



C o m m u n i t y   E x p e r i e n c e   D i s t i l l e d

# Learning Bitcoin

Embrace the new world of finance by leveraging the power of  
crypto-currencies using Bitcoin and the Blockchain

**Richard Caetano**

**[PACKT]** open source\*  
PUBLISHING community experience distilled

# Learning Bitcoin

Embrace the new world of finance by leveraging the power of crypto-currencies using Bitcoin and the Blockchain

**Richard Caetano**



BIRMINGHAM - MUMBAI

# Learning Bitcoin

Copyright © 2015 Packt Publishing

All rights reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, without the prior written permission of the publisher, except in the case of brief quotations embedded in critical articles or reviews.

Every effort has been made in the preparation of this book to ensure the accuracy of the information presented. However, the information contained in this book is sold without warranty, either express or implied. Neither the author, nor Packt Publishing, and its dealers and distributors will be held liable for any damages caused or alleged to be caused directly or indirectly by this book.

Packt Publishing has endeavored to provide trademark information about all of the companies and products mentioned in this book by the appropriate use of capitals. However, Packt Publishing cannot guarantee the accuracy of this information.

First published: November 2015

Production reference: 1271015

Published by Packt Publishing Ltd.  
Livery Place  
35 Livery Street  
Birmingham B3 2PB, UK.

ISBN 978-1-78528-730-5

[www.packtpub.com](http://www.packtpub.com)

# Credits

**Author**

Richard Caetano

**Project Coordinator**

Harshal Ved

**Reviewers**

Francesco Canessa

Jose Celano

**Proofreader**

Safis Editing

**Commissioning Editor**

Edward Bowkett

**Indexer**

Rekha Nair

**Acquisition Editor**

Tushar Gupta

**Production Coordinator**

Aparna Bhagat

**Content Development Editor**

Dharmesh Parmar

**Cover Work**

Aparna Bhagat

**Technical Editor**

Namrata Patil

**Copy Editor**

Alpha Singh

# About the Author

**Richard Caetano** is an entrepreneur and software developer living in Paris, France, and was originally raised on a dairy farm in the middle of California. He discovered a strong interest in software development at an early age. Over the years, he has designed and developed systems ranging from agriculture process automation and government accounting to high-tech security, digital music, and mobile video games.

In 2011, Richard found the Bitcoin whitepaper and experienced a paradigm shift. After realizing the potential of this new technology, he changed course, and since then has been evangelizing this powerful new technology to the world.

He launched an early application called btcReport, which leverages good design to bring news and information to those interested in Bitcoin. Since then, he has been speaking at conferences and meetings to help spread the word about Bitcoin.

In 2015, he launched Stratumn, a company focused on helping developers build transparent, easy-to-audit, and secure applications by using the blockchain, the technology that powers the Bitcoin currency.

# Acknowledgments

I would like to first thank Tyler Love, a close friend from my hometown in California. I clearly remember the day, back in early 2011, when he sent me an instant message about Bitcoin. It has been an amazing journey since that day, and has been ever so rewarding.

I'm very thankful to my good friends at Epicenter Bitcoin, Sebastien Couture and Brian Fabian Crain, as they were the ones who introduced me to the publisher of Learning Bitcoin. In addition, I would like to thank all my friends in and around the Bitcoin space.

The editorial staff at Packt Publishing has been very supportive and helpful in making this book project a reality. I would like to thank Tushar Gupta for getting me into the right headspace to write, Natasha DSouza for her encouragement, Dharmesh Parmar for his guidance towards delivery, and Namrata Patil for her attention to the editorial details. I especially would like to thank the technical reviewers of the book: Francesco Canessa, Jose Celano, and John Jegutanis.

I have all my family and friends from my childhood on the farm to thank for all the opportunities I have had in life. I am thankful for my father's patience as he taught me electronics, and my mother's support as she took me to Radio Shack countless times to purchase packets of transistors and diodes. Ultimately, it was the TRS-80 computer that they gave me that set the course for my life.

