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A comparative study on security features of banknotes of various countries

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Abstract

Counterfeiting is a major problem in banknotes. To prevent counterfeiting every country includes various types of security features in their banknotes. These security features make banknote less prone to counterfeiting. These are the special features which were added either at the time of manufacturing of banknote or in the middle of the manufacturing process. These special features are paper quality, intaglio printing, watermarks, security threads, latent image, etc. Every country has their own type of security features. In this paper security features of Indian Rupees (₹), Australian Dollar (\$), British Pound (£), Euro (€), American Dollar (\$) and Renminbi (¥) are studied and compared. After studying the features it can be concluded that Indian currency i.e. Rupee (₹) has the maximum number of security features present and the latest addition is the anti-photocopying feature i.e. "Omron" feature. Due to these security features, they make Indian Rupee less prone to counterfeiting.

Keywords: Counterfeiting, security features, bank note, currency

Introduction

The most serious issue of the new-age banknote is to keep the bank notes with up-to-date security features to prevent counterfeiting of money. A bank note is a paper money, comprising a cardinal bank promissory note to pay someone a particular sum of money on demand. The cardinal bank varies from country to country; they are responsible for issuing currency of a particular country. Like- Reserve Bank of India (India), Reserve Bank of Australia (Australia), Bank of England (England), European Central Bank (For all European countries- Spain, France, Italy, etc.), Federal Reserve System (USA), The People's Bank of China, etc. The currencies issued by these banks are Indian Rupee (₹), Australian Dollar (\$), British Pound (£), Euro (€), American Dollar (\$) and Renminbi (¥) respectively and these currencies are the most tradable currencies in the world. Counterfeiting of currency means an imitation of bank notes with intent to fake out. The criminal activity of counterfeiting currency is as old as making of currency itself. Latest growth in computer technologies and photography, along with the accessibility to low-cost tools, has made the manufacturing of fake money simply and this leads to serious menacing to national financial systems, banking organizations and customers globally. Just to stop the counterfeiting of money, every country is updating its currency regularly by adding technical security features to its banknote, security features are of two types' one which can be seen by naked eyes and others require use of equipment's like Magnifying glass, Ultra Violet lamp, Infra-red viewer, etc.

Every modern banknote consist of following security features like-

1. Paper quality- The type of paper that we use in our daily lives is totally different from the type of paper used in manufacturing of a banknote, special type of paper are used in order to give longer life to a bank note and make it more complicated to counterfeit. Now a day's special type of polymers are also been used because they have more average life than paper notes and they are resistant to fire and water.
2. Security thread- Security threads are the most common and safe features, which are remarkably hard to be made without the help of any specialized tool / equipment. These threads are ingrained into the paper at very early stage of banknote production. Usually there are two types of security threads: internal security thread and diving security thread. The internal security threads are completely within the sheet of the paper and these threads may be solid and transparent, comprising some micro-inscriptions. Plastics and metal can be used. The diving security threads are generally formed of foil, these types of threads contains written text in them, which is noticeable when seen across some light source.

