

FALL 2014 **CENTRAL** Banker

NEWS AND VIEWS FOR EIGHTH DISTRICT BANKERS

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Bitcoin and Beyond

The Possibilities and Pitfalls of Virtual Currencies

Virtual currencies have taken center stage in the media, with the currency bitcoin making a number of headlines so far this year:

- In January, the Sacramento Kings of the NBA announced it would accept bitcoin as payment for tickets and merchandise from the team store.
- In February, the bitcoin exchange Mt. Gox halted all withdrawals and announced it had lost almost 850,000 bitcoins, which had a total value of about \$480 million at the time.
- In March, the IRS ruled that bitcoins would be treated as property, not a currency, for tax purposes.
- In July, computer company Dell announced it would accept bitcoins as payment through its website.

With public interest in virtual currencies piqued, the Federal Reserve Bank of St. Louis presented "Bitcoin and Beyond: The Possibilities and the Pitfalls of Virtual Currencies" as part of its *Dialogue with the Fed* series earlier this year. *Dialogue with the Fed* was started in the fall of 2011 to address key economic and financial issues of the day and to provide the public with the opportunity to ask questions of Fed experts.

In this session, David Andolfatto, a vice president and economist with the St. Louis Fed, discussed the rising popularity of virtual currencies, focusing specifically on bitcoin. He explained what bitcoins are and how they work, and he addressed some commonly asked questions about the currency.

For the system to work, participants must trust the integrity of the blockchain. It's absolutely critical. The power to alter or fabricate the history of transactions is the power to steal.

What Is Bitcoin?

Andolfatto explained that he thinks of bitcoin as a computer program designed to do two things:

- Create and manage a supply of digital currency units called bitcoins
- Process payments between anonymous users by debiting and crediting digital accounts with these bitcoin units

Credit for developing this program is given to Satoshi Nakamoto, though many information technology industry watchers believe the name is likely a pseudonym for a programmer or a group of programmers. The bitcoin program is open source, meaning that the program is developed in a public, cooperative manner and anyone can read the program and work to fix bugs and make improvements.

How Bitcoin Works

To begin using bitcoins, Andolfatto explained that users must down-

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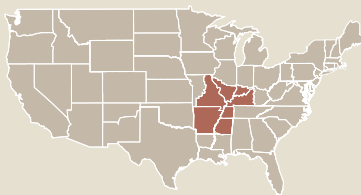
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Fed Banks Complete Research on Payment System Improvements

By David Sapenaro



David Sapenaro is the first vice president of the Federal Reserve Bank of St. Louis and chair of the Executive Management Group under the Fed's Financial Services Policy Committee.

Changes in the U.S. payment system over the past few decades—even over the past few years—have been truly remarkable. With these changes comes opportunity, which is why the Federal Reserve has been collaborating with key stakeholders to evaluate how the payment system can be improved to keep pace with these and future innovations.

In the coming months, the Fed will release a payment system improvement roadmap. The report is the culmination of significant research and analysis conducted over the past two years. In the fall of 2012, the Fed's Financial Services Policy Committee began reviewing the current state of the payment system and gathering feedback from stakeholders. In September 2013, the Fed released a public consultation paper that solicited comments from stakeholders on the gaps and opportunities present within the current payment system, as well as desired outcomes, strategies and tactics to shape the future of U.S. payments. The paper also described the Fed's role in implementing the strategies and tactics.

Driving this evolution of change is the desire to increase payment speed while improving the safety and security of the system. One of our subsequent research efforts explored needs related to faster retail payments and included insights on end-user demand for specific payment attributes and a consultant-led assessment of alternatives for speeding up U.S. payments.

