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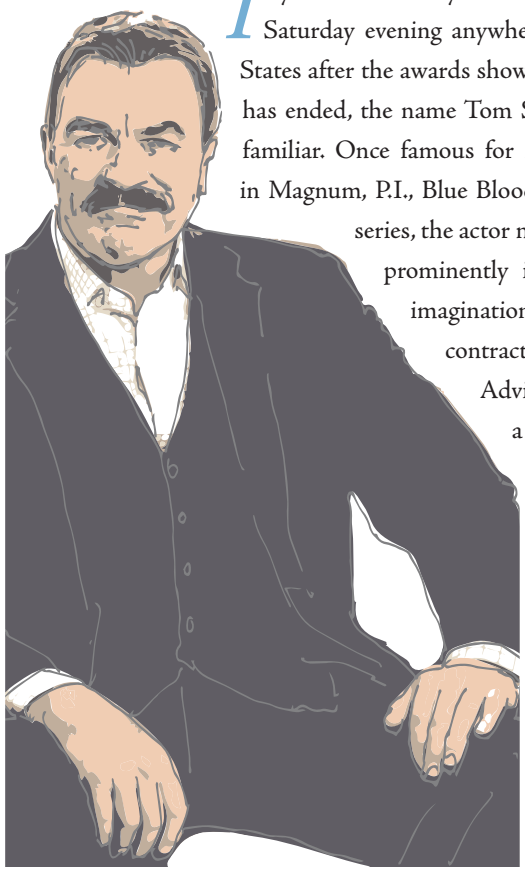
POINT of VIEW

SUMMER 2017

Our Perspective on Issues Affecting Global Financial Markets

Put It In Reverse, Tom Selleck: A Look at Reverse Mortgages



If you have found yourself up too late on a Saturday evening anywhere in the United States after the awards show or football game has ended, the name Tom Selleck should be familiar. Once famous for his starring roles in Magnum, P.I., Blue Bloods and other TV series, the actor now features more prominently in the American imagination as a result of his contract with American Advisors Group—a leading reverse mortgage lender (*see Figure 1*).

Never one to put his Ferrari in reverse, if Tom Selleck can put his career in reverse mortgages we figured a short essay exploring the seemingly esoteric "reverse mortgage" financial product was in order. To some familiar with reverse mortgages they are a lifeline. To others, these loans seem to be a scam. With $112 billion in federally guaranteed reverse mortgages outstanding in the United States, let us clarify this otherwise unclear product.[1]

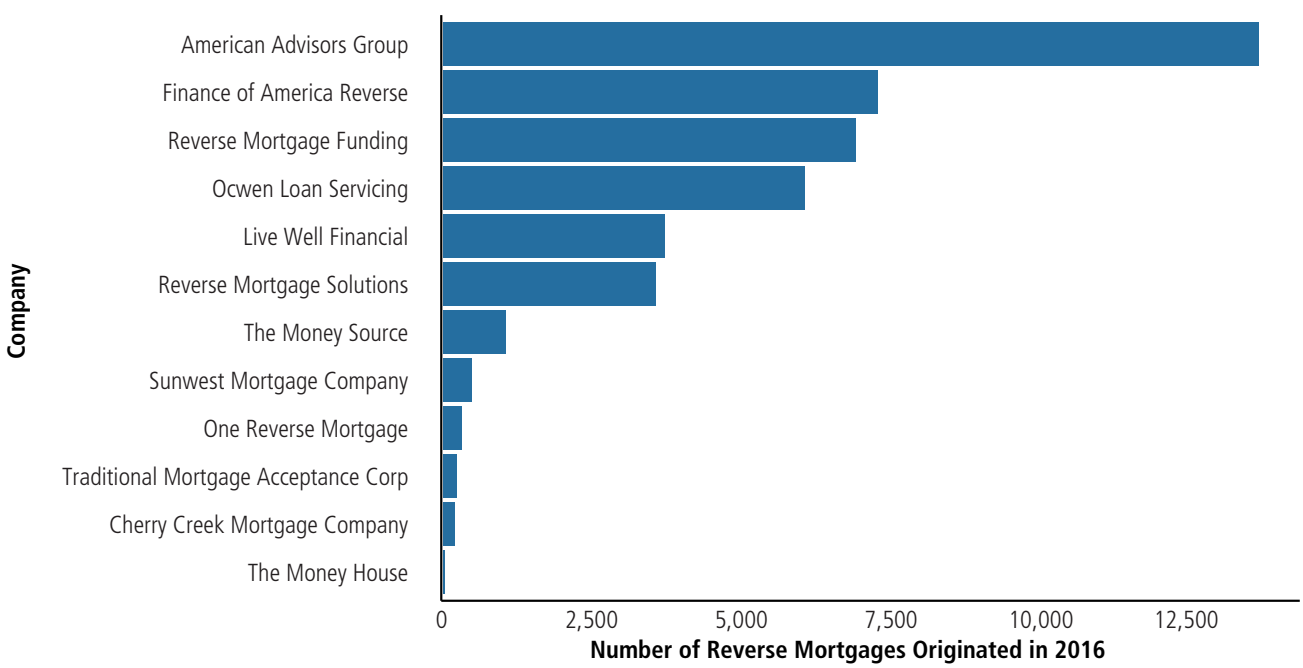
Our goal in this essay is neither to condone nor to condemn the use of reverse mortgages. Instead, we will walk through the mechanics of a reverse mortgage, to explore why such a financial product might exist, and finally to review the advantages and disadvantages of a reverse mortgage.

WHAT IS A REVERSE MORTGAGE?

The first thing to know about a reverse mortgage is that it is a financial product designed to allow older homeowners to convert the ownership stake they have in their property into cash without having to sell. For those who wish to extinguish their mortgage payment and remain in their own home, the reverse mortgage provides a solution.

Meet Janice and Jerry (J&J), a 65-year-old retired couple with a modest amount saved for retirement and a home worth $200,000. J&J do not have an existing mortgage. They do, however, have to cover a large medical expense and their retirement savings alone won't cut it.

fig. 1 WHO'S IN REVERSE? TOP REVERSE MORTGAGE ORIGINATION COMPANIES IN 2016



Source: Ginnie Mae, Payden Calculations
*Origination count is an estimate based on Ginne Mae securitization data

fig. 2 REVERSE VS. TRADITIONAL MORTGAGES, A CHEAT SHEET

SITUATION	"Forward" Mortgage	"Reverse" Mortgage
Purpose of loan	to purchase a home	to generate income
Before closing, borrower has...	no equity in the home	a lot of equity in the home
At closing, borrower...	owes a lot, and has little equity	owes very little, and has a lot of equity
During the loan, borrower...	makes monthly payments to the lender, loan balance goes down, equity grows	receives payments from the lender, loan balance rises, equity declines
At end of loan, borrower...	owes nothing, has substantial equity	owes substantial amount, has much less, little, or no equity
Type of transaction	Falling debt, rising equity	Rising debt, falling equity

Source: AARP (2008). "Reverse Mortgage Loans: Borrowing Against Your Home."

J&J's 65 years of life not only qualifies them for grandchildren, it also qualifies the couple for a reverse mortgage—according to the rules for such loans made by the U.S. Department of Housing and Urban Development (the U.S. government insures approximately 90% of all reverse mortgages. Borrowers must be at least 62 to qualify. Our comments here describe the Home Equity Conversion Mortgage loans that qualify for government insurance).

J&J trot down to the bank and ask for a reverse mortgage as a means of paying for their medical expense. After certifying their age and checking other requirements such as occupancy plans and financial standing, the bank agrees to offer the couple a reverse mortgage. Accepting the loan sets a few important things in motion (*see Figure 2*).

First, J&J just took out a loan worth approximately 50-60% of their $200,000 house. The loan can be disbursed in different ways, but J&J choose the most common option whereby their funds can be accessed at any time up to their maximum loan amount, similar to a line of credit.

While J&J won't have to make monthly cash payments for interest and principal on the loan, that doesn't mean they aren't paying interest and principal. The payments are implicit in the amount available to borrow: said differently, a large part of the reason that J&J only get about 50-60% of their home's value in the loan is that 40-50% of the home's value goes to paying interest/principal and fees.

