

Comparative Analysis of Top 5 Currencies in the world using Mathematical Techniques and Graphs

Ansh Rajput

Date of Submission: 20-09-2022

Date of Acceptance: 30-09-2022

ABSTRACT- This research paper summarizes the “Comparative Analysis of top 4 Currencies in the world with Rupee using Mathematical Techniques and Graphs”. The data has been taken from 2005-2022. For this we have used different mathematical formulas, analyzed it graphically and structured it in the form of a research paper.

Key words- USD, INR, Pound Sterling, Euro and Japanese Yen

I. INTRODUCTION

As the foundation for the exchange process, exchange rates are one among the foremost important elements in business, both internationally and domestically. Defined because the rate at which one currency is also converted into another, exchange rates are utilized by countries so as to get products or services from each other. When examining these exchange rates, it's important to notice that their two distinct kinds of rates used for global trade: nominal and real. The first of those exchange rates, nominal, is that the range of units of a given currency which will purchase a unit of a given foreign currency, once mistreatment this rate, countries square measure ready to price of their own currency relative to one-another once commercialism within the interchange market. Currently the most popular currencies in the world are US Dollar, Japanese Yen, Euro, Pound Sterling and Indian Rupee. The purpose of my research is to compare and analyze the most popular currencies in the world.

1.1 United States Dollar (USD)

The USD (United States dollar) is that the official currency of the us of America. The us dollar, or U.S. dollar, is formed from one hundred cents. it's pictured by the image \$ or US\$ to differentiate it from alternative dollar-

based currencies. The U.S. dollar is taken into account a benchmark currency and is that the most used currency in transactions across the planet. It is used as the official currency in several territories outside of the U.S., whereas several others use it aboard their own as Associate in Nursing unofficial currency. The U.S. dollar is that the most listed currency within the world. in step with the 2019 Triennial bank survey conducted by the Bank of International Settlements, the North American country dollar was on the aspect of half of 1 mile (out of 2 hundredth due to two-sided currency pairs) of all foreign-exchange trades. The monetary unit was a remote second with thirty second of all transactions. The reach of the U.S. dollar has resulted in its own index, the USDIX, that may be a weighted price index against a basket of six different currencies; the monetary unit, Japanese yen, British monetary unit, franc, Swedish krona, and also the Canadian dollar. Furthermore, the U.S. dollar is that the official currency of the many U.S. territories, as well as Puerto RICO Act, Guam, and the U.S. Virgin Islands.

1.2 Indian Rupee (INR)

The rupee (INR) is that the currency of India. agency is that the world organization for Standardization currency code for the rupee, that the currency image is ₹. The rupee derives its name from the rupiya, a silver coin 1st issued by grand Turk Sher Shah Suri within the sixteenth century.

Coins - Coins in India are issued in denominations of fifty paise, one rupee, two rupees, 5 rupees, and 10 rupees. A paise is 1/100th of a rupee. Coins value fifty paise are known as tiny coins, whereas coins equal or on top of one rupee are referred to as rupee coins.

Banknotes - Paper currency or banknotes are issued in denominations of five, 10, 20, 50, 100, 500, and

2,000 rupees. On the reverse aspect of paper rupees, denominations are written in fifteen languages, whereas denominations are written in Hindi and English on the front aspect. The banknotes are updated oftentimes with new styles, as well as distinct variations from recent spiritual leader Series of banknotes to the new ones of an equivalent name. The notes embrace numerous themes of India's made heritage. India is a cash-based economy, that has resulted in pretend currency being circulated by those engaged in ill-gotten behavior. The bank of India (RBI) has had to alter and update rupee notes with new safety features over the years. Fake notes, which could seem like legal notes, are counterfeited by cash launderers and terrorists. Typically, the high denominations are sometimes the foremost counterfeited notes. In 2016, the Indian government declared the demonetization of all ₹500 and ₹1,000 banknotes of the spiritual leader Series, claiming it'd hamstring the underground economy, creating the utilization of ill-gotten and counterfeit take advantage funding criminality and terrorist act way more tough. The five hundred notes have been replaced by one within the new spiritual leader Series with increased safety features. The rupee has been subject to numerous capital controls and fungibility restrictions over the years. For instance, it's ill-gotten for foreign nationals to import or export rupees, and Indian nationals might solely import and export rupees in restricted amounts. The current account, that is comprised of the country's savings, investment flows, and also the web interchange product and services have no currency conversion restrictions (aside from trade barriers). The capital account measures foreign reserves, business, and institutional flows. The Indian government relaxes and tightens restrictions on foreign investment, golf stroke caps or removing them sporadically to take care of a healthy and balanced capital account. In recent years, the govt. relaxed foreign investment flow restrictions to spice up the weakening currency rate of exchange and encourage business investment within the country. Foreign institutional investors and native firms will bring cash in and take cash out of the country however ought to talk over with the bank of India for this rules and laws.