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3. Gradient coloring- It is also most reliable security feature which is nearly difficult to recreate even with best duplicating devices. Banknotes are printed with color gradients that change so a little bit that a copier would not be able to figure out the variations in color.
4. Intaglio printing- It is also very common type of security features used in modern banknotes. Intaglio means 'raised'. In this technique the image is carved into the surface. It is designed by putting about 60 layers of colour on the same position on the banknote. Just because of this layering the letter or image gains volume and thus you can feel it by touching it with your fingers.
5. UV glowing- It is the most newly added security feature in modern banknotes. In this the particular image or denomination in the banknotes glows when they are exposed to UV rays, because of fluorescent paint or dyes used in their production.
6. Micro texts- micro texts are extremely texts which cannot be seen by naked eyes. These are hidden in any part of a banknote like near portraits, numbers, etc. in order to prevent counterfeiting.
7. Holograms- Holograms are the most modern feature of today. They are very difficult to counterfeit because hologram are imitated from the main hologram which needs costly, specific and technically innovative equipment. They are ingrained via a special technique like hot-stamping foil.
8. Anti-copying feature- This feature was incorporated in banknotes in late twentieth century. These are specially types of lines and decorations incorporated in banknote with help of special software and hardware that makes it difficult to be copied.
9. Watermarks- these are the most well-known security feature of paper banknote. A watermark is basically any type of image or pattern. When a watermark is exposed to any light source it appears lighter and darker as compared to its surrounding area. It incorporated during manufacturing by using water coated metal stamp.
10. IR glowing- It is one of the newly introduced security feature in banknotes. Currently only two countries are using this feature in their currency i.e. the Euro and Russian Rouble. It is similar like UV glowing. In this special kind of dyes or paints are used and these paints or dyes appear darker when exposed to IR source.
11. Color changing- It is also one of the newly introduced security features in modern banknotes. This is a special kind of effect, in which when the imprint is viewed from different angles its color changes. And when the imprint is viewed under microscope it shows a raised polygonal object whose topmost side is of one color and other sides have different type of color.
12. Denomination marks- It is the most commonly used security feature. It is large size numerical written several times in different locations of a banknote. Now a day's to prevent counterfeiting, the denomination marks are repeated in several ways like in backgrounds, micro texts, etc.
13. Numbers- numbers written on banknote have relation with the security features. Numbers present on the banknotes are unique because every banknote has its unique number and they never repeat.
14. Complicated portraits- This feature is most difficult to copy because of presence of fine details in a portrait. Currently most of the currencies in the world possess portraits.
15. Background decorations- The background decorations are complicated and also very hard to copy because they are made by putting several layers on one another.
16. Mark for blind- Every currency in world consists of different type and different shapes of mark. These marks help in identification of particular type of banknote for blind people by using their fingers. [1]

This paper will be discussing about security features of Indian Rupee (₹) and five other major currencies- Australian Dollar (\$), British Pound (£), Euro (€), American Dollar (\$) and Renminbi (¥).

Observation

Security Features of Indian Rupee (500 ₹ and 1000 ₹)
 Indian Rupee (₹) is issued by Reserve Bank of India (RBI). In India following denomination of note are in circulation- 5 ₹ note, 10 ₹ note, 20 ₹ note, 50 ₹ note, 100 ₹ note, ₹500 note and ₹1000 note. [2]



Fig 1: security features present in a ₹500 note



Fig 2: security features present in a ₹1000 note

1.1 Security Features Of American Dollar (50\$ and 100\$)- American dollar is also known as United States Dollar, US dollar and U.S. Dollar. American dollar is the main leading currency all over the world. An American dollar (\$) is issued by Federal Reserve Bank. Currently in United States of America following are the banknotes which are in circulation - \$5 note, \$10 note, \$20 note, \$50 and \$100 note. [3, 4, 5]