Additional initiatives involved identifying gaps and opportunities related to payment system security and analyzing the business case to adopt the ISO 20022 international payment standard for the U.S. payment marketplace. The business case analysis was conducted in collaboration with three other industry organizations:

- The Clearing House Payments Co.
- NACHA—The Electronic Payments Association
- The Accredited Standards Committee X9

The responses we received on the public consultation paper indicated strong support for the desired outcomes but differing views on how these outcomes should be accomplished. Accordingly, the Fed spent the past several months discussing and debating potential strategies we would pursue in support of the desired outcomes and vetting potential strategies with various payment stakeholders. The Fed plans

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Earnings, Asset Quality and Capital: Community Banks and Thrifts

	2013:Q2	2014:Q1	2014:Q2
RETURN ON AVERAGE ASSETS¹			
All US Banks	1.06%	0.97%	1.01%
All Eighth District Banks	0.99	1.01	1.08
Arkansas Banks	1.28	1.31	1.38
Illinois Banks	0.80	0.77	0.84
Indiana Banks	1.03	0.87	0.97
Kentucky Banks	0.90	0.94	0.96
Mississippi Banks	0.86	0.91	0.94
Missouri Banks	0.99	1.06	1.06
Tennessee Banks	0.84	0.93	0.95
NET INTEREST MARGIN			
All US Banks	3.72%	3.74%	3.76%
All Eighth District Banks	3.78	3.83	3.84
Arkansas Banks	4.33	4.48	4.53
Illinois Banks	3.41	3.44	3.47
Indiana Banks	3.70	3.73	3.68
Kentucky Banks	3.80	3.75	3.80
Mississippi Banks	3.97	3.84	3.87
Missouri Banks	3.58	3.65	3.61
Tennessee Banks	3.81	3.81	3.85
NET NONINTEREST EXPENSE RATIO			
All US Banks	1.86%	1.97%	1.94%
All Eighth District Banks	1.91	1.99	1.97
Arkansas Banks	1.80	1.98	1.90
Illinois Banks	1.79	1.98	1.95
Indiana Banks	1.77	1.96	1.82
Kentucky Banks	2.08	2.10	2.14
Mississippi Banks	2.14	2.11	2.10
Missouri Banks	1.80	1.80	1.88
Tennessee Banks	2.14	2.16	2.14
LOAN LOSS PROVISION RATIO			
All US Banks	0.19%	0.14%	0.14%
All Eighth District Banks	0.19	0.11	0.12
Arkansas Banks	0.23	0.15	0.17
Illinois Banks	0.25	0.16	0.13
Indiana Banks	0.14	0.06	0.07
Kentucky Banks	0.23	0.13	0.12
Mississippi Banks	0.24	0.10	0.11
Missouri Banks	0.18	0.08	0.10
Tennessee Banks	0.21	0.10	0.11

	2013:Q2	2014:Q1	2014:Q2
NONPERFORMING LOAN RATIO²			
All US Banks	2.32%	1.90%	1.74%
All Eighth District Banks	1.96	1.61	1.48
Arkansas Banks	2.35	1.92	1.79
Illinois Banks	2.95	2.68	2.45
Indiana Banks	1.89	1.42	1.23
Kentucky Banks	2.23	1.91	1.70
Mississippi Banks	2.27	1.58	1.57
Missouri Banks	2.10	1.63	1.51
Tennessee Banks	2.19	1.75	1.62
PROBLEM ASSETS RATIO³			
All US Banks	3.28%	2.69%	2.45%
All Eighth District Banks	3.32	2.69	2.48
Arkansas Banks	4.34	3.47	3.20
Illinois Banks	4.34	3.84	3.48
Indiana Banks	2.45	1.83	1.60
Kentucky Banks	3.29	2.86	2.63
Mississippi Banks	3.65	2.80	2.70
Missouri Banks	3.60	2.87	2.61
Tennessee Banks	3.76	3.04	2.82
RETURN ON AVERAGE EQUITY			
All US Banks	9.12%	8.38%	8.67%
All Eighth District Banks	9.20	9.37	9.89
Arkansas Banks	10.82	10.86	11.30
Illinois Banks	7.52	7.20	7.83
Indiana Banks	9.19	7.91	8.79
Kentucky Banks	8.15	8.58	8.63
Mississippi Banks	8.01	8.61	8.75
Missouri Banks	8.82	9.60	9.44
Tennessee Banks	7.55	8.35	8.53
TIER 1 LEVERAGE RATIO			
All US Banks	10.73%	10.77%	10.78%
All Eighth District Banks	10.02	10.20	10.39
Arkansas Banks	10.78	10.96	11.09
Illinois Banks	9.81	9.95	10.01
Indiana Banks	9.97	10.03	10.32
Kentucky Banks	10.47	10.67	10.83
Mississippi Banks	9.80	9.87	9.98
Missouri Banks	10.74	10.69	10.84
Tennessee Banks	10.45	10.63	10.63

