Predictors for the ratio of dollar and pound

TEAM Z

JOHN PHILIP WILSON, NUNZIO GATTI, SUSMITA GANGOPADHYAY, SUMESH RAMACHANDRAN, and BANG DU

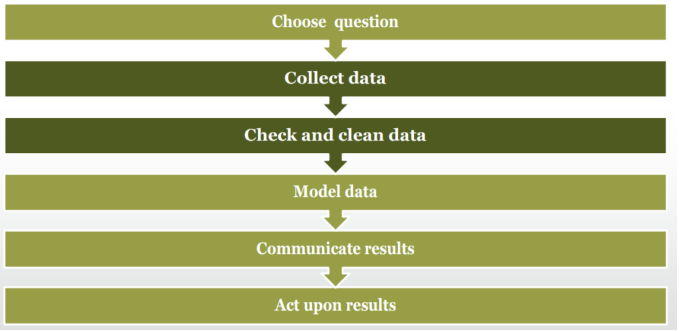
ACM Reference Format:
John Philip Wilson, Nunzio Gatti, Susmita Gangopadhyay, Sumesh Ramachandran, and Bang Du. 2018. Predictors for the ratio of dollar and pound: TEAM Z. 1, 1 (January 2018), 4 pages. https://doi.org/10.1145/nnnnnnn.nnnnnnn

1 INTRODUCTION

The application tries to find the predictors for the ratio of dollar to pound. As team we had first decided on a different topic "Will I live longer if I cycle to work?" . But in the process of trying to collect data it was seen that there was a lot of scientific studies associated with the topic but no real proof. We could not find out any scientific method that directly links the factors we were considering(amount of oxygen intake, pollution,BMI etc)to the increase in life expectancy[].Combining all these factors into one prediction model became a challenge.So ,after spending almost 4 weeks in trying to collect data we had to shift our focus to some other topic where at least we could get a significantly high volume of data.Now we are trying to predict the top three indicators affecting the currency of that country.We have taken into account several factors like exchange rates,interest rates, employment, population, trade networks,GDP and inflation.We are mainly focussing on the G20 countries.The annual factors,like the employment,population,trade networks,GDP and inflation are taken in the time range of 1991-2016.For the high frequency data like interest rates and exchange rates the data ranges from Dec 1998 to Dec 2017

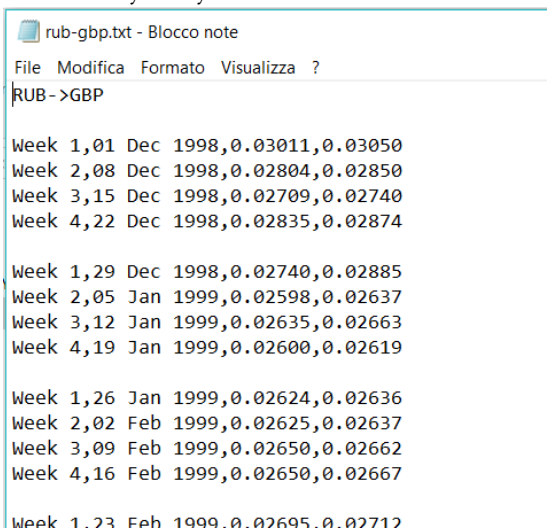
2 IMPLEMENTATION

2.1 Data Cleaning with python



Authors' address: John Philip Wilson; Nunzio Gatti; Susmita Gangopadhyay; Sumesh Ramachandran; Bang Du.