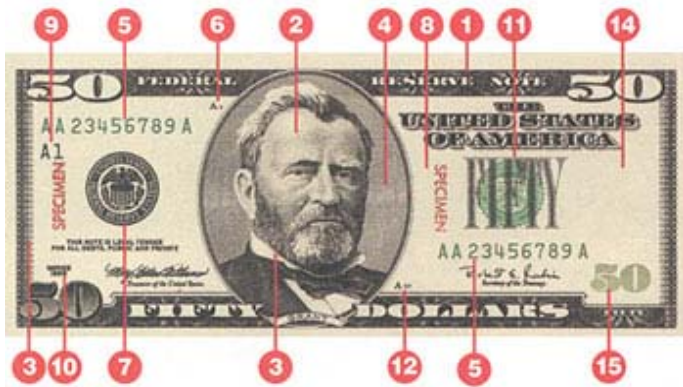


Fig 3: security features present in a 50\$ note

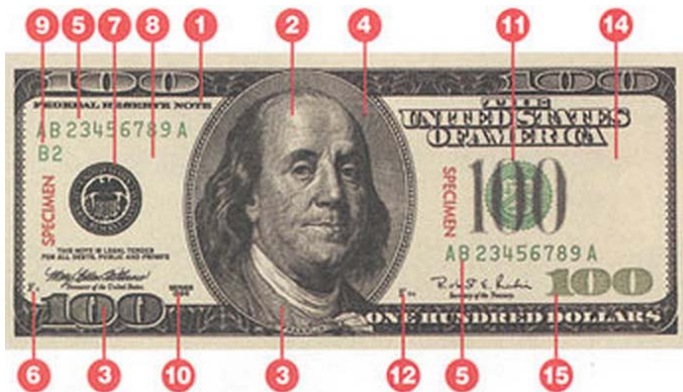


Fig 4: security features present in a 100\$ note

- | | |
|------------------------------------|---------------------------------------|
| 1 Type of Note | 8 Inscribed Security Thread |
| 2 Portrait | 9 Federal Reserve Letter/Number |
| 3 Microprinting | 10 Series |
| 4 Fine-Line Printing Pattern | 11 Treasury Seal |
| 5 Serial Number | 12 Check Letter and Face Plate Number |
| 6 Check Letter and Quadrant Number | 13 Back Plate Number |
| 7 Federal Reserve Seal | 14 Watermark |
| | 15 Color Shifting Ink |

Fig 5: Legends

1.2 Security Features Of Australian Dollar (50\$ and 100\$)- Australian dollar (\$) is issued by Reserve Bank of Australia. It was established in January 14, 1960. Currently there are five distinct denomination banknotes are in circulation \$5 note, \$10 note, \$20 note, \$50 note and \$100 note. Australia is among one of the few countries where the counterfeiting of money is very low, because of their security features present in banknotes. Special feature of Australian banknotes are that they are made up of polymer. [6, 7, 8]



Fig 6: security features present on front side of \$50 note



Fig 7: security features present on back side of \$50 note



Fig 8: security features present on front side of \$100 note



Fig 8: security features present on front side of \$100 note

1.3 Security Features of British Pound (20£and 50£)-
 British pound is issued by Bank of England that is the central bank of United Kingdom. Bank of England was founded in 1694. It is also known as “Old Lady” of Thread needle Street. The motive of the bank is to “promote public good and benefit of our health” by keeping up monetary and financial stability. Currently in UK there are four distinct denomination banknotes are in circulation, which are £5note, 10£note, £20note and £50note (old and new). [9, 10]



- | | |
|--|---------------------------------|
| 1. Paper quality and Intaglio printing | 5. Microlettering / Micro texts |
| 2. Security thread | 6. Ultra-violet feature |
| 3. Watermark | 7. Holographic strip |
| 4. Print Quality | 8. See-through register |

Fig 9: security features present on 20£ note



- | | |
|--|-------------------------|
| 1. Paper quality and Intaglio printing | 6. Ultra-violet feature |
| 2. Security thread | 7. Motion thread |
| 3. Watermark | 8. See-through register |
| 4. Print Quality | |
| 5. Microlettering / Micro texts | |

Fig 10: security features present on 50£ note (new style)

1.4 Security Features Of Euro (200€and 500€)-

Euro is issued by The European Central Bank (ECB); it was established in June 1, 1998. Eighteen European Union countries are the member of this bank. The main motive of

ECB is to maintain “the euro’s purchasing power and price stability in euro region.” Currently there are five distinct denomination banknotes are in circulation, which are €5, €10, €20, 50€, €100, €200 and €500 notes. [11, 12, 13]