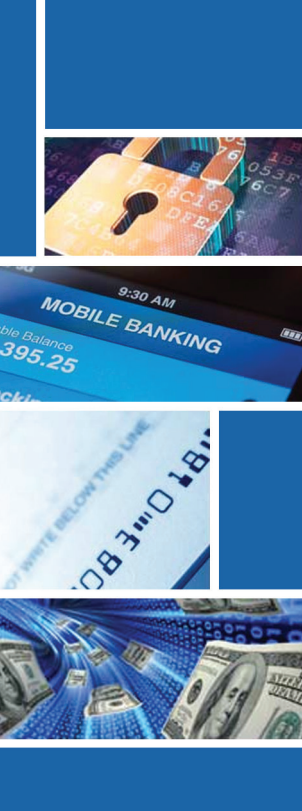
SOURCE: Reports of Condition and Income for Insured Commercial Banks

NOTE: Community banks and thrifts are those institutions with assets of less than \$10 billion.

¹ All earnings ratios are annualized and use year-to-date average assets or average earning assets in the denominator.

² Nonperforming loans are loans 90 days past due or in nonaccrual status.

³ Problem assets consist of nonperforming loans plus other real estate owned (OREO).



IN PURSUIT OF A BETTER PAYMENT SYSTEM

The “Payment System Improvement—Public Consultation Paper” shares Federal Reserve perspectives on the key gaps and opportunities in the current U.S. payment system and identifies the desired outcomes that close these gaps and capture these opportunities. The paper, along with additional details regarding the payment system improvement project, is available at <http://fedpaymentsimprovement.org/>.

Central View

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to use these research conclusions and the stakeholder feedback to prepare the roadmap for payment system improvements.

As we continue working to release the roadmap, I’m reminded that there is still a long way to go. While the plan is the result of significant effort over the past few years, its release will signify that the work is just beginning. Implementing the strategies outlined in the plan will require significant commitment and continued collaboration with all users and stakeholders over the next several years. While change is required, it’s important to keep focused on the perspective of the end users, namely consumers and businesses, and fully embrace responding to their continually evolving needs.

Homeownership Declining among Young Families

In a 2014 issue of the Federal Reserve Bank of St. Louis’ *In the Balance*, Senior Economic Adviser William Emmons and Policy Analyst Bryan Noeth, both of the St. Louis

Fed’s Center for Household Financial Stability, examined why young families (defined as those with a head of household younger than 40) have lagged their older counterparts during

TABLE 1
Homeownership Rate in Percent of Households by Age and Year of Birth of Family Head

Age of Family Head at Time of Observation	2004–06 Average Rate (%)	Year of Birth of Family Head									
		1924-28	1929-33	1934-38	1939-43	1944-48	1949-53	1954-58	1959-63	1964-68	1969-73
Under 25	25.2										14.0
25-29	41.0									34.0	36.2
30-34	56.7								50.0	53.6	56.5
35-39	66.4							60.5	63.7	65.1	64.6
40-44	71.6						67.8	70.1	71.3	69.4	64.3
45-49	75.4					73.8	73.9	75.5	73.6	69.6	
50-54	78.1				76.7	77.8	78.0	76.5	72.8		
55-59	80.7			78.1	79.8	80.9	79.4	75.7			
60-64	81.9		79.9	82.2	82.0	80.9	77.8				
65-69	82.8	80.2	81.9	82.6	81.6	80.4					
70-74	83.1	82.2	82.1	81.7	82.8						
75 and older	78.8	78.7	78.6	79.8							

SOURCE: U.S. Census Bureau’s Current Population Survey.

