



Data Glacier

Your Deep Learning Partner

Bank Marketing

virtual internship

Dec-29-2022

Agenda

Background

Path to profit

Idea

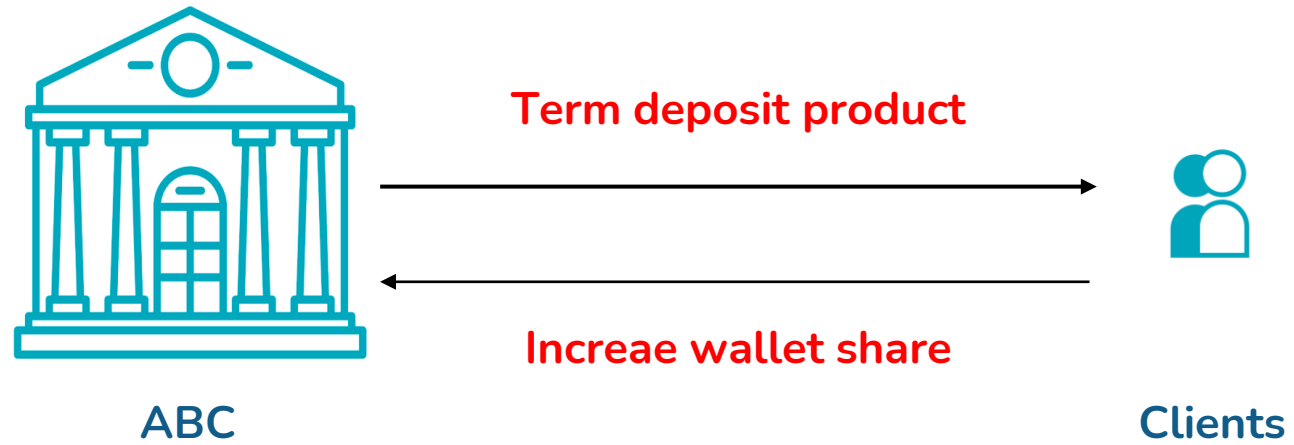
Roadmap

Results

Data visualization

Recommendations

Background



Path to profit

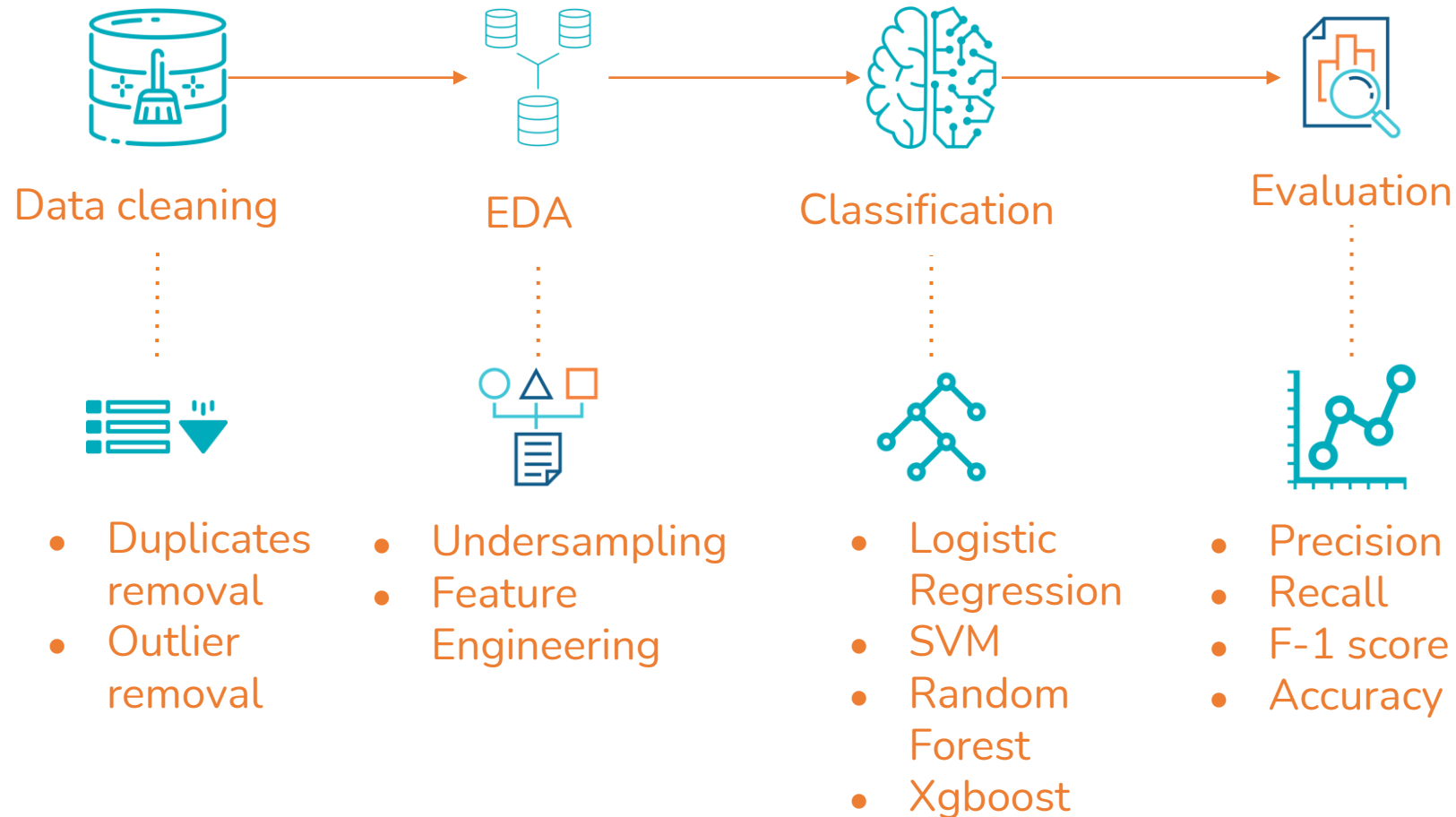


Idea



How can we apply **machine learning** on ABC's **internal data** to better understand ABC's **clients** and support **expert advisers**.

Roadmap



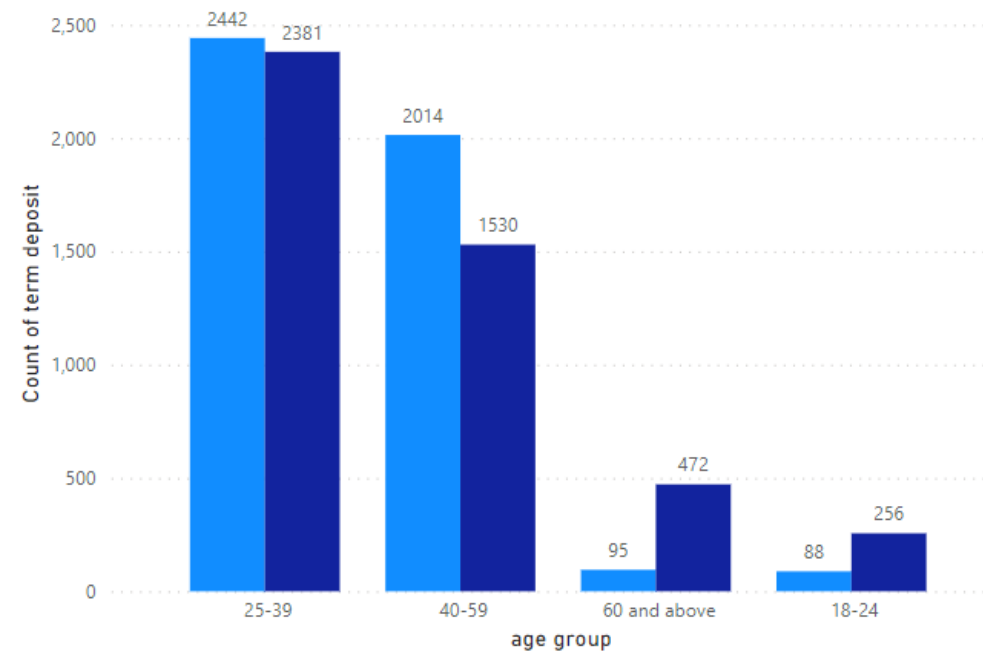
Results

	Data with all features				Data with multicollinearity removal through the heatmap				Data with multicollinearity removal through the VIF function				Data with outlier removal			
	Accu racy	Recal l	Preci sion	F1	Accu racy	Recal l	Preci sion	F1	Accu racy	Recal l	Preci sion	F1	Accu racy	Recal l	Preci sion	F1
LR	0.8745	0.8817	0.8674	0.8745	0.8422	0.8622	0.8309	0.8463	0.8517	0.8340	0.8666	0.8500	0.8714	0.8694	0.8825	0.8759
SVM	0.8784	0.9042	0.8485	0.8755	0.8426	0.8511	0.8389	0.8450	0.8590	0.8143	0.8964	0.8534	0.8746	0.8511	0.9030	0.8763
RF	0.8793	0.8314	0.9213	0.8741	0.8521	0.8203	0.8782	0.8482	0.8724	0.8179	0.9201	0.8659	0.8841	0.8563	0.9162	0.8852
Xgboost	0.8840	0.8562	0.9083	0.8815	0.8439	0.8306	0.8555	0.8428	0.8577	0.8203	0.8887	0.8532	0.8827	0.8607	0.9098	0.8846

Data visualization

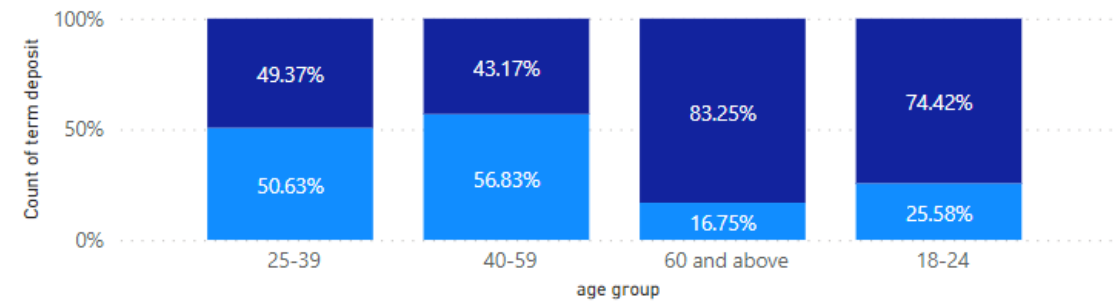
Count of term deposit by age group and term deposit