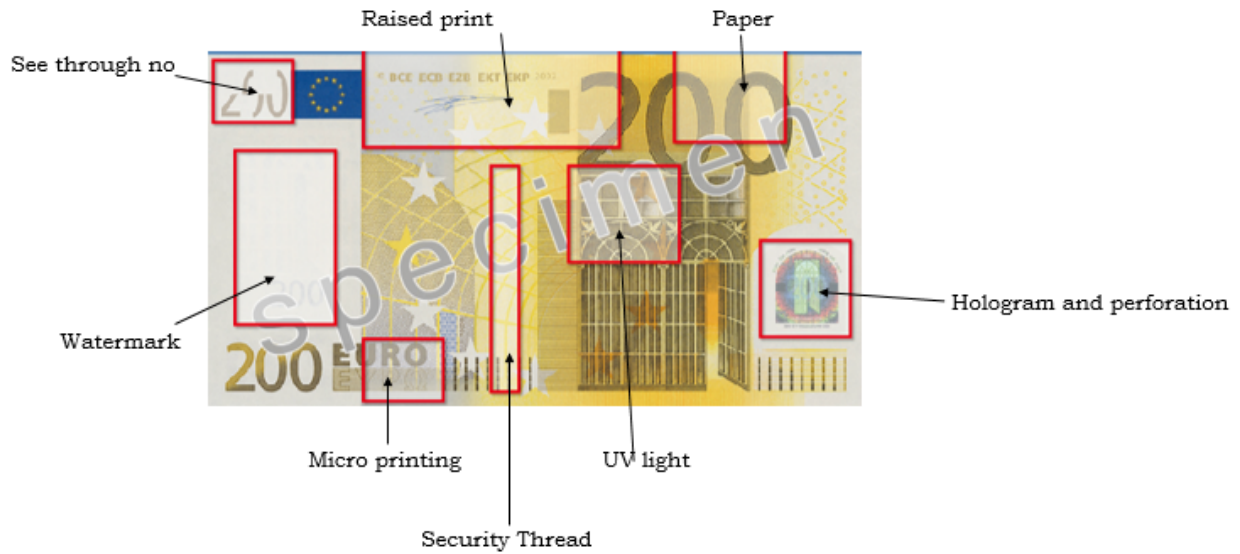


Fig 11: security features present on €200 note

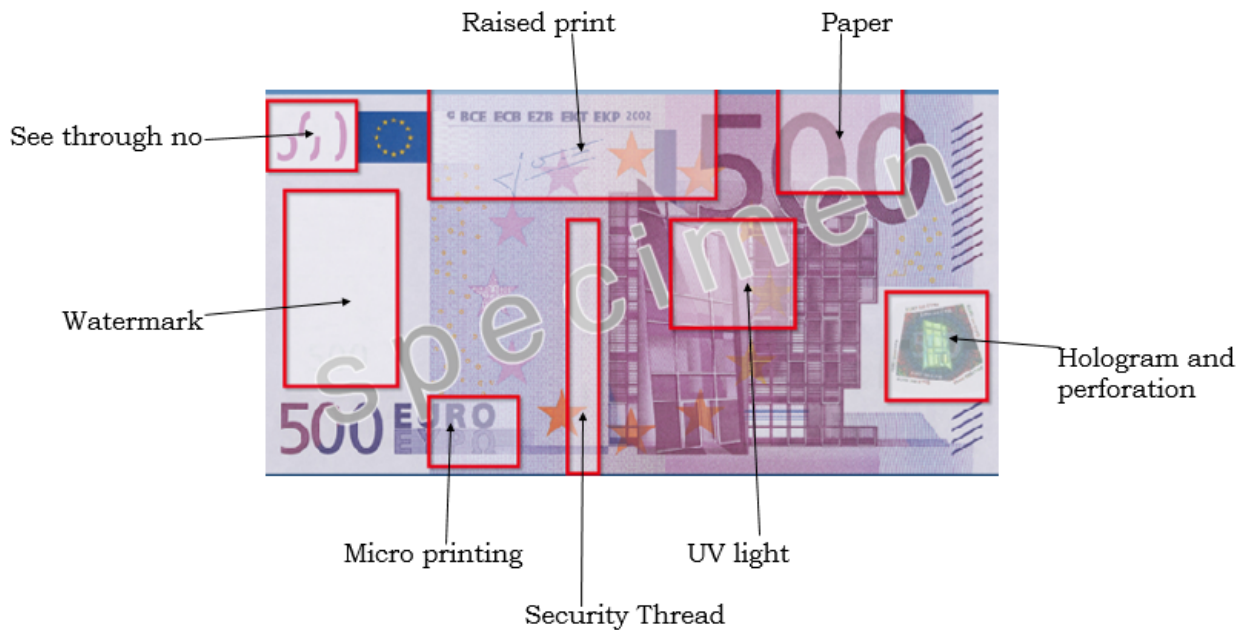


Fig 12: security features present on €500 note

1.5 Security Features Of Renminbi (50¥ and 100¥)-

Renminbi (¥) is Chinese currency which is issued by the central bank of china that is The People’s Bank of China (PBC). PBC was established in 1st December 1948. Renminbi is also called as Yuan; basically Yuan is primary unit of Renminbi. The Chinese currency is printed in *China Banknote*

