDP ratio is used over absolute dollar figures or ratios against government/military spending for a few methodological reasons. Using a ratio against GDP over absolute dollar figures allows comparisons between otherwise economically dissimilar countries by normalizing the costs- adjusting for differences in economic scale over time and space. GDP is a more widely and accurately reported data point for countries than government spending or military budgets (many times concealed for strategic reasons). Furthermore, government and military budgets can be increased at the margin for military reasons in a way GDP can't. Cost to GDP ratios give a more accurate picture of what a country would be willing to invest presently.

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6 Ibid

Cost

It is both easier and harder to undermine bitcoin. Its easier in that the path to undermining bitcoin is much more well-understood. If an entity has over half of the hashing power, trust in the system will be significantly reduced, which guarantees non-trivial amounts of wealth destruction.

On the other hand, as bitcoin grows larger, it becomes more costly to acquire enough computing resources to carry out the attack. Conventional currencies didn't historically become harder to attack as they became more prominent. During World War II, Nazi Germany developed a plan to sabotage the British economy by dropping counterfeit notes over British cities and countryside[7]. The plan wasn't completed because Britain had regained air superiority over the home-islands, but the theoretical ease of sabotage was not proportional to the scale and prestige of the pound-sterling itself. This is a good sign. As bitcoin becomes more important in the world financial system, it should be harder to attack.

Present costs

The big-picture formula for the cost of acquiring the computing resources is as follows:

$$(cost\ of\ computer) * (\frac{difficulty * 2^{32}}{600 * computer \frac{H}{s}})$$

The electricity cost can be thought of as follows:

$$((computer\ power\ draw * number\ of\ computers) * \left(dollars\ per \frac{kW}{h} / 1000\right))$$

The source I used had the following data to calculate the computational and electricity costs as of September 17th, 2015[8] :

Data	**Value**
Antminer S5+ H/s	7.7e12 H/s
Antminer S5+ cost	$2,300
Network difficulty	5.60E+10
Power draw per Antminer	3.4 kW
Electricity cost	$0.045

The resulting computational cost using the above data and formula reaches $120 million with an electricity cost of $8,000 per hour. According to the IMF, Chinese GDP in 2015 is

[7] ibid.

[8] Eldredge, Nate. "How Much Would It Cost to Do a 51% Attack." Mining. Accessed December 8, 2015. http://bitcoin.stackexchange.com/questions/40577/how-much-would-it-cost-to-do-a-51-attack.

approximately $11.3 trillion dollars[9]. This means the computational resources for a 51% attack would cost China **.01% of GDP**. However the data above could be modified. The network difficulty has since risen to 7.9e10, a 40% increase. Furthermore, electricity in Shenzhen, China costs approximately $.075 kW/h, which is 60% higher than power in Washington State, US[10]. This, and complications involving labor, overhead, acquiring the miners, and more would increase the cost of conducting a successful attack. That said, this number is moer intended to give an estimate of the order of magnitude cost it would take for China to conduct an attack and less of a precise estimate of the full cost of a 51% attack.

Future costs

Bitcoin is currently not geopolitically relevant. Bitcoin has a market capitalization of $5 billion dollars[11]. A 51% attack on bitcoin probably wouldn't existentially harm the national interest of any country, besides upsetting black market dealers, technologists, libertarians, and combinations of the three. Bitcoin would only be attacked for tactical reasons if it grew to sufficient scale to damage a geopolitical rival of China's. To estimate the cost of attacking bitcoin in this hypothetical world takes many more generous assumptions. A market capitalization of 20 trillion dollars by 2030 means bitcoin will be a significant foreign exchange asset. The Yuan was recently brought into a special club of Important Currencies in the IMF's "Special Drawing Rights" currency basket. This imbues the Yuan with "reserve currency" status. Chinese GDP is currently at $11.3 trillion dollars. A 20 trillion dollar currency in 15 years would have to merit similar attention. It would also potentially make it worth attacking.

To calculate the cost to Chinese GDP of a 51% attack in 2030, I will assume the proportion of money necessary to successfully attack bitcoin to market capitalization remains stable in 2030. This is intuitively logical. As the market capitalization of bitcoin increases, mining bitcoin becomes a more profitable activity. This encourages miners to enter the market, driving up the network difficulty and cost of attack in the long term. Below are the graphs of network difficulty and market capitalization over time.