1.3 British Pound Sterling (GBP)

GBP is that the abbreviation for British Pound Sterling, the official currency of the United Kingdom. British Overseas Territories of South Georgia, the South Sandwich Islands, and British Antarctic Territory and also the U.K. crown dependencies the islet of Man and also the Channel Islands. several alternative currencies are unit pegged to British pound, together with the Falkland Islands pound, promontory pound, Saint capital of Montana pound, Jersey pound (JEP), milch cow pound (GGP), Manx pounds, European country notes. and European country notes. The penny sterling (plural: pence), is 1/100 of a pound. several stocks are listed in pence instead of in pounds; in these cases, stock exchanges might use GBX or GBP to distinguish between pence and pounds (GBP), the official name of GBP is British pound, "sterling" or STG is also used a lot of unremarkably in accounting or interchange settings. The British pound has one among the very best commercialism volumes within the world, trailing solely the U.S. dollar, euro, and Japanese yen in daily volume. British pound accounts for roughly thirteen of the daily commercialism volumes in interchange markets. The pound image is £, whereas the euro image is €. The foremost common currency pairs involving British pound are Euro (EUR/GBP) and U.S. Dollar (GBP/USD). GBP/USD is brought up as "cable" by interchange traders. The GBP, or British pound sterling, is that the oldest currency within the world that is still in active use. British pound is symbolized by the pound sign (£) and is typically brought up merely as "sterling" or by the nickname "quid."

1.4 EURO

Euro is the official currency of the European Union (EU), adopted by 19 of its 27 member nations. it's the world's second most popular reserve currency after the U.S. dollar, and therefore the second most traded currency within the world. Launched in 1999 as a part of the EU's integration because the European Economic and financial Union (EMU), the monetary unit was strictly an electronic currency till the introduction of paper notes and coins denominated in euros in 2002. The monetary unit is typically abbreviated as "EUR." The monetary unit is that the sole medium of exchange within the EU member states that have adopted it, together with Oesterreich, Belgium, Cyprus, Estonia, Finland, France, Germany,

Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Holland, Portugal, Slovakia, Slovenia, and Spain. These countries kind the eurozone, a section wherever the monetary unit is the common currency. Four little non-EU nations (Andorra, city, San Marino, and Monaco) additionally use the monetary unit as their official currency and a number of other countries have currencies pegged to the monetary unit. The European financial institution (ECB) has AN EU mandate to keep up worth stability by protective the worth of the monetary unit The ECB is a component of the ecu System of Central Banks (ESCB) at the side of the national central banks of all the EU member states, together with people who haven't adopted the monetary unit. Adopting the monetary unit eliminated interchange risk for European businesses and money establishments with cross-border operations within the progressively integrated EU economy. The commercial enterprise and financial stipulations for adopting the monetary unit have additionally inspired deeper political integration of member states. On the opposite hand, the eurozone brought along economies with disparate characteristics and national budgets while not the authority for the type of cross-border commercial enterprise transfers that come about between the U.S. federal and U.S. states. That has forced the EU to introduce measures like ECB guarantees for the debt issued by member states in response to promote turmoil caused by the ecu sovereign debt crisis. National governments and central banks stay forced in responding to economic conditions in their country by their reliance on the ECB's financial policy and budget rules set by the EU. for instance, the financial institution of a rustic experiencing AN economic delay will now not cut interest rates, devaluing a national currency against that of its major European commerce partners to stimulate exports. where as the monetary unit cannot be debased to facilitate economic changes inside the EU, that is additionally created the common currency an additional reliable store useful. The monetary

unit remains overpoweringly widespread among the residents of the countries that have adopted it.