And although J&J don't have an existing mortgage, in cases where a prospective reverse mortgagee doesn't own their home outright, the proceeds from the reverse mortgage loan MUST first go to paying down the existing mortgage. After fees and paying down the first mortgage many reverse mortgages won't have much cold hard cash left over.

The second important note related to the reverse mortgage is that the loan balance will not have to be repaid until the last of Janice or Jerry die, they move, or they fail to maintain and pay taxes on the property. In any of these events, the lender is entitled to take possession of the house and sell it for its fair market value to recoup their loan.

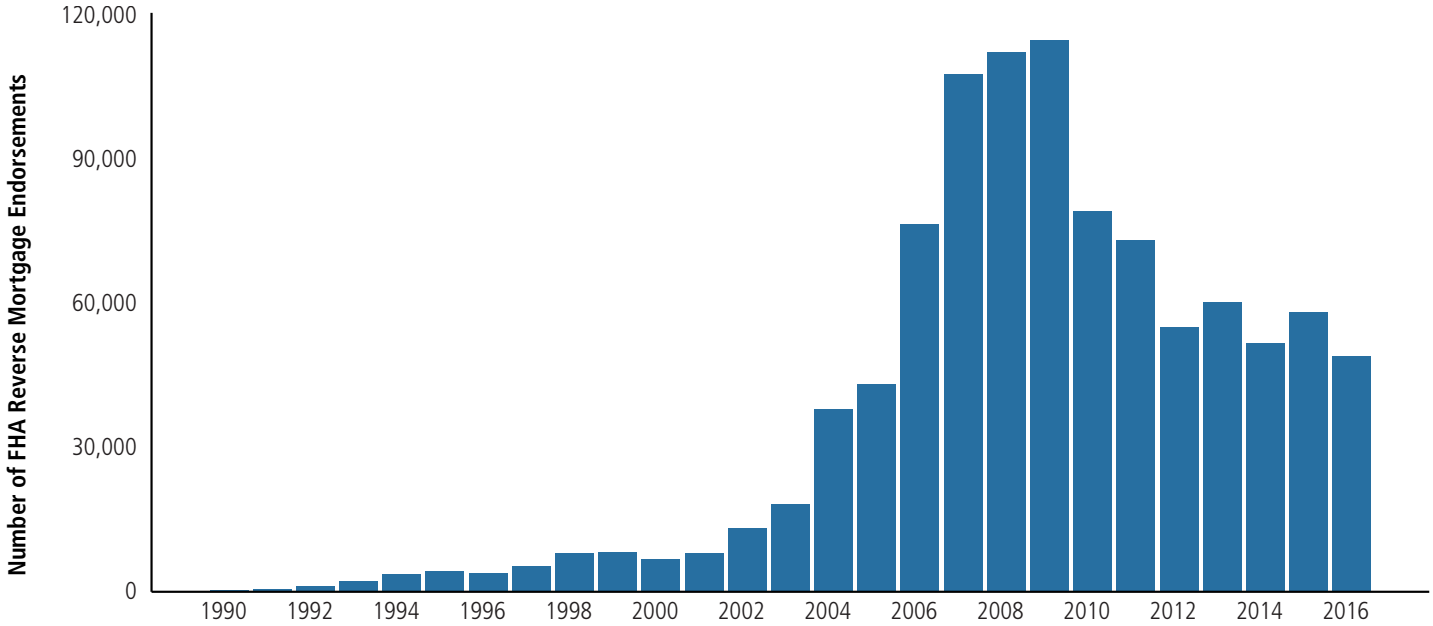
The last observation to make about the reverse mortgage taken on by our dearly beloved couple is that, despite what many think, J&J's heirs will not be liable for any losses the bank might incur if the home's sale value is below the loan amount. What could go wrong?

«FOR THOSE WHO WISH TO EXTINGUISH THEIR MORTGAGE PAYMENT AND REMAIN IN THEIR OWN HOME, THE REVERSE MORTGAGE PROVIDES A SOLUTION.»

NEED, OR ANOTHER CASE OF TOO MUCH FINANCIAL INNOVATION?

Reverse mortgage skeptics don't mince words. Articles touting things like "10 Reasons Not to Take Out a Reverse Mortgage" are numerous.

fig. 3 THE CRISIS IN REVERSE...ANNUAL REVERSE MORTGAGE VOLUME HAS FALLEN DRAMATICALLY POST–CRISIS



Source: NRMLA

Many lenders and economists, see reverse mortgages as a useful, if pricey, financial product which solves a widespread problem.

What exactly is that problem? An academic paper described it well: "less income, less saving, and more debt for a growing senior population."[2] In this context, financial planning for retirement quickly becomes a complicated exercise.

Consider first the assets owned by seniors. In the United States, 87% of households 65 and older own a home, and the equity in those homes represents 56% of that cohort's assets.[3] Other studies have found that 2/3rds of workers at a sample of large American companies had saved less than $50,000 for retirement.[4]

«MANY LENDERS AND ECONOMISTS, SEE REVERSE MORTGAGES AS A USEFUL, IF PRICEY, FINANCIAL PRODUCT WHICH SOLVES A WIDESPREAD PROBLEM.»

In cases where the asset base for retiring households is insufficiently large or liquid, salvation won't likely arrive from government programs. The many seniors who survive only on social security benefits aren't living lavish lives. The U.S. Social Security Administration reports that among retired workers, the average annual benefit is just over $16,000.[5] Considering that in 2016 the average U.S. consumer household *over the age of 65* spent almost $44,000, social security alone isn't enough.

Costs for seniors are rising, too. The average American aged 65 or older dedicates about 22% of her current income to monthly mortgage payments. Beyond housing, the other large growing expense for seniors is medical care. Indeed, "between 1996 and 2009, the average out-of-pocket expense for health care for those age 65 and older increased 46%," outpacing inflation over the same time period by 10% nominally.[6]

So it isn't surprising that, once eligible, retirees look to the equity in their homes as a source of funds, or that in times of crisis the number of people using their home equity to pay other obligations skyrocketed (*see Figure* 3).

THE BEST ARGUMENTS FOR AND AGAINST REVERSE MORTGAGES

Secure in our knowledge of how reverse mortgages work and the financial straits in which many retirees often find themselves, we turn now to the best and worst arguments for reverse mortgages. The shortest conclusion we draw is that reverse mortgages are an expensive source of funds and should be considered a last resort. Those retirees able to move or with other monies should exhaust those options first.

There are some arguments in favor of reverse mortgages, however. Most critically, as we've described, many older households find themselves in a "house rich, cash poor" situation. Under these circumstances using a reverse mortgage to tap savings provides a lifeline for those who otherwise would be unable to service debt, pay large medical expenses, or float a monthly mortgage payment.

Another, though less notable, financial reason to take out a reverse mortgage is that it might allow the borrower to delay calling upon her social security benefit. By delaying her claim, the borrower can increase the value of her social security payments. Under reasonable assumptions, calculations suggest that the real monthly social security benefit is "76% greater if one waits until 70 rather than starting benefits at 62."[7]