term deposit ● 0 ● 1



Percentage of term deposit by age group and term deposit

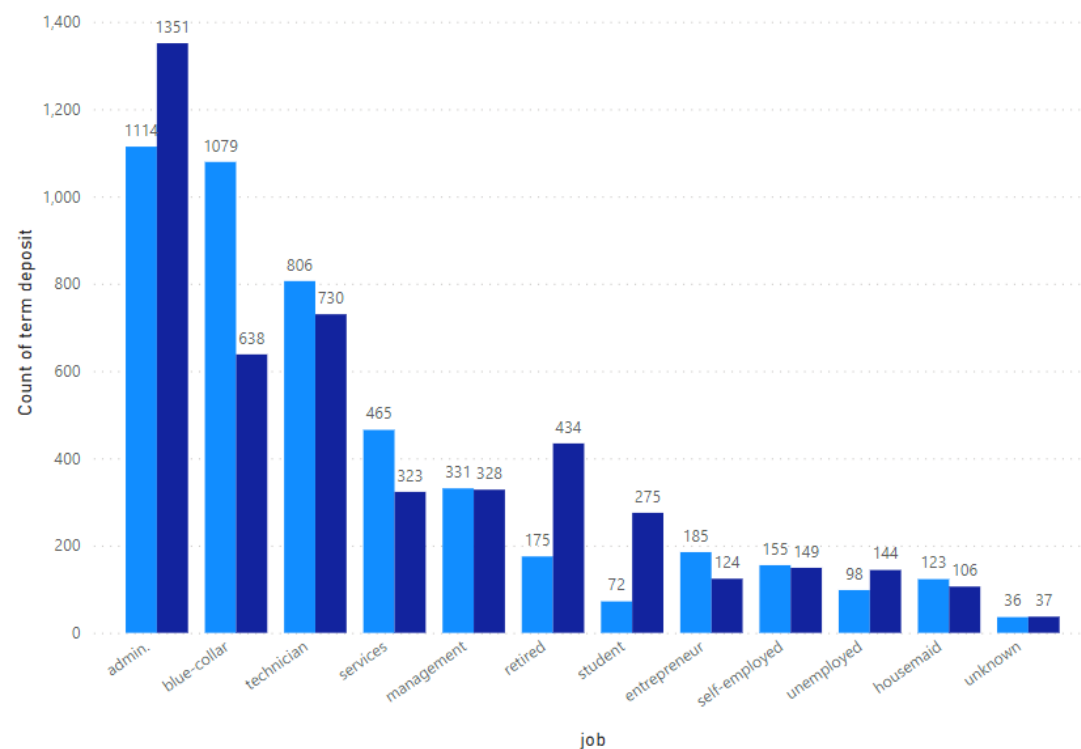
term deposit ● 0 ● 1



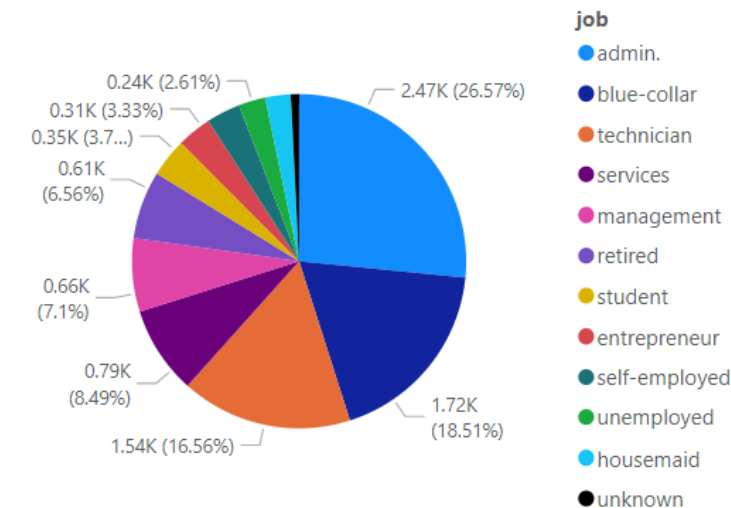
Data visualization

Count of term deposit by job and term deposit

term deposit ● 0 ● 1

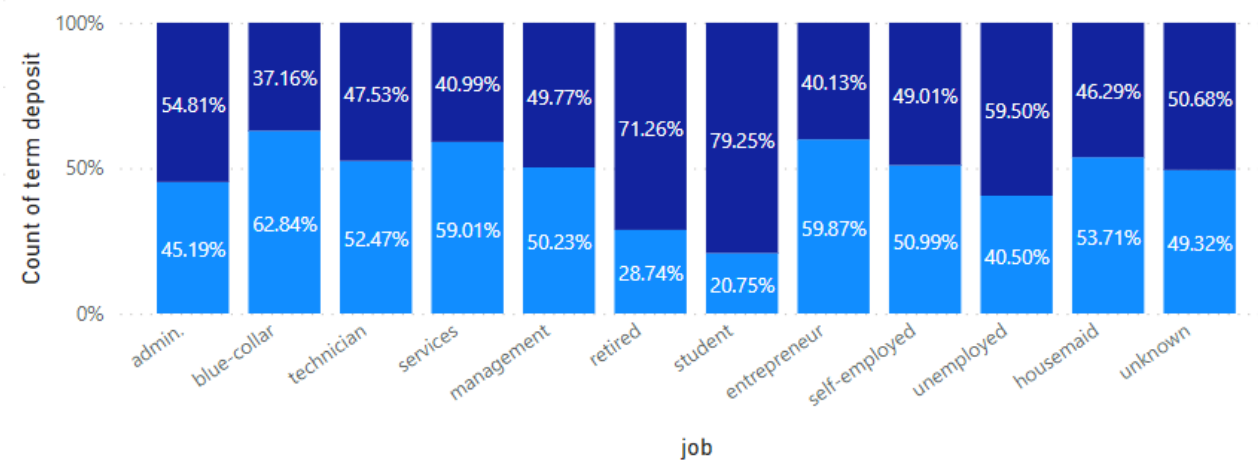


Percentage of job



Percentage of term deposit by job and term deposit

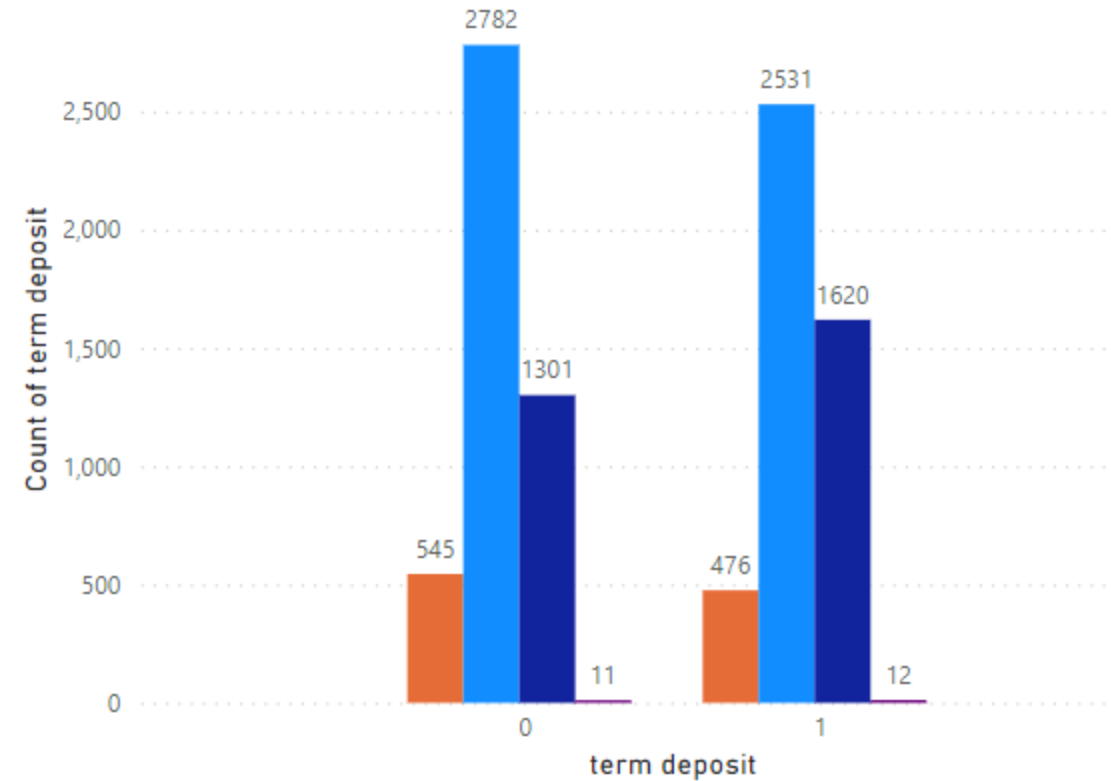
term deposit ● 0 ● 1



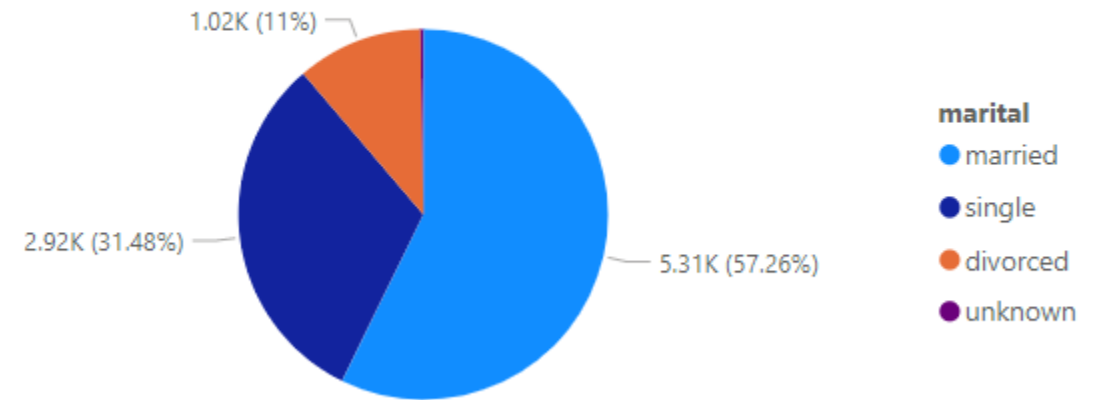
Data visualization

Count of term deposit by term deposit and marital

marital ● divorced ● married ● single ● unknown

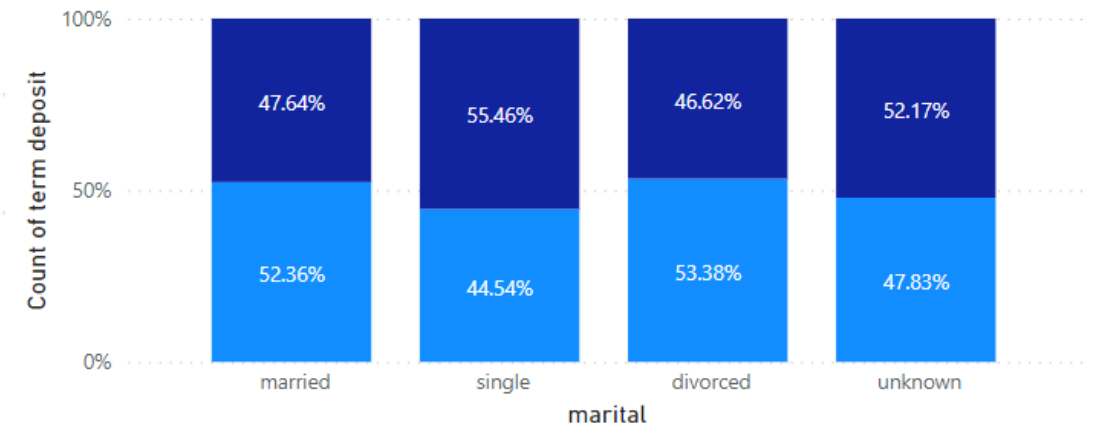


Percentage of marital status



Percentage of term deposit by marital and term deposit

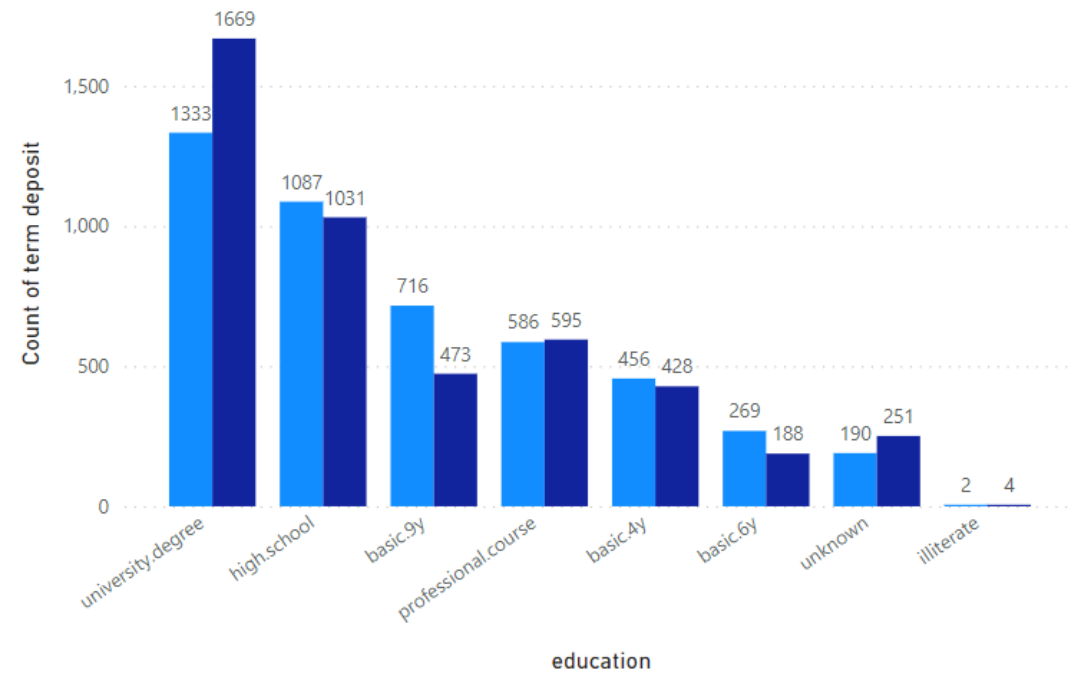
term deposit ● 0 ● 1



Data visualization

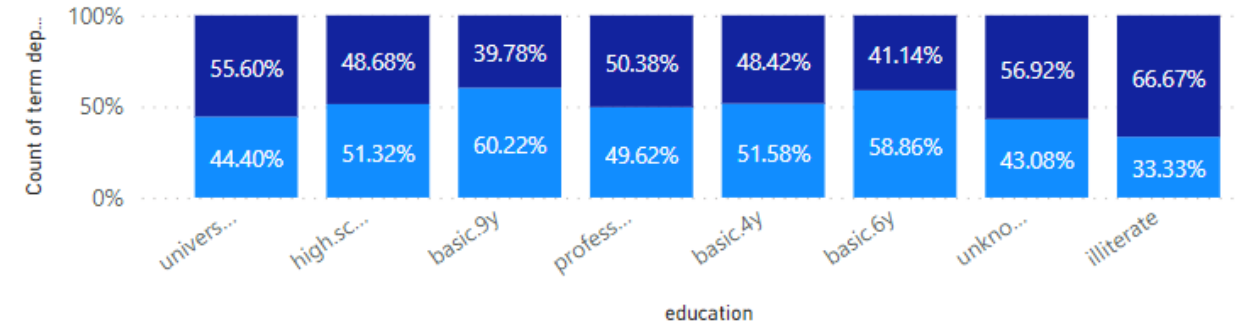
Count of term deposit by education and term deposit