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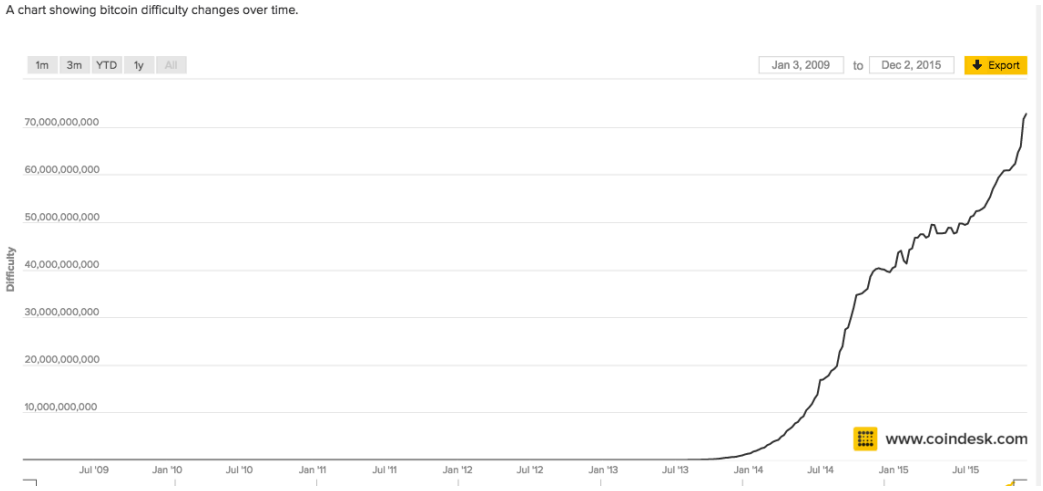
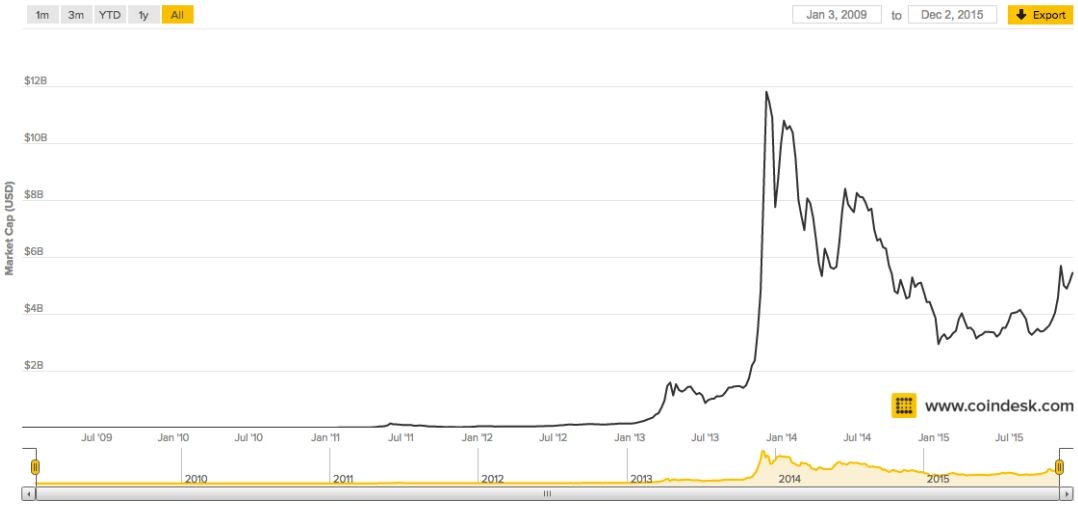
[9] "World GDP Ranking 2015 | Data and Charts - Knoema.com." Knoema.
[10] "Tiered Power Bill Debated." Shenzhen Government Online.
[11] "Bitcoin Price Index - Real-time Bitcoin Price Charts." CoinDesk RSS. Accessed December 8, 2015. http://www.coindesk.com/price/.

