Countering Counterfeits in a Digital World

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Abstract

Counterfeiting of banknotes has existed as long as banknotes have been used. However, the extent of counterfeiting by traditional means has largely been controlled by the cooperative efforts of the banknote designers, producers, issuers and enforcement agencies. Until the introduction of office and desktop color reproduction equipment, counterfeits were mainly produced using photographic and offset printing techniques. As modern reprographic technology has become commonplace and as digital printing equipment replaces older formats, the challenges and methods of preventing counterfeiting have changed. In particular, preventing the use of digital production equipment to counterfeit will likely require cooperation between banknote authorities and the printing industry.

Paper Money

Since its advent, paper currency has served as a convenient medium of exchange, despite its low intrinsic worth. The acceptance of paper notes as instruments of exchange is largely a social agreement founded on public trust, whether the instruments are backed by securities or merely promise. To maintain that trust and ensure that the agreement is upheld requires that certain related expectations be fulfilled by the design of the exchange instrument commonly known as a banknote:

1. The Banknote Must Connote Its Value

The set worth of the note must be stated or implied in a way that is recognizable to each party in a transaction. If the value of the note is arbitrary or variable from transaction to transaction, the agreement is broken and the implicit trust is jeopardized. Uncertainty in the value of local currencies has partly been responsible for the acceptance of U.S. currency as a worldwide instrument of value. In a number of Asian, South or Central American countries, the U.S. dollar is unofficially, or even officially, the base unit of currency. Some countries, like Argentina, have pegged the value of the local currency to the U.S. dollar, while other countries, among them Ecuador, El Salvador and Guatemala, are in the process of dollarizing.

2. The Banknote Must Be Issued By A Credible Centralized Authority

When banknotes first appeared in Canadian colonial America in the 17th century, they took the form of playing cards adapted for the purpose, cut into different pieces depending on the value. If these unofficial-looking pieces of playing cards had not been signed by the Intendant of New France, it is unlikely that they would have been accepted as payment by potentially mutinous soldiers demanding compensation for their efforts.

Establishing the credibility of the central authority played a significant role in the successful establishment of the U.S. dollar as national currency during the Civil War. Although the so-called "Greenback" dollars were first issued in 1862, their credibility among the public was at risk until the government established the Secret Service in 1865 to combat the rampant counterfeiting which was threatening to undermine the new monetary system.

3. The Banknote Itself Must Be Credible

To be credible, banknotes must by design elicit confidence in their integrity and authenticity. They must have features and characteristics that distinguish them from the attempted duplication, simulation or counterfeiting so that the public, as well as the banknote authorities and experts can tell they are in possession of the genuine article. Additionally, counterfeiting must be contained in order to maintain confidence in the banknote system. Prior to the U.S. Civil War, banknotes were issued by state-chartered banks. As many as 1600 different styles of notes were in circulation at the time. Counterfeiting was prevalent, and with so many varieties of genuine notes, knowing what each type was supposed to look like was an onerous task. This situation gave rise to the compilation and marketing of large descriptive counterfeit detection manuals, which described in detail genuine notes and every known variety of the corresponding counterfeit. As new notes emerged, genuine and counterfeit, these manuals had to be updated. However, once the authority to issue currency was taken over by the U.S. Department of the Treasury, and the Secret Service was established to investigate and suppress counterfeiting, currency designs became more standard and counterfeiting was brought into check.

Today, the dollar is backed by U.S. Treasury securities, which earn interest as long as the notes remain in circulation. Last year, the $540 billion of U.S. currency in circulation worldwide produced $26 billion in interest, a substantial contribution to the credibility of the U.S. dollar as a stable currency.

Banknote Authorities

Typically, a number of specific functions help to maintain a circulating supply of paper currency:

Design and Production
Issuance, monitoring and retiring of notes from circulation

Enforcement of laws to protect the circulating supply against counterfeiting.

In different countries, these functions are carried out through different mechanisms. In some countries, authority for carrying out the separate functions are transferred to commercial or added to the responsibilities of existing agencies. In many countries, banknote production is controlled by the state or central bank, while in others, the banknote producer is a commercial agency. Authority to process and monitor notes in circulation may also be delegated to commercial facilities. Whatever the relationship, the agencies supporting each of the functions usually work in concert to ensure the value, authority and integrity of the currency under their purview.

Counterfeiting

New threats from advanced reprographics present a much more difficult challenge to enforcement by placing an additional burden on the banknote designer. Conventional counterfeiting using lithographic techniques requires large, specialized equipment and materials. An extensive industry network is able to alert the enforcement agency (the U.S. Secret Service) when suspicious activity is noticed or suspect purchases are attempted. The criminals can then be tracked by the trail of equipment and materials.

Traditionally, counterfeiting has been carried out by a limited criminal element with a specialized set of skills and equipment. Producing counterfeit currency required cameras and other photographic equipment, plate burners, presses and the expertise to use each. The production process was time-consuming, tedious, and required privacy to create counterfeit currency undetected. Beginning in the late 1980's, the introduction of high-end full-color copiers made push-button counterfeiting possible. This possibility prompted formation of an industry coalition to develop technologies to prevent counterfeiting with color copiers. Likewise, international banknote authorities established their own cooperative group to work with the color imaging industry on counterfeit deterrence issues. Working in concert, the copier industry and the banknote authorities were able to extend the technologies used in color copiers to enhance their potential effectiveness at preventing counterfeiting.