NOTE: The observations for a given five-year birth cohort were in the years 1993, 1998, 2003, 2008 and 2013. The homeownership rates for 1993 have been estimated based on data and trends reported for 1994-97.

the economic recovery. They found that young families have recovered only about one-third of the wealth they lost during the recession, while middle-aged and older families have nearly recovered to precrisis levels. Emmons and Noeth concluded that one of the most significant reasons involved declining homeownership among younger families. Those declining levels may not rebound quickly, if at all, they noted.

The U.S. homeownership rate has been declining for nearly a decade. It peaked at 69 percent in 2004, but has fallen nine consecutive years, reaching 65.1 percent in 2013.¹

To be sure, they noted that young families aren't the only ones retreating from homeownership. The homeownership rate for middle-aged families (those with a head of household between 40 and 61 years old) has dropped from 76.9 percent in 2005 to 72.1 percent in 2013. However, this decrease is notably smaller than the nearly 8 percentage point drop (50.1 percent to 42.2 percent) experienced by young families over the same period. The homeownership rate of older families (those headed by someone 62 or older) actually increased by almost a full percentage point.

Table 1 displays movements in age-specific homeownership rates by various birth-year cohorts reported by the Census Bureau at five points during

the past 20 years (1993, 1998, 2003, 2008 and 2013). Reading down any column shows that homeownership rates generally increased for a given cohort as they aged. For example, the column regarding family heads born in 1964-68 shows that about 34 percent of these families owned homes when the head was age 25-29. By the time these heads of household were age 40-44, 69.4 percent owned a home.

Reading across each row shows declines related to the housing crash for given age groups. For example, the homeownership rates for families headed by someone age 35-39 rose from 60.5 percent to 65.1 percent over the first three observations (which would be in 1993, 1998 and 2003). However, the percentage fell over the next two observations to 64.6 percent (2008), then 55.4 percent (2013).

The table also includes the average homeownership rates for each age group for the period 2004 through 2006, when the housing boom and homeownership rate reached their peaks. Subtracting the 2004-06 rates from the annual observations shows that families headed by someone between the ages of 24 and 38 experienced the largest declines in homeownership rates from peak levels for their stage in the life cycle. Middle-aged families had notable declines as well, though the declines were less steep than those for young families. Older families experienced much smaller declines or even increases.

Emmons and Noeth wrote that the declines among young and middle-aged families were continuing as of 2013 but that it was reasonable to expect them to eventually level off. However, a leveling off of homeownership rate declines obviously means a lower overall rate than what was experienced during the 2004-06 peak. Emmons and Noeth noted that this "likely represented unusual conditions in housing and mortgage markets that we will never see again. Thus, it appears unlikely that the overall homeownership rate will return to its peak level any time soon, if ever."

ENDNOTES

1 U.S. Census Bureau's Current Population Survey.

1974-78	1979-83	1984-88	1989-93
18.2	22.8	23.6	21.8
39.8	40.0	34.5	
53.5	48.4		
55.4			

Bitcoin and Beyond

continued from Page 1

load a free virtual wallet, which is an encrypted computer file used to store bitcoins. This wallet can be stored anywhere a typical computer file can be stored, and users can have multiple wallets, just like having multiple banking accounts. A key difference according to Andolfatto is that all wallets are publicly observable, though the owner's identity remains hidden. Andolfatto likened these wallets to a glass post office box. Anyone can see what is in there, but they don't know who it belongs to and cannot access it without a key. Only the owner has the key to get into the box and take money out.