term deposit ● 0 ● 1



Percentage of term deposit by education and term deposit

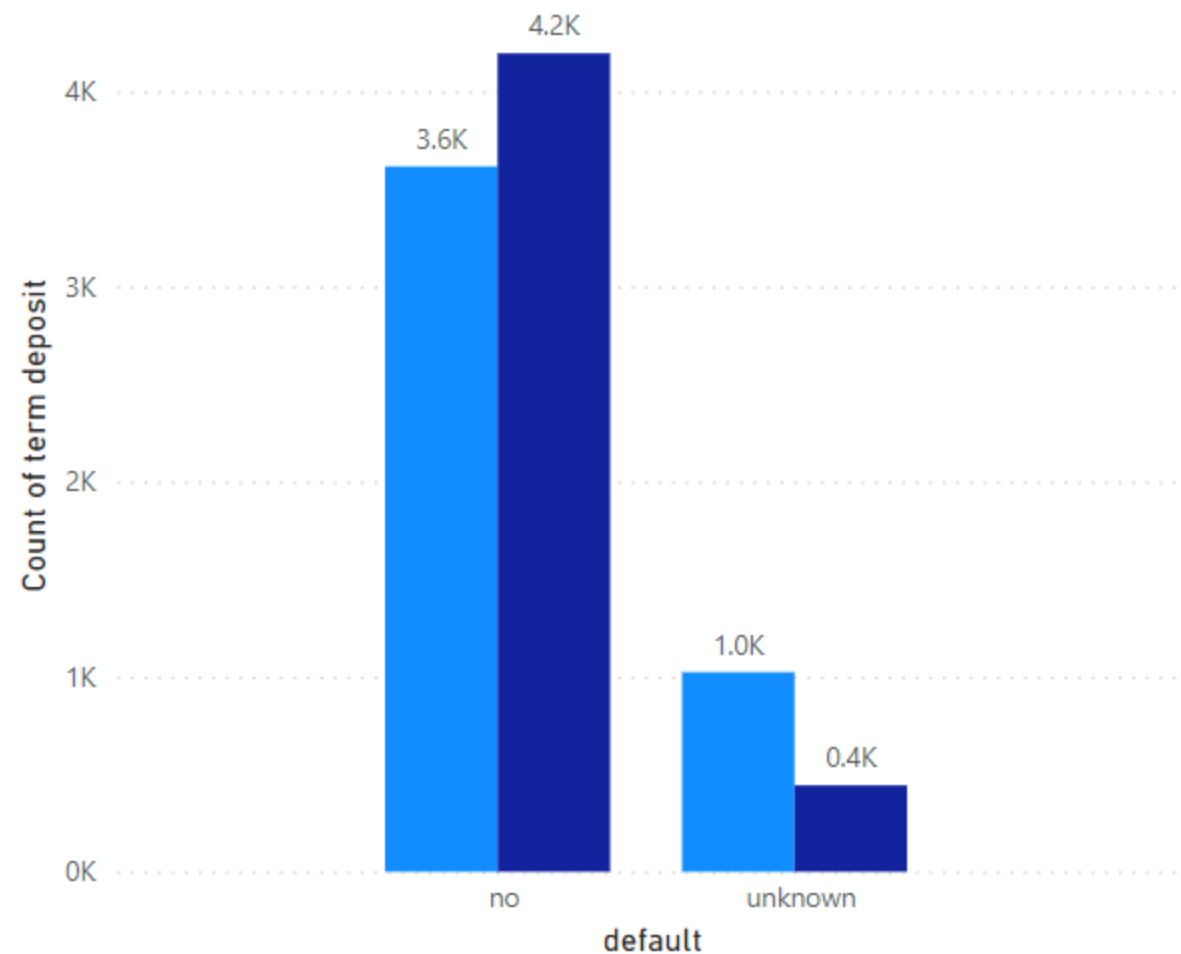
term deposit ● 0 ● 1



Data visualization

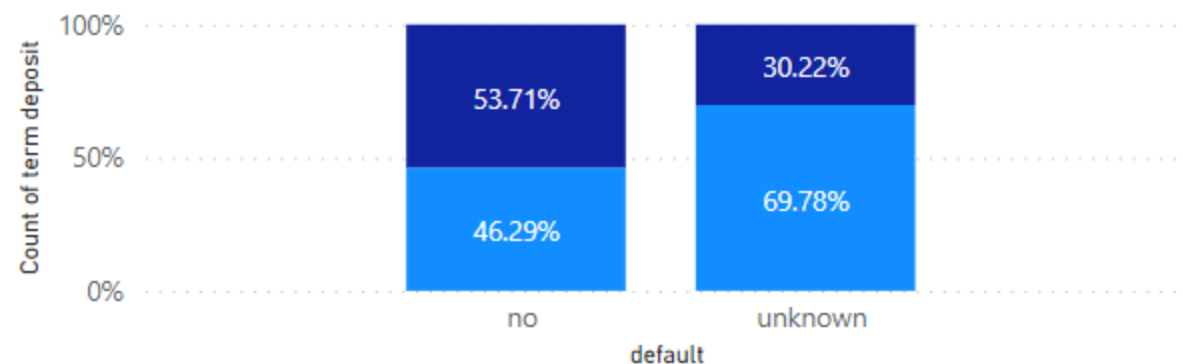
Count of term deposit by default and term deposit

term deposit ● 0 ● 1



Percentage of term deposit by default and term deposit

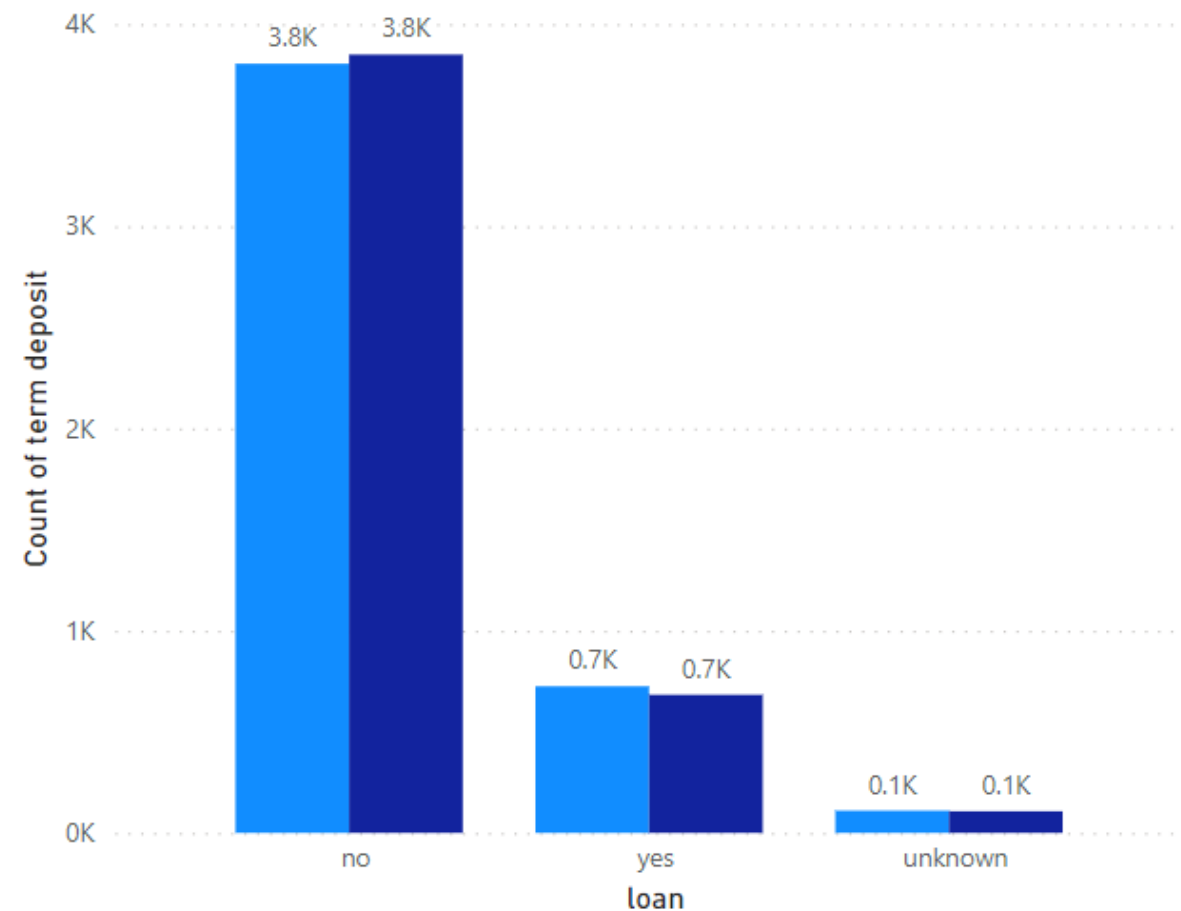
term deposit ● 0 ● 1



Data visualization

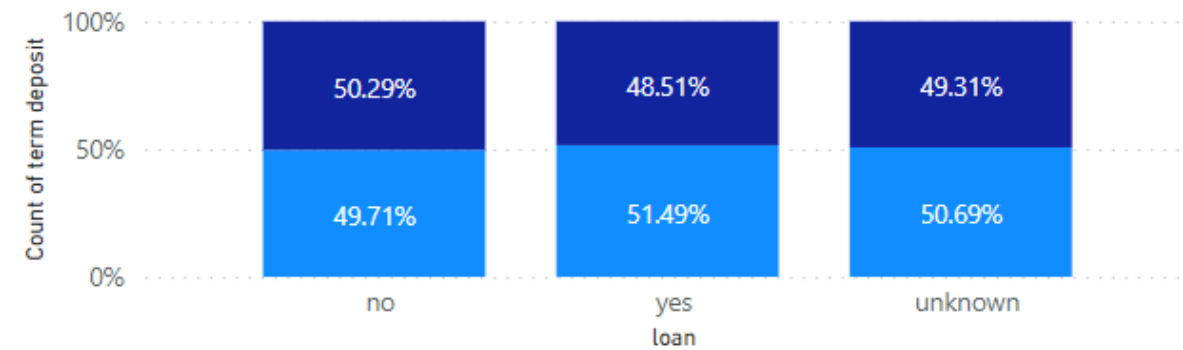
Count of term deposit by loan and term deposit