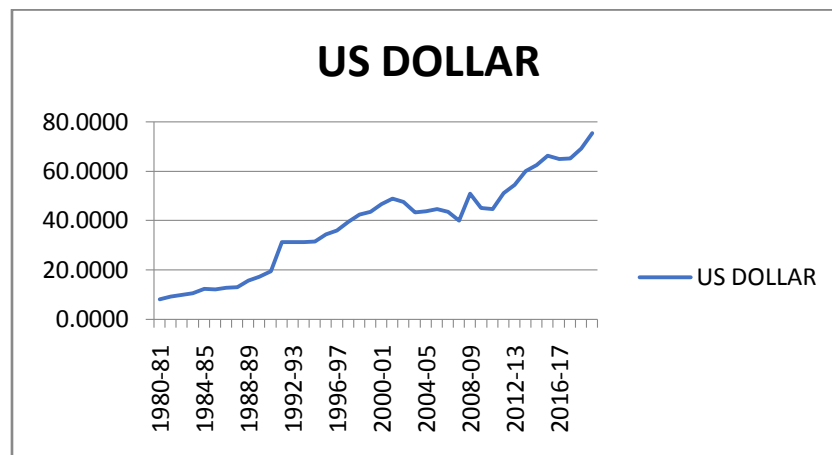
1.5 Japanese Yen

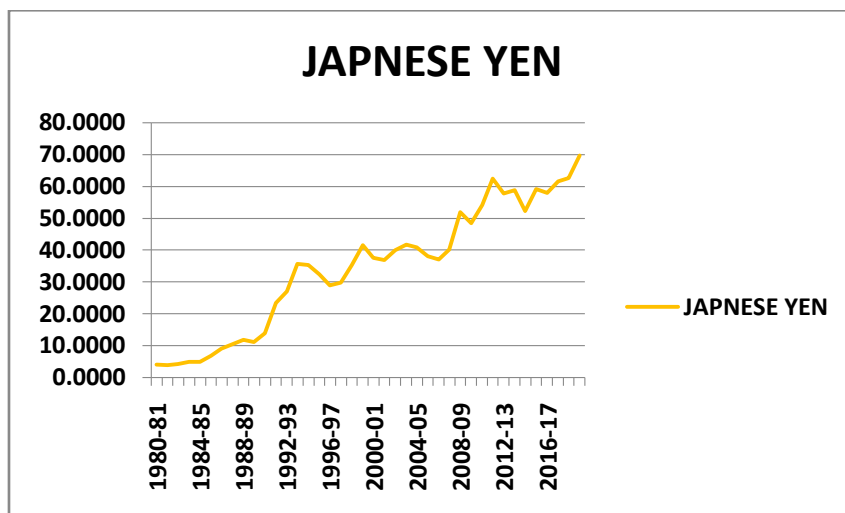
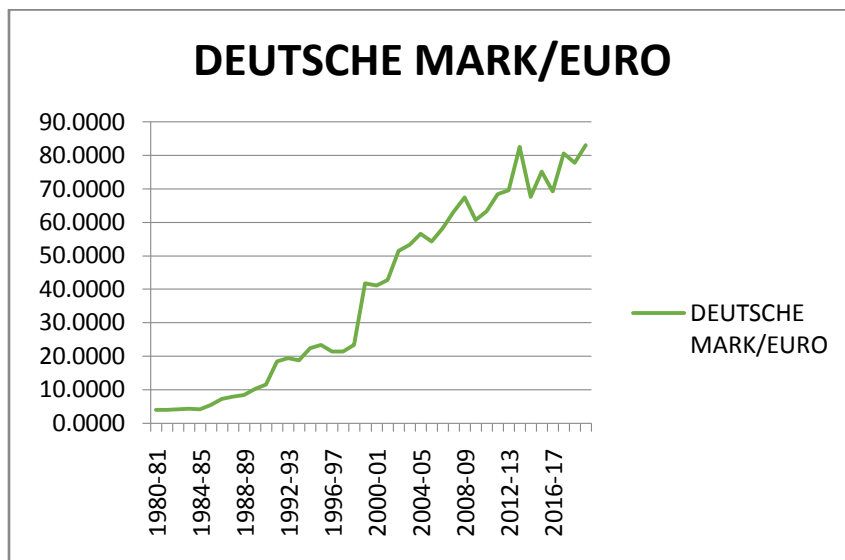
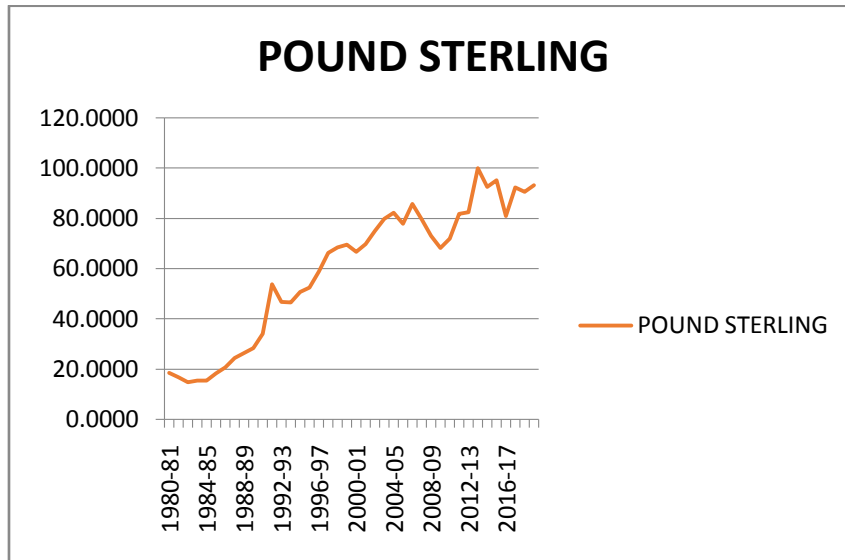
JPY is that the abbreviation for the Japanese yen, the currency of Japan. The yen is commonly represented with an emblem that appears just like the character Y with two horizontal dashes through the center: ¥. the Japanese yen is that the third-most traded currency within the exchange market after the U.S. dollar (USD) and therefore the euro. The yen figured in trades accounting for 16.8% of foreign currency trading turnover during a 2019 survey, compared with quite 88.3% for the dollar and 32.3% for the euro. The yen is additionally a foreign third behind the U.S. dollar and therefore the euro because the denomination of official exchange reserves, with the reserves held in dollars exceeding those in yen quite 10-fold as of Q4 2021. Japan's accounting surplus stemming from its role as a serious net exporter limits the buildup of yen by foreign central banks. The yen's name may be a derivative of "en," the Japanese term for circle, or round object that itself springs from "yuan," a Chinese term for imported silver coins. The Meiji government adopted the yen in 1871, replacing the metal coinage of the Tokugawa shogunate that preceded it likewise because the patchwork of paper scrip issued by many of the country's feudal lords. The Bank of Japan (BoJ) was created in 1882 as a financial organization, and granted sole power to issue currency in 1884, producing its first yen banknote the subsequent year. After a period of steady devaluation against the Canadian and U.S. dollars, Japan followed the U.S. and Canada by adopting the gold standard in 1897. war II destroyed the worth of the yen, and U.S. occupation authorities after the war imposed a posh web of regulated exchange rates while steadily depreciating the yen against the dollar amid rapid inflation. The yen's value was pegged to the dollar in 1949 but allowed to float in 1973 following the collapse of the Bretton Woods system of fixed currency exchange rates. The 1985 Plaza Accord agreement led to the managed depreciation of the U.S. dollar that over doubled the worth of the Japanese yen against the dollar by 1988, from ¥239 to ¥123 per \$1.