Network Difficulty 2009-2015



Source: coindesk

Bitcoin Market Capitalization 2009-2015



Source: coindesk

The relationship between the difficulty and market capitalization of bitcoin is roughly positive, with some caveats. What is surprising is that sharp drops in market cap don't yield a significant drop in network difficulty, while increases in market cap yield a quick increase in difficulty. My intuition would expect the exactly the opposite, since gaining more computing capacity is a fixed cost investment to be made more judiciously, while mining less is simply a question of letting the ASICS idle. The results are counter-intuitive, and while interesting, are outside the scope of this paper.

Using a $120 million price of attack with a $5 billion market capitalization in September 2015, the proportional price of attack to a $20 trillion dollar market cap bitcoin is $480 Billion.

Chinese GDP in 2030, using my assumptions of a 5% growth rate (China is attempting to become a consumer oriented economy), 3% inflation, and 2% annual Yuan appreciation leads to a GDP of $56 trillion. An attack in 2030 would therefore cost China **.85% of GDP**.

Geopolitics

Measuring the costs and benefits of any tactical measure in war or politics is extremely difficult if not impossible to construct *a priori*. Therefore, to understand whether or not attacking bitcoin would be tactically "worth it," we have to measure it looking back at earlier instances of currency coercion to get a picture of what the aggressors were willing to invest. The data is sparse, considering many acts of coercion are done covertly, but what is out there indicates little money was invested since it wasn't particularly costly. The examples of Germany creating counterfeit British notes or Nigeria making a new currency are not very costly. Even the US dumping pounds to make the British withdraw from the Suez Canal was nearly costless because British currency was pegged. The price didn't drop in the sell-off. It was simply a threat.

Japan imposing the Yen on China during WWII is an example of a potentially costly currency manipulation that may not have been costly at all. Japan introduced the Military Yen into Occupied China during WWII. They introduced $1 Billion Yen worth of currency into the Chinese economy, which was approximately 1% of Japan's $31 Billion GDP[12]. However, at the same time, they drained China of National Chinese dollars, and banned its use, which reduced the cost burden of introducing the new Yen into China would have had on the Japanese economy[13].

Given the .85% of GDP cost of a 51% attack in 2030, and the upper bound of 1% GDP invested by Japan to manipulate currency, the cost-benefit of attacking looks indeterminate. However, note that the $20 trillion dollar market capitalization of bitcoin in 2030 wouldn't just be in a geopolitical rival like the US. Goldman Sachs estimates 80% of bitcoin transactions exchanging Yuan for bitcoin[14]. That means a 51% attack in 2030 will not only harm China's rival, but will also harm Chinese citizens with similar, if not more losses. Attacking bitcoin for strategic purposes probably will be a losing proposition, since China would be spending money to harm itself as much as a rival.

Money laundering

Bitcoin's currently $5 billion market capitalization comes from speculators, early adopters, and almost certainly from black market economic activity. If significant amounts of money are laundered through bitcoin, it could be in the national interest of the Chinese to shut down the currency to damage socially subversive elements in China. Before addressing whether money is actually laundered through bitcoin, let's look at the cost of current anti-money laundering (AML) operations, and where that stacks up against shutting down bitcoin. According to pymnts.com, the US spends $7 billion dollars on AML operation and

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[12] "Quantitative Comparison: Germany, Japan and the US • Axis History Forum." Axis History Forum. Accessed December 8, 2015. http://forum.axishistory.com/viewtopic.php?t=191473.
[13] Ibid. Page 59-60.
[14] Banjo, Shelley. "80% of Bitcoin Is Exchanged for Chinese Yuan." Quartz.

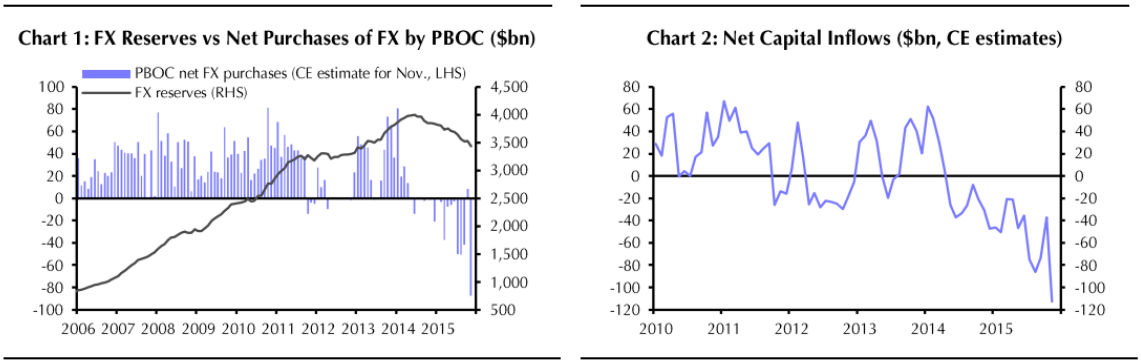
seizes assets on the "hundreds of millions" order of magnitude[15]. US GDP in 2015 is $18 Trillion dollars; meaning .03% of US GDP is invested in AML efforts[16].