I would like to mention Atelier Meraki located in my neighborhood in Paris. While writing this book, I spent many late nights working there. The word "Meraki" in Greek means to put your love, soul, and creativity into your work. That motto has been an inspiration for this project. I would like to thank Sherif Sy and Marie-Charlotte Moreau for all their hard work in making the space a wonderful place to work.

I would like to thank my Buddhist teachers and friends for helping me work with the best state of mind. More and more, I find that happiness comes from the simplest of lessons. Thank you.

Mais surtout, je tiens à remercier mon épouse Cécile pour toute son aide et son soutien alors que j'ai sauté la tête la première dans le Bitcoin. À l'époque, cela pouvait sembler une idée folle mais elle m'a toujours été derrière moi. C'est grâce à elle que j'ai écrit ce livre.

# About the Reviewers

**Francesco Canessa** is a software developer experienced in Bitcoin and blockchain technologies. His preferred tools when working with Bitcoin are Bitcoin Core via its JSON API for its solidity and simplicity, and the Bitcore JavaScript library for making slim client-side wallet software. As he believes that Bitcoin and blockchain are important innovations of our times, he builds open source projects (for example, BitNFC—<http://bitnfc.org>) to research and show the true power of these new technologies, and find new ways to drive Bitcoin's adoption. He has been working as the main translator on the Italian edition of *Mastering Bitcoin*, O'Reilly Media, written by Andreas M. Antonopoulos. His favorite programming language is Ruby and his hobbies are creating 3D printers and IoT.

**Jose Celano** started with computers when he was 10 and was given a Commodore 64. Jose holds a bachelor's degree in technical engineering in computer systems from the University of Las Palmas de Gran Canaria. He set up an IT company in 2004 after he finished his studies (iQ ingenieros), where he worked for 10 years, mainly developing web applications. He has always been interested in Internet payment systems and web development.

In September 2013, he began to investigate Bitcoin. In February 2014, he became a freelancer and started working on Bitcoin projects. Recently, Jose has worked as a private PHP consultant for BlockCypher, a San Francisco start-up providing blockchain web services to enable developers to easily build reliable blockchain applications.

# www.PacktPub.com

## Support files, eBooks, discount offers, and more

For support files and downloads related to your book, please visit [www.PacktPub.com](http://www.PacktPub.com).

Did you know that Packt offers eBook versions of every book published, with PDF and ePub files available? You can upgrade to the eBook version at [www.PacktPub.com](http://www.PacktPub.com) and as a print book customer, you are entitled to a discount on the eBook copy. Get in touch with us at [service@packtpub.com](mailto:service@packtpub.com) for more details.

At [www.PacktPub.com](http://www.PacktPub.com), you can also read a collection of free technical articles, sign up for a range of free newsletters and receive exclusive discounts and offers on Packt books and eBooks.



<https://www2.packtpub.com/books/subscription/packtlib>

Do you need instant solutions to your IT questions? PacktLib is Packt's online digital book library. Here, you can search, access, and read Packt's entire library of books.

## Why subscribe?

- Fully searchable across every book published by Packt
- Copy and paste, print, and bookmark content
- On demand and accessible via a web browser

## Free access for Packt account holders

If you have an account with Packt at [www.PacktPub.com](http://www.PacktPub.com), you can use this to access PacktLib today and view 9 entirely free books. Simply use your login credentials for immediate access.