term deposit ● 0 ● 1



Percentage of term deposit by loan and term deposit

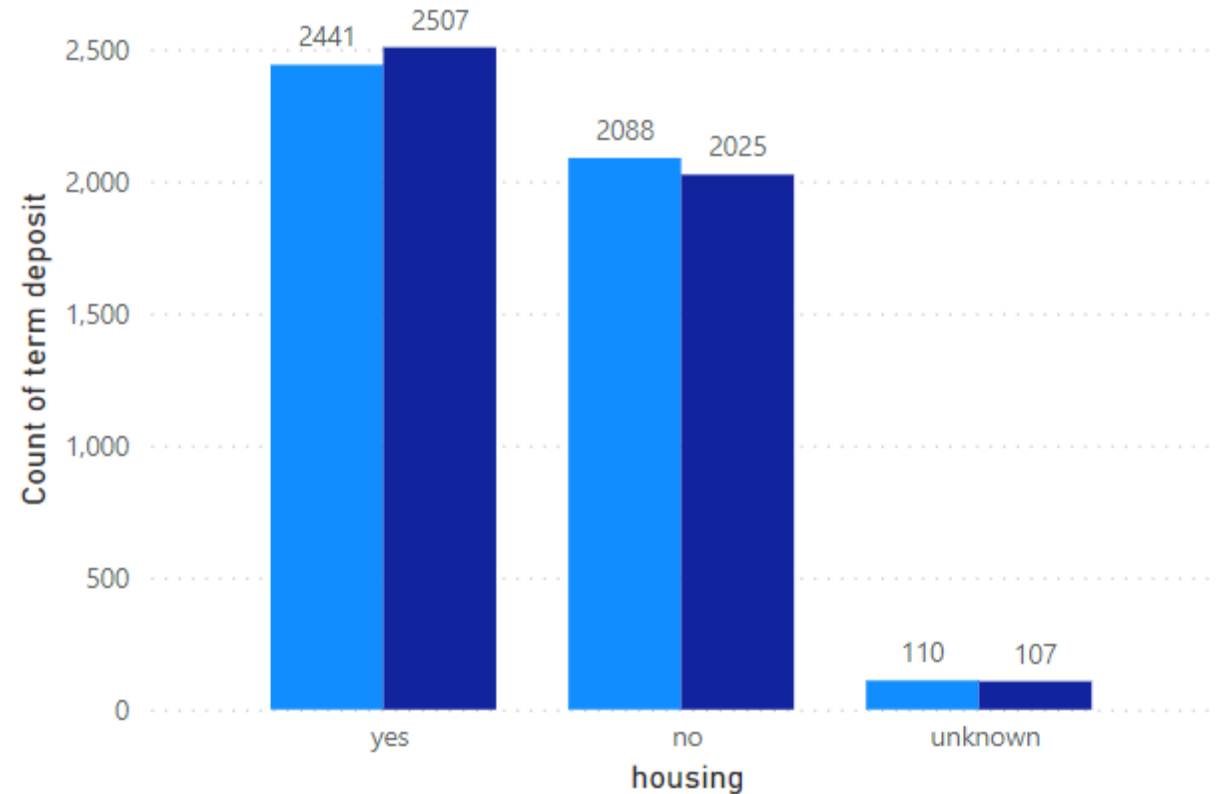
term deposit ● 0 ● 1



Data visualization

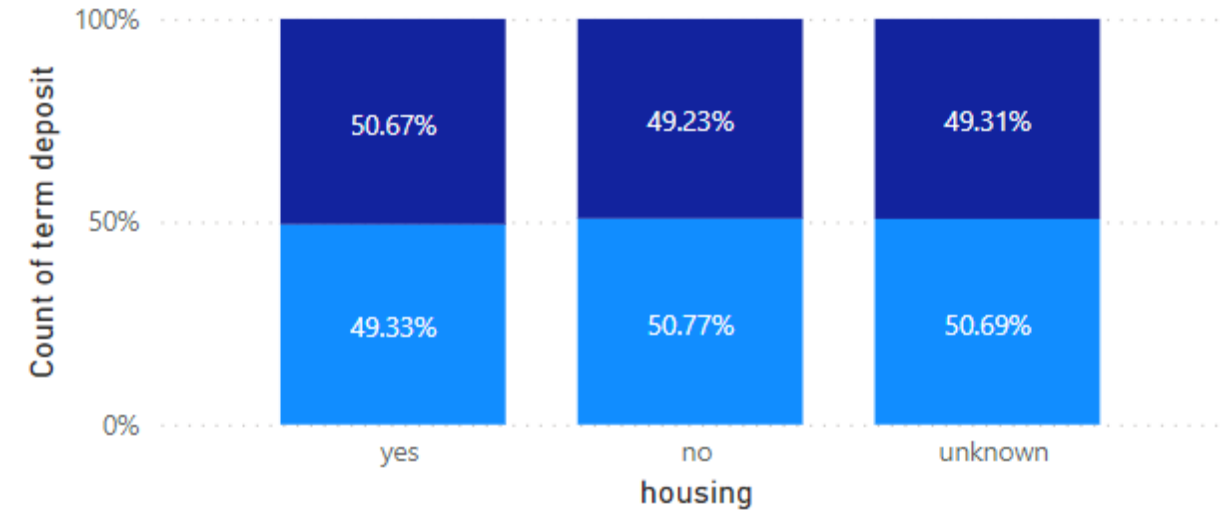
Count of term deposit by housing and term deposit

term deposit ● 0 ● 1



Percentage of term deposit by housing and term deposit

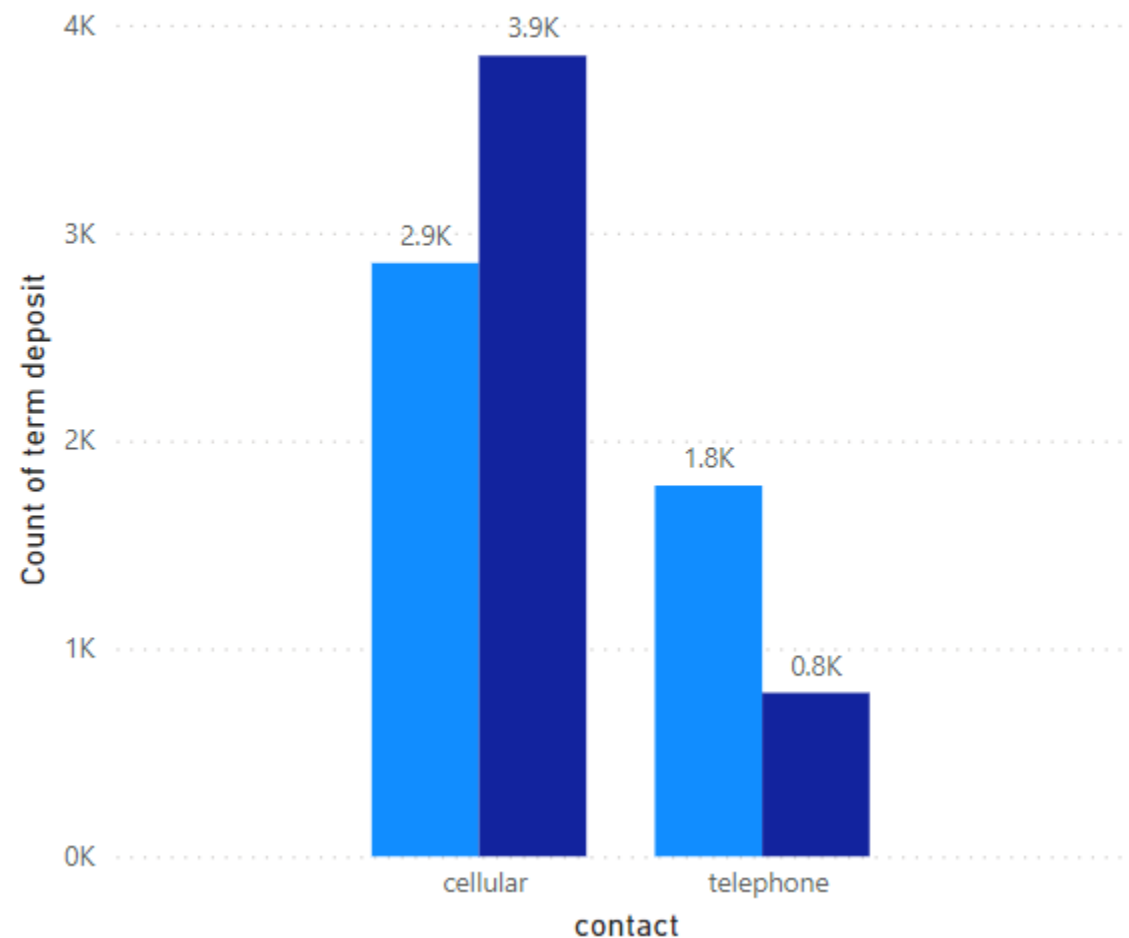
term deposit ● 0 ● 1



Data visualization

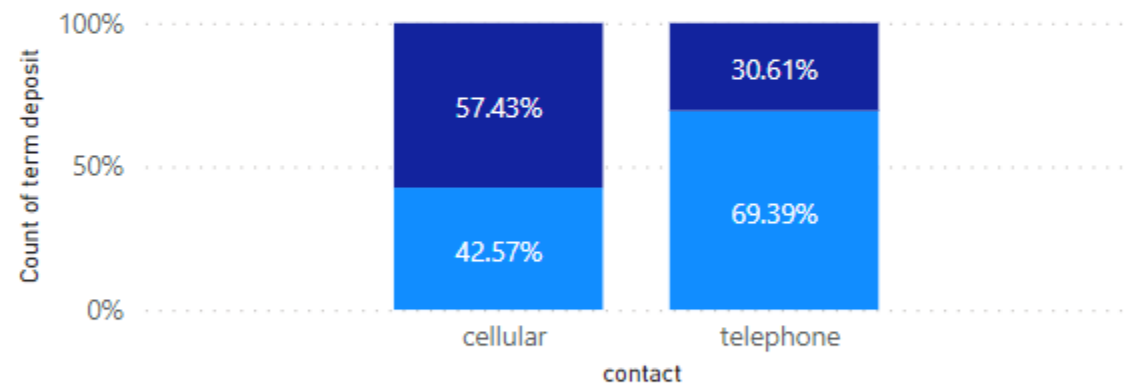
Count of term deposit by contact and term deposit

term deposit ● 0 ● 1



Percentage of term deposit by contact and term deposit

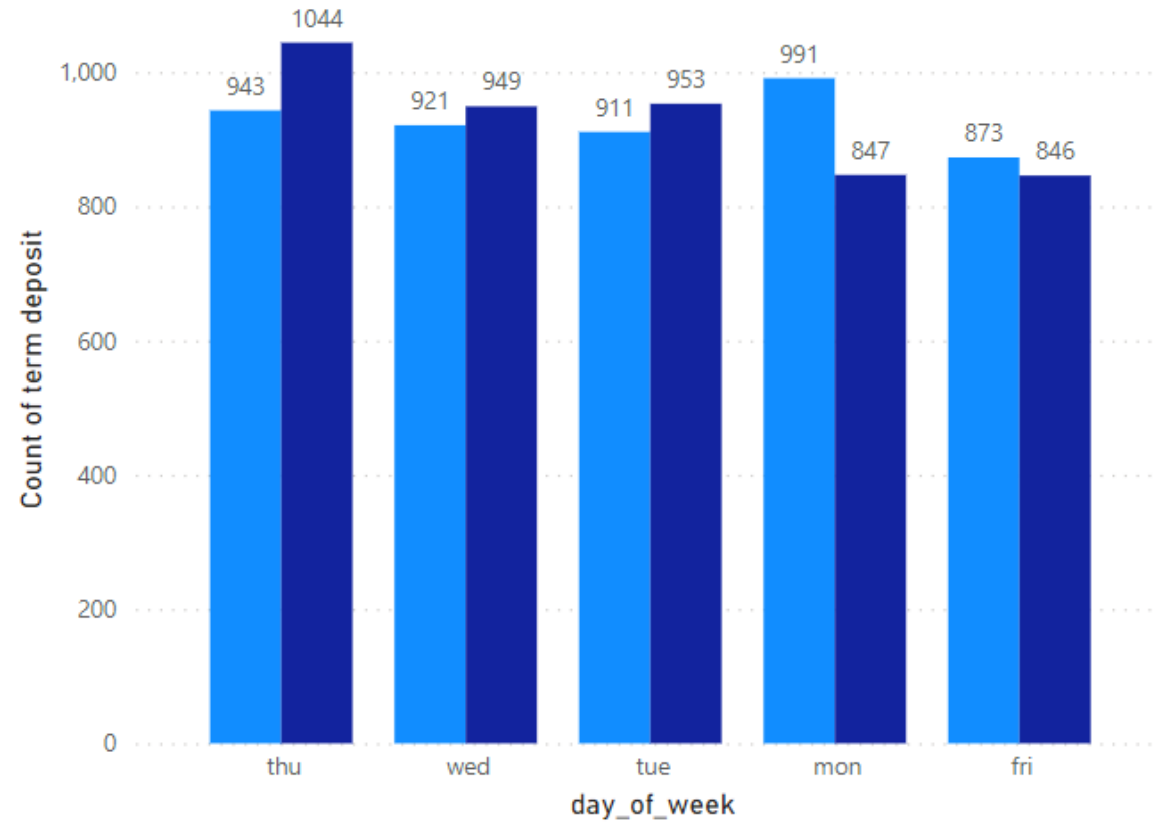
term deposit ● 0 ● 1



Data visualization

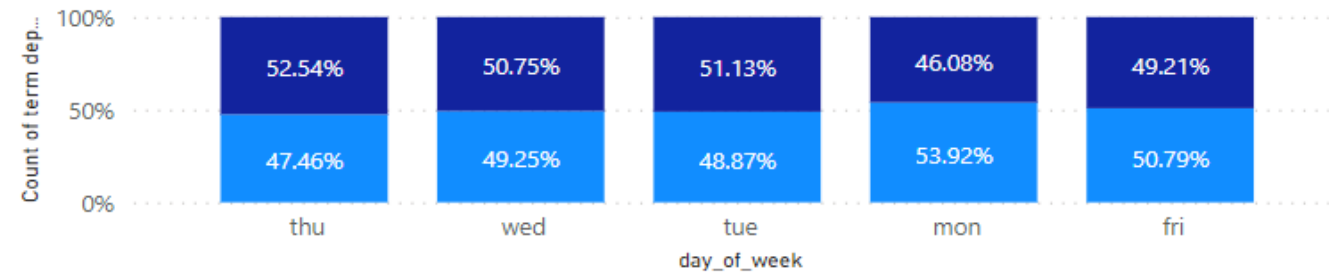
Count of term deposit by day_of_week and term deposit