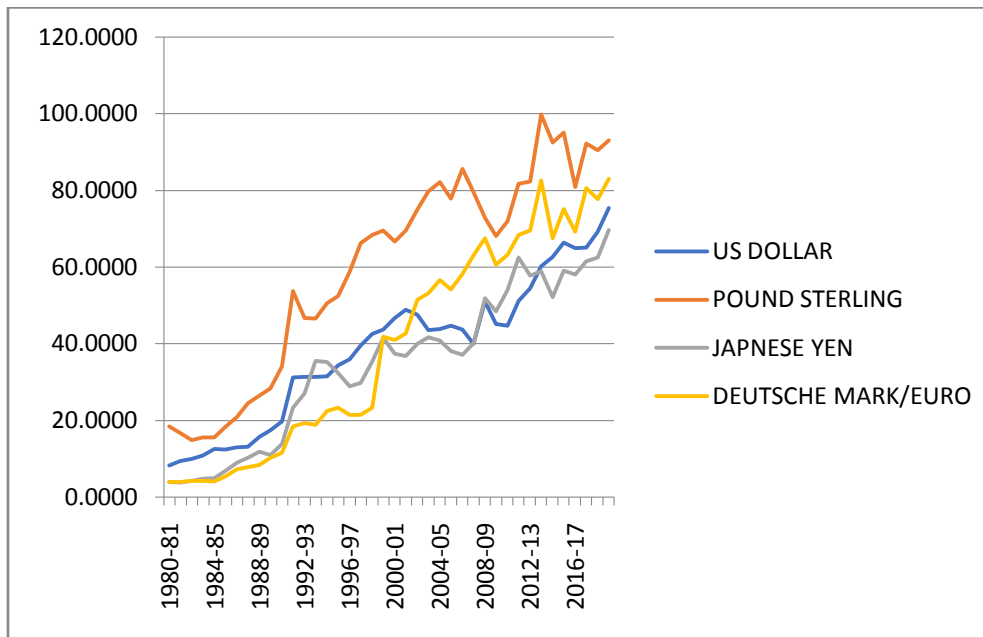
Table of 4 currencies with respect to Rupee from 1980-2020

