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BANK SENTRAL REPUBLIK INDONESIA



Big Data Analytics on Payment System Data for Measuring Household Consumption

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BACKGROUND

- **Household consumption is one of the main indicators to measure state of the economy in Indonesia** (largest contributor, 55%, in Indonesia's GDP). However, GDP data (incl. household final consumption expenditure) are published and available on a quarterly basis with a publication lag of one month.
- Bank Indonesia provides retail value payment system, SKNBI (The National Clearing System), that can **generate data related to fund transfers, including household transactions**.
- Advancements of technology and widespread use of payment systems have opened the **opportunity to explore large dataset of payment data for monitoring economic activity**.

OBJECTIVE

Developing a high frequency measure of household consumption in Indonesia **from retail value payment system data** (SKNBI), by utilizing Big Data Analytics methodology, particularly text mining.



Fund Transfer of SKNBI:

Credit transfer transaction between participants (banks) on behalf of the customers.



- ✓ **Total Transactions** \cong 13 mio trx/month
- ✓ **Nominal Transactions** \leq Rp. 1 Billion/trx
- ✓ **Availability Period** : July 2015 s.d. December 2021

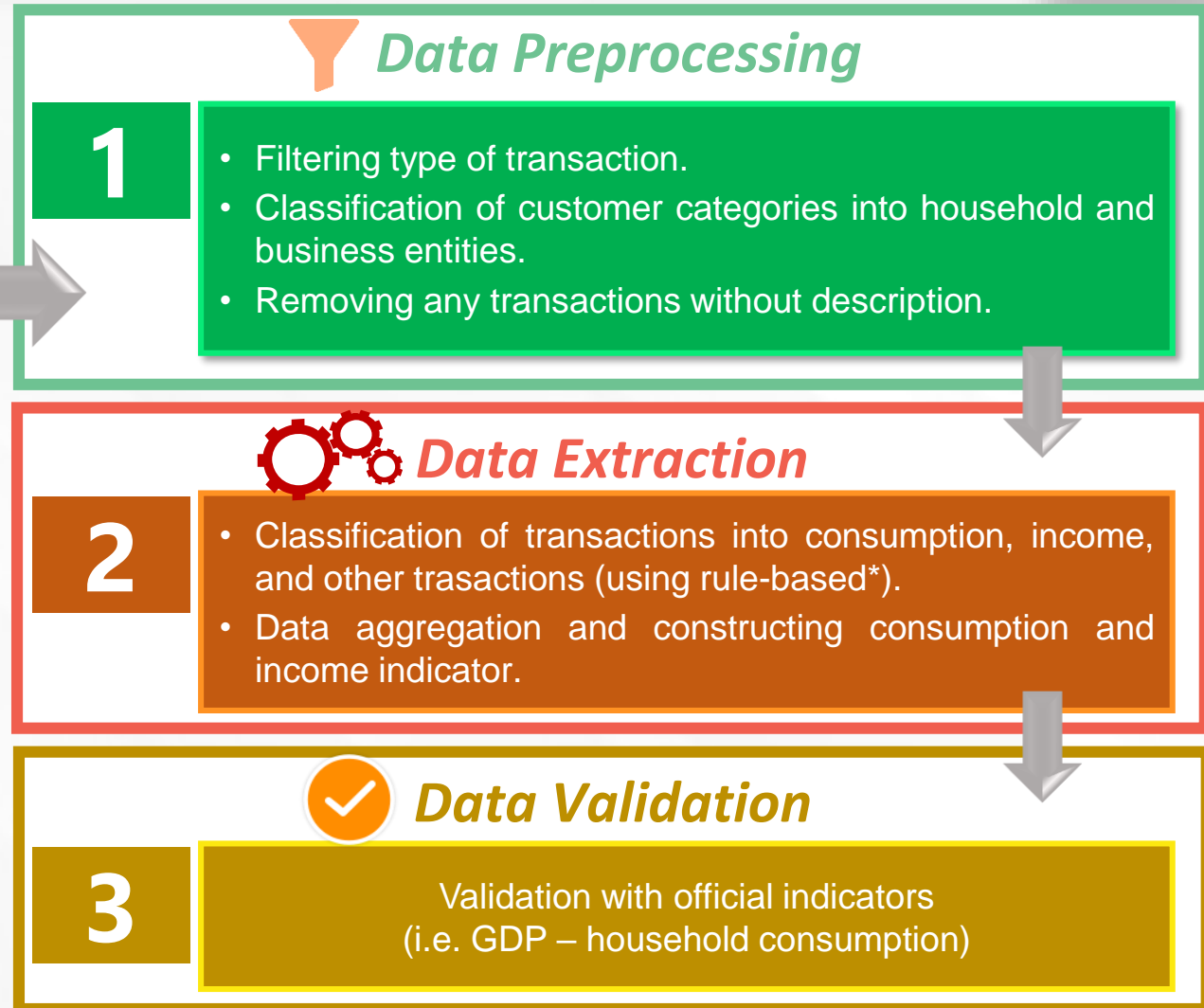
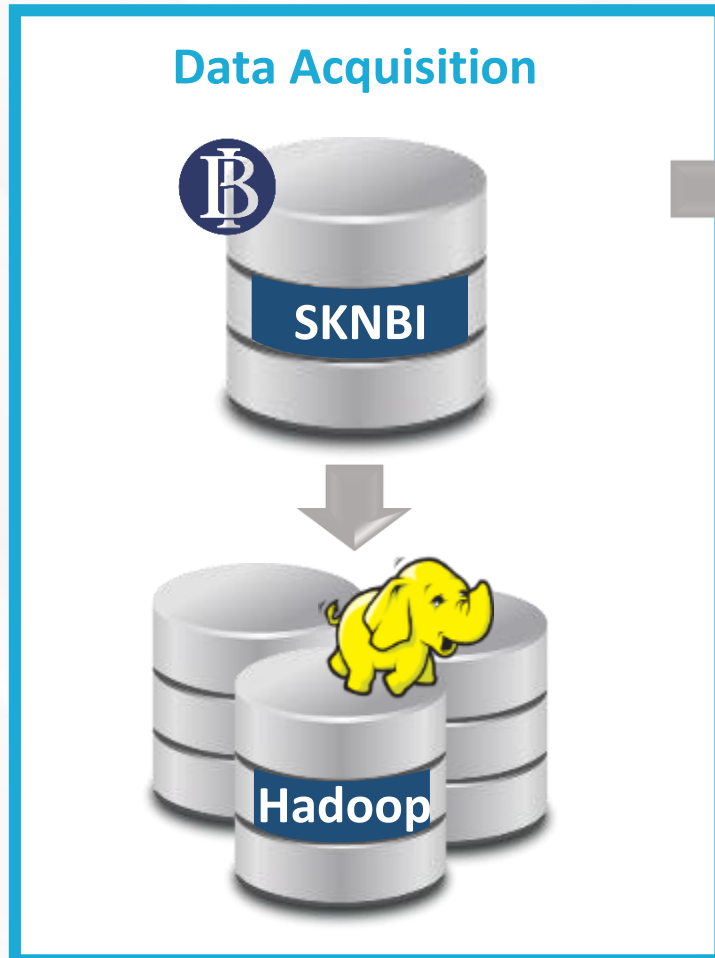
DATA SOURCE

