The Fit Factor:
Matching Loans and Savings to Cash Flows

Yoshinari Noguchi
yoshinari.noguchi@gojo.co
Cheriel Neo
cheriel.neo@gojo.co
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Introduction

In financial inclusion, impact measurement tends to focus on what happens after financial services are provided. For example, whether sales, income, or employment increased after a loan.

However, these outcomes are usually not the result of the financial services alone. An inconvenient loan, a high-fee or high-interest loan, or even a predatory loan, can produce good results if the business or the environment is right. Conversely, someone using a client-friendly flexible loan or a low-interest loan may meet with an unavoidable accident, disaster, or depression. Figure 1 sets out the interaction between the loan product and the outcomes of the loan. Further, unlucky events may happen to many borrowers simultaneously, making it difficult to separate the effects of the loan from the suitability of the loan.

Figure 1		product is	
		more suitable	less suitable
outcomes are	good	happy	lucky
	bad	unlucky	unhappy

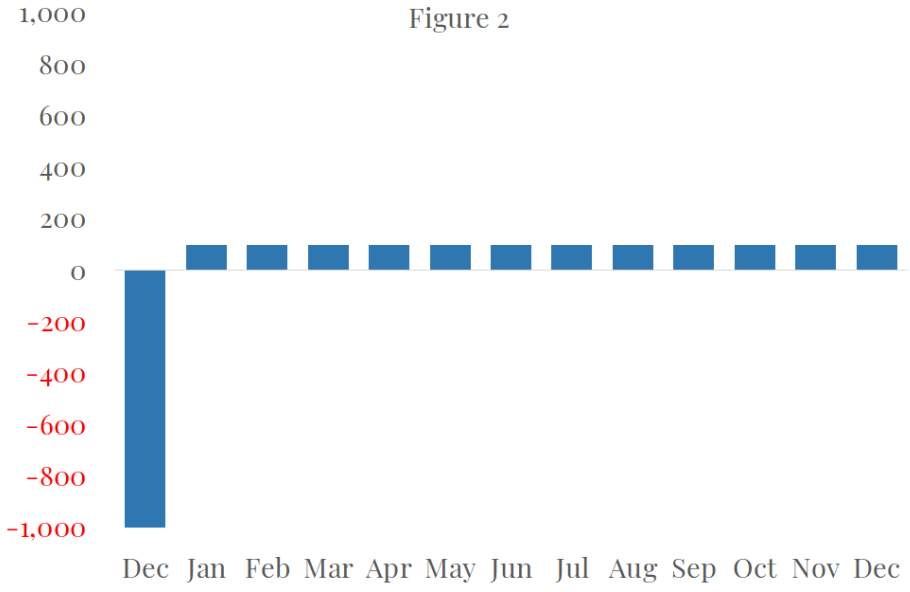
Instead of assessing the impact of a financial service by looking at the outcomes that follow its delivery, what if we look at how well the service suited the customer at the time it was delivered? We call this the 'Fit' between a financial service and a customer's cash flows, and introduce the following definition of fitness:

Volatility(Household Cash Flow Without the Financial Service) -
Volatility(Household Cash Flow With the Financial Service)

The definition is quantitative to allow for cross-sectional comparison across households and across financial services and/or providers. It is the volatility of household cash flow without the financial service, minus the volatility of household cash flow with the financial service, with volatility evaluated by standard deviation. It can also be explained as subtracting the volatility of the actual total cash flow from the volatility of the hypothetical cash flow "if the financial service had not been delivered?". If the difference between the two volatilities is positive and large, the service is interpreted as providing Fit. If the difference is negative, it is interpreted as causing additional volatility.