2.1.1 . First step : Download The data that we have collected are from oanda.com,Bank of England and World Bank websites. It contains yearly employment rates,population,GDP,trade network import,export and currencies of all G20 countries.For the currency exchange data ,it was about weekly average exchange rates from December 1998 to December 2017. We considered all currency of the G20's countries and downloaded all data considering the GBP as base currency. Every file downloaded was made in this way :


rub-gbp.txt - Blocco note

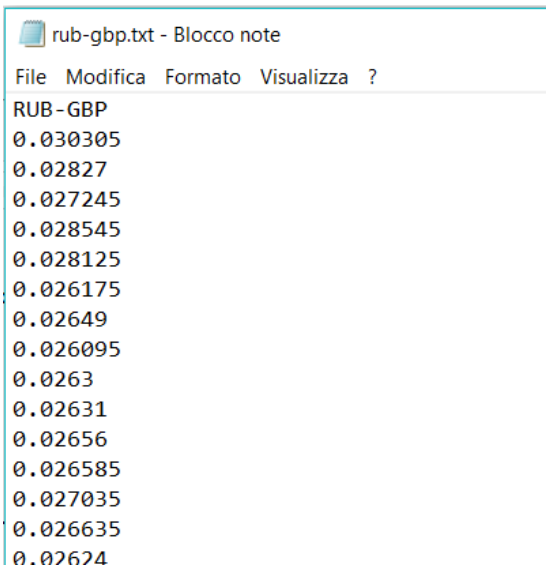
File Modifica Formato Visualizza ?

```
RUB->GBP

Week 1,01 Dec 1998,0.03011,0.03050
Week 2,08 Dec 1998,0.02804,0.02850
Week 3,15 Dec 1998,0.02709,0.02740
Week 4,22 Dec 1998,0.02835,0.02874

Week 1,29 Dec 1998,0.02740,0.02885
Week 2,05 Jan 1999,0.02598,0.02637
Week 3,12 Jan 1999,0.02635,0.02663
Week 4,19 Jan 1999,0.02600,0.02619

Week 1,26 Jan 1999,0.02624,0.02636
Week 2,02 Feb 1999,0.02625,0.02637
Week 3,09 Feb 1999,0.02650,0.02662
Week 4,16 Feb 1999,0.02650,0.02667

Week 1,23 Feb 1999,0.02695,0.02712
```

For currency exchange data below technique was observed

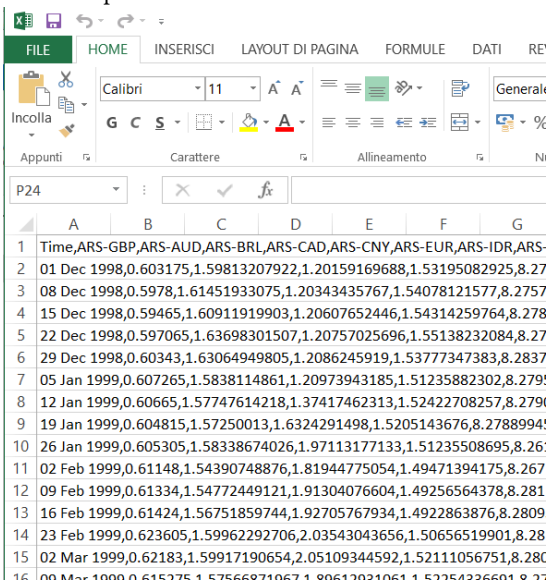
- Size of table : 1240 x 4 columns
- Col[0]= Week(1,2,3,4)
- Col[1]= Month-Year(i.e may 2002)
- Col[2]= Bid (Bid is the price a buyer is willing to pay for a security)
- Col[3]= Ask (Ask is the price a seller is willing to accept for a security)

We had 16 files(16 because in the G20 group there is France Italy and Germany where currency is Euro and also there is one member called European union that is a representative of UE). Using python we gave in input a file formed by 1240(included blank space between rows) x 4 columns and received the below output

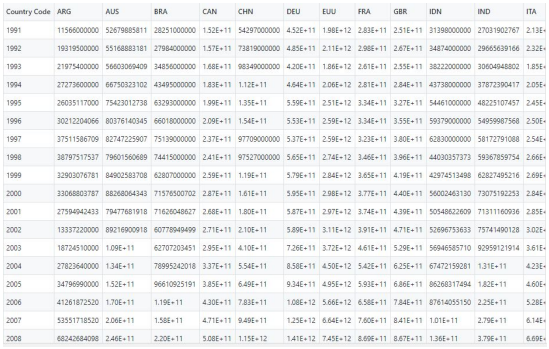


Using the python script all spaces were removed,saved in one different file, and an average between bid and ask was calculated.