DATA STRUCTURES

COLUMN NAME	
1	DKE ID
2	BATCH ID
3	TRANSACTION DATE
4	ORIGINATING BANK CODE
5	SENDER LOCATION
6	BENIFICIARY BANK CODE
7	RECEIVER LOCATION
8	AMOUNT
9	TRANSACTION TYPE CODE

COLUMN NAME	
10	SENDER CUSTOMER'S NAME
11	SENDER CUSTOMER'S ACC NUMBER
12	SENDER CUSTOMER'S ADDRESS
13	SENDER CUSTOMER'S ID NUMBER
14	SENDER CUSTOMER'S TYPE CODE
15	BENEFICIARY CUSTOMER'S NAME
16	BENEFICIARY CUSTOMER'S ACC NUMBER
17	BENEFICIARY CUSTOMER'S ADDRESS
18	BENEFICIARY CUSTOMER'S ID NUMBER
19	BENEFICIARY CUSTOMER'S TYPE CODE
20	DESCRIPTION

OVERALL WORKFLOW



*) e.g. : Consumption is SKNBI Fund Transfer with transaction detail containing keywords related to household consumption, e.g. : 'buy', 'shop', 'pay', 'paid off', 'installments', etc.

We use rule-based (keyword) approach for classifying customer categories.