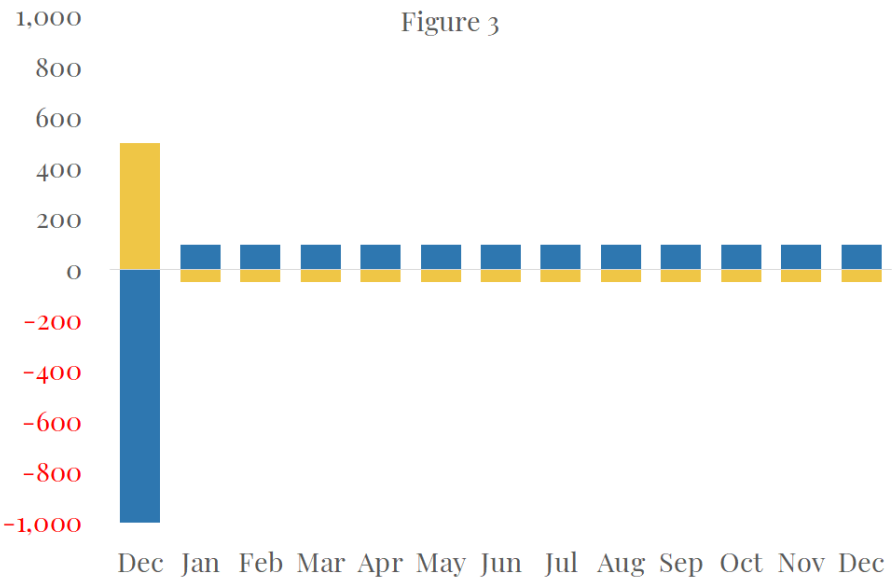
We know from the work of Stuart Rutherford and other financial diary researchers in Portfolios of the Poor that a key function of financial services for low-income people is enabling them to manage their money better, by moving money through space and/or time. Volatile net cash flows require more active management and can therefore be inconvenient and time-consuming for low-income people. The Fit aims to measure the extent to which a financial service contributes to easier money management by reducing volatility in net cash flows.

Take the case (Figure 2) where a large investment is made in equipment which then generates a series of positive cash flows:



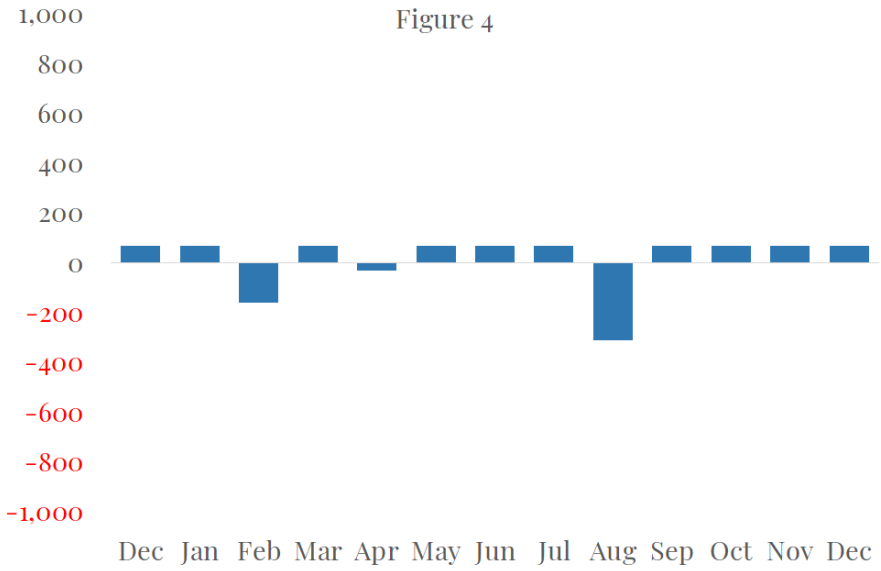
	Without
Dec	-1,000
Jan	100
Feb	100
Mar	100
Apr	100
May	100
Jun	100
Jul	100
Aug	100
Sep	100
Oct	100
Nov	100
Dec	100
stdev	305

If a loan were to be taken to pay part of the initial investment (Figure 3), with repayments spread equally over the following months, volatility is reduced by a large margin. In other words, it provides a positive Fit.