term deposit ● 0 ● 1



Percentage of term deposit by day_of_week and term deposit

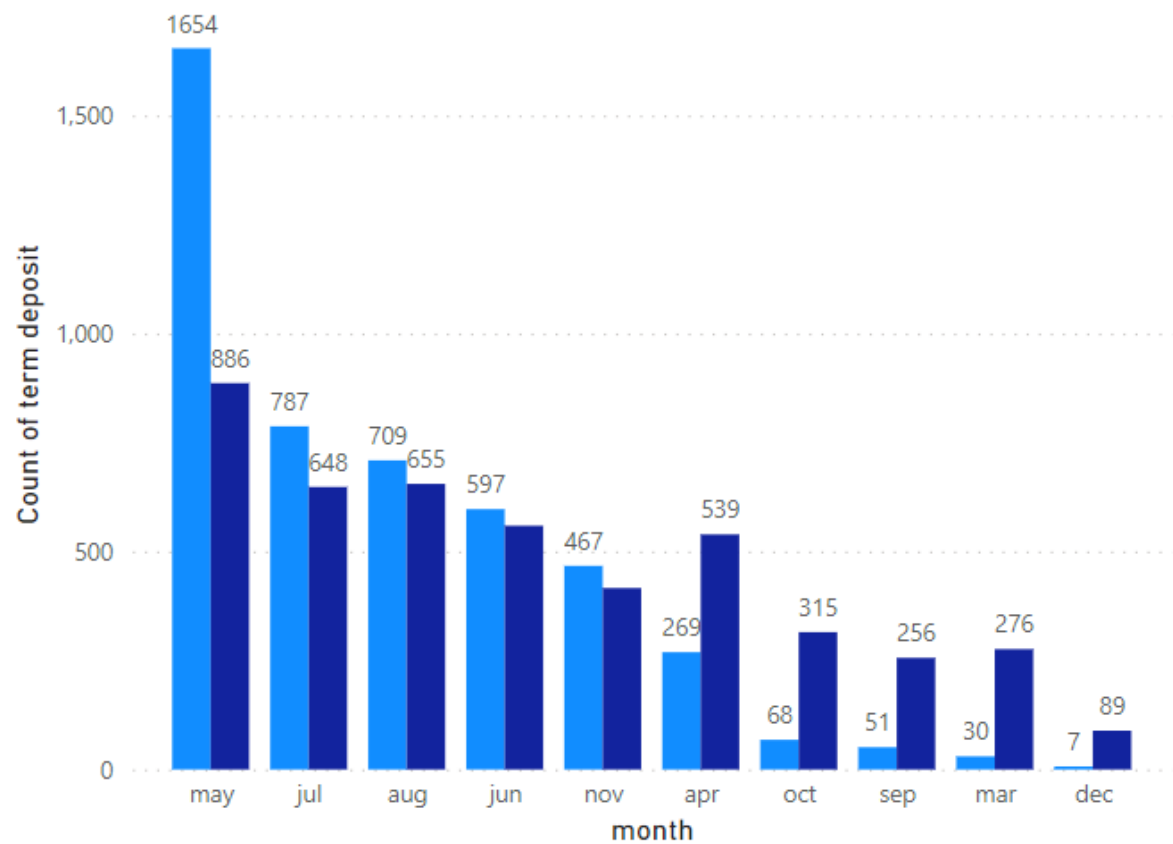
term deposit ● 0 ● 1



Data visualization

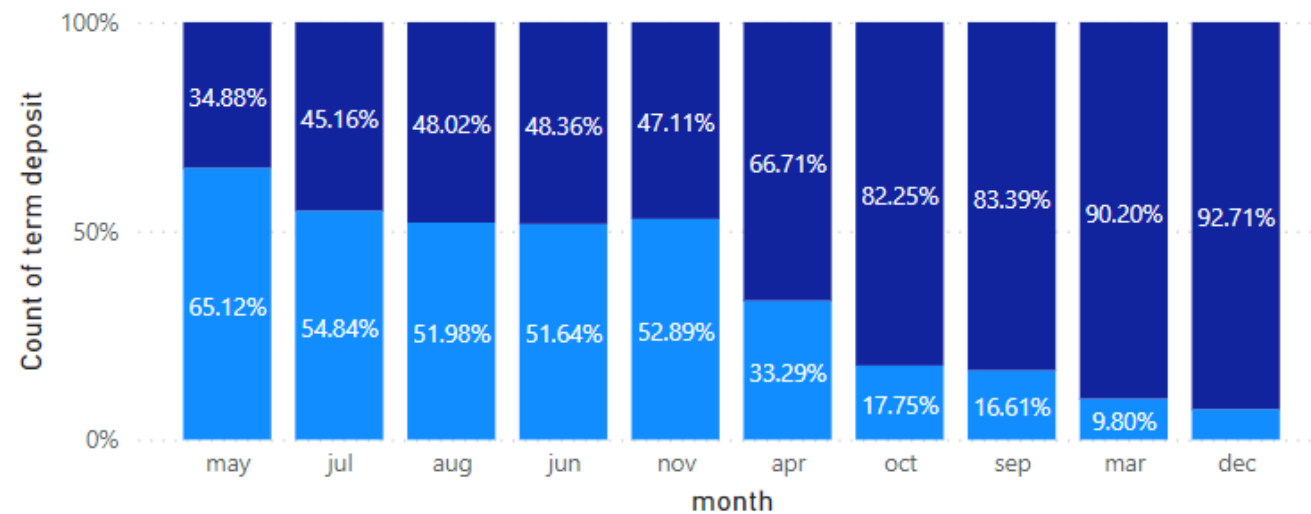
Count of term deposit by month and term deposit

term deposit ● 0 ● 1



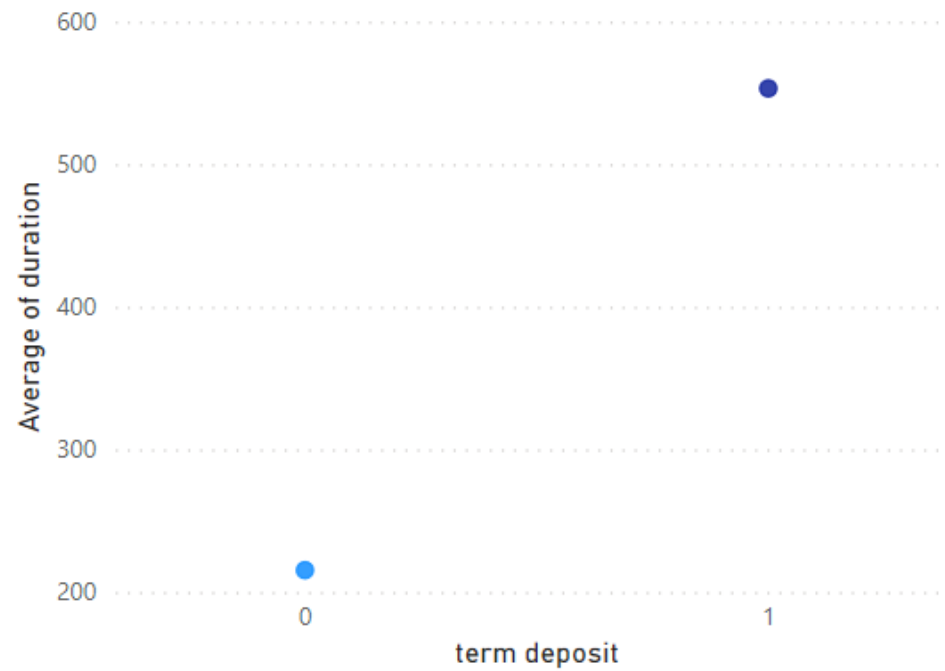
Percentage of term deposit by month and term deposit