'PT.', 'CV.', 'UD.', 'PD.', 'BANK', 'TBK', 'PERUSAHAAN', 'SDN BHD', 'INTERNATIONAL', 'INTERNASIONAL', 'FINANCE', 'LIFE', 'UNITED', 'RESTAURANT', 'ASURANSI', 'INSURANCE', 'AUTOMOTIVE', 'MANUFACTURING', 'MOTOR', 'LOGISTIC', 'LOGISTIK', 'PRODUCT', 'DEVELOPMENT', 'INDUSTRY', 'INDUSTRIES', 'PHARMA', 'CORP', 'PROD', 'DAIRY', 'LTD', 'GRAND', 'HOTEL', 'GREEN', 'CONSULTING', 'GROUP', 'GLOBAL', 'INTER', 'AGRO', 'RESORTS', 'TRANS', 'JASA', 'AJB', 'SECURITY', 'TEXTILE', 'INDO', 'SUKSES', 'RUMKIT', 'SUMBER', 'PERTAMINA', 'PLN', 'JASAMARGA', 'ELECTRONIC', 'INTL', 'POSCO', 'PTPN', '.CO', 'KANTOR PUSAT', 'PERUM', 'PROPERTY', 'RESEARCH', 'LIMITED', 'MEDICAL', 'ASTRA', 'HUSADA', 'TRADE', 'AGRICULTURE', 'FOOD', 'OPERATION', 'MAINTENANCE', 'SERVICES', 'STEEL', 'SUPPLIES'

**Business
Entities**

'OTORITAS', 'RSUD', 'BADAN', 'BPJS', 'PUSKESMAS', 'DINAS', 'KAB.', 'KABUPATEN', 'KEC.', 'KECAMATAN', 'KEL.', 'KELURAHAN', 'KPU', 'PEMERINTAH', 'PEMKAB', 'PEMKOT', 'PROVINSI', 'PROV.', 'PEMPROV', 'RKUD', 'EMBASSY', 'DITJEN', 'DIKBUD', 'CAMAT', 'DAERAH', 'PDAM', 'KERETA', 'KAS UMUM', 'RPKBUN', 'RPK-BUN', 'SPAN', 'SETDA', 'SEKDA', 'POLRES', 'POLDA', 'POLSEK'