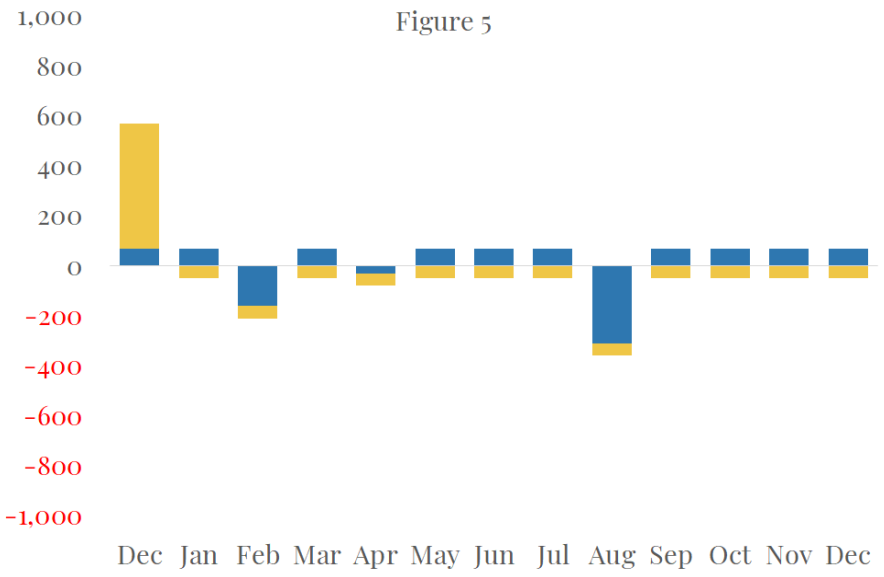
	Without	With	diff
Dec	-1,000	-500	-500
Jan	100	50	50
Feb	100	50	50
Mar	100	50	50
Apr	100	50	50
May	100	50	50
Jun	100	50	50
Jul	100	50	50
Aug	100	50	50
Sep	100	50	50
Oct	100	50	50
Nov	100	50	50
Dec	100	50	50
stdev	305	153	153

In the context of microfinance, the cash flow for the customer's business is often inseparable from the cash flow for the customer's life. In real life, most microfinance customers' net cash flows do not stay the same from month to month, but tend to be uneven and irregular (Figure 4).



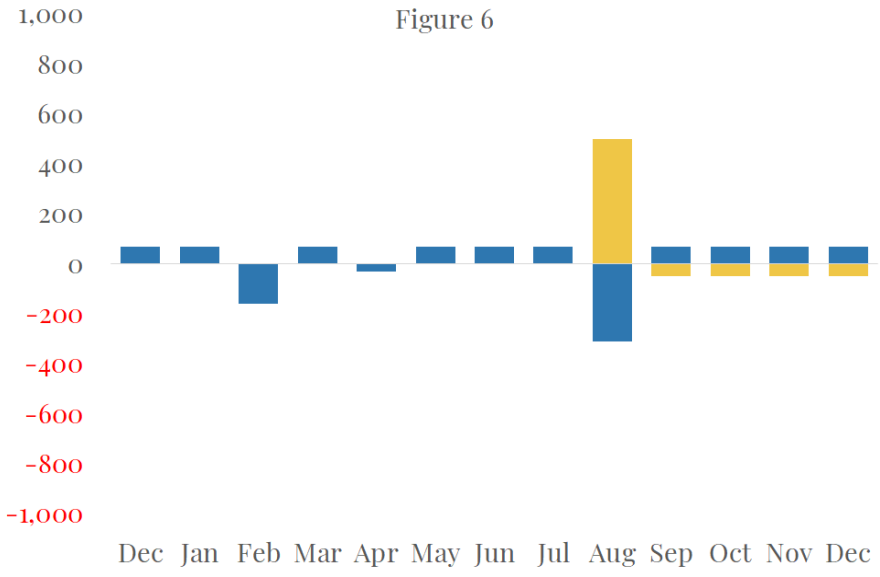
	Without
Dec	70
Jan	70
Feb	-160
Mar	70
Apr	-30
May	70
Jun	70
Jul	70
Aug	-310
Sep	70
Oct	70
Nov	70
Dec	70
stdev	119