2.1.2 . Third step : Creation of a complete matrix We wrote another py script called complete Matrix.py that was used to create all possible currency pair. Remembering that the currency were 16 , we had a output matrix with 16x16 column and 994 rows.



We followed a similar approach was taken for the high frequency data that was collected yearly.All the high frequency data (employment,population,trade networks,GDP)were collected ,normalised using python script clean_data.py and then a spreadsheet containing all data ranging from 1991-2016 was combined and placed in a csv file called import.csv.



Country Code	ARG	AUS	BRA	CAN	CHN	DEU	EUU	FRA	GBR	IDN	IND	ITA
1991	11566000000	52679885811	28251000000	1.52E+11	54297000000	4.52E+11	1.98E+12	2.83E+11	2.51E+11	31398000000	27031902767	2.13E+
1992	19319500000	55168883181	27984000000	1.57E+11	73819000000	4.85E+11	2.11E+12	2.98E+11	2.67E+11	34874000000	29665639166	2.32E+
1993	21975400000	56603069409	34856000000	1.68E+11	98349000000	4.20E+11	1.86E+12	2.61E+11	2.55E+11	38222000000	30604948802	1.85E+
1994	27273600000	66750323102	43495000000	1.83E+11	1.12E+11	4.64E+11	2.06E+12	2.81E+11	2.84E+11	43738000000	37872390417	2.05E+
1995	26035117000	75423012738	63293000000	1.99E+11	1.35E+11	5.59E+11	2.51E+12	3.34E+11	3.27E+11	54461000000	48225107457	2.45E+
1996	30212204066	80376140345	66018000000	2.09E+11	1.54E+11	5.53E+11	2.59E+12	3.34E+11	3.55E+11	59379000000	54959987568	2.50E+
1997	37511586709	82747225907	75139000000	2.37E+11	97709000000	5.37E+11	2.59E+12	3.23E+11	3.80E+11	62830000000	58172791088	2.54E+
1998	38797517537	79601560689	74415000000	2.41E+11	97527000000	5.65E+11	2.74E+12	3.46E+11	3.96E+11	44030357373	59367859754	2.66E+
1999	32903076781	84902583708	62807000000	2.59E+11	1.19E+11	5.79E+11	2.84E+12	3.65E+11	4.19E+11	42974513498	62827495216	2.69E+
2000	33068803787	88268064343	71576500702	2.87E+11	1.61E+11	5.95E+11	2.98E+12	3.77E+11	4.40E+11	56002463130	73075192253	2.84E+
2001	27594942433	79477681918	71626048627	2.68E+11	1.80E+11	5.87E+11	2.97E+12	3.74E+11	4.39E+11	50548632609	71311160936	2.85E+
2002	13337220000	89216900918	60778949499	2.71E+11	2.10E+11	5.89E+11	3.11E+12	3.91E+11	4.71E+11	52696753633	75741490128	3.02E+
2003	18724510000	1.09E+11	62707203451	2.95E+11	4.10E+11	7.26E+11	3.72E+12	4.61E+11	5.29E+11	56946585710	92959121914	3.61E+
2004	27823640000	1.34E+11	78995242018	3.37E+11	5.54E+11	8.58E+11	4.50E+12	5.42E+11	6.25E+11	67472159281	1.31E+11	4.23E+
2005	34796990000	1.52E+11	96610925191	3.85E+11	6.49E+11	9.34E+11	4.95E+12	5.93E+11	6.86E+11	86268317494	1.82E+11	4.60E+
2006	41261872520	1.70E+11	1.19E+11	4.30E+11	7.83E+11	1.08E+12	5.66E+12	6.58E+11	7.84E+11	87614055150	2.25E+11	5.28E+
2007	53551718520	2.06E+11	1.58E+11	4.71E+11	9.49E+11	1.25E+12	6.64E+12	7.60E+11	8.41E+11	1.01E+11	2.79E+11	6.14E+
2008	68242684098	2.46E+11	2.20E+11	5.08E+11	1.15E+12	1.41E+12	7.45E+12	8.69E+11	8.67E+11	1.36E+11	3.79E+11	6.69E+