# Table of Contents

<b>Preface</b>	<b>vii</b>
<b>Chapter 1: Setting up a Wallet</b>	<b>1</b>
<b>A brief history of money</b>	<b>2</b>
<b>Buying your first bitcoin in 15 minutes</b>	<b>2</b>
Signing up for a wallet – five minutes	4
Adding a funding source – ten minutes	5
Buying bitcoin – less than a minute	6
Looking at your Bitcoin balance	7
<b>Explaining Bitcoin addresses</b>	<b>9</b>
<b>Sending and receiving bitcoins</b>	<b>10</b>
Sending bitcoins	11
Receiving bitcoins	14
<b>Private keys and wallets</b>	<b>15</b>
<b>Transactions and confirmations</b>	<b>17</b>
Transactions	17
Confirmations	20
<b>Comparing Bitcoin wallets</b>	<b>21</b>
Online wallets	21
Desktop wallets	22
Mobile wallets	23
Hardware wallets	24
<b>Summary</b>	<b>25</b>
<b>Chapter 2: Buying and Selling Bitcoins</b>	<b>27</b>
<b>Understanding Bitcoin's price volatility</b>	<b>27</b>
Exchange rates	28
Bitcoin's price history	29
Price bubbles	29

Theft	30
Seizure	31
<b>Following exchange rates and news</b>	<b>32</b>
Price tickers	32
Detailed price tracking	34
Candlestick charts	35
Market orders	36
Trading techniques	36
News sources	38
<b>Comparing Bitcoin exchanges</b>	<b>40</b>
Volume and liquidity	40
Fees and commissions	41
Transfer limits	42
Jurisdiction and regulations	42
Service uptime	43
<b>Trading Bitcoins on an exchange</b>	<b>43</b>
Setting up an account	44
Depositing funds	45
Using Coinbase Exchange	46
Funding and orders	47
Order book and history	47
Price charts	47
<b>Physical Bitcoins</b>	<b>48</b>
<b>Summary</b>	<b>50</b>
<b>Chapter 3: Protecting Your Bitcoins</b>	<b>51</b>
<b>Storing your bitcoins</b>	<b>52</b>
Bitcoin savings	53
Paper wallets	53
One time use paper wallets	54
Creating a paper wallet	55
Verifying your wallet's balance	56
Importing versus sweeping	58
Importing your paper wallet	59
Paper wallet guidelines	59
Paper wallet services	60
Brainwallets	61
Creating a brainwallet	61
<b>Increasing brainwallet security</b>	<b>63</b>
Deterministic wallets	65
Type 2 Hierarchical Deterministic wallets	68
<b>Installing a HD wallet</b>	<b>70</b>
<b>Bitcoins in cold storage</b>	<b>71</b>
Cold storage with Electrum	72

---

Verifying access to a private key	74
<b>Good housekeeping with Bitcoin</b>	<b>75</b>
<b>Summary</b>	<b>76</b>
<b>Chapter 4: Understanding the Blockchain</b>	<b>77</b>
<b>The Genesis block</b>	<b>77</b>
Satoshi Nakamoto	78
The whitepaper	79
The blockchain	80
<b>Keys, transactions, and blocks</b>	<b>80</b>
Creating a transaction	80
Digital signatures	83
Public key encryption	83
Signing a document	84
Elliptic Curve Cryptography	85
Bitcoin addresses	85
Cryptographic hashes	86
Generating a Bitcoin address	87
Signing a transaction	89
Decentralized network	90
Broadcasting the transaction	91
<b>The blockchain</b>	<b>91</b>
Blocks	92
Forks	93
The Bitcoin supply	95
Proof of work	96
Confirmation	96
Difficulty level	97
Mining	97
Solving a difficult problem	98
Transaction fees	99
<b>Network attacks</b>	<b>100</b>
51 percent attacks	100
Race attacks	100
Finney attacks	101
<b>Alternative coins</b>	<b>101</b>
<b>Summary</b>	<b>102</b>
<b>Chapter 5: Installing a Bitcoin Node</b>	<b>103</b>
<b>Understanding a Bitcoin node</b>	<b>103</b>
Bitcoin Core	104