Often, loans are not only used for investment, but also to support a variety of life's financial needs. In such cases where a customer may parcel out the money received from the loan over several smaller expenditures over time, we may not see a neat fit between the timing of their actual cash flows and the loan schedule (Figure 5).



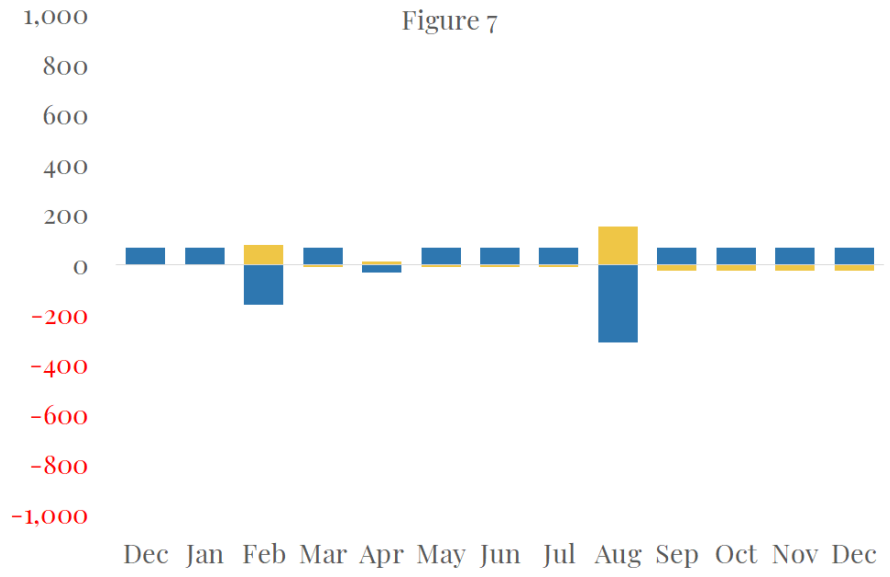
	Without	With	diff
Dec	70	570	-500
Jan	70	20	50
Feb	-160	-210	50
Mar	70	20	50
Apr	-30	-80	50
May	70	20	50
Jun	70	20	50
Jul	70	20	50
Aug	-310	-360	50
Sep	70	20	50
Oct	70	20	50
Nov	70	20	50
Dec	70	20	50
stdev	119	206	-87

The Fit could be improved if the timing of the loan matched a big expenditure. In Figure 6 we show what it would look like if the loan was taken in August, when a large expenditure was made.



	Without	With	diff
Dec	70	70	
Jan	70	70	
Feb	-160	-160	
Mar	70	70	
Apr	-30	-30	
May	70	70	
Jun	70	70	
Jul	70	70	
Aug	-310	190	-500
Sep	70	20	50
Oct	70	20	50
Nov	70	20	50
Dec	70	20	50
stdev	119	79	40

Providing the loan in the form of a credit line contract (as in Figure 7) would result in an even greater Fit improvement:



	Without	With	diff
Dec	70	70	
Jan	70	70	
Feb	-160	-80	-80
Mar	70	62	8
Apr	-30	-15	-15
May	70	61	10
Jun	70	61	10
Jul	70	61	10
Aug	-310	-155	-155
Sep	70	45	25
Oct	70	45	25
Nov	70	45	25
Dec	70	45	25
stdev	119	68	50