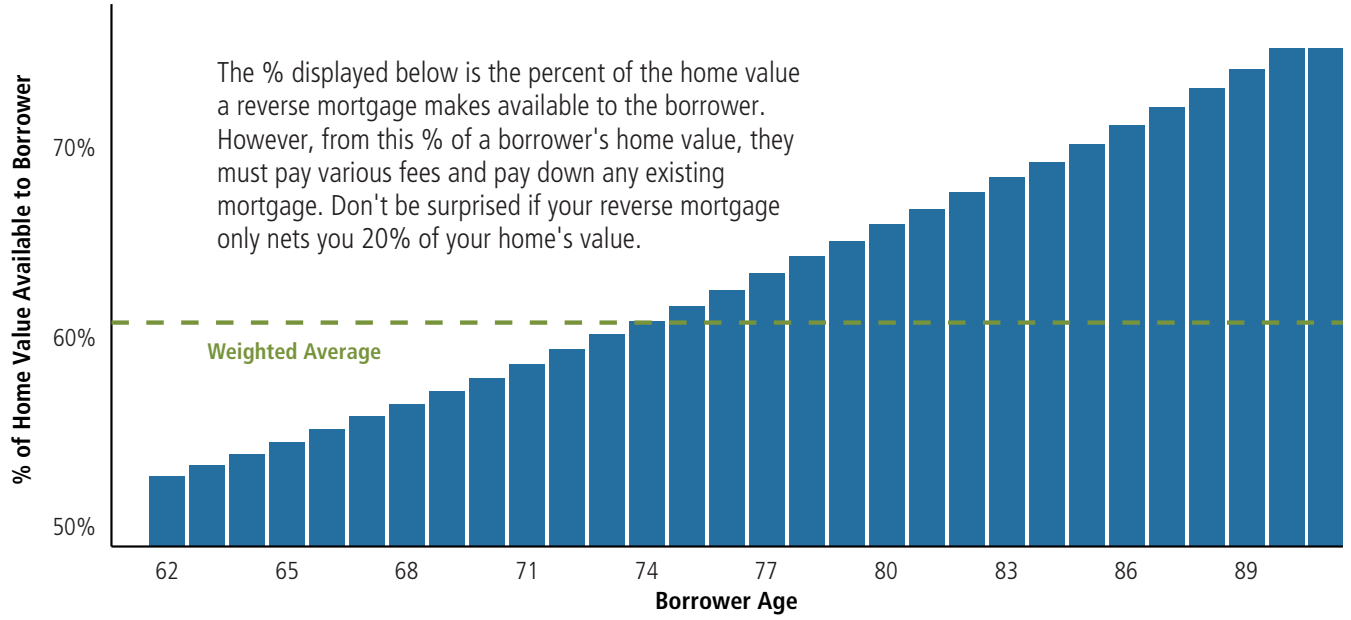
With some of the benefits established we turn now to the high costs and risks associated with reverse mortgages. It cannot be stressed enough—reverse mortgages are very expensive. Comprehending the cost of funding a medical expense or extinguishing monthly mortgage payment with a reverse mortgage is made clear by comparing the net proceeds such a loan makes available to the net amount one collects from a home sale.

Back to Janice and Jerry. If J&J own their $200,000 house and it hasn't appreciated since we left them, we might imagine a traditional home sale would net them about $184,000 (assuming 8% transaction costs and no taxes on gains). If we assume further that J&J will rent for the next ten years, we can subtract from the $184,000 sale proceeds $80,000, which is approximately the present value of 10 years of rent. In total, then, a traditional home sale and 10 years of rental payments will leave J&J with a final amount of roughly $104,000 in their pockets.

«CLAIMING A REVERSE MORTGAGE TOO EARLY IN RETIREMENT COULD LEAVE REVERSE MORTGAGEES AT RISK FOR CASH-CALLS LATER IN LIFE.»

By contrast, let us review what J&J stand to collect from a reverse mortgage. The main drivers of the amount available are: your age (older translates to a larger loan), interest rate (lower rates translates to a larger loan), financial obligations (if you have an existing mortgage, you'll have to pay it off with proceeds leaving less for you to spend), and the distribution type (lump sum is the lowest and line of credit is usually the highest). Because J&J are only 65, three years beyond the minimum age needed to qualify for the reverse mortgage, their total proceeds will be lower than if they wait. On their $200,000 home, assuming no existing debt, an adjustable rate, as well as no lump sum, J&J could plausibly access 52% of their home's value, or $104,000, via a reverse mortgage line of credit (*see Figure 4*).

fig. 4 HOW MUCH CAN YOU GET? DEPENDING ON INTEREST RATES AND YOUR AGE, DON'T EXPECT MUCH CASH FROM A REVERSE MORTGAGE



Source: Ginnie Mae, Payden Calculations
*The above is an estimate based on the initial principal limit (not the net principal limit) as a percent of the maximum claim amount for purchase HECM loans securitized by Ginnie Mae in 2016. The average is weighted by the number of loans taken out by each age group.

In addition to the reverse mortgage costs, they will still be responsible for paying property taxes and maintenance on their reverse-mortgaged home. If we assume those costs amount to 3% of the home's value ($6,000) and we take the present value of $6,000 for 10 years ($42,000), we see that a reverse mortgage would net J&J only $62,000 ($104,000 minus $42,000). Comparing this $62,000 sum to the $104,000 sale proceeds (and rental payments purchased) J&J would net from a traditional home sale, we see that the true cost of "aging in place" for our happy couple amounts to $42,000 ($104,000 minus $62,000).

Not only are the proceeds from a reverse mortgage significantly lower than from a sale (and J&J still have to maintain the property and pay taxes), claiming a reverse mortgage too early in retirement could leave reverse mortgagees at risk for cash-calls later in life (a large and unexpected medical expense or broken-down car for example).

REVERSING COURSE

The appearance of Tom Selleck on TV is not just a symptom of late-night financial scams. Instead, a large cohort of Americans may be "house rich, cash poor" and looking for a solution. We only hope would-be borrowers realize how much they pay to stay put. Caveat emptor.

With a firmer understanding of the mechanics, the market need, and the costs of reverse mortgages, we hope our readers feel more comfortable contemplating this esoteric financial product. Compared to a traditional mortgage, reverse mortgages are sold as a means of eliminating monthly payments for elderly homeowners while allowing these folks to remain in their homes.

In the absence of other (better) options, and for those unable or unwilling to move, the reverse mortgage is a financial innovation that, though expensive, transforms an illiquid asset—one's home equity—into a liquid source of funds during retirement. Reverse borrowers are, in the end, making a choice to pay a high cost to stay in the home where their memories have been made.

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1. Table 5, FHA Production Report, HUD, February 2017
2. Twomey, Tara (2015). "*Crossing Paths: The Intersection of Reverse Mortgages and Bankruptcy*". 89 Am. Bankr. L.J. 363.
3. Davidoff Thomas, et. al (2016). "*Reverse Mortgages: What Homeowners (Don't) Know and How it Matters*." Journal of Economic Behavior & Organization, Vol. 133, Jan 2017, pp. 151 – 171.
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7. Shoven, John B. and Sita Slavov (2012). "*The Decision to Delay Social Security Benefits: Theory and Evidence*" NBER Working Paper No. 17866

How We Learned to Stop Worrying and Love the Fed's Big Balance Sheet

One of the most discussed topics in 2017 has been the Federal Reserve's bloated balance sheet and the steps the Fed might take to reduce the bloat. Interest in the topic has reached a fevered pitch of late, with the number of media stories referencing the "Fed's balance sheet" spiking (*see Figure 1*).

The Fed itself has fanned the flames of market worries by suggesting that an unwind could begin soon and by publishing research to show that successive quantitative easing (QE) programs boosted equity prices by 11-15%, depressed longer-term interest rates by around 90 basis points (or 0.90%) and weakened the U.S. dollar versus its peers by up to 5%.

Given these alleged market impacts as the balance sheet grew, it is natural for investors to wonder whether the unwind will cause waves as the tide rolls out. Or, as one bond market observer remarked, "Who will buy all those bonds if the Fed isn't buying?"[1] We say, worry not. We think the Fed will seek to avoid a "Taper Tantrum 2.0" at all costs. Dire economic and market consequences from the Fed's balance sheet will be more imagined than real. And the big balance sheet is here to stay, as the Fed has discovered a new role for itself in the money markets.