In the mid 1990's, a new threat emerged when low-end full-color ink jet printers and inexpensive scanners became available. Today, abundant, cheap and easy to use, digital imaging equipment not only provides the counterfeiter with powerful imaging abilities, but also with the twin luxuries of time and privacy. With hundreds of products marketed specifically for personal use, the equipment is readily accessible to the counterfeiter in the privacy of his own home. No longer does the print shop employee have to sneak in during off hours to photograph the images, burn the plates, mix the inks, print the notes and clean the press. Now the counterfeiter can leisurely scan or download images, tweak the images in a graphics program and print when needed. This shift in venue is reflected in current U.S. seizure statistics. Before 1995, nearly all counterfeiting was done in professional print shops. Statistics for fiscal year 2000 indicate that 94% of the ink jet counterfeiting plants suppressed for which venues were reported were in homes. Nearly all the remaining operations suppressed were in venues such as hotels, dorm rooms, offices, schools and storage facilities. See Figure 1.

Until 1995, U.S. counterfeit currency was almost exclusively created by offset lithography. In the mid 1990's, the market exploded with inexpensive full color printers and copiers. Since then these ink jet printers/copiers have increasing supplanted the offset printed counterfeit. Currently, almost half of the counterfeit notes passed domestically are ink jet counterfeits with essentially all of the domestic counterfeit printing operations employing ink jet machines See Figures 2 and 3.

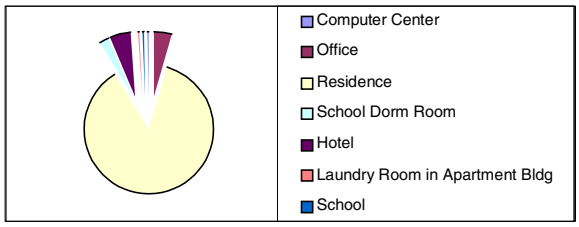

Figure 1. Location of Ink Jet Counterfeiting Operations

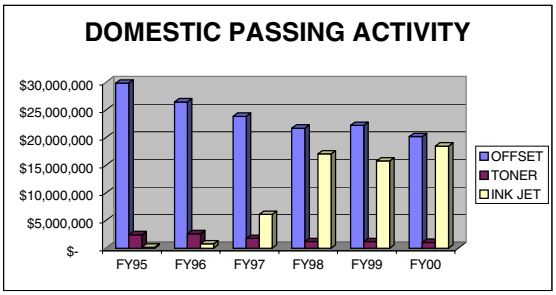

Figure 2. Domestic Counterfeit Passing Activity

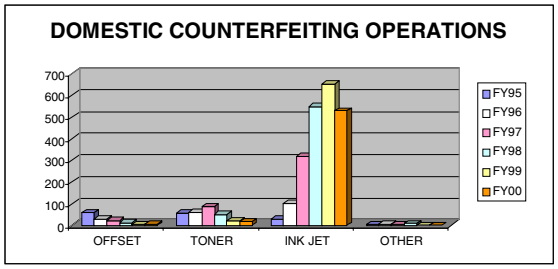

Figure 3. Domestic Counterfeiting Operations

High Volume Threat

As industrial print shops upgrade to realize the benefits of digital systems, this equipment will become more available to rogue individuals with criminal intentions. In fact, in a recent case, an operation using a digital press was discovered and thwarted by police before any of the counterfeits were circulated. The counterfeiters had produced hundreds of millions worth of U.S. and German counterfeit over the course of a couple weeks. Fortunately, either due the lack of need or the lack of familiarity with the equipment, the full capabilities of the system were not exploited and no special attempts to simulate the security features of these banknotes were made.

With these digital industrial presses, the major problems associated with both traditional offset equipment and modern digital systems are combined to form a more challenging enforcement threat than either type of equipment alone. The high speed and high volumes associated with the methods of the traditional counterfeiter and the ease and flexibility of modern digital methods make counterfeiting easier.

Banknote Design

In the past, designing banknotes that would be secure against counterfeiting was relatively straightforward. Cash was handled only by human beings, and counterfeits were generated almost exclusively using cameras to image and offset presses to print. The traditional techniques used to make banknotes, including hand-engraved designs, machine-scrolled line-work, non-standard engraved and typographic lettering and seal styles, plus tightly registered front and back offset rainbow tints, worked well in this environment.

In recent decades, the requirements for banknote design have become more complex. Banknotes are handled both by humans in direct transactions and by machines with varying ranges of sophistication, from simple over-the-counter authentication devices to complex, multi-detector, high-speed central bank processing machines. Methods of counterfeiting are not limited to traditional lithographic methods but extend to modern reprographics, such as office and desktop color copiers, scanners and printers. These new methods of counterfeiting require new methods of counteraction. One method employs traditional banknote designs that incorporate features that are reflective or diffractive, properties that are not captured in the imaging process, forcing the counterfeiter into additional processes to mimic the feature.

The advancements in digital technology have also created new opportunities for banknote designers and good corporate citizens within the imaging industry. Digital techniques for both banknote designing and for anti-counterfeiting systems in imaging equipment have been developed and implemented to make banknotes more secure. As new imaging technologies are developed and implemented, new alliances must be formed between the banknote and imaging industry to prevent its misuse for counterfeiting.

Biography

Sara E. Church is a program manager and research chemist in the Securities Technology Institute at the U.S. Bureau of Engraving and Printing. Her background includes a doctoral degree in physical chemistry and twelve years of experience at the Bureau in counterfeit deterrence. Her responsibilities include broad participation in programs to implement counterfeit deterrence and authentication features in U.S. currency. She participates extensively in national and international activities concerning counterfeit deterrence.