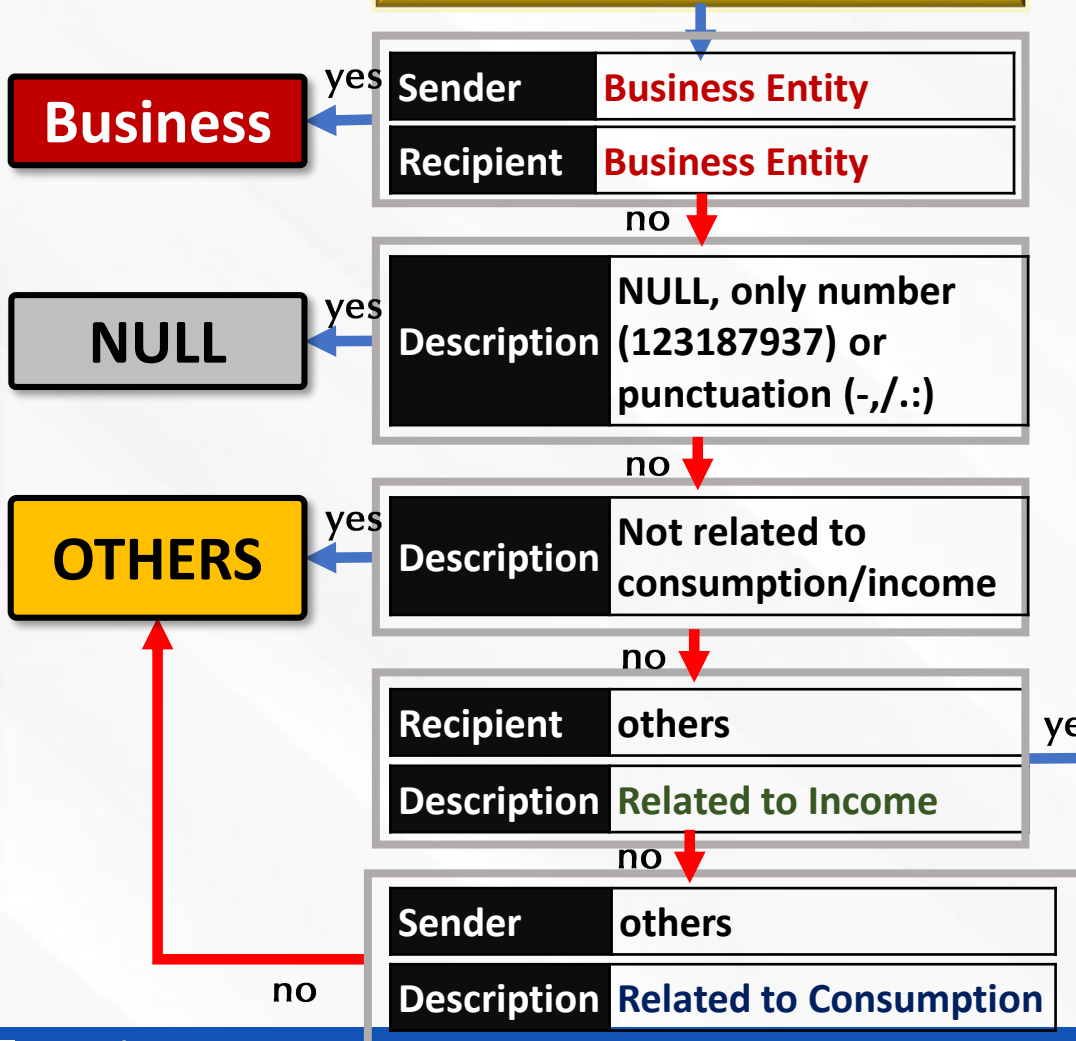
Government

Example:

Sender	Sender Category	Beneficiary	Beneficiary Category
INDO PRIMA SEMESTA	Business Entity	PT. UNITED FAMILY FOOD	Business Entity
RPKBUNP. SPAN BNI	Government	CV. TANJUNG AGUNG	Business Entity
TRI AMALIA	Others	PT. MAJU MOBILINDO	Business Entity

METHODOLOGY – DATA EXTRACTION

Fund Transfer of SKNBI



We use rule-based (keyword) approach for classifying transaction purpose (consumption, income, business)

Household Income Keywords

'gaji', 'honor', 'upah', 'payroll', 'salary', 'remunerasi', 'insentif', 'wage', 'sales', 'pensiun', 'lembur', 'overtime', 'dividen', 'kompensasi', 'bagi hasil', 'bonus', 'claim', 'klaim', 'payoneer', 'komisi', 'tukin', 'uang makan'

Household Consumption Keywords

'pembayaran', 'konsumsi', 'belanja', 'pelunasan', 'kos', 'cicilan', 'dp', 'payment', 'dana', 'pelunasan', 'setoran', 'angsuran', 'jasa', 'invoice', 'listrik', 'service', 'sewa rumah', 'kasbon', 'catering', 'premi', 'asuransi', 'umroh', 'haji', 'tiket', 'spp', 'donasi', 'air', 'kuliah', 'obat', dsb.

Keywords that are not related to consumption/income

'retur', 'return', 'tabungan', 'refund', 'saving', 'reimburse', 'pemindahbukuan', 'nabung', 'tsa', 'span', 'pemerintah', 'pajak', 'sp2d', 'sppd', 'pendes', 'dana bos'