2.2 Framework with Flask

It a simple framework with no roadblocks which we are using as a web server

2.3 Frontend with D3

D3 is the best choice for interactivity.Hence we have used D3 in the front end

Our application is a tool to discover what factors correlate best with the exchange rates.We have a webpage where there are two drop downs giving currency for two countries. On selection of the two countries the result is a multiseries line chart containing the other exchange rates that mostly correlates with the behavior of the exchange rates.Also we find the top three economic indicators that correlate with the exchange rates.

3 RESULTS

As the data we have used is not very huge, we chose to find the strongest correlation between the exchange rates and the indicators which led to this correlation. We have used Pearson.s correlation coefficient as the mathematical approach since the data was not suitable for any mathematical regression or any other kind of predictive analysis. The result that we have found can be summarised in the following table

Table 1. My caption

Currency Code	Indicator	Value
JPY-USD	JPY GDP	0.99
JPY-SAR	JPY GDP	0.99
SAR-JPY	JPY GDP	-0.99
MXN-CNY	MXN Population	-0.98
AUD-TRY	TRY Population	0.98
CAD-TRY	TRY Population	0.98
SAR-CNY	SAR imports	-0.98
AUD-IDR	IDR Population	0.98
AUD-TRY	AUD Population	0.98
MXN-CNY	CNY Population	-0.98
RUB-CAD	CAD Population	-0.98
CAD-TRY	CAD Population	0.98
CNY-SAR	SAR Imports	0.97
TRY-MXN	MXN Inflation	0.97
RUB-AUD	AUD Population	-0.97
AUD-IDR	AUD Population	0.97
AUD-ZAR	AUD Population	0.97
AUD-ZAR	ZAR Population	0.97

From the table above, a few things can be concluded

- GDP,Population,Imports and Inflation have been the strongest indicators in the past. These factors have played the most important role in determining the exchange rates for the two currencies
- A high correlation value indicates that the corrosponding indicator is the strongest factor in determining the exchange rates between those two countries. For example, We find a very strong correlation value (0.99) between Japanese Yen and US Dollar and also between Japanese Yen and South African Rand .The strongest indicator being Japan GDP. In the past,as the Gross Domestic Product of Japan has increased, the exchange rates between Japan and USA and also between Japan and South Africa have increased.An increase of Japanese population has led to more US Dollar and South African Rand in exchange for Japanese Yen.

4 CONCLUSION

5 LIMITATIONS AND FUTURE WORK

6 TYPICAL REFERENCES IN NEW ACM REFERENCE FORMAT

A paginated journal article [Abril and Plant 2007], an enumerated journal article [Cohen et al. 2007], a reference to an entire issue [Cohen 1996], a monograph (whole book) [Kosiur 2001], a monograph/whole book in a series (see 2a in spec. document) [Harel 1979], a divisible-book such as an anthology or compilation [Editor 2007] followed by the same example, however we only output the series if the volume number is given [Editor 2008] (so Editor00a's series should NOT be present since it has no vol. no.), a chapter in a divisible book [Spector 1990], a chapter in a divisible book in a series [Douglass et al. 1998], a multi-volume work as book [Knuth 1997], an article in a proceedings (of a conference, symposium, workshop for example) (paginated proceedings article) [Andler 1979], a proceedings article with all possible elements [Smith 2010], an example of an enumerated proceedings article [Gundy et al. 2007], an informally published work [Harel 1978], a doctoral dissertation [Clarkson 1985], a master's thesis: [Anisi 2003], an online document / world wide web resource [Ablamowicz and Fauser 2007; Poker-Edge.Com 2006; Thornburg 2001], a video game (Case 1) [Obama 2008] and (Case 2) [Novak 2003] and [Lee 2005] and (Case 3) a patent [Scientist 2009], work accepted for publication [Rous 2008], 'YYYYb'-test for prolific author [Saeedi et al. 2010a] and [Saeedi et al. 2010b]. Other cites might contain 'duplicate' DOI and URLs (some SIAM articles) [Kirschmer and Voight 2010]. Boris / Barbara Beeton: multi-volume works as books [Hörmander 1985b] and [Hörmander 1985a].