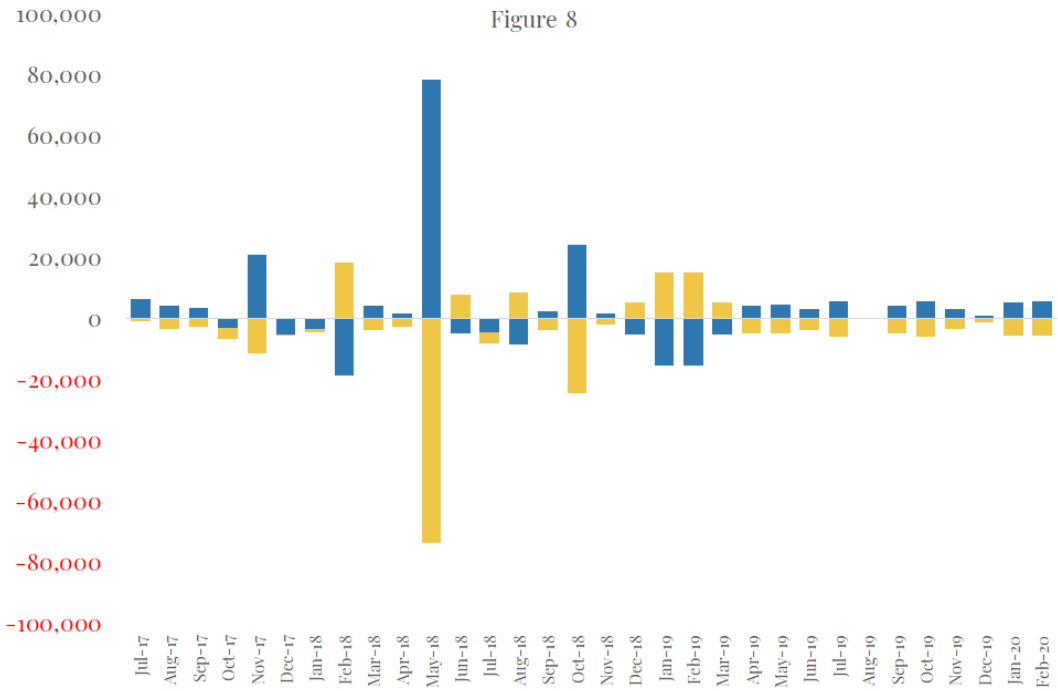
Holding a large sum of money from a loan (as in Figure 5) may be inconvenient or less than ideal for a microfinance customer, especially if they do not have a bank account. While the money sits idle in their home or bank account, they begin paying interest on the full sum before they are able to put it to work for them. In addition, the loan schedule may actually increase the volatility of their monthly cash flows, making it more difficult for them to plan and manage their money.

If the microfinance customer were able to match the timing and amount of their loan(s) more closely to their actual cash outflows (as in Figures 6 and 7), their monthly repayment amounts might be smaller, and they would not have to deal with large sums of loan money sitting idle on their hands.

Real Life Examples

Moving from hypothetical examples, we next review some actual transactions to examine the validity of the Fit Factor in real life. We also discuss actions that financial institutions could take to improve their financial services from the Fit Factor perspective. The analysis was conducted using detailed transaction data from the Hrishipara Financial Diaries.

Figure 8 shows the monthly financial transactions of one of the Hrishipara diarists with a large MFI (in gold) and all the diarist's other transactions (in teal). In both cases these are net transaction values. In other words, the gold bars show the balance of incoming and outgoing financial transactions with the particular MFI, and the teal bars show the balance of incoming and outgoing transactions of all other kinds – including business cash flows, family cash flows, and, possibly, transactions with other MFIs or financial partners. Figure 8 is an example of a financial institution providing a very close Fit, using a combination of loans and savings.