---

Internals of a node	105
Node discovery	105
Messaging	106
Maintaining a Blockchain	106
Transaction relaying	106
Bitcoin wallets	107
<b>Installing the client</b>	<b>107</b>
Requirements	108
Starting the client	109
Connecting to the network	109
Downloading the blockchain	110
<b>Using the client</b>	<b>110</b>
Encrypting your wallet	111
Backing up your wallet	111
Balance and history	112
Receiving transactions	112
Sending transactions	114
<b>Executing Bitcoin operations</b>	<b>115</b>
Opening the console	116
Working with an encrypted wallet	117
Working with Bitcoin addresses	118
Creating and sending a transaction	120
Generating a destination address	121
Selecting a funding source	121
Specifying a change address	122
Including a transaction fee	122
Defining the transaction in JSON	122
Encoding and signing the transaction	123
Reviewing the transaction	124
Broadcasting the transaction	125
<b>Summary</b>	<b>126</b>
<b>Chapter 6: Understanding the Mining Process</b>	<b>127</b>
<b>Digital gold</b>	<b>128</b>
Bitcoin mining	128
<b>Exploring the mining ecosystem</b>	<b>129</b>
Validating transactions	130
Proof-of-Work	131
SHA-256	131
Scrypt	133
Mining rewards	133
Difficulty metrics	133
Mining hardware	135

<b>Mining conditions</b>	<b>136</b>
Mining pools	137
Mining shares	137
Fees and Payout	137
Cloud mining	138
Estimating profitability	138
Hardware efficiency	139
Factoring in the difficulty level	139
Selecting a currency	140
Exchange rates	141
<b>Setting up a mining client</b>	<b>142</b>
Requirements	142
Capital	142
Hardware	142
Facilities	143
Choosing the equipment	144
Choosing the software	145
<b>Connecting to a mining pool</b>	<b>145</b>
The payout method	145
The pool fees	146
The pool speed	146
Additional features	146
Avoiding large pools	147
Running the client	147
<b>Summary</b>	<b>148</b>
<b>Chapter 7: Programming Bitcoin</b>	<b>149</b>
<b>Programmable money</b>	<b>150</b>
Decentralized applications	151
Blockchains	151
Public Blockchains	152
Permissioned Blockchains	152
Smart contracts	152
<b>Installing BitcoinJS</b>	<b>153</b>
Requirements	154
Beginning the installation	154
Editing the source code	155
<b>Programming common Bitcoin operations</b>	<b>156</b>
Checking your balance	158
Generating addresses for a website	161
<b>Sending transactions</b>	<b>161</b>
Simple transactions	162

<b>Building an Escrow contract</b>	<b>165</b>
Generating the keys	167
Generating the Escrow address	169
Creating a withdraw script	171
Signing the transaction	173
Broadcasting the transaction	176
Refunding	177
<b>Summary</b>	<b>177</b>
<b>Chapter 8: Exploring Alternative Coins</b>	<b>179</b>
<b>Open source money</b>	<b>180</b>
The rise of the alt-coin	180
<b>Namecoin</b>	<b>181</b>
Decentralized domain name service	181
Merged mining	182
<b>Litecoin</b>	<b>184</b>
Block rate	184
Script mining	185
<b>Peercoin</b>	<b>186</b>
Proof-of-stake	186
<b>Primecoin</b>	<b>187</b>
Prime numbers	187
Mining prime numbers	188
<b>Evaluating an alt-coin</b>	<b>188</b>
Developer activity	189
Launching of the alt-coin	189
The legitimate feature set	190
<b>Protocols built on the Bitcoin Blockchain</b>	<b>190</b>
Digital assets	190
<b>Building a voting system with Counterparty</b>	<b>191</b>
The XCP alt-coin	191
Creating a voting system	192
Creating a wallet	193
Funding the wallet	196
Creating the tokens	198
Sending tokens	199
Casting votes	201
Verifying the results	201
Finishing up	202
<b>The future of finance</b>	<b>203</b>
<b>Index</b>	<b>205</b>

---

# Preface

Bitcoin is truly a new kind of money. As an open network of computers, it exists purely on the Internet. Anyone with access to the Internet can send and receive money as easily as sending an e-mail. With this new form of digital cash, we are seeing the beginning of a new world of finance.