term deposit ● 0 ● 1

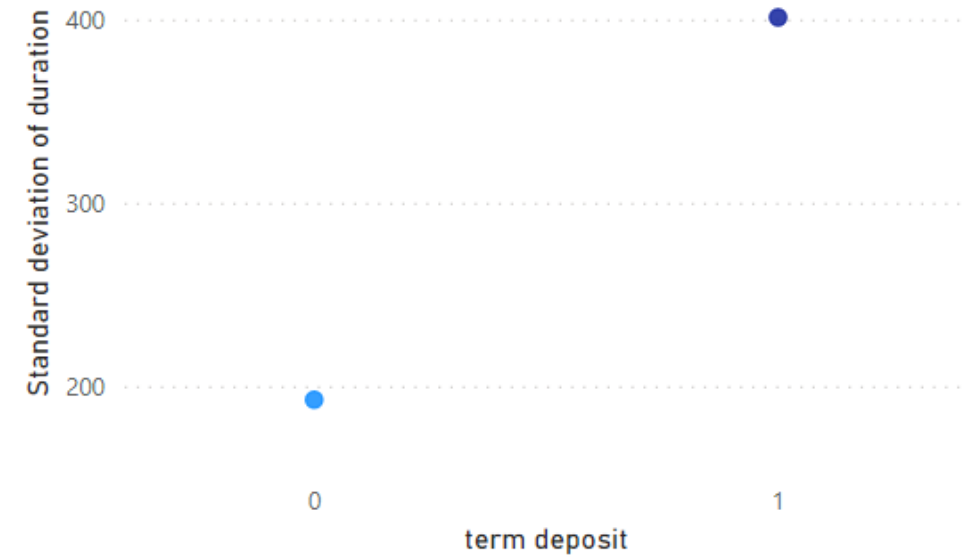


Data visualization

Average of duration by term deposit

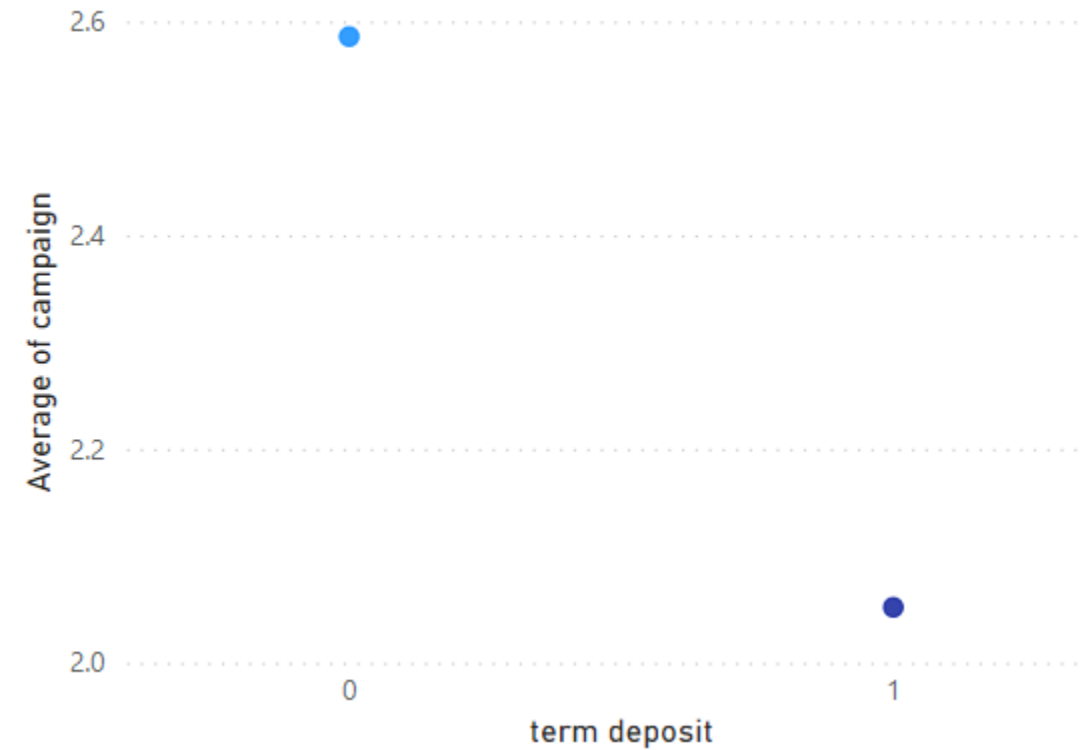


Standard deviation of duration by term deposit

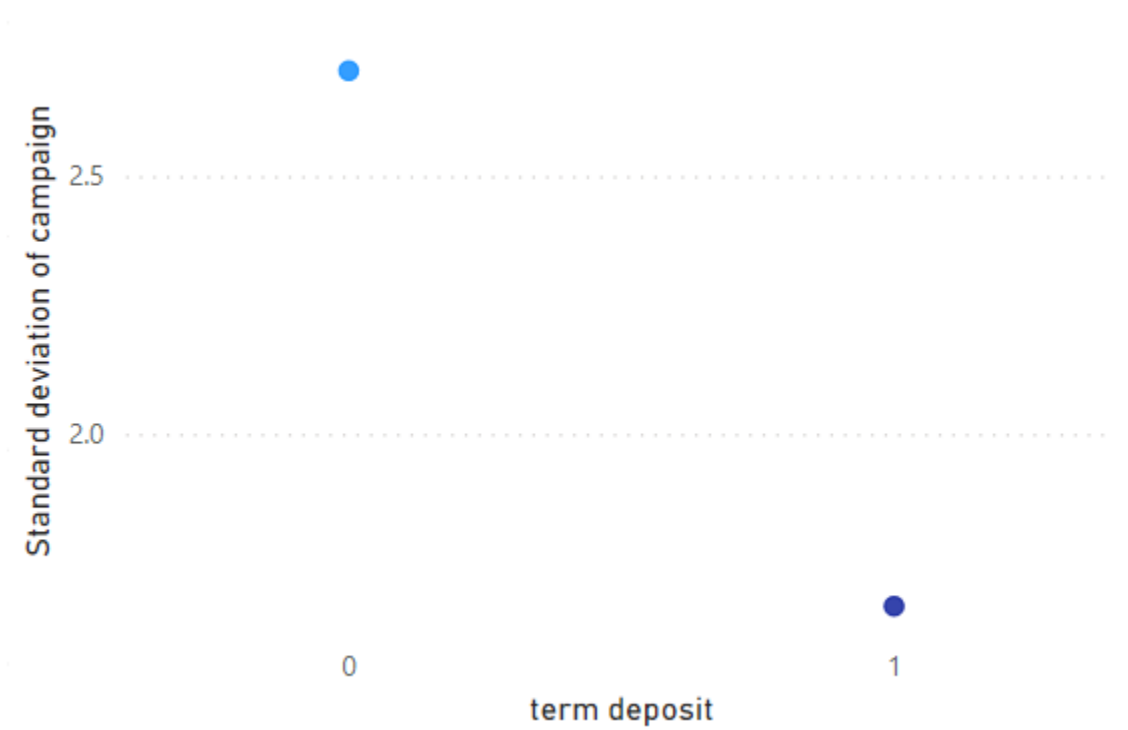


Data visualization

Average of campaign by term deposit

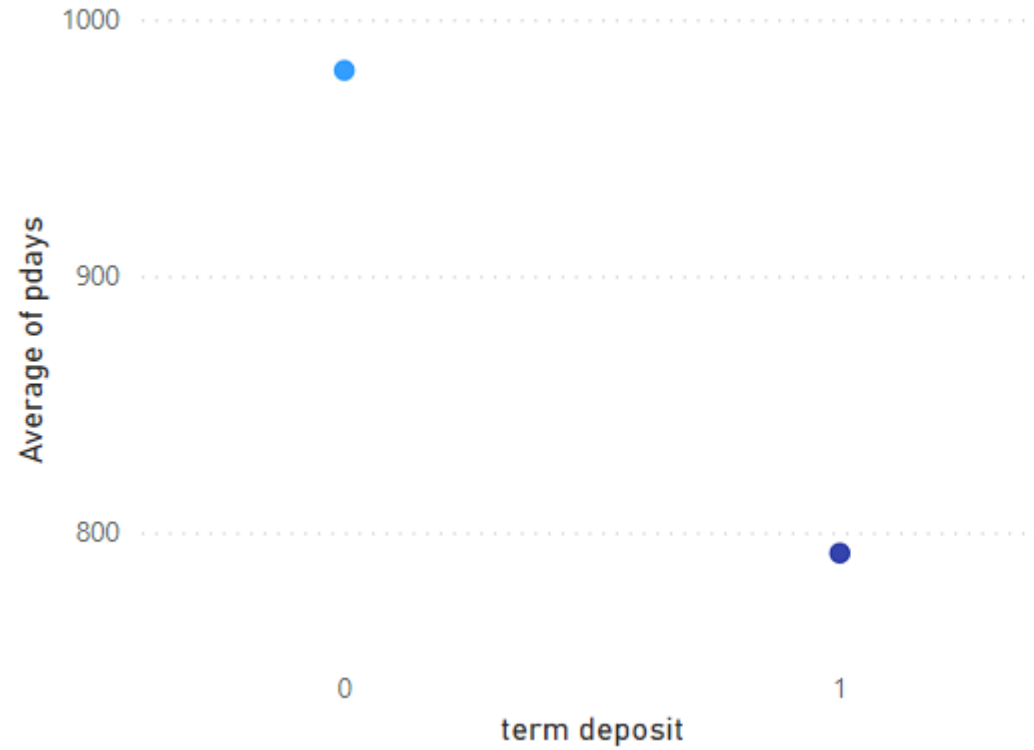


Standard deviation of campaign by term deposit

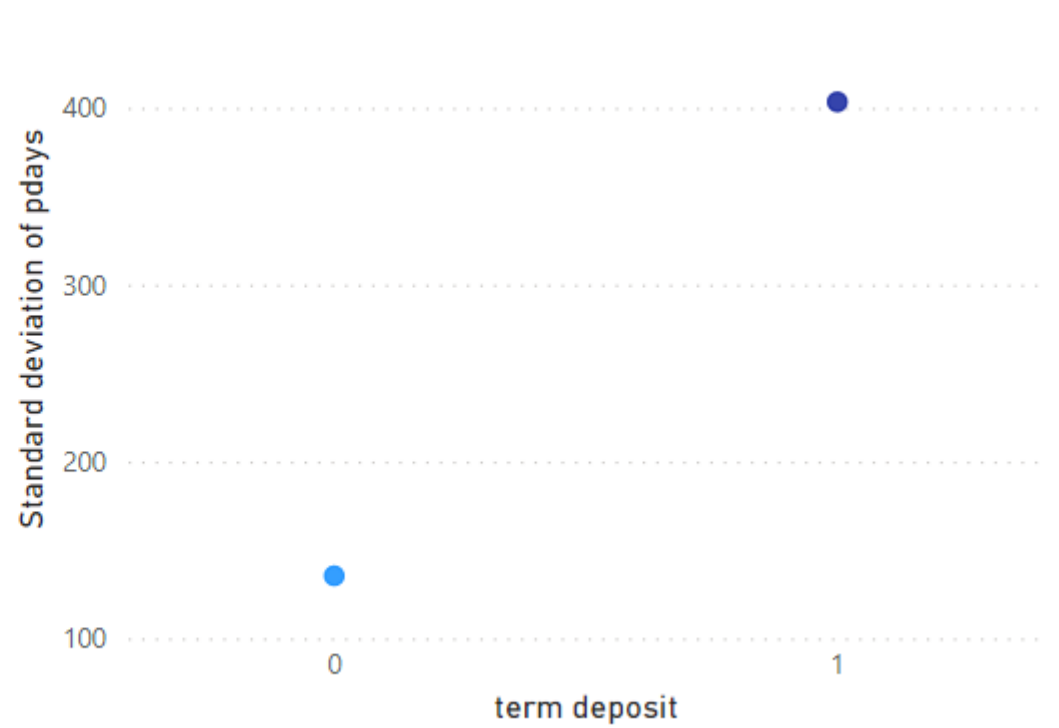


Data visualization

Average of pdays by term deposit

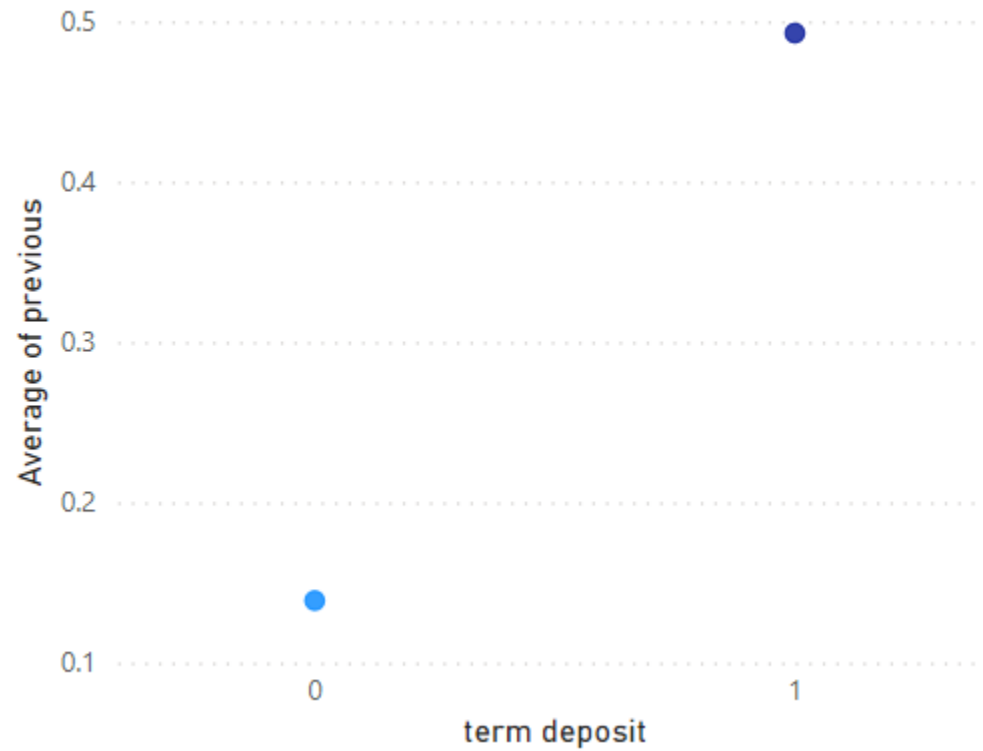


Standard deviation of pdays by term deposit

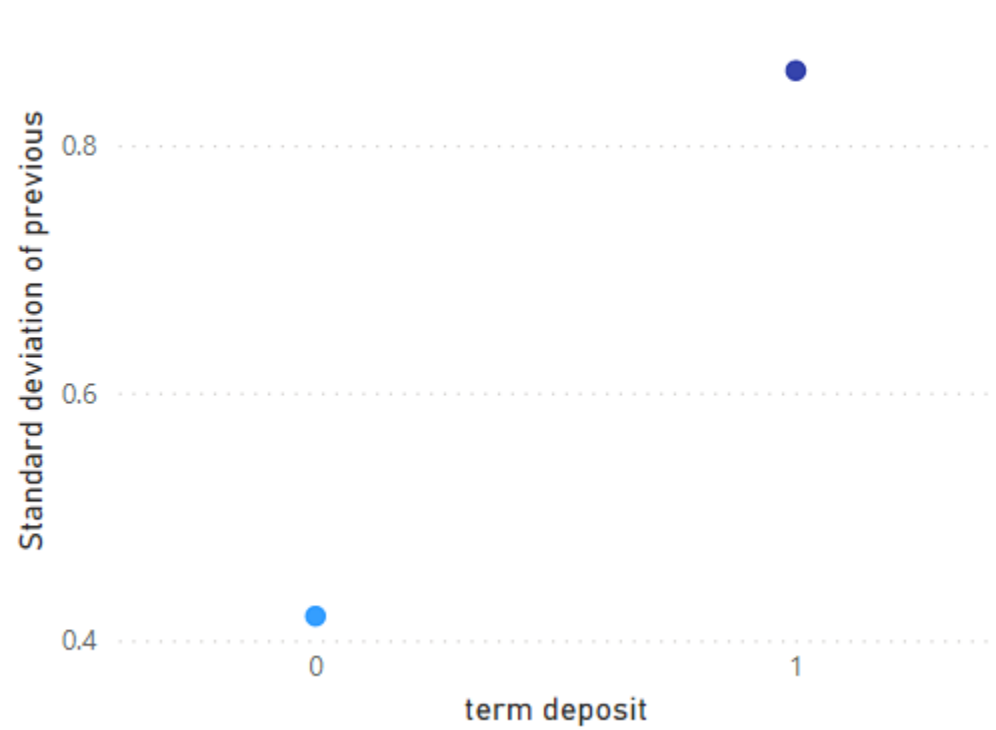


Data visualization

Average of previous by term deposit



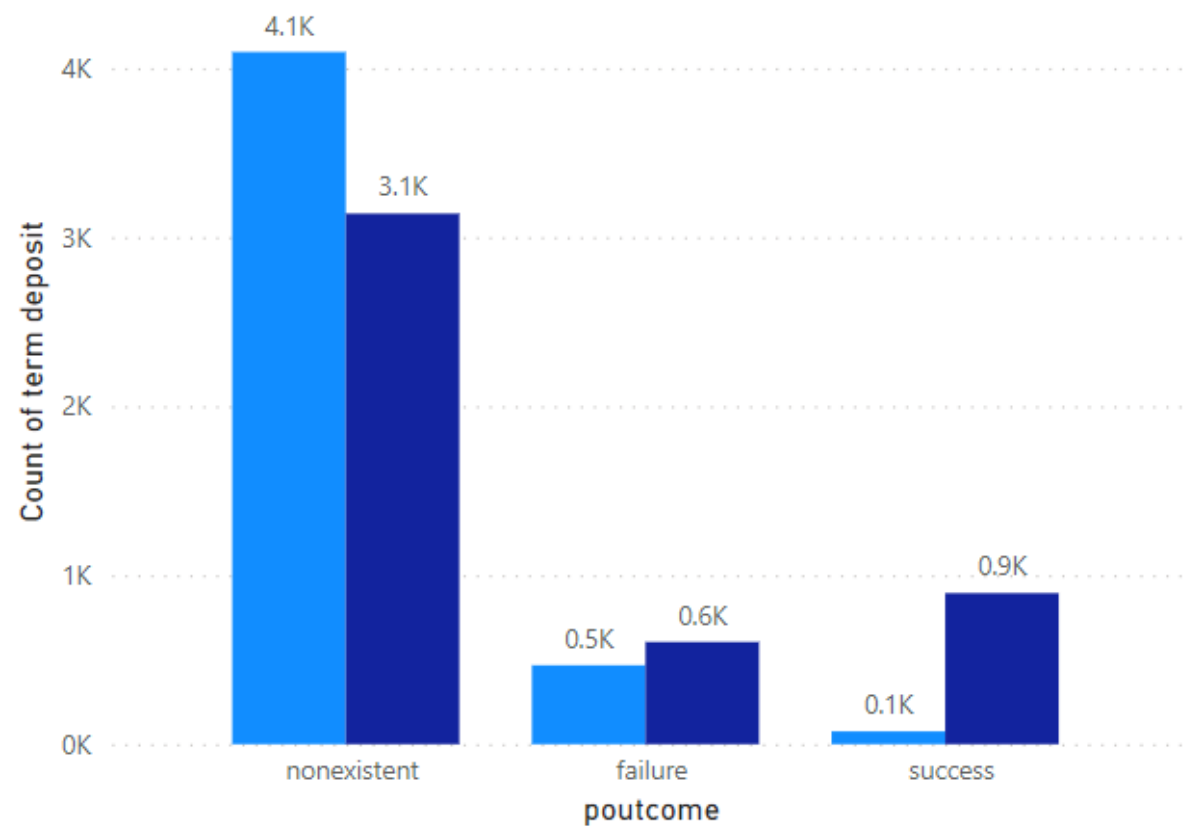
Standard deviation of previous by term deposit