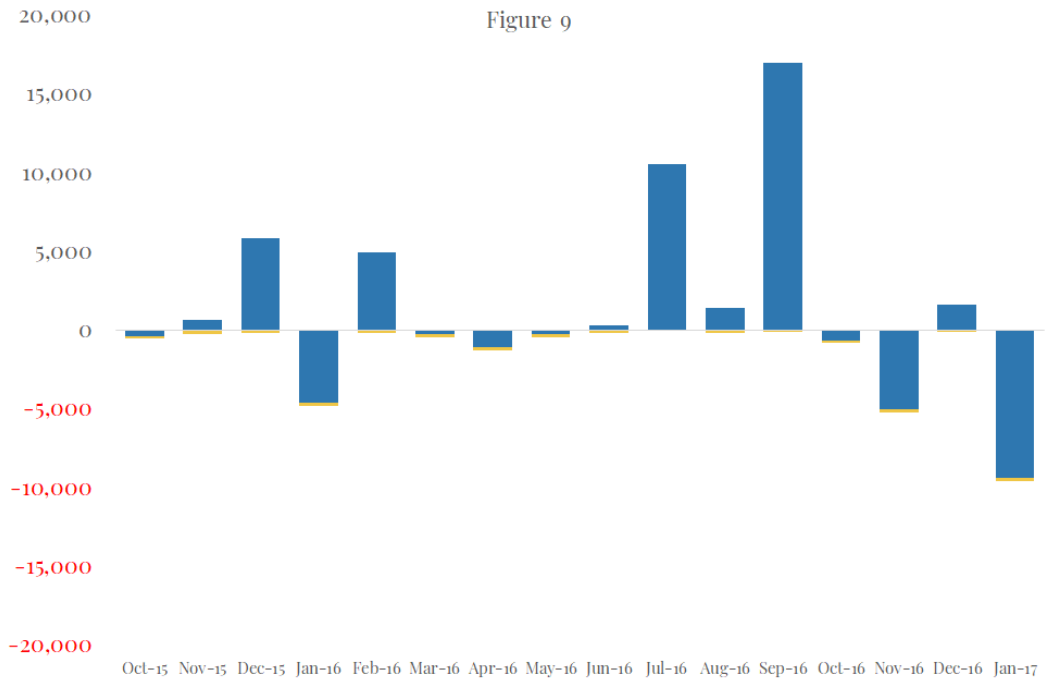


The standard deviation of the sum of the teal and the gold bars is minimal here, compared to the standard deviation of the teal bars alone. The gold and teal bars are almost symmetrical, as if mirrored across the zero line.

The positive teal bars in May and October 2018 are mostly from land sales. In these months, the MFI's savings service absorbed the incoming cash, as seen in the corresponding negative gold bars. The cost and risk of storing cash in hand were avoided. In February 2018 and January and February 2019, the diarist took loans (positive gold bars) and lent most of them to brother and sister (negative

teal bars). The close Fit happened because the MFI both absorbed surplus funds and supplied funds when needed.