THE BALANCE SHEET BASICS: THE GOOD OLD DAYS

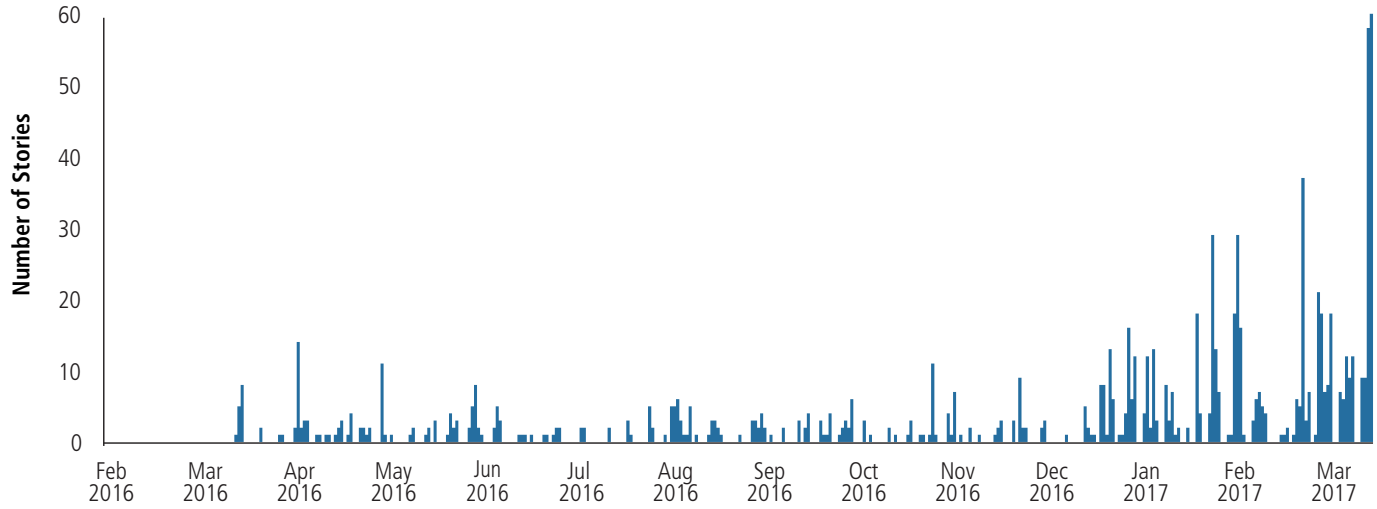
Understanding a central bank's balance sheet requires a few basics. The primary purpose of the Fed's balance sheet—or that of any central bank for that matter—is to back the nation's currency. To that end, the Fed holds assets to match its liabilities, which comprise the nation's money, in the form of bank reserves and physical currency.

«THE PRIMARY PURPOSE OF THE FED'S BALANCE SHEET—OR THAT OF ANY CENTRAL BANK FOR THAT MATTER—IS TO BACK THE NATION'S CURRENCY.»

Circa 2007 (before the balance sheet ballooned), most of the Fed's balance sheet consisted of Treasury bills on the asset side and currency on the liability side (*see Figure 2 on page 7*). In those days, as bank lending and deposit creation progressed, demand for currency and reserves increased. The balance sheet grew at roughly 5-7% per year for several decades, coincident with nominal spending growth (remember this, it will be important later).

Bank reserves were a tiny share of the Fed's liabilities. Then, as now, all depository institutions held bank reserves at the Fed, as prescribed by law, to meet minimum "reserve requirements." Think of bank reserves' function like an individual's checking account, save one detail: unlike a personal checking account, banks can temporarily skirt overdrafts.

fig. 1 MEDIA HOOPLA AROUND THE "FED'S BALANCE SHEET" TAKES OFF IN 2017



Source: Bloomberg

Imagine the following situation: you overdraft your checking account and the bank calls asking for more funds (and charges you a hefty fee). Instead of running the overdraft, you call someone else who also banks at your bank and ask them to lend you money to cover your overdraft. If they agree, then the bank simply debits their account and credits your account. No more overdraft.

«BEFORE 2007, THIS "PHONE A FRIEND" MARKET WAS A SMALL, YET IMPORTANT MARKET. TOTAL RESERVE BALANCES AVERAGED JUST $11 BILLION (MOSTLY TO MEET RESERVE REQUIREMENTS, NO EXCESS SAVINGS). EXCESS RESERVES, THOSE BALANCE HELD ABOVE AND BEYOND THE CALL OF REGULATIONS, AVERAGED JUST $1.5 BILLION!»

The "phone a friend" equivalent in banking is an unsecured overnight market where banks borrow and loan reserves. The rate of interest banks charge each other is the famous "federal funds rate." Before 2007, this "phone a friend" market was a small, yet important market. Total reserve balances averaged just $11 billion (mostly to meet reserve requirements, no excess savings). Excess reserves, those balance held above and beyond the call of regulations, averaged just $1.5 billion![2] Since the market was so small, the Fed could manipulate the federal funds rate by either making reserves more scarce (for higher rates) or more plentiful (lower rates) relative to market demand.

POST-2008: MORE MONEY, MORE PROBLEMS

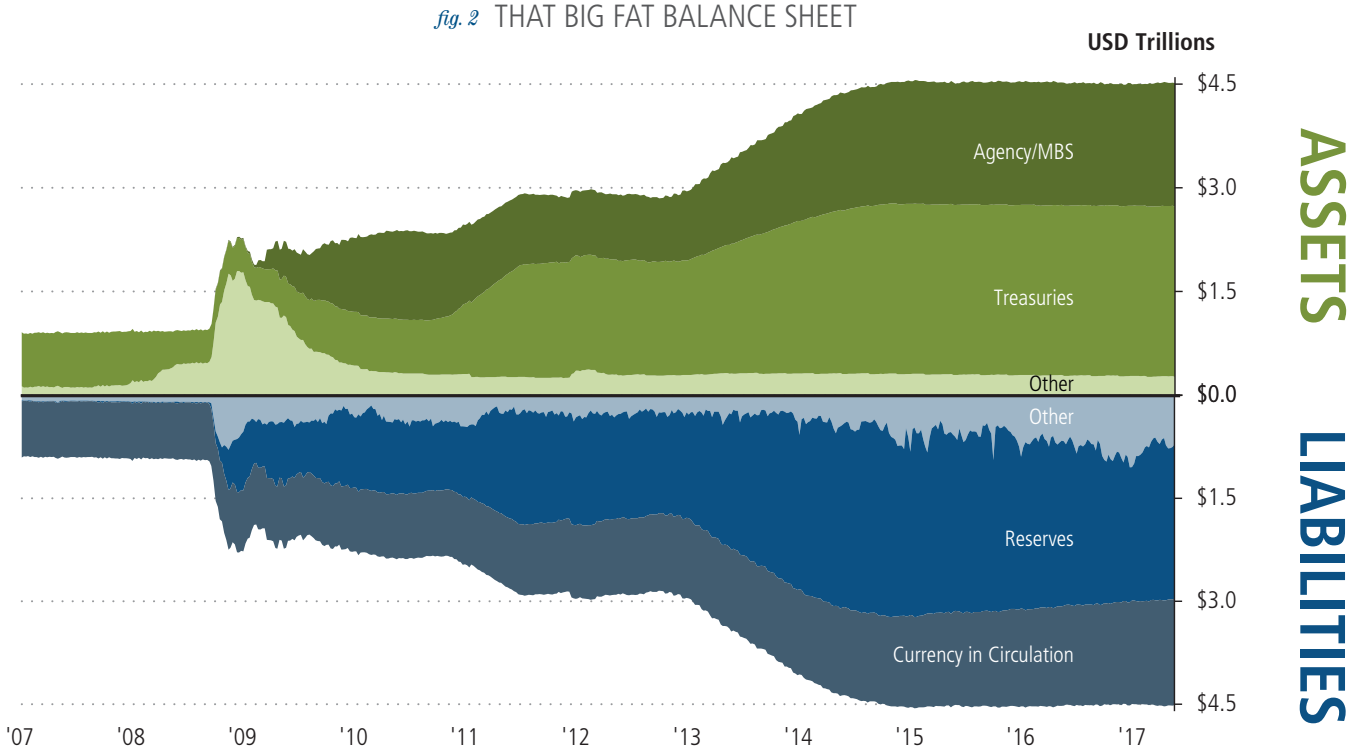
Under successive QE programs, the Fed increased the size of its balance sheet from $800 billion to more than $4.5 trillion (*see again Figure 2*). How did that happen? The Fed created $2.6 trillion in new *liabilities* (reserves). Those reserves were exchanged with member banks for great quantities of Treasury notes, Treasury bonds and agency-backed MBS (the Fed's assets).

As a result, today there is *anything* but a scarcity of reserves!