Printing and Minting Corporation (CBPMC), which is located in various parts of People’s Republic of China, for example- Shanghai, Beijing, Chengdu, Nanchang, etc. Following denomination of note are currently in circulation in People’s Republic of China- 1¥ note, ¥5 note, ¥10 note, ¥20 note, ¥50 note and ¥100 note. [14]

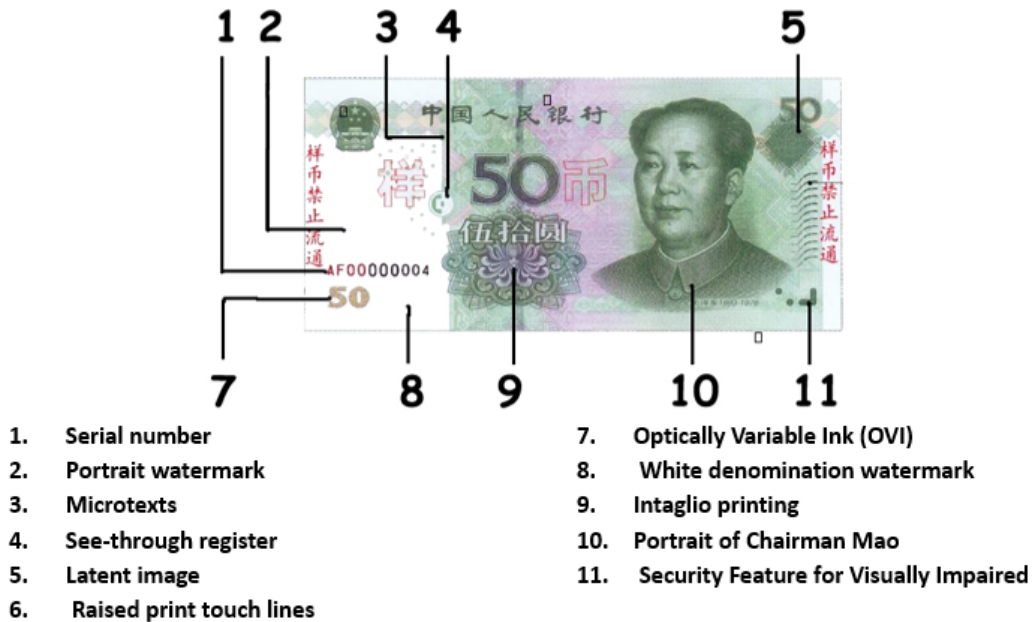


Fig 13: security features present on ¥50 note

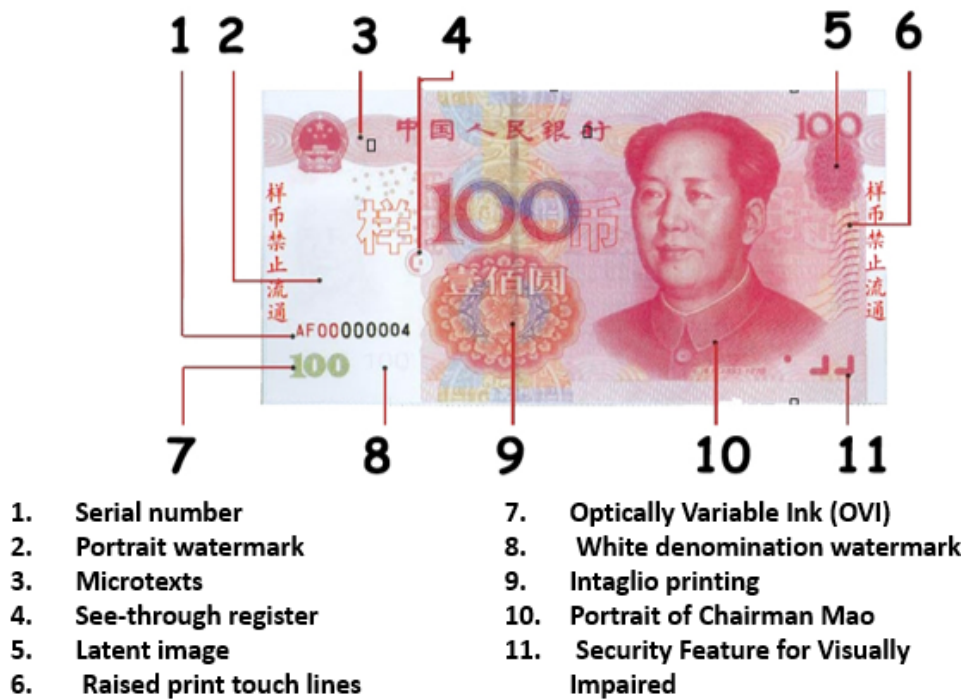


Fig 14: security features present on ¥100 note

Results And Discussions

The various security features present in all the six currencies were studied and compared with each other. It was found that for the manufacturing of the banknote pure cotton is used, except in the case of the American dollar (\$), Australian dollar (\$) and Renminbi(¥) they are made up to 75% - paper 25% - linen, polymer and paper respectively. The most common security features encountered in all the banknotes were watermark, micro text/micro lettering, denomination mark and complicated portrait. Security thread was present in all the banknotes except in Australian dollar (\$). American dollar (\$) and Renminbi (¥) lacks UV features. The