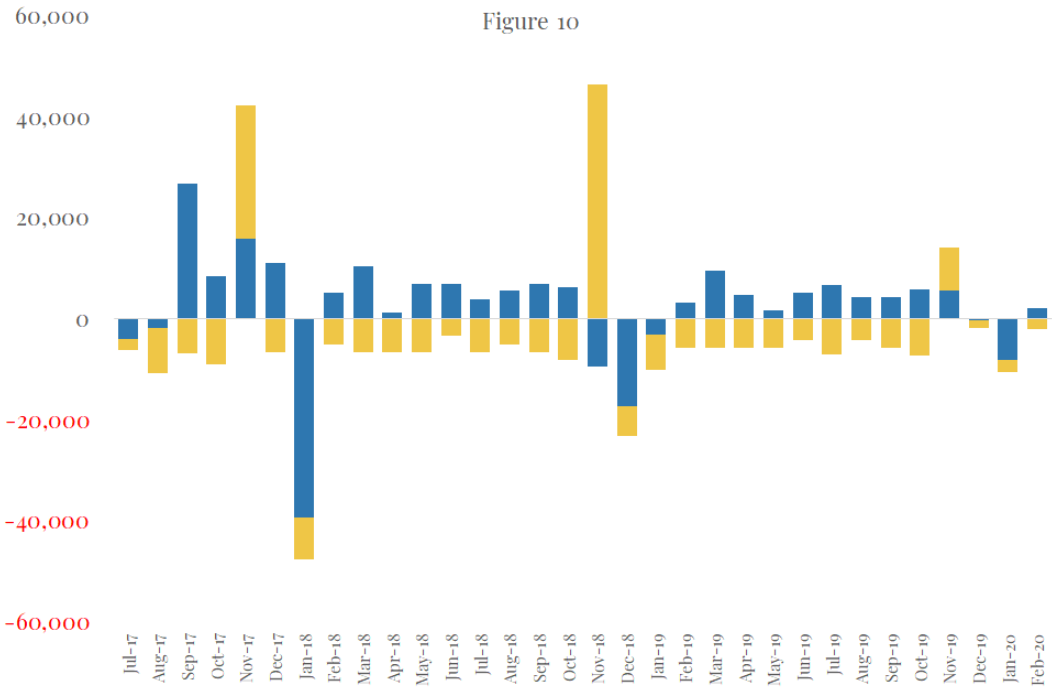
In the next example (Figure 9) no particular Fit occurred. The diarist uses the same large MFI as the previous diarist, but does not take loans and mainly uses its savings services.



The diarist deposited the same amount every week, regardless of income or expenditure. Adding this constant to each element of the series did not affect the standard deviation, so the Fit is almost zero. But it is not a negative Fit. Since no withdrawals are observed, we infer that the flow of deposits contributed to the growth of the savings balance. This suggests that Fit may not be the best measure for evaluating the impact of this savings service. The diarist may also experience the regularity of the savings as a useful discipline in their money management practices.

The following (Figure 10) is an example of a negative Fit. The diarist uses the same large MFI as in the previous cases, with a combination of loans and savings. In 2017, 2018, and 2019, loans taken in November are large compared to other cash flows. In 2017 and 2019, the sum of other cash flows is positive, so it is unlikely that the diarist would have experienced trouble if they hadn't taken the loans.

However, the utility of a loan does not necessarily stem solely from the immediate cash flow. For example, some borrowers may like to have cash on hand to respond to any sudden shortage of funds. This diarist had a big expenditure in January 2018 (a loan to a daughter), and a large part of the funds probably came from the loan taken in November.



Nevertheless, from the financial institution's perspective, there is room for improvement. For example, if the timing of loans had been more flexible, the loan disbursed in November 2017 could have been delayed to January 2018, and the diarist would have avoided the cost and risk of keeping cash in hand for two months. Providing such flexibility would have improved the Fit.

Limitations

One limitation is that our indicator may appear tautological, since we define our own measure of fitness and then judge MFI performance by it. It requires that when a customer makes a large transaction, the financial institution simultaneously provides a financial counter-transaction. But in real life, large transactions are usually ones that the customer wants to make or cannot avoid making, and the timing of such transactions are often not easy to change. If so, the key to providing

Fit for financial institutions is to offer flexible timings for disbursing loans, accepting repayments, and depositing and withdrawing savings.

Of course, even where there are matching transactions and our indicator evaluates it as Fit, it is not self-evident whether it was the actions of the customer or of the financial institution that caused the Fit. For example, if a customer delayed a capital investment by waiting for a loan to be provided, one might conclude that the customer played the bigger role in creating the Fit. Nevertheless, it is not usually easy to distinguish the contributions made by each of the two parties.

As long as the customer is willing to wait for the loan to make their expenditure, a financial institution is able to provide Fit. However, in an environment where the customer has many loan providers to choose from, they may be less willing to wait for one specific financial institution to disburse a loan. Therefore, in a competitive market, financial institutions must focus on fast and flexible services in order to ensure they have the opportunity to provide Fit to their clients. When applied to a competitive market, the Fit indicator measures the speed and flexibility of a particular provider's services.