Of course, the surfeit of reserves created a new problem for the Fed: how to control the "phone a friend" interest rate when so many reserves were available. Why "phone a friend" when your account is flush with cash? Indeed, trading volumes are 75% lower in the "phone a friend" market than pre-crisis daily volumes.

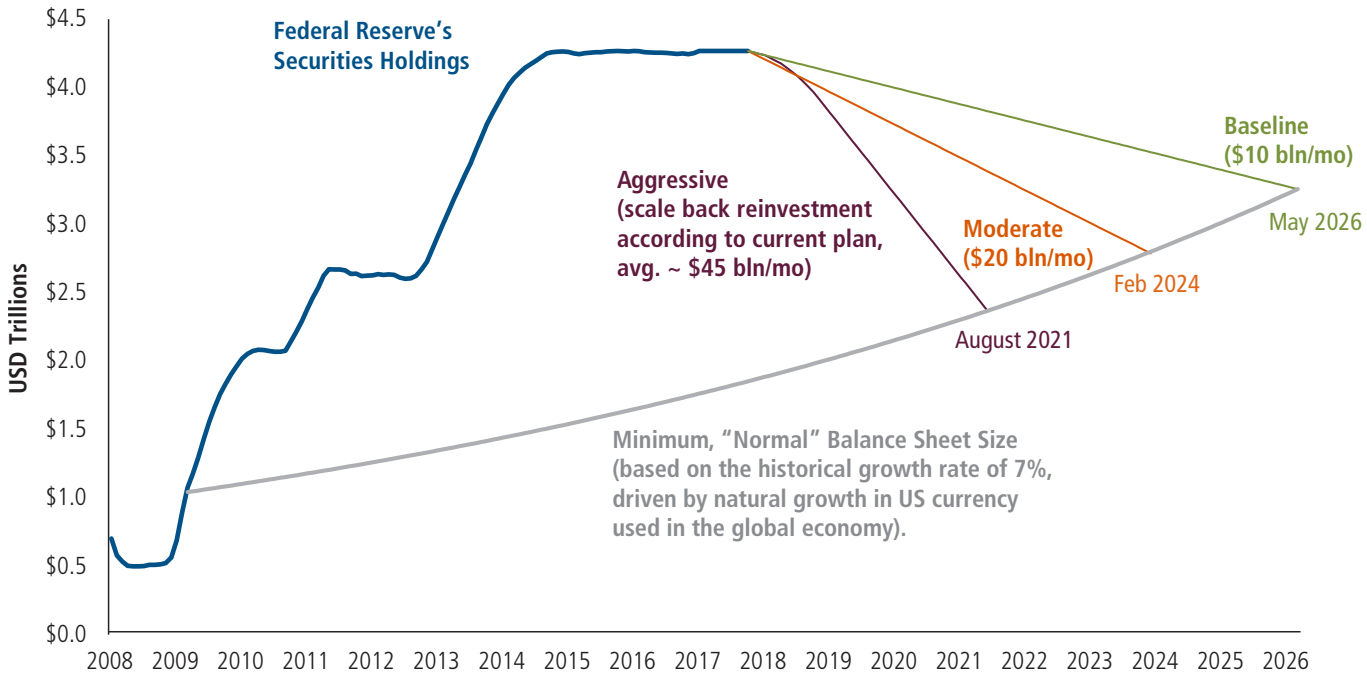
At first the central bank settled on a solution: pay banks interest on excess reserves to, in the words of the New York Fed, "reduce the incentive for [banks] to lend at rates much below IOER (Interest on Excess Reserves) providing the Federal Reserve additional control" over the fed funds rate. If banks receive 100 basis points (the IOER for holding onto reserves), they will not likely lend them out to someone else for any less, thereby enforcing the federal funds rate.

fig. 2 THAT BIG FAT BALANCE SHEET



Source: Federal Reserve Board, WSJ
*Weekly End of Wednesday Levels

fig. 3 PATH OF THE FEDERAL RESERVE'S BALANCE SHEET UNDER VARIOUS SCENARIOS



Source: Federal Reserve, Payden Economics

But reality upended the central bankers' best-laid plans. Officials learned that some participants in the "phone a friend" market could not legally earn the Fed's posted rate (we see you, Federal Home Loan Banks!). These participants in the market willingly lent out their excess balances for less than the posted rate. The Fed's first plan to manage front end interest rates failed.

«UNDER SUCCESSIVE QE PROGRAMS, THE FED INCREASED THE SIZE OF ITS BALANCE SHEET FROM $800 BILLION TO MORE THAN $4.5 TRILLION (SEE AGAIN FIGURE 2). HOW DID THAT HAPPEN? THE FED CREATED $2.6 TRILLION IN NEW LIABILITIES (RESERVES).»

Necessity is, of course, the mother of invention. A team at the New York Federal Reserve Bank hatched a new plan to appeal to a wider array of money market participants. A new tool was born: the fixed-rate, full-allotment overnight reverse repurchase facility (ON RRP).[3] Jargon-free, this new tool is just like having an overnight deposit account at the Fed for the non-bank institutions, with deposits backed by collateral the Fed holds on its balance sheet (all the bonds acquired with QE!).

With these two new tools, the Fed has maintained an iron grip on overnight interest rates. Most important for investors, the use of the ON RRP means that for the first time in history, institutional investors (i.e., non-broker-dealers and non-banks, such as money funds) have direct access to deposits at the Fed—a bit like having a checking account at the Fed. Said differently, the Fed has its tentacles wrapped around money markets like never before.

MAKING BANK RESERVES SCARCE AGAIN![4]

So the Fed's balance sheet is large. Yet policymakers seem intent on raising short-term interest rates. But, control of short-term rates depends, at least in part, on use of securities on the big balance sheet (the ON RRP).

Before we go too far, you might be thinking: "Well, if the Fed created all of these extra reserves to pay for the bond purchases under the various QE programs, *why not just sell the bonds?* By selling, reserve balances would also fall. Making reserves scarce would return the Fed to the comfortable confines of the pre-crisis mechanics in order to impact overnight interest rates by constraining or expanding the supply of reserves. End of story. Right?"

Not quite. While this is the first and simplest option, the Fed has a problem with selling the bonds before hiking interest rates to an

as-yet-unstated level. The uncertainty of selling all those bonds may spook the bond market. Consider that a few words from former Fed chairman Ben Bernanke spoken in spring of 2013 sparked a 150 basis point sell off in 10-year Treasuries (the so-called "Taper Tantrum"), which, in turn, spiked mortgage rates and sent home sales into a renewed slump.

The minutes of the March 2017 FOMC meeting show that the Fed prefers a "passive and predictable" roll-off of both Treasuries and MBS.[5] We learned in June 2017 what this would mean. The unwind process will permit $6 billion of Treasury securities and $4 billion of agency debt and mortgage- backed securities (MBS) to roll off the Fed's balance sheet each month. Note: the Fed will not be selling assets, only collecting the coupon, principal and maturity payments below the $10 billion monthly "cap" and returning those proceeds to the U.S. Treasury—just like any normal bond investor might sweep maturities out of a portfolio to meet payroll obligations instead of selling a bond. If future economic conditions warrant shrinking the balance sheet further, every three months the initial caps will increase by $6 billion (Treasuries) and $4 billion (agency and MBS), up to a maximum of $30 billion in Treasuries and $20 billion in agency and MBS per month.

In the meantime, since the future is unknown, we've mapped out three scenarios for the balance sheet (*see Figure 3 on page 8*). Even in the "aggressive" scenario in which the Fed ceased all reinvestment of the proceeds of its bond portfolio today—and maintained that policy for four years—the balance sheet would still exceed $2 trillion in 2021. Further, as mentioned above, the balance sheet would have grown naturally without the crisis of 2008. A simple extrapolation at the historical rate of growth in demand for the nation's currency of 7% puts a floor under the balance sheet over time (the gray line).