Its unclear shutting down bitcoin would in practice reduce much money laundering activity. Homeland Security officials reportedly rejected efforts by Senators to increase the regulator's power to enforce AML laws on bitcoin[17]. While it's hard to estimate money laundering activities on bitcoin (and in general) since launders aren't prone to reporting their finances, the lack of regulator interest can be taken as at least a small signal that Chinese money laundering hasn't made its way en masse into the bitcoin ecosystem. A 51% attack on bitcoin on the account of money laundering accordingly seems unlikely.

Capital flight

Capital flight is hypothesized to be driving the most recent surge in bitcoin price. Macroeconomic instability in China has been driving capital flight through conventional channels- over-invoicing imports and withdrawing Yuan when traveling abroad.

Capital outflows have been especially sharp in 2015 according to *The Financial Times*.



Source: *Financial Times*

With capital outflows hitting $120 Billion in late 2015, only .1% of capital outflows need to be going through bitcoin to match the cost of a 51% attack today. This is true even though China has capital controls, restricting the amount of Yuan that is legally allowed to leave China to $50,000[18].

Capital flight is particularly dangerous to a highly indebted economy with overheated asset prices. Yuan leaving a country puts downward pressure on the exchange rate, drawing down foreign exchange reserves. If there is devaluation, the real burden of foreign denominated debts increases, increasing the likelihood of a financial crisis. Capital flight also puts

[15] "The Global Cost Of Anti-Money-Laundering Efforts"
[16] Ibid.
[17] Mangu-Ward, Katherine. "Are Bitcoins Really Making Money Laundering Easier?"
[18] Durden, Tyler. "China Scrambles To Enforce Capital Controls (Which Is Great News For Bitcoin)."

downward pressure on overinflated asset prices as people sell Yuan denominated assets. For assets like property that are used as collateral on debt, the falling prices slows the economy and makes banks insolvent, also precipitating a financial crisis. As such, the Chinese have a strong interest in controlling the outflow of capital. There is already evidence that the Chinese have used bitcoin to circumvent capital controls. In 2013, a "triangle arbitrage" opportunity opened up, where the bitcoin price in dollars on Chinese exchanges were higher than the dollar price in US exchanges[19]. This opportunity existed because the foreign exchange peg held up by the Chinese central bank was above the USD-CNY exchange rate mediated through bitcoin.

If capital flight through bitcoin rapidly gains momentum, the risk of a Chinese 51% attack could become real. The actual attack would be preceded by the government shutting down exchanges and by *threats* of a 51% attack. Its quite likely China wouldn't even need to attack bitcoin itself, the threat along would significantly rock markets because everybody knows the threat is credible- China can easily afford shutting down the currency. This scenario only seems likely if capital flight in general and through bitcoin increases very suddenly and drives down most of Chinese foreign exchange reserves, which doesn't appear to be happening.

Conclusion

It would be unwise for China to attack Bitcoin for geostrategic reasons if bitcoin becomes a mainstream currency in its own right. The global distribution of bitcoin holdings combined with the large expense projected for a bitcoin attack in the future makes the upside of a 51% attack on bitcoin quite low in both economic and military terms. Significant Chinese capital flight through bitcoin could pose a threat to the value of bitcoin through the *threat* of a 51% attack, even if the attack itself is not likely. Therefore, if the price of bitcoin ascends rapidly again, keep the threat of a 51% attack in the back of your mind before putting your savings into bitcoin.

[19] "China Bitcoin Arbitrage Ends as Traders Work around Capital Controls."

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