Bitcoin was launched in January 2009, just a few months after the financial crisis of 2008. As a true peer-to-peer currency, anyone in the world has access to bitcoin, with the ability to send it to anyone else. Its design insures that nobody can have their funds locked or taken away. The effects of this breakthrough currency are quite impressive. We have already seen the currency rise in price from less than one US cent to over a thousand dollars.

Since its launch, Bitcoin has challenged the mainstream view of finance. Originally designed as Digital Gold, Bitcoin's scarce supply and resistance to manipulation has resulted in an explosion of new ideas and projects with the strong potential to disrupt major industries and revolutionize finance.

Its anonymous creator, Satoshi Nakamoto, is only known through his contributions, namely the Bitcoin whitepaper and his initial forum posts to help guide core developers to support and maintain the source code. While nobody can confirm his identity, the value of his work is evident in the fact that the Bitcoin source code has been tested and challenged without any serious bugs or exploits reported. This is truly an amazing feat.

In this book, we will introduce Bitcoin with a hands-on approach. We will begin with a simple and easy-to-follow introduction, which includes buying and selling bitcoin. Throughout the middle, we will look into the internal workings of Bitcoin to understand how its various pieces work. Towards the end, we will explore various ways in which Bitcoin can be used as "programmable money".



## What this book covers

*Chapter 1, Setting Up a Wallet*, introduces the reader to Bitcoin and how to purchase some within 15 minutes. It covers the basics of Bitcoin, which includes addresses, keys, and wallets.

*Chapter 2, Buying and Selling Bitcoins*, covers more advanced ways of buying and selling bitcoin. Market trading and the tools involved are introduced.

*Chapter 3, Protecting Your Bitcoins*, educates you about how to become *your own bank*. Different approaches to safeguarding bitcoin are introduced and discussed.

*Chapter 4, Understanding the Blockchain*, gets into the nuts and bolts of Bitcoin's underlying technology. Its various technologies and algorithms are illustrated and explained.

*Chapter 5, Installing a Bitcoin Node*, is a step-by-step tutorial on setting up a Bitcoin node, which allows you to participate in the network. Some basic Bitcoin programming is introduced.

*Chapter 6, Understanding the Mining Process*, guides you through the various options available for mining bitcoin. The chapter focuses on the expenses involved and helps you to evaluate profitability.

*Chapter 7, Programming Bitcoin*, dives into the potential of Bitcoin as "programmable money". The chapter describes an example of how to build a simple Bitcoin escrow service using JavaScript.

*Chapter 8, Exploring Alternative Coins*, takes a tour around four innovative alternative coins based on Bitcoin's original source code. It ends with an example of how to set up a voting ballot secured by cryptographic proof.

## What you need for this book

To follow along with the examples of this book, you will need a modern web browser and a stable internet connection. Many of the Bitcoin services mentioned in the book are web-based and will only work on modern equipment. An iOS or Android smartphone might be necessary for some operations and authentication.

To be able to set up and install a Bitcoin node, a fast internet connection and a computer with a strong processor is required. The hard drive should have a minimum storage of 50 GB available, but more will be needed as the blockchain grows in size.

For the various aspects that involve programming, a computer with access to a terminal is required. Mac OS/X, Windows, and Linux have console access within a terminal. There are some additional tools required for setting up, such as Node.js, in order to follow along with the examples. Lists of the tools are provided with the examples.

If you are interested in setting up a Bitcoin mining rig, special equipment is required. Some of the equipment might be difficult to find and expensive to purchase. As the market is still new, one can expect many changes in pricing and availability. It is recommended that you check the forums and online marketplaces, such as eBay and Craigslist, to find more information about purchasing the equipment.

## Who this book is for

This book is written to help introduce Bitcoin to anyone who has basic experience with online banking. Most of the first half of the book is written for those who are very new to digital finance.

The second half of the book is written for those who are interested in seeing Bitcoin's potential. You do not have to be a programmer or hardware engineer to follow along, as simple explanations with clear illustrations are provided.