Given what we know now, our best guess is that by decade's end the balance sheet will still be $2-3 trillion. But the intersect between those two lines may end up being higher. In short, a big balance sheet in dollar terms is here to stay—we are not going back to $800 billion.[6]

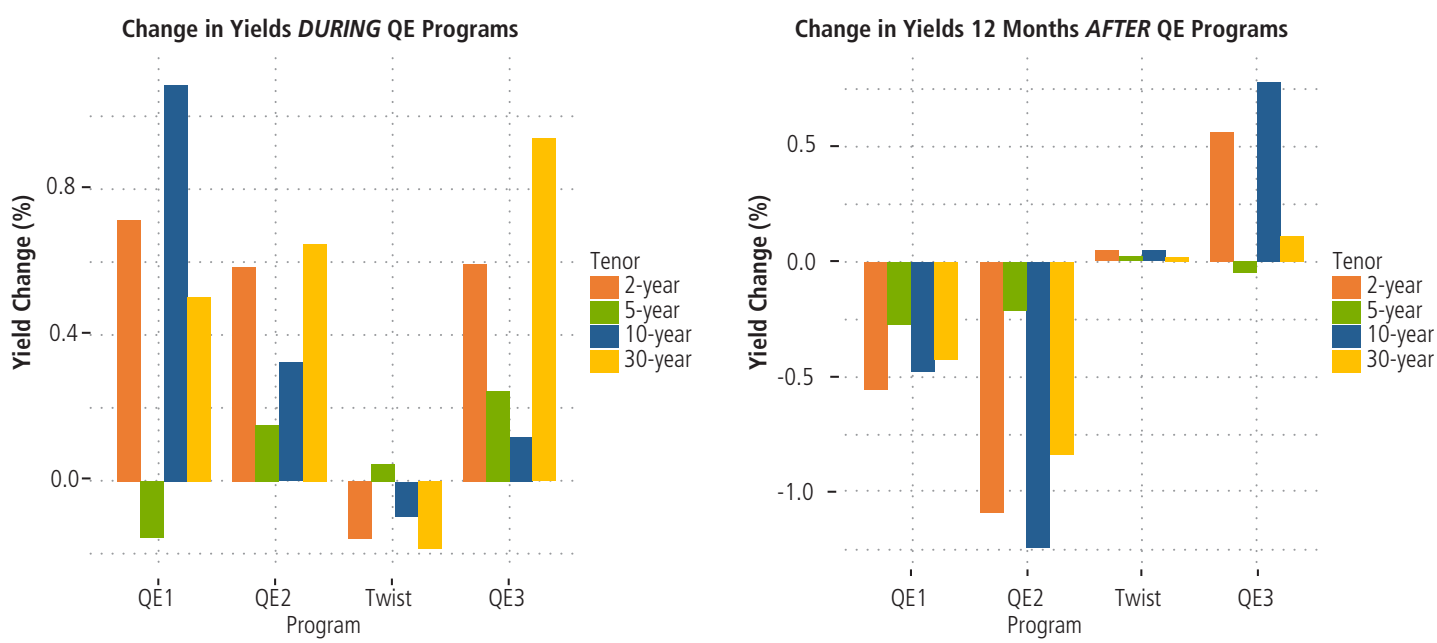
«THE LESSON: INVESTORS SHOULD INFER VERY LITTLE ABOUT THE DIRECTION OF LONGER-TERM RATES FROM CHANGES IN THE FED'S BALANCE SHEET.»

EMBRACE THE BIG BALANCE SHEET

Inquiring bond investor minds want to know: what does the unwind mean for interest rates? Telling the tale above is absolutely necessary for understanding what might happen next. We reach several conclusions, first concerning short-term rates and second longer-term rates.

The Fed's control of short-term rates has been successful so far, and the Fed's ability to control the federal funds rate and other short-term interest rates will remain the key tool of monetary policy. All else

fig. 4 WHAT DOES THE BALANCE SHEET MEAN FOR THE LONG-END OF THE YIELD CURVE? IT IS HARD TO SAY.



Source: Federal Reserve, Payden Economics

equal, the faster the pace of balance sheet run-off, the slower the pace of rate hikes, and vice versa.

In the words of Janet Yellen from a January speech, "The downward pressure on longer-term interest rates that the Fed's asset holdings exert is expected to diminish over time—a development that amounts to a 'passive' removal of monetary policy accommodation. Other things being equal, this factor argues for a more gradual approach to raising short-term rates." Hiking rates quickly while the balance sheet shrinks rapidly amounts to too much monetary policy tightening for the Fed's tastes.

At the longer end of the yield curve, the "conventional wisdom" seems to be that "when the Fed stops buying, interest rates rise" because "who will step in when the Fed steps away?" As we are fond of pointing out, the conventional wisdom is often wrong. We looked at four historical examples of when the Fed ceased or curtailed purchases, and in three out of four instances interest rates rose when the Fed was buying. Further, of the four 12-month periods after buying ceased or was curtailed, two periods saw interest rates fall (*see Figure 4 on page 9*). The lesson: investors should infer very little about the direction of longer-term rates from changes in the Fed's balance sheet.

HERE'S SOMETHING TO THINK ABOUT

Yes, the Fed's balance sheet is bloated. But, no, you shouldn't worry—at least not about the concerns voiced most often (higher rates). Policymakers aim to reduce the balance sheet gradually over time. While most investors focus on the asset side shrinking, we see minimal impact to financial markets.

The real story to watch will be the evolving relationship of the Fed to money markets. As a result of its big balance sheet, the Fed, for the first time in its 100-year history, now engages with non-bank, non-primary dealer participants in the money markets, redefining the Fed's relationship with financial markets. Rather than going through a dealer, money market funds (among others) can directly transact with the Fed. By lending out securities, the Fed will be able to influence the bond market more directly. What central banker wouldn't love more of this power? To continue this relationship, however, the Fed must maintain a bigger balance sheet. While there are many unknowns, including who will helm the Fed if Janet Yellen departs at the end of her term in January 2018, we suspect central bankers will learn to embrace the bigger balance sheet.

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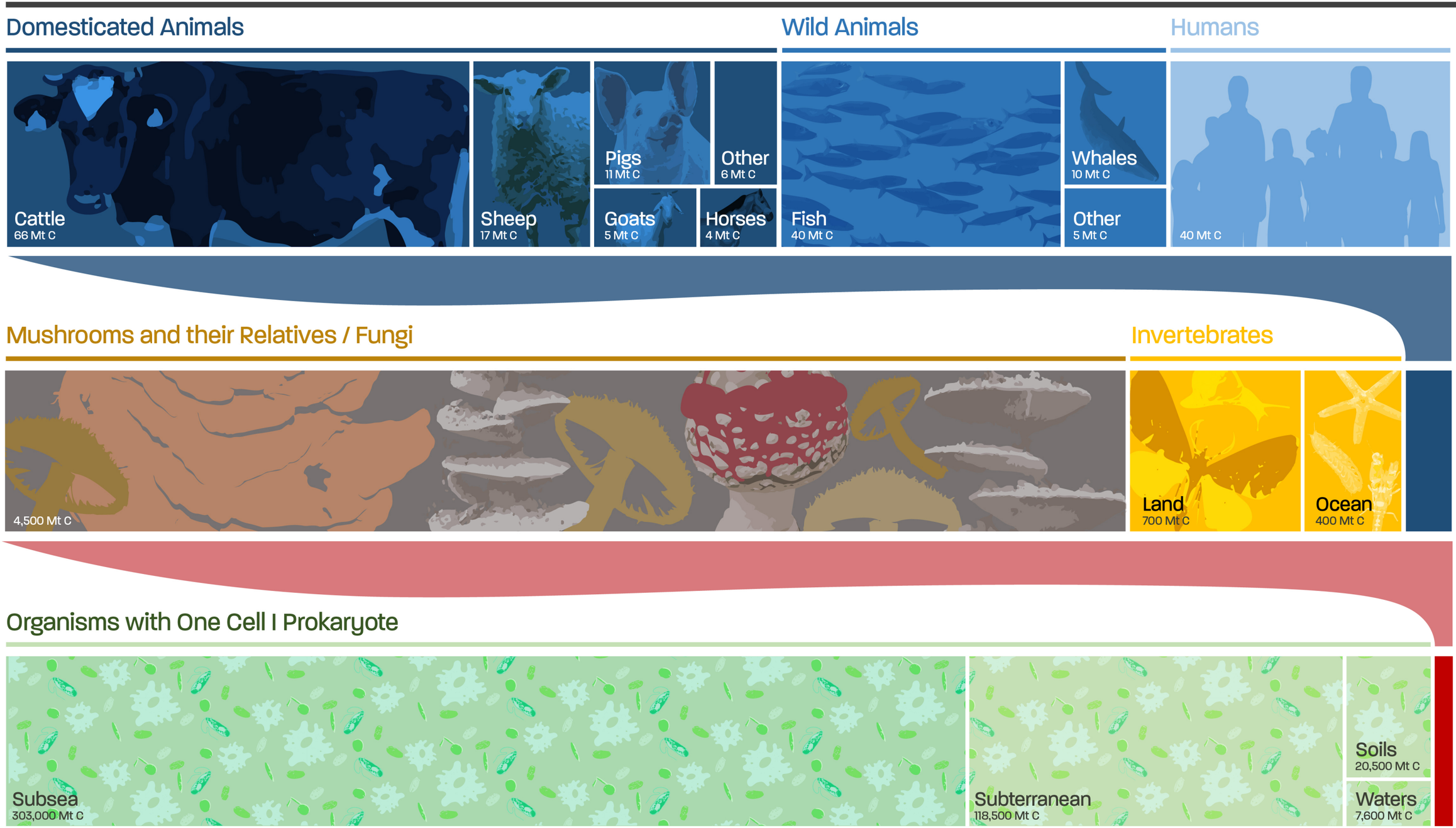
2. Frost, Josh, Lorie Logan, Antoine Martin, Patrick McCabe, Fabio Natalucci, and Julie Remache (2015). "Overnight RRP Operations as a Monetary Policy Tool: Some Design Considerations," Finance and Economics Discussion Series 2015-010. Washington: Board of Governors of the Federal Reserve System, http://dx.doi.org/10.17016/FEDS.2015.010.
3. "Interest rate control during normalization," Remarks by Mr Simon M Potter, Executive Vice President of the Markets Group of the Federal Reserve Bank of New York, at the SIFMA Conference on Securities Financing Transactions, New York City, 7 October 2014.
4. White,L. (2017). *A Rejoinder to Andolfatto*. Alt-M
5. March FOMC meeting minutes
6. Inquiring minds may wonder whether the balance sheet will shrink as a share of GDP, not merely in terms of absolute value. On this basis the balance sheet will indeed move back toward a more "normal" level over time as the economy grows .