Andolfatto compared the potential for losing access to the wallet to carrying cash in a physical wallet. Losing the key to opening the wallet or losing the wallet itself (for example, storing it on a USB drive and losing the drive) means no longer having access to that account, which is a serious concern for people with wallets containing large sums in bitcoins. He said, "What if you lost your USB drive? What would you do? If the security key was in there with the USB drive, the person who found it could use your wallet and spend it. If the security key wasn't there ... that money is gone. It will never be used."

Andolfatto explained that one way of guarding against this risk is to use an intermediary to store bitcoins, similar to how people who don't want to carry large amounts of cash store their money in banks.

Transacting with Bitcoins

From a user perspective, Andolfatto explained that the experience of using bitcoins to buy something is no different from typical online banking. However, the processing of payments is handled quite differently. Volunteers called "miners" review individual transactions and approve or decline them.

Once approved, transactions are added to a public ledger called the blockchain. Andolfatto explained that this blockchain contains the historical record of all bitcoin transactions in the currency's history. Andolfatto remarked, "For the system to work, participants must trust the integrity of the blockchain. It's absolutely critical. The

power to alter or fabricate the history of transactions is the power to steal."

The blockchain does not, however, contain the identities of the transactors or a record of the items being purchased or sold. Andolfatto explained that it only shows the amount in bitcoins that have been transferred from a specific wallet to another specific wallet.

Is Bitcoin a "Bubble"?

To discuss whether bitcoin is experiencing a bubble, Andolfatto first provided a definition of a bubble as an object's value having a liquidity premium. He said by this definition, bitcoin was indeed in a bubble, as it has no intrinsic value.

"If you think about decomposing the market price of any security into components—some measure of its intrinsic or fundamental value—and if you take a look at the difference between the market price, if it's trading above its intrinsic value, we could ascribe the difference to a liquidity premium. That is to say, most assets are valued not only for their intrinsic use, but how easily they can be liquidated, how easily they can be passed along in future transactions. ... Most assets, like I said though, have this property, at least a bit of a liquidity premium, even gold."

Is Bitcoin a "Good Investment"?

Andolfatto began discussing whether bitcoin is a good investment by pointing out: "We have very good economic theory that tells us that asset price changes are difficult to forecast. A lot of people have lost a lot of money not listening to this theory."

He said in his opinion it really depends on future outlooks for this product, like any new product. Investors considering bitcoin as an investment should ask a lot of questions:

- How rapidly and extensively will it penetrate the market?
- How might government regulations evolve over time?
- How easy is it to replicate the product?
- What sort of competing products might emerge now and in the future?

Is Bitcoin a "Good Money"?

Similar to how he discussed whether bitcoin was a bubble, Andolfatto

discussed whether bitcoin was a “good money,” specifically, whether bitcoin as a medium of exchange would maintain a stable purchasing power over short periods of time. To demonstrate, he plotted the purchasing power of four currencies since 1990, normalizing the purchasing power of each currency to 100: the yen, the euro, the U.S. dollar and the Zimbabwean dollar.

As Figure 1 shows, the Zimbabwean dollar experienced hyperinflation until its purchasing power essentially fell to zero. The yen, dollar and euro, on the other hand, have remained relatively stable. Andolfatto said, “The striking thing about those lines, in my view, is that they’re relatively stable. They don’t exhibit wild fluctuations. Sure, there’s a 2 percent inflation in the United States, but it’s forecastable. It’s something you can predict, you can bet on.”

Figure 2 plots the purchasing power of bitcoin against that of the U.S. dollar over a much shorter time period (November 2013 through July 2014). Andolfatto concluded that the purchasing power of bitcoin has shown significant volatility over the short term.

Nominal Exchange Rate Indeterminacy

Andolfatto next turned to the issue of nominal exchange rate indeterminacy, or the inability to determine the exchange rate between two intrinsically worthless objects.

Andolfatto pointed out that there is nothing in economic theory that would explain the value of one intrinsically worthless object relative to another. He gave an example of casino chips, asking how consumers would determine the value of a red versus a blue chip if the values weren’t already fixed. He then applied the example to determining the exchange rate between two virtual currencies.