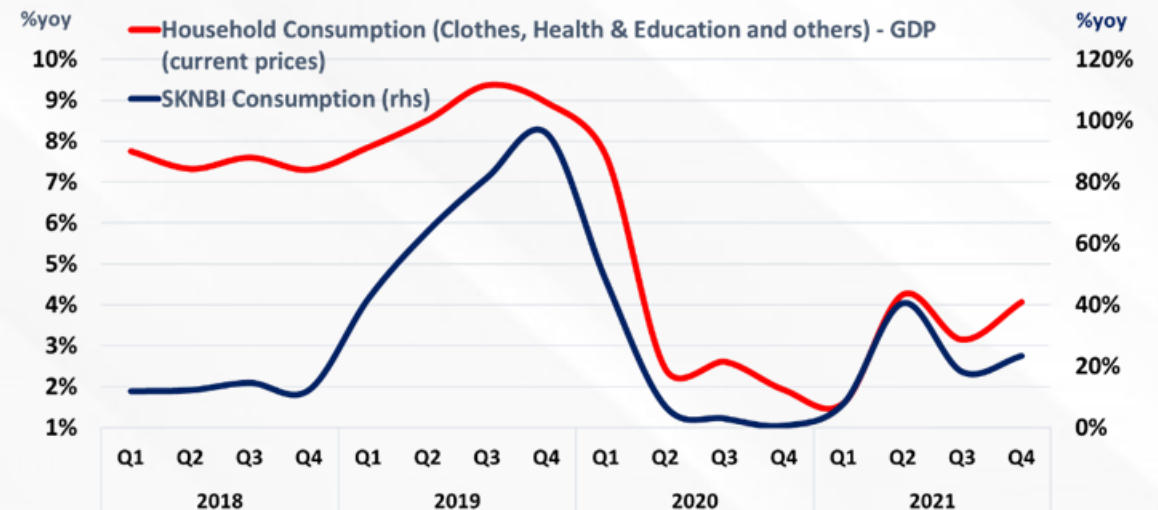
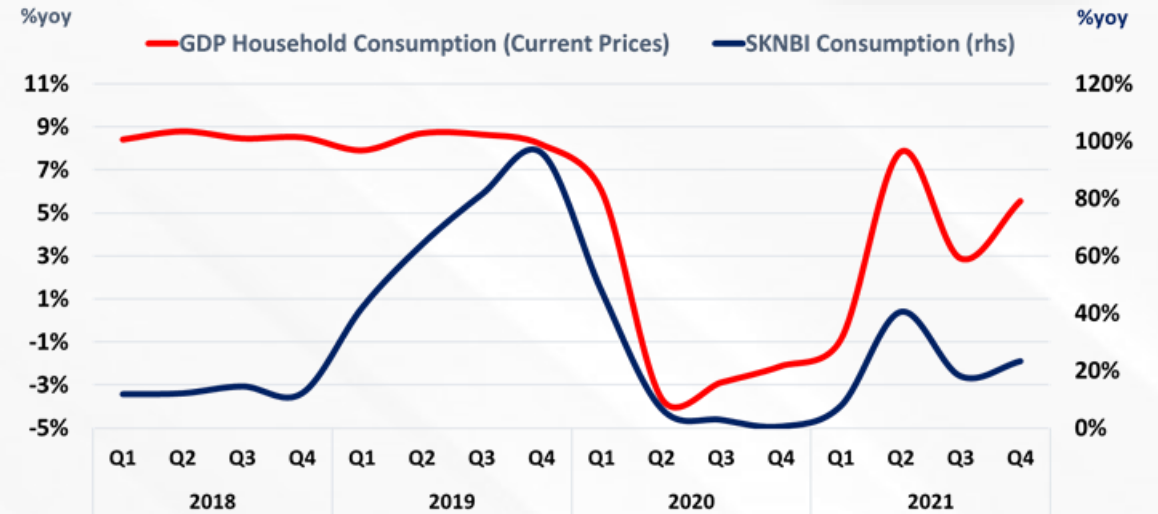
In this study, we use F1-score as an evaluation metric. The evaluation was carried out on ± 4.000 transactions (random sampling) during the period of 2018 to 2021. **The evaluation results show us a good value of the overall F1-score (84,5%).**

<u>CONFUSION MATRIX EVALUATION RESULT</u>		PREDICTION			
A C T U A L	Purpose of Transaction	Consumption	Income	Business	Others
	Consumption	154	0	0	38
	Income	17	569	4	76
	Business	42	0	1.078	240
	Others	33	7	12	1.935

Purpose of Transaction	Recall	Precision	F1-score	F1-score (average)	Accuracy
Consumption	80,2%	62,6%	70,3%	84,5%	88,3%
Income	85,4%	98,8%	91,6%		
Business	75,6%	98,2%	85,4%		
Others	97,4%	84,5%	90,5%		

The validation results show a high correlation between the two indicators since quarter 1-2019, including during the Covid-19 pandemic.

Indicators	Correlation of SKNBI Consumption Growth Rate with GDP		
	Q1-2018 s.d. Q4-2021	Q1-2019 s.d. Q4-2021	Q1-2020 s.d. Q4-2021
Total of Household Consumption	55,2%	85,2%	91,2%
Clothes, Health & Education, Restaurant & Hotel, and others	61,3%	85,2%	90,4%
Clothes, Health & Education and others	67,7%	93,3%	90,3%
Health & Education	65,9%	83,4%	60%
Restaurant & Hotel	50,8%	69,2%	80,2%



Conclusion

1. We have **proposed a new approach** in utilizing high-frequency payment system transaction data, **using text mining methodology through a rule-based model**, to construct a proxy indicator for household consumption. **Based on the evaluation of the model, the average F1-score of the model is 84,5%.**
2. Our consumption indicator can be **generated from payment system data more quickly** compared to household consumption indicators in GDP publications. The validation results show a **high correlation** between our consumption indicator from payment system and publication of GDP data, which indicates that the indicator from payment system can be used as **a proxy for household consumption indicators.**

Future Works

1. **Improving the methodology for classifying customer categories and transaction purposes**, including the use of machine learning algorithms.
2. **Utilizing Bank Indonesia's Fast Payment (BI-FAST) transaction data** (implemented since the end of 2021) as additional data source in constructing consumption indicators from retail payment system.
3. Using consumption indicators from payment system, e.g. funds transfer from SKNBI customers or payment transactions via cards, with other macroeconomic variables, to **construct the nowcasting model of household consumption.**



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THANK YOU TERIMA KASIH

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