For more technical readers, scripts and installation notes are provided to help develop a deeper understanding of Bitcoin.

## Conventions

In this book, you will find a number of text styles that distinguish between different kinds of information. Here are some examples of these styles, and explanations of their meanings.

Code words in text, database table names, folder names, filenames, file extensions, pathnames, dummy URLs, user input, and Twitter handles are shown as follows: "We can include other contexts through the use of the `include` directive."


A block of code is set as follows:


```
// convert 'satoshi' to bitcoin value
var satoshiToBTC = function(value) {
  return value * 0.00000001
}
```

Any command-line input or output is written as follows:

```
~ npm install bitcoinjs-lib -g
```

New terms and important words are shown in bold. Words that you see on the screen, for example, in menus or dialog boxes, appear in the text like this: "Clicking the **Next** button moves you to the next screen."

[  Warnings or important notes appear in a box like this. ]

[  Tips and tricks appear like this. ]

## Reader feedback

Feedback from our readers is always welcome. Let us know what you think about this book – what you liked or disliked. Reader feedback is important for us as it helps us develop titles that you will really get the most out of.

To send us general feedback, simply e-mail [feedback@packtpub.com](mailto:feedback@packtpub.com), and mention the book's title in the subject of your message.

If there is a topic that you have expertise in and you are interested in either writing or contributing to a book, see our author guide at [www.packtpub.com/authors](http://www.packtpub.com/authors).

## Customer support

Now that you are the proud owner of a Packt book, we have a number of things to help you to get the most from your purchase.

## Downloading the example code

You can download the example code files from your account at <http://www.packtpub.com> for all the Packt Publishing books you have purchased. If you purchased this book elsewhere, you can visit <http://www.packtpub.com/support> and register to have the files e-mailed directly to you.

## Errata

Although we have taken every care to ensure the accuracy of our content, mistakes do happen. If you find a mistake in one of our books – maybe a mistake in the text or the code – we would be grateful if you could report this to us. By doing so, you can save other readers from frustration and help us improve subsequent versions of this book. If you find any errata, please report them by visiting <http://www.packtpub.com/submit-errata>, selecting your book, clicking on the Errata Submission Form link, and entering the details of your errata. Once your errata are verified, your submission will be accepted and the errata will be uploaded to our website or added to any list of existing errata under the Errata section of that title.

To view the previously submitted errata, go to <https://www.packtpub.com/books/content/support> and enter the name of the book in the search field. The required information will appear under the Errata section.

## Piracy

Piracy of copyrighted material on the Internet is an ongoing problem across all media. At Packt, we take the protection of our copyright and licenses very seriously. If you come across any illegal copies of our works in any form on the Internet, please provide us with the location address or website name immediately so that we can pursue a remedy.

Please contact us at [copyright@packtpub.com](mailto:copyright@packtpub.com) with a link to the suspected pirated material.

We appreciate your help in protecting our authors and our ability to bring you valuable content.

## Questions

If you have a problem with any aspect of this book, you can contact us at [questions@packtpub.com](mailto:questions@packtpub.com), and we will do our best to address the problem.



# 1

## Setting up a Wallet

*"When bitcoin currency is converted from currency into cash, that interface has to remain under some regulatory safeguards. I think the fact that within the bitcoin universe an algorithm replaces the functions of the government ...[that] is actually pretty cool."*

*– Al Gore, former Vice President of the United States*

Bitcoin's potential is quickly becoming apparent in the rapidly changing world of Internet finance. In just the few short years since its launch, we have seen an explosion of interest in this new, and somewhat mysterious, Internet money. Yet, several questions quickly come to mind: How does it work? Where does it come from? How do I buy it?