“The evidence is that exchange rates of fiat currencies are excessively volatile. And as I just alluded to, the problem is that there’s no fundamental economic force that pins down the relative price of two intrinsically worthless objects.”

Does Bitcoin Facilitate Illegal Trading?

Andolfatto explained that the identities of bitcoin wallet owners are disguised, “so in that sense, they’re very similar to using U.S. cash in facilitating illegal trades.” However, the

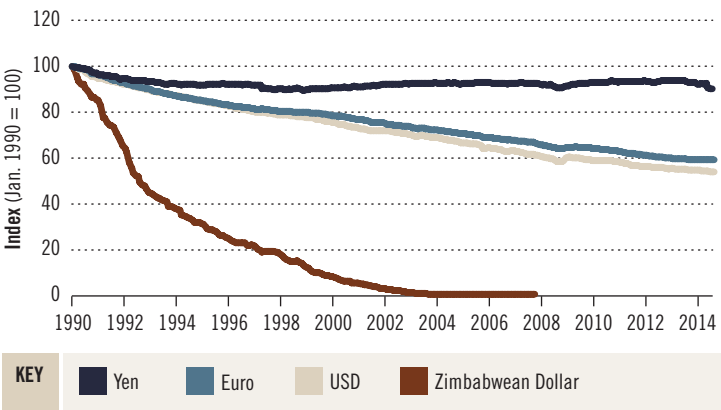
blockchain’s public availability means transactions could still potentially be linked to users. For example, discovering a wallet on someone’s computer would then allow transaction history to be viewed.

“If I’m some government authority, you’re going to have some explaining to do. That’s not a property of a U.S. cash transaction.”

Can Bitcoin Be Regulated?

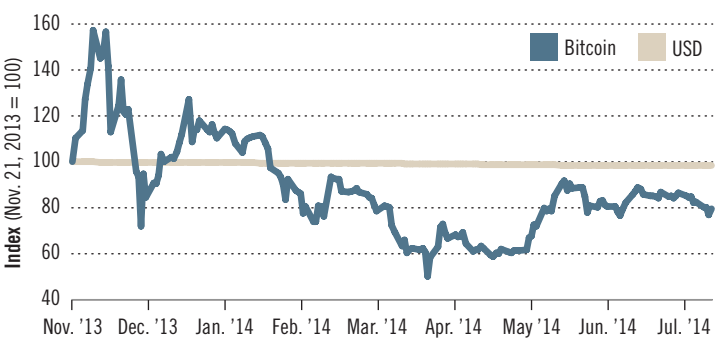
Andolfatto noted that some countries have banned the use of bitcoins and that banning currencies has been a common practice for countries aiming to protect their local currencies. However, the fact that bitcoin does not have a central authority makes regulating the currency challenging. “It’s like trying to slay the hydra. You cut off one head, and three other heads appear. I mean, it’s this distributed network out there in the world. How are you supposed to regulate something like that?”

FIGURE 1
Purchasing Power of Currencies



SOURCES: Bureau of Labor Statistics, Euro Stats, International Monetary Fund and Ministry of Internal Affairs.

FIGURE 2
Purchasing Power of Bitcoin and the US Dollar



SOURCES: Bureau of Labor Statistics, Haver Analytics and Bitcoincharts.com.



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AT THE FEDERAL RESERVE BANK OF ST. LOUIS

The Federal Reserve Bank of St. Louis opened its doors this fall to the *Inside the Economy*™ Museum. Through nearly 100 exhibits, games, sculptures and videos, the museum helps visitors better understand how the economy works, and their role in it, in a fun and interactive way.

The museum covers topics such as banking, inflation, markets, the global economy, barter, trade and money. Walk-in visitors are welcome, and groups of 11 or more can register on the museum website. The museum is an ideal location for a class field trip for students in middle school through college.

The *Inside the Economy* Museum is located inside the St. Louis Fed at Broadway and Locust Street in downtown St. Louis. Admission is free. For hours and other information, go to stlouisfed.org/economymuseum.

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