A couple of citations with DOIs: [IEEE 2004; Kirschmer and Voight 2010].

Online citations: [Thornburg 2001; TUG 2017; Veytsman [n. d.]].

REFERENCES

Rafal Ablamowicz and Bertfried Fauser. 2007. CLIFFORD: a Maple 11 Package for Clifford Algebra Computations, version 11. (2007). Retrieved February 28, 2008 from http://math.tntech.edu/rafal/cliff11/index.html

Patricia S. Abril and Robert Plant. 2007. The patent holder's dilemma: Buy, sell, or troll? *Commun. ACM* 50, 1 (Jan. 2007), 36–44. https://doi.org/10.1145/1188913.1188915

Sten Andler. 1979. Predicate Path expressions. In *Proceedings of the 6th. ACM SIGACT-SIGPLAN symposium on Principles of Programming Languages (POPL '79)*. ACM Press, New York, NY, 226–236. https://doi.org/10.1145/567752.567774

David A. Anisi. 2003. *Optimal Motion Control of a Ground Vehicle*. Master's thesis. Royal Institute of Technology (KTH), Stockholm, Sweden.

Kenneth L. Clarkson. 1985. *Algorithms for Closest-Point Problems (Computational Geometry)*. Ph.D. Dissertation. Stanford University, Palo Alto, CA. UMI Order Number: AAT 8506171.

Jacques Cohen (Ed.). 1996. Special issue: Digital Libraries. *Commun. ACM* 39, 11 (Nov. 1996).

Sarah Cohen, Werner Nutt, and Yehoshua Sagic. 2007. Deciding equivalances among conjunctive aggregate queries. *J. ACM* 54, 2, Article 5 (April 2007), 50 pages. https://doi.org/10.1145/1219092.1219093

Bruce P. Douglass, David Harel, and Mark B. Trakhtenbrot. 1998. Statecarts in use: structured analysis and object-orientation. In *Lectures on Embedded Systems*, Grzegorz Rozenberg and Frits W. Vaandrager (Eds.). Lecture Notes in Computer Science, Vol. 1494. Springer-Verlag, London, 368–394. https://doi.org/10.1007/3-540-65193-4_29

Ian Editor (Ed.). 2007. *The title of book one* (1st. ed.). The name of the series one, Vol. 9. University of Chicago Press, Chicago. https://doi.org/10.1007/3-540-09237-4

Ian Editor (Ed.). 2008. *The title of book two* (2nd. ed.). University of Chicago Press, Chicago, Chapter 100. https://doi.org/10.1007/3-540-09237-4

Matthew Van Gundy, Davide Balzarotti, and Giovanni Vigna. 2007. Catch me, if you can: Evading network signatures with web-based polymorphic worms. In *Proceedings of the first USENIX workshop on Offensive Technologies (WOOT '07)*. USENIX Association, Berkley, CA, Article 7, 9 pages.

David Harel. 1978. *LOGICS of Programs: AXIOMATICS and DESCRIPTIVE POWER*. MIT Research Lab Technical Report TR-200. Massachusetts Institute of Technology, Cambridge, MA.

David Harel. 1979. *First-Order Dynamic Logic*. Lecture Notes in Computer Science, Vol. 68. Springer-Verlag, New York, NY. https://doi.org/10.1007/3-540-09237-4

Lars Hörmander. 1985a. *The analysis of linear partial differential operators. III*. Grundlehren der Mathematischen Wissenschaften [Fundamental Principles of Mathematical Sciences], Vol. 275. Springer-Verlag, Berlin, Germany. viii+525 pages. Pseudodifferential operators.