Year	US DOLLAR	POUND STERLING	JAPNESE YEN	DEUTSCHE MARK/EURO
1980-81	8.1900	18.3800	3.9000	3.9000
1981-82	9.3460	16.6520	3.8000	3.8710
1982-83	9.9700	14.7460	4.2000	4.1090
1983-84	10.7070	15.4460	4.8000	4.1340

1984-85	12.4300	15.4500	4.9000	4.0190
1985-86	12.3061	18.2500	6.8000	5.3020
1986-87	12.8882	20.7490	8.9000	7.1620
1987-88	13.0318	24.3510	10.3000	7.8070
1988-89	15.6630	26.3990	11.8000	8.2590
1989-90	17.3248	28.3010	11.0000	10.1670
1990-91	19.6429	34.0500	13.9000	11.4270
1991-92	31.2256	53.6913	23.2800	18.3501
1992-93	31.2354	46.6200	26.9900	19.2864
1993-94	31.3725	46.5200	35.5200	18.7575
1994-95	31.4950	50.5650	35.2888	22.3600
1995-96	34.3500	52.4300	32.2975	23.3038
1996-97	35.9150	58.6938	28.9463	21.3863
1997-98	39.4950	66.1638	29.7813	21.3350
1998-99	42.4350	68.3588	35.3263	23.2863
1999-00	43.6050	69.5100	41.4825	41.7975
2000-01	46.6400	66.5788	37.4338	41.0113
2001-02	48.8000	69.5863	36.8063	42.6438
2002-03	47.5050	74.9225	39.8925	51.4925
2003-04	43.4450	79.6813	41.6725	53.1725
2004-05	43.7550	82.1125	40.8075	56.5863
2005-06	44.6050	77.7963	38.0188	54.1875
2006-07	43.5950	85.5938	37.0338	58.1513
2007-08	39.9850	79.5138	40.0650	63.0963
2008-09	50.9450	72.8575	51.8900	67.4713
2009-10	45.1350	68.0188	48.4338	60.5913
2010-11	44.6450	71.9163	54.0175	63.2350
2011-12	51.1600	81.7975	62.4250	68.3550
2012-13	54.3893	82.3209	57.7600	69.5438
2013-14	60.0998	99.8498	58.8300	82.5765
2014-15	62.5908	92.4591	52.1100	67.5104
2015-16	66.3329	95.0882	59.0600	75.0955
2016-17	64.8386	80.8797	57.9600	69.2476
2017-18	65.0441	92.2846	61.5400	80.6222
2018-19	69.1713	90.4756	62.5200	77.7024
2019-20	75.3859	93.0760	69.6500	83.0496







Explanation and Calculations



Research Paper.pdf

II. CONCLUSION

From graphically as well as mathematical analysis of exchange rates of 4 . Currencies w.r.t Rupee it is evident that British Pound Sterling has the maximum growth rate succeeded by Euro , Japanese Yen and US Dollar almost at the same growth rate .

REFERENCES

- [1]. <https://www.investopedia.com/>
- [2]. <https://www.sbi.co.in/>
- [3]. <https://www.rbi.org.in>
- [4]. <https://www.japan.go.jp>
- [5]. <https://www.gov.uk>
- [6]. <https://www.european-union.europa.eu>
- [7]. <https://www.usa.gov>

Biographies

Ansh Rajput

Currently editing in Sat Paul Mittal School in class XII
Lead Designer School Newspaper
Best Delegate in more than 5 MUN
Freelancer in Video and graphic designing
Logo Designer for Horizon School of Excellence
Scored 92.2% in ICSE Board Exam

Letter of Evaluation from Boston University, Boston, Massachusetts, United States of America

Under the guidance of:

Dr. Mamta Jain

M.Sc(Mathematics) (Double gold medallist)
M.Phil (Computer Applications) with honours
From University of Roorkee (now IIT Roorkee)
PhD (Mathematics)
5 papers published in international journals
Former Lead Auditor ISO 9001, ISO 22000
School Accreditation Examiner by QCI
26 years of teaching experience