hologram / holographic strip was only present in British Pound (£) and Euro (€). Identification mark was only present in Indian Rupee (₹), American dollar (\$) and Renminbi (¥). Color changing ink / optically variable ink feature was present in all the banknotes except Australian dollar (\$) and British pound

(£). The latent image feature was only present in Indian rupee (₹) and Renminbi (¥). Only American dollar lacks see through register feature and intaglio printing feature.

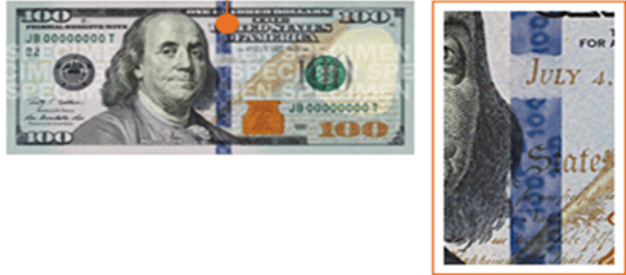



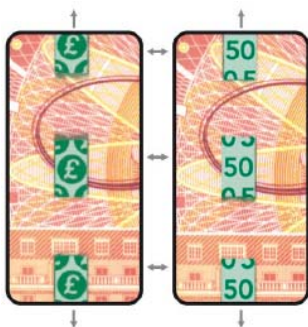
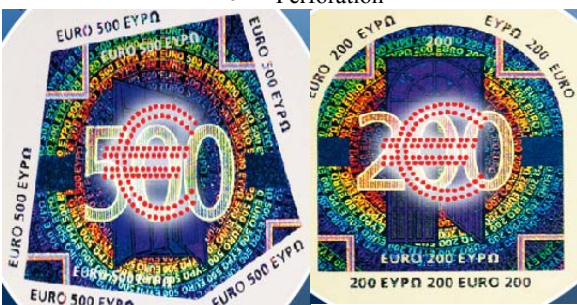
Apart from the common features encountered in the banknotes, there were some special security features present in all the six currencies which are not common. For instance, Indian Rupee comprises Anti-photocopying “Omron” feature. American Dollar (\$) contains ‘three dimensional ribbon’ and ‘bell in the ink’ feature. Australian Dollar (\$) consists a ‘clear window’ feature. British pound (£) has ‘foil patch’ and ‘motion thread’ feature. Euro (€) banknotes consist of ‘perforation’ feature. Renminbi (¥) consists of ‘white denomination watermark’.