Data visualization

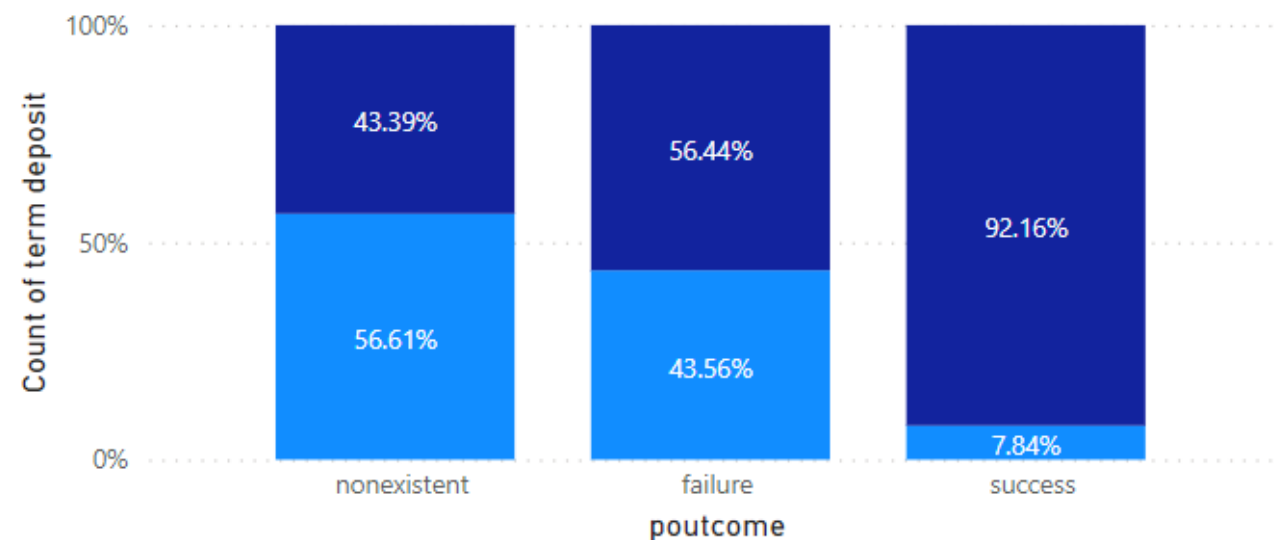
Count of term deposit by poutcome and term deposit

term deposit ● 0 ● 1



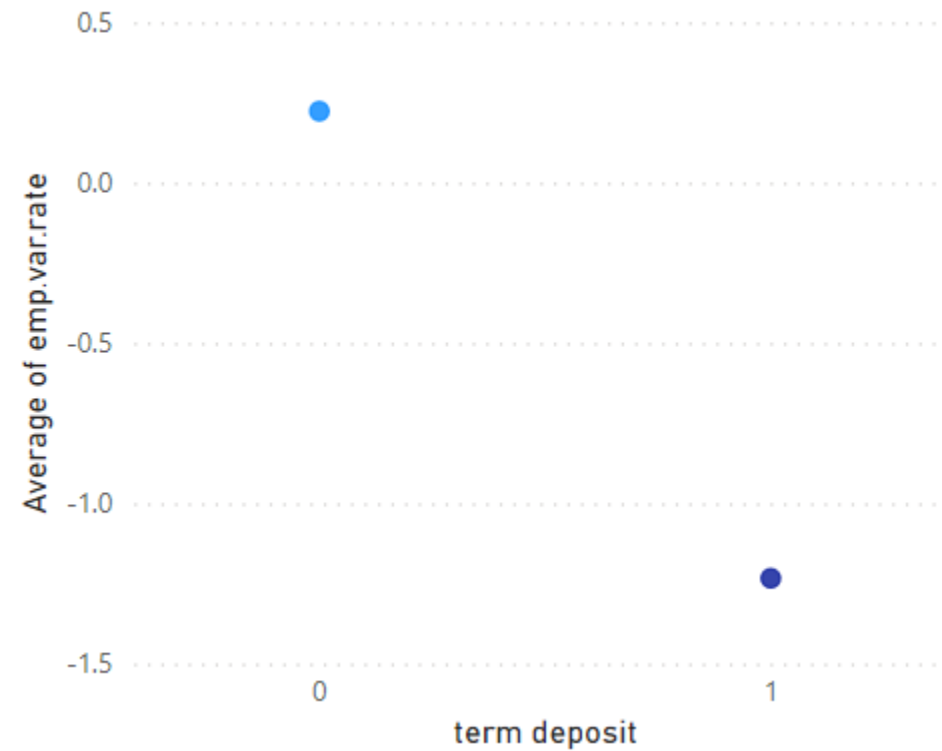
Percentage of term deposit by poutcome and term deposit