Weighing the World

Earth is a planet teeming with life. Often when we think of life we think of our pets, livestock, insects, birds, fish and, of course, the 7+ billion *homo sapiens* scattered around the globe. However, taking stock of everything around us reveals a surprising picture. Estimate the weight—in million tonnes of carbon (Mt C)—of animal life on Earth and you find that the organisms we cannot even see with the naked eye comprise most of life on earth. That is right, single-celled organisms outweigh all other forms of animal life on the planet. Even within the realm of multi-cellular organisms, we (humans) are nothing more than a speck. Fungi vastly outnumber us. Our pets and livestock ("domesticated animals") vastly outweigh not only humans but also the stock of wild animals, too. What is truly miraculous is how such a minuscule part of life on Earth (humans) dominate the planet.

Animal Life by Weight (starting at bottom with Organisms)



Sources: Smil, Vaclav (2002) The Earth's Biosphere. MIT Press.; Land Mammals. XKCD (https://xkcd.com/1338/)

Notes: Since carbon is the building block of life, biomass is measured in million of tonnes carbon (Mt C) rather than kilograms. Smil (2002) data is given with ranges of estimates. We use the median of the range for this chart.

India Undergoing Modi-fications:
Putting "Demonetization" in Perspective

It is just like any other Tuesday evening in New Delhi, the capital of India. Thick with smog from firecrackers during the *Diwali* celebrations, the bustling city is quieter than usual as people seek refuge in their homes. On this cold night, Narendra Modi, Prime Minister of India, takes over the airwaves to make a sudden and stunning announcement. With the demeanor of a head of state announcing that his country is going to war, he states that "corruption, black money and terrorism are festering sores, holding [India] back in the race towards development" and announces that the two largest denomination notes (the 500 rupee and 1000 rupee, equivalent to $7.79 and $15.57) in use "will no longer be legal tender from midnight tonight."

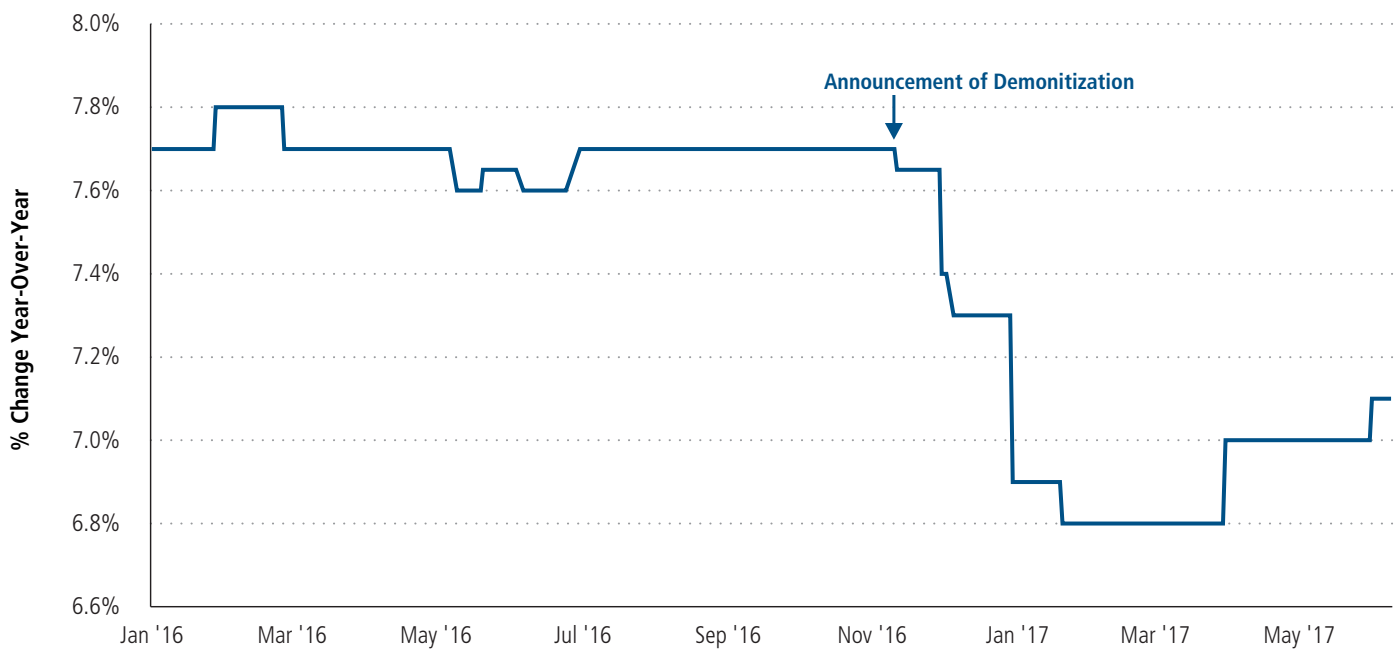
The administration was criticized by some and applauded by others. Despite shortcomings in the implementation, Modi's ruling party performed surprisingly well in the local elections in India's largest state by population, Uttar Pradesh. Since then Indian equities (as measured by the SENSEX stock index) rallied almost 15%, even as economic forecasters slashed real GDP growth estimates for 2017 from 7.7% to 7.1% (*see Figure 1*).

The true long term impact of demonetization will take decades to determine. In the interim, investors must look behind the scenes to see the major transformation that the Indian economy is undergoing. Once seen in context, demonetization is a blip in India's economic trajectory.

Demonetization is merely the halfway point on the path to the real change investors should be focused on: *digitization*. The Modi government envisioned the process of digitization as having four steps: identification, banking infrastructure, digital records, and, ultimately, cashless commerce. We will examine each in turn. The journey began with the Aadhaar Act of 2009 and, we think, ends with the implementation of IndiaStack. If India can endure the substantial bumps along the way, it will enjoy the fruits of being a truly digitized economy.