Lars Hörmander. 1985b. *The analysis of linear partial differential operators. IV*. Grundlehren der Mathematischen Wissenschaften [Fundamental Principles of Mathematical Sciences], Vol. 275. Springer-Verlag, Berlin, Germany. vii+352 pages. Fourier integral operators.

IEEE 2004. IEEE TCSC Executive Committee. In *Proceedings of the IEEE International Conference on Web Services (ICWS '04)*. IEEE Computer Society, Washington, DC, USA, 21–22. https://doi.org/10.1109/ICWS.2004.64

Markus Kirschmer and John Voight. 2010. Algorithmic Enumeration of Ideal Classes for Quaternion Orders. *SIAM J. Comput.* 39, 5 (Jan. 2010), 1714–1747. https://doi.org/10.1137/080734467

Donald E. Knuth. 1997. *The Art of Computer Programming, Vol. 1: Fundamental Algorithms (3rd. ed.).* Addison Wesley Longman Publishing Co., Inc.

David Kosiur. 2001. *Understanding Policy-Based Networking* (2nd. ed.). Wiley, New York, NY.

Newton Lee. 2005. Interview with Bill Kinder: January 13, 2005. Video. *Comput. Entertain.* 3, 1, Article 4 (Jan.-March 2005). https://doi.org/10.1145/1057270.1057278

Dave Novak. 2003. Solder man. Video. In *ACM SIGGRAPH 2003 Video Review on Animation theater Program: Part I - Vol. 145 (July 27–27, 2003).* ACM Press, New York, NY, 4. https://doi.org/99.9999/woot07-S422

Barack Obama. 2008. A more perfect union. Video. (5 March 2008). Retrieved March 21, 2008 from http://video.google.com/videoplay?docid=6528042696351994555

Poker-Edge.Com. 2006. Stats and Analysis. (March 2006). Retrieved June 7, 2006 from http://www.poker-edge.com/stats.php

Bernard Rous. 2008. The Enabling of Digital Libraries. *Digital Libraries* 12, 3, Article 5 (July 2008). To appear.

Mehdi Saeedi, Morteza Saheb Zamani, and Mehdi Sedighi. 2010a. A library-based synthesis methodology for reversible logic. *Microelectron. J.* 41, 4 (April 2010), 185–194.

Mehdi Saeedi, Morteza Saheb Zamani, Mehdi Sedighi, and Zahra Sasanian. 2010b. Synthesis of Reversible Circuit Using Cycle-Based Approach. *J. Emerg. Technol. Comput. Syst.* 6, 4 (Dec. 2010).

Joseph Scientist. 2009. The fountain of youth. (Aug. 2009). Patent No. 12345, Filed July 1st., 2008, Issued Aug. 9th., 2009.

Stan W. Smith. 2010. An experiment in bibliographic mark-up: Parsing metadata for XML export. In *Proceedings of the 3rd. annual workshop on Librarians and Computers (LAC '10)*, Reginald N. Smythe and Alexander Noble (Eds.), Vol. 3. Paparazzi Press, Milan Italy, 422–431. https://doi.org/99.9999/woot07-S422

Asad Z. Spector. 1990. Achieving application requirements. In *Distributed Systems* (2nd. ed.), Sape Mullender (Ed.). ACM Press, New York, NY, 19–33. https://doi.org/10.1145/90417.90738

Harry Thornburg. 2001. Introduction to Bayesian Statistics. (March 2001). Retrieved March 2, 2005 from http://ccrma.stanford.edu/~jos/bayes/bayes.html

TUG 2017. Institutional members of the TEX Users Group. (2017). Retrieved May 27, 2017 from http://wwtug.org/instmem.html

Boris Veytsman. [n. d.]. acmart—Class for typesetting publications of ACM. ([n. d.]). Retrieved May 27, 2017 from http://www.ctan.org/pkg/acmart