In this chapter, we will illustrate, in simple terms, most of what anyone new to Bitcoin will need to know to start. We will start by covering the following core topics:

- Buying your first bitcoin, in 15 minutes
- Explaining Bitcoin addresses
- Sending and receiving
- Private keys and wallets
- Transactions and confirmations
- Comparing Bitcoin wallets

## A brief history of money

Humans have been trading various forms of money for thousands of years. Many types of precious objects, acting as a *Medium of Exchange*, have been used. In the early ages, we traded grain, cattle, shells, and gems for other goods and services. This type of money, which we can touch and see, can be considered **Physical Money**.

As civilization progressed, so did our political systems. Eventually, sparse tribes and villages consolidated into kingdoms, states, and empires. Through the transformation, we saw our money shift into *Political Money*; money that's governed and issued by a central body such as the King, Emperor or, as in today's society, a Central Bank. State issued coins, bills, and notes, as well as taxation, regulation, and monetary policy – all emerged from this shift.

Today, Internet technology connects us directly to each other, opening a vast range of possibilities. By dissolving pre-existing physical and political boundaries, for the first time in history, the entire planet has access to the same information. This level of access is guaranteed by the Internet's decentralized design. Without a centralized hub, there is no single point of failure or control.

Satoshi Nakamoto, the creator of Bitcoin, leveraged this powerful network to implement a peer-to-peer (P2P) system for exchanging virtual cash. Built on a decentralized design and protected by powerful cryptography, this new type of money is no longer physical, yet resilient against corruption and manipulation.

No single group of individuals, including governments, banks, and corporations, control Bitcoin because all the peers are equal actors, participating through the same protocol. Its monetary policy is defined and self-regulated by its open network of computers. Thus, with Bitcoin we're seeing the emergence of a new phase of money. This P2P money is called cryptographic money or simply *Crypto-Currency*.

We're going to start exploring the world of Bitcoin by purchasing a small amount.

## Buying your first bitcoin in 15 minutes

Buying bitcoin is similar to buying foreign currencies. When an American lands in Paris, the first thing he/she may need to do is exchange dollars for Euros. While at the airport, it's likely he/she will be able to find a currency exchange to help. Just as there are many exchanges for exchanging government currencies, there are many exchanges for exchanging bitcoins.

Today there are markets for exchanging bitcoin with most of the world's major currencies. Most of them are online markets through which you can connect your bank account or credit card. There are some markets where the buyer and seller meet in person to exchange by hand. For the more technical users, private markets exist on chat forums where anonymous users trade with the other users based on their online reputation.

Of all the diverse ways to buy bitcoin, using a reputable online exchange may be the likely option for most users. Online exchanges generally operate similar to conventional online banking systems and are easy to set up.

We're going to buy 25 dollars worth of bitcoin using a credit card with an online exchange called Circle. In 2013, Circle was launched by a team competent in technology and finance. Additionally, they are registered as a money transmitter with FinCEN, a US government agency responsible for safeguarding the financial system from illicit use. For US citizens, they offer an instant exchange with a user-friendly wallet service. To buy bitcoins with Circle, you'll need the following:

- Valid photo ID
- A US home or business address
- A US bank account or credit card
- An iOS or Android smartphone
- 15 Minutes of free time

Buying and selling bitcoin on Circle is only available to users with a US address. As a registered money transmitter, Circle must follow standard banking practices such as Know your customer (KYC) and anti-money laundering laws (AML). These are the requirements to accept bank transfers from the US banking system.

Most European and Canadian customers can use Coinbase (<http://coinbase.com>) for direct wire transfers. We'll discuss buying and selling with Coinbase later in *Chapter 2, Buying and Selling Bitcoins*.

What's important to remember about Bitcoin is that the currency exists independently of any government's requirement for an individual's identity. Bitcoins can be exchanged with cash, hand-to-hand, thus by passing the registration process that we will describe in this chapter.

There are services such as **Local Bitcoins** (<http://localbitcoins.com>) where the users can buy and sell Bitcoin through direct exchange with the other users. While it is generally safe to do so, some users may be at risk from local regulations. It is important to research the local currency laws before transacting through these services, especially with large amount of cash.