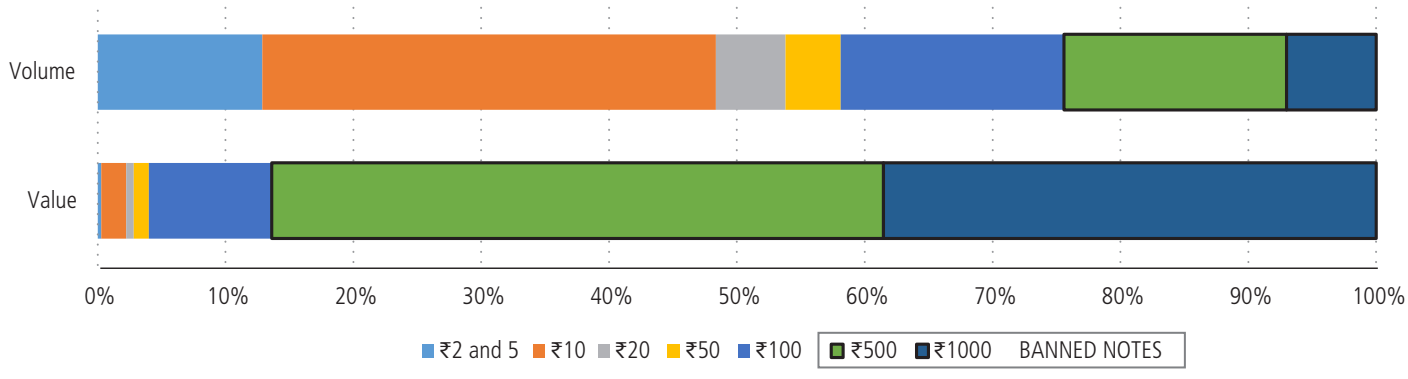
«ON THIS COLD NIGHT, NARENDRA MODI, PRIME MINISTER OF INDIA, TAKES OVER THE AIRWAVES TO MAKE A SUDDEN AND STUNNING ANNOUNCEMENT.»

fig. 1 BLOOMBERG CONSENSUS FORECAST FOR 2017 REAL GDP GROWTH IN INDIA



Source: Bloomberg

fig. 2 VALUE AND VOLUME OF ALL BANKNOTES IN INDIA BY DENOMINATION



Source: Reserve Bank of India
₹ = Indian Rupee

INDIA BEFORE 2009: FINDING AN IDENTITY

Most citizens in the developed world contemplate their identity in selfies and sleepless nights.

In India, before 2009, nearly 50% of the population lacked an official identity. Millions of babies were born every year without a birth certificate, which precludes that individual from basic services such as driving licenses, bank accounts and mobile phones.

To remedy this problem, India launched a project called Aadhaar, a nationwide biometric database based on a twelve-digit digital identity, fingerprints and retina scans. Eight years later, Aadhaar is the largest biometric database in the world and has achieved a stellar participation rate of 99% for those over the age of 18.[1] In case the scale of this success doesn't register, the number of "identified" Indians now equates to roughly 15% of the world's population.

«MOST CITIZENS IN THE DEVELOPED WORLD CONTEMPLATE THEIR IDENTITY IN SELFIES AND SLEEPLESS NIGHTS. IN INDIA, BEFORE 2009, NEARLY 50% OF THE POPULATION LACKED AN OFFICIAL IDENTITY.»

ERECTING A DIGITAL BANKING INFRASTRUCTURE

The next phase of India's digital infrastructure overhaul was the banking and mobile phone industries. Building on the identification infrastructure, digital banking now allows Indian customers to open an account with just their Aadhaar identification number. The proliferation of new bank accounts as a result of the initiative boggles the mind. Over 270 million new bank accounts were opened in the span of three years.[2]

One of the primary incentives used to convince the previously unbanked to open an account was the linkage to social welfare programs. The rural population finally had an efficient and non-burdensome method of collecting on social welfare programs provided by the federal government with less leakage. Once people could instantly open a mobile phone account with their Aadhaar numbers, mobile phone penetration rapidly increased as well. In March 2017, the government made Aadhaar verification mandatory for all mobile phone numbers.

THE WAR ON CASH

This brings us to cashless commerce: once bank accounts and wallets become digital and linked to biometrics, cash is no longer needed.

In his initial speech (the one quoted at the beginning of this article), Modi gave the country until the end of 2016 to deposit their notes in a bank account. The idea is to curb the circulation of money in the shadow economy, the so-called *kala dhan*, or "black" money, thereby making counterfeit notes used by nefarious elements in society worthless. However, in an economy where cash transactions make up 98% of all consumer transactions,[3] getting rid of 86% of the currency in circulation was disruptive, to say the least (*see Figure 2*).

Working people across India skipped work for days or weeks at a time to make sure their cash was properly deposited into banks. These same citizens spent additional days or weeks waiting in line at ATMs to withdraw new notes, notoriously difficult to source, in order to conduct daily business. The subsequent cash shortages affected millions. Without cash, the economy temporarily froze.

«IndiaStack WILL ALLOW EVERYONE TO DEVELOP APPS THAT COULD ENRICH THE LIVES OF INDIANS.»

Will Indians start using digital money? Demonetization resulted in a sharp increase in mobile app payments. Additionally, it scared the public into thinking that cash was no longer a permanent store of value. This forced the public to reconsider their allocation to holding cash versus holding deposits at banks and using digital payments.

GOING FULLSTACK

The final step in the digitization process is IndiaStack. IndiaStack opens up the biometric system of Aadhaar and its payment process to app developers everywhere. Apple and Google have allowed app developers access to their platform, resulting in a proliferation of apps that have enriched the value proposition of smartphones and their operating systems. In a similar vein, IndiaStack will allow everyone to develop apps that could enrich the lives of Indians.

IndiaStack will allow developers to use government biometric data to verify the identity of customers. Businesses and branches of government could capitalize on this massive biometric database to build solutions for anything that requires identity or banking. Imagine all of the bureaucratic paperwork around the world that relies on photocopies of IDs, passports, and bank statements, and then digitize it all so as to never require "showing" or "mailing a copy" of your ID ever again.

«IT REMAINS TO BE SEEN WHETHER THE BEST-LAID PLANS CAN BE TRANSLATED INTO A REALITY IN ONE OF THE WORLD'S LARGEST ECONOMIES.»

IndiaStack gives developers the protocols, tools and procedures (technical term: Application Programming Interface, APIs) to know how to use this data. The evolution of IndiaStack began with the objective to issue UIDs (Unique Identification Numbers) and has evolved through the years to include biometrics, a series of eKYC (electronic Know Your Customer) verification platforms and interfaces, and finally APIs.

Taken together, IndiaStack is presence-less because it utilizes biometrics that can be used and verified via smartphone anywhere in the world. It is paperless because digital records can move without the enormous burden of paper collection and storage historically required for record keeping.

JURY OUT

Plenty of risks and uncertainty remain. Chief among them is security. The importance of cybersecurity to protect such a massive and centralized database will now be paramount for India, but the potential benefits of a national, biometric database for which APIs exist can spur innovation and digitization unlike the world has ever seen.

The government also hopes that some of this economic activity makes its way onto official books and broadens the tax base once digitization is in full effect. A broader tax base has the potential to spur many of Modi's fiscal initiatives including revamping the country's roads, railroads, electricity grid and other desperately-needed infrastructure.

A digital infrastructure that can accommodate the sheer size of India's economy had to be established and developed before a demonetization event in order to capture economic activity.

It is too soon for unbridled optimism, but investors should step back and consider the broader context for demonetization: the most useful benefit of demonetization could be to speed up the digitization process. It remains to be seen whether the best-laid plans can be translated into a reality in one of the world's largest economies. Such foundations provide bright futures for economic progress, says the optimist.

SOURCES

1. *"Aadhaar covers 99% of adults in India.",* The Hindu (2017).
2. Maulden, John (2017). *"India's Tech Revolution Has Already Left the West Behind."* Forbes
3. *Disrupting Cash*, pg. 6 (2015). PWC

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