term deposit ● 0 ● 1

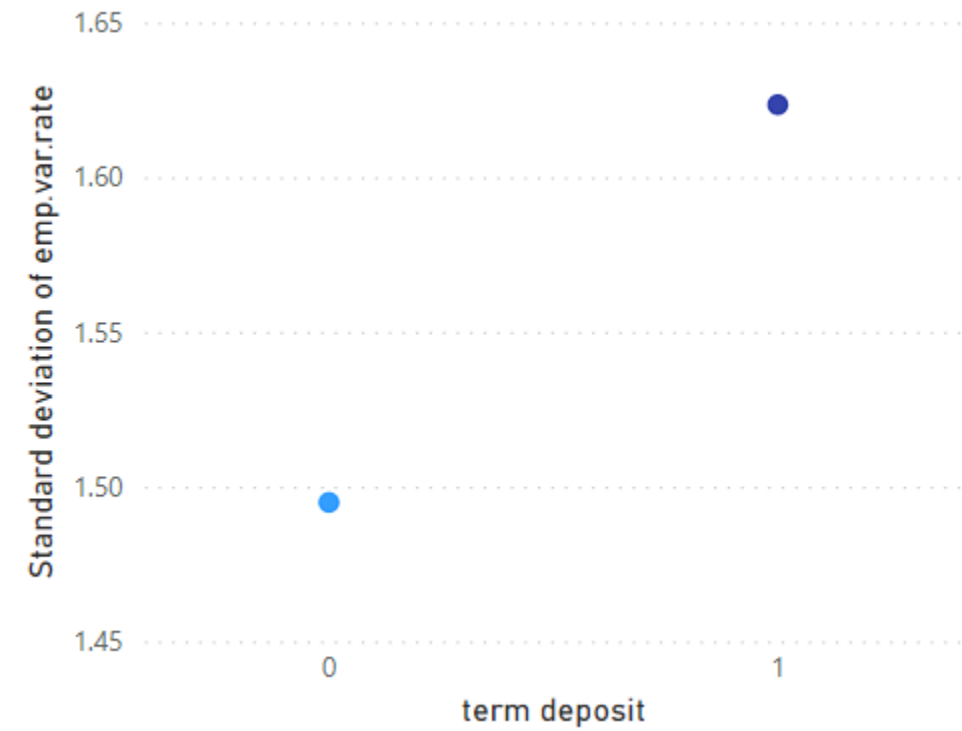


Data visualization

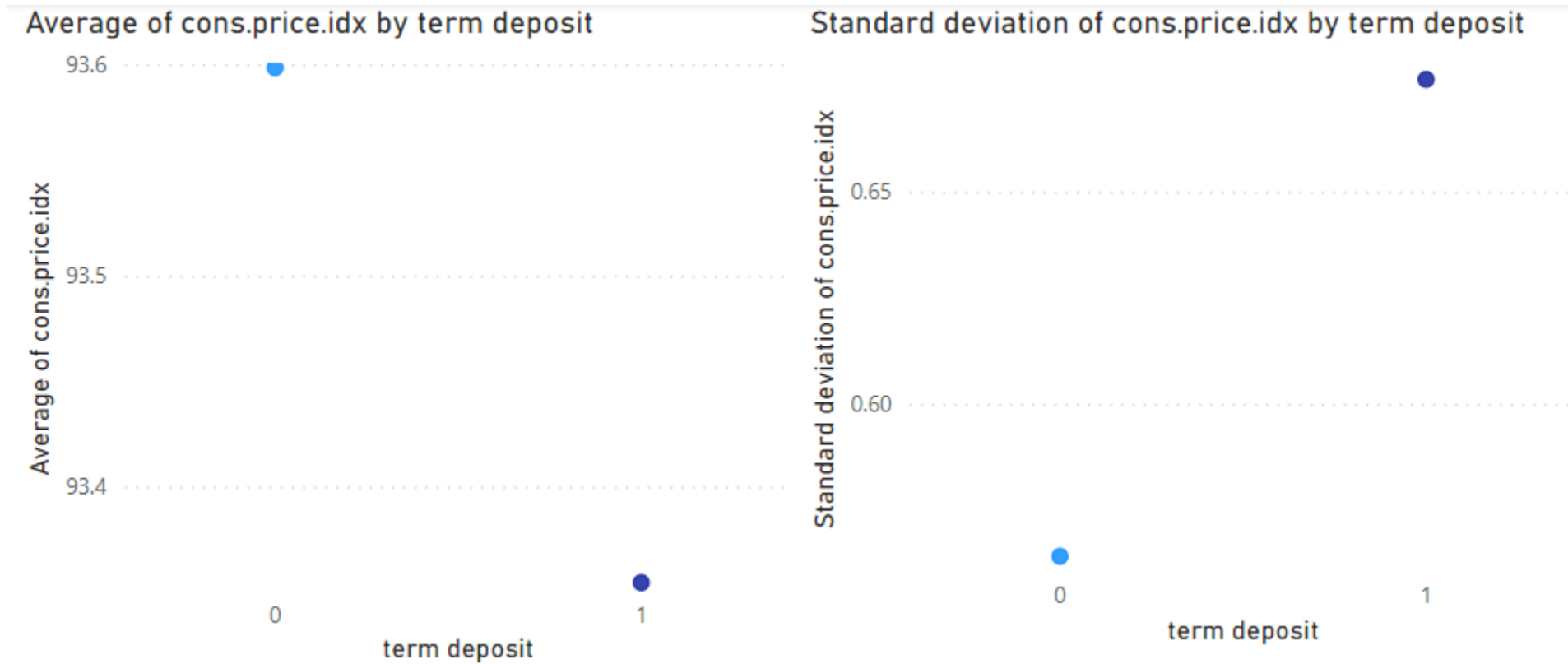
Average of emp.var.rate by term deposit



Standard deviation of emp.var.rate by term deposit

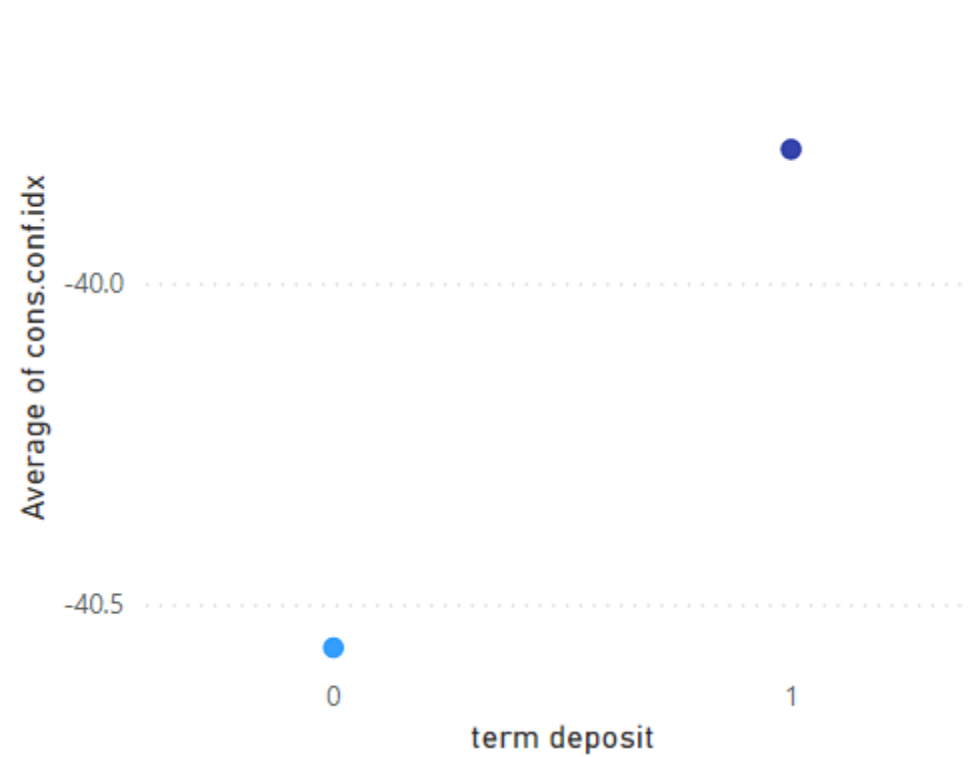


Data visualization

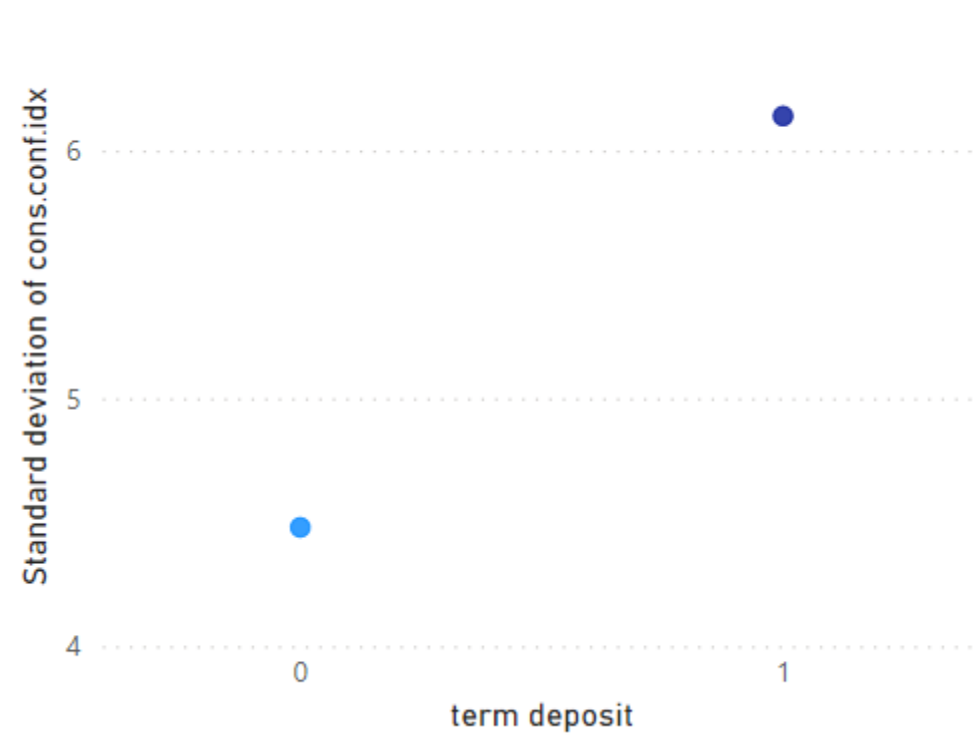


Data visualization

Average of cons.conf.idx by term deposit

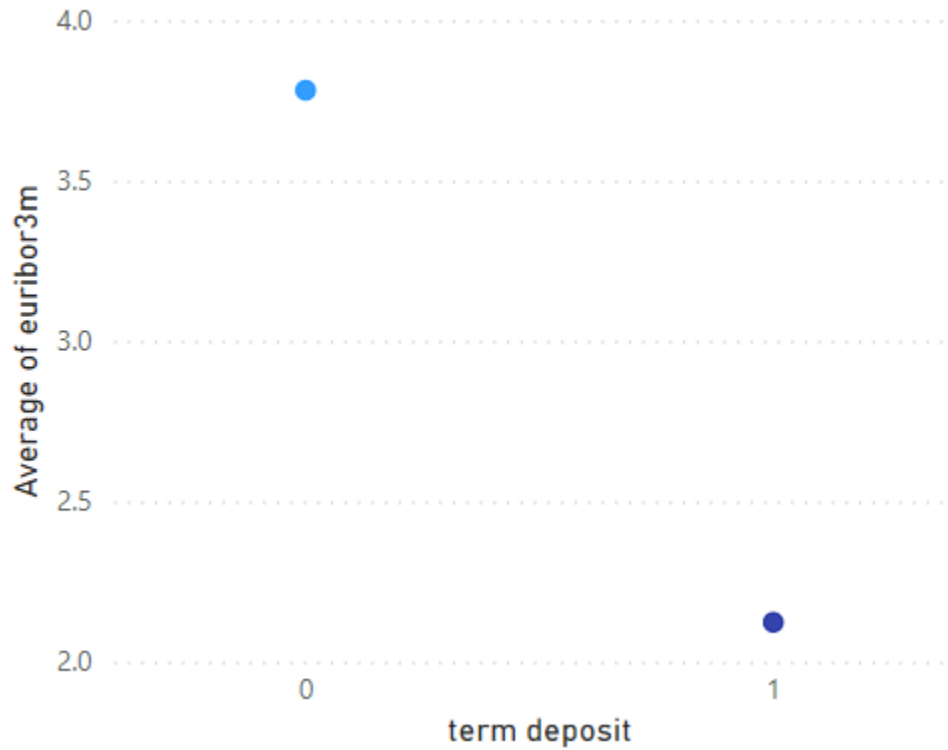


Standard deviation of cons.conf.idx by term deposit

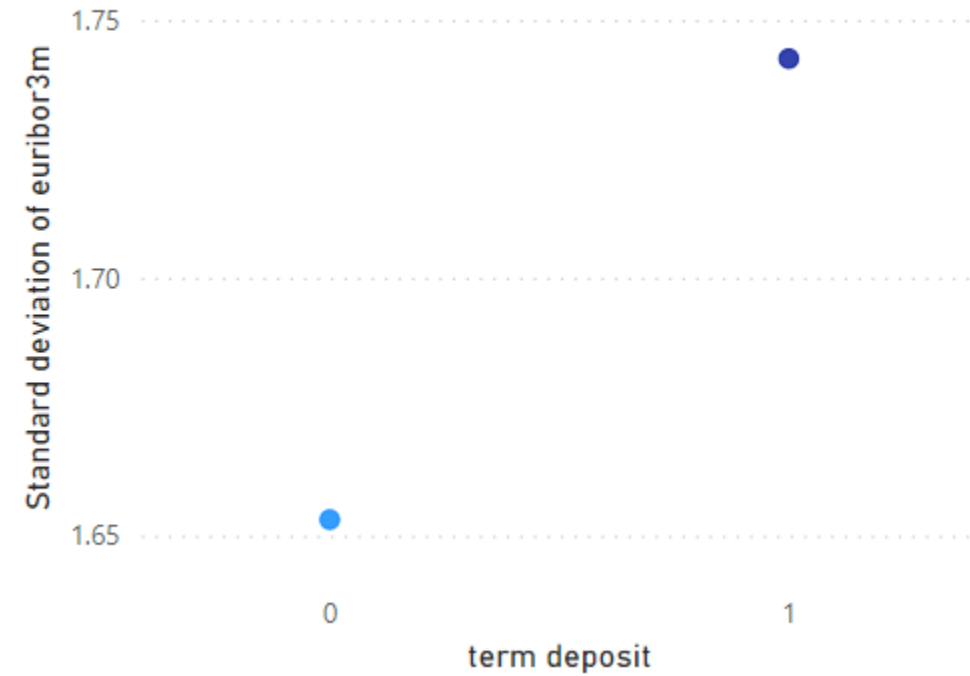


Data visualization

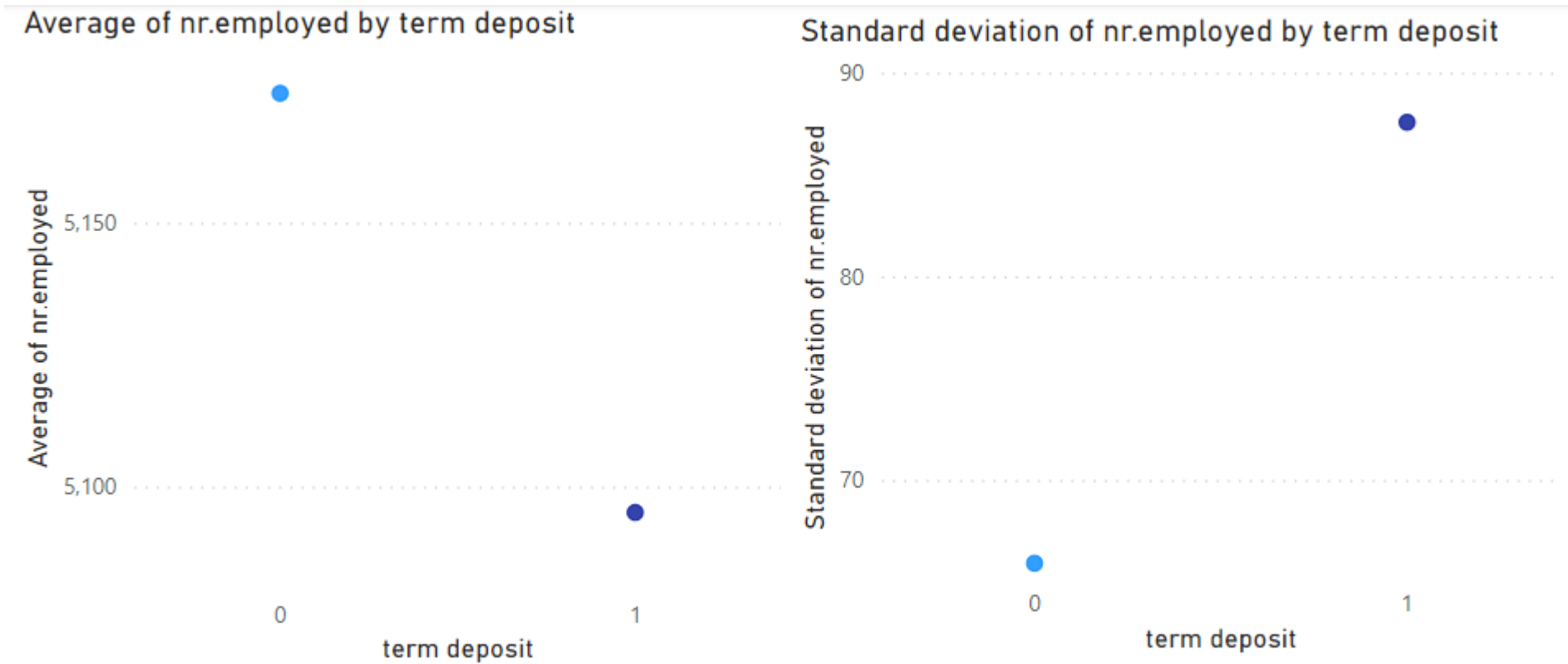
Average of euribor3m by term deposit



Standard deviation of euribor3m by term deposit



Data visualization



Recommendations

The recommendations are from various aspects based on the data visualization.

- **Age** – People who age from 25 to 39 are the most likely group to use the term deposit product and also have the most potential to use it. 40 to 59 people should be given more incentives to use the term deposit.
- **Job** – Blue-collar, entrepreneur and services workers should be encouraged more to use the term deposit product.
- **Marital** – Divorced and married people are less likely to use the term deposit.
- **Education** – The higher degree, the more chances to use the term deposit.
- **Loan** – Whether has personal loans or not doesn't necessarily affect the chance of using the term deposit.

Recommendations

- **Housing** – Those people who have housing loans prefer to use the term deposit.
- **Contact** – Sales should contact potential customers through **cellular** as much as possible.
- **Day of week** – Sales should avoid contacting potential customers on Mondays or Fridays.
- **Duration** – The more time spent on conversations, the more possibility for customers to use the term deposit
- **Campaign** – ABC should lower the number of contacts through the campaign.
- **Pdays** – ABC should contact potential customers as early as possible.
- **Previous** – The greater number of contacts before the campaign, the more opportunity to use the term deposit.
- **Poutcome** – ABC should pay attention to the outcome of every campaign in order to increase the customer loyalty.

Recommendations

- **Emp.var.rate** – The more employment variation rate, the less opportunity to use the term deposit.
- **Cons.price.idx** – The more consumer price index, the less opportunity to use the term deposit.
- **Euribor3m** – The more euribor 3 month rate, the less opportunity to use the term deposit.
- **Cons.conf.idx** – The more consumer confidence index, the more opportunity to use the term deposit.
- **Nr.employee** – The greater number of employees, the less opportunity to use the term deposit.

Thank You