Table 1: Shows the features which are commonly present in the following currencies-

Serial no.	Security features	Indian Rupee (₹)	American Dollar (\$)	Australian Dollar (\$)	British Pound (£)	Euro (€)	Renminbi (¥)
1.	Intaglio printing	✓	×	✓	✓	✓	✓
2.	Watermark	✓	✓	✓	✓	✓	✓
3.	Security threads	✓	✓	×	✓	✓	✓
4.	Material used	Pure cotton fibre	75% - paper 25% - linen	Polymer	Pure cotton fibre	Pure cotton fibre	Paper
5.	UV features	✓	×	✓	✓	✓	×
6.	Micro texts	✓	✓	✓	✓	✓	✓
7.	Hologram / Holographic strips	×	×	×	✓	✓	×
8.	Anti-photocopying feature	✓	×	×	×	×	×
9.	Color changing ink / Optically Variable Ink	✓	✓	×	×	✓	✓
10.	Denomination mark	✓	✓	✓	✓	✓	✓
11.	Complicated portraits	Portrait of Mahatma Gandhi	Portrait of Benjamin Franklin(\$100), Ulysses S. Grant (\$50), Andrew Jackson (\$20), Alexander Hamilton (\$10), Abraham Lincoln (\$10), George Washington (1 \$)	Portrait of Dame Nellie Melba (\$100), David Unaipon (\$50), Mary Reibey (\$20), AB Banjo Paterson (\$10) and Her majesty Queen Elizabeth II (\$5)	Portrait of queen.	Portrait of bridges, arches and gateways.	Portrait of Chairman Mao
12.	Identification mark	✓	✓	×	×	×	✓
13.	Latent image	✓	×	×	×	×	✓
14.	See-through Register	✓	×	✓	✓	✓	✓

Table 2: Shows the features which are unique in currencies

Serial no.	Currency	Security features
1.	Indian Rupee (₹)	<ul style="list-style-type: none"> Anti-photocopying feature- 

<p>2.</p>	<p>American Dollar (\$)</p>	<p>3-D Security Ribbon</p>  <ul style="list-style-type: none"> • 3-D ribbon- <p>Bell in the Inkwell</p>  <ul style="list-style-type: none"> • Bell in ink-
<p>3.</p>	<p>Australian Dollar (\$)</p>	<ul style="list-style-type: none"> • Clear window- 
<p>4.</p>	<p>British Pound (£)</p>	<ul style="list-style-type: none"> • Foil patch-  <ul style="list-style-type: none"> • Motion thread- 
<p>5.</p>	<p>Euro (€)</p>	<ul style="list-style-type: none"> • Perforation – 
<p>6.</p>	<p>Renminbi (¥)</p>	<ul style="list-style-type: none"> • White denomination watermark-



Conclusion

The conclusion that can be drawn from the present study is that Indian currency, i.e. Rupee (₹) has the maximum number of security features present and the latest addition is the anti-photocopying feature i.e. “Omron” feature. This feature is basically present on the backside of the note on the right and the front side of the banknote above the denomination of the note. Due to these security features, they make Indian Rupee less prone to counterfeiting rather than any other country’s currency notes.

Further improvements can be introduced in Indian Currency to make it less prone to counterfeiting. Various software applications are available worldwide for instance counterfeit detector and EyeNote to check whether a bank note is genuine or not, similar applications could be developed in India to cope with the serious issue of counterfeiting of Indian Rupee. Awareness regarding security features should be created among Indian citizens to make them efficient enough to check whether the bank note is genuine or not. Paper quality can be improved by adding jute, polymer or other fibers, as it is more stable and cheaply available, which as a result can cut the cost of making a single banknote. Specific chemical can be incorporated into the ink that is used in the manufacturing of the banknote, it improves the quality and it will enhance the individuality of the genuine banknote.

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