Comparing providers

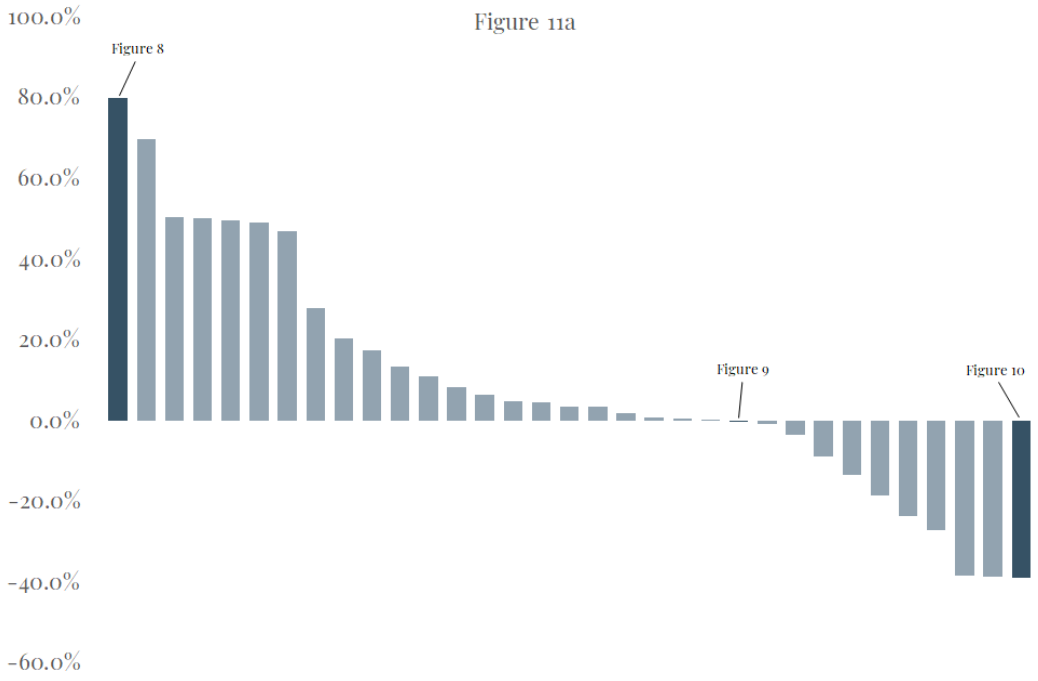
One of the benefits of using quantitative indicators is comparability. Even if they are less accurate in evaluating a single transaction, their utility in evaluating and comparing multiple transactions using the same criteria is significant. Here we compare two financial institutions that provided financial services to the diarists participating in the Hrishipara Financial Diaries in terms of the Fit indicator.

The Hrishipara Financial Diaries has been running since 2015, and about 60 diarists are participating in it. A large MFI, with many clients in Hrishipara and the surrounding area, provides financial services to 33 of the diarists (counting only those who have been transacting for more than 12 months). Another provider, a co-op, is a much smaller financial institution that provides financial services to 35 of the diarists (again counting only those who have been transacting for more than 12 months). Eighteen diarists have transactions at both of these financial institutions.

For this comparison, we have standardized the Fit indicator by dividing it by its first term to evaluate the difference in volatility relative to the size of each person's cash flows. Until now we have expressed the Fit, as the difference in volatilities, in dollar terms. For a poor borrower with relatively small cash flows, however, even if the Fit is small in dollar terms, the impact on their finances may be significant if the difference is significant in percentage terms. The following standardisation of the Fit therefore helps us better understand the impact on each individual's cash flows.

$$\frac{\textit{(Volatility(Household Cash Flow Without the Financial Service) - Volatility(Household Cash Flow With the Financial Service))}}{\textit{Volatility(Household Cash Flow Without the Financial Service)}}$$

Figure 11a shows the Fit evaluation for all diarists who used the services of the MFI, and Figure 11b shows that of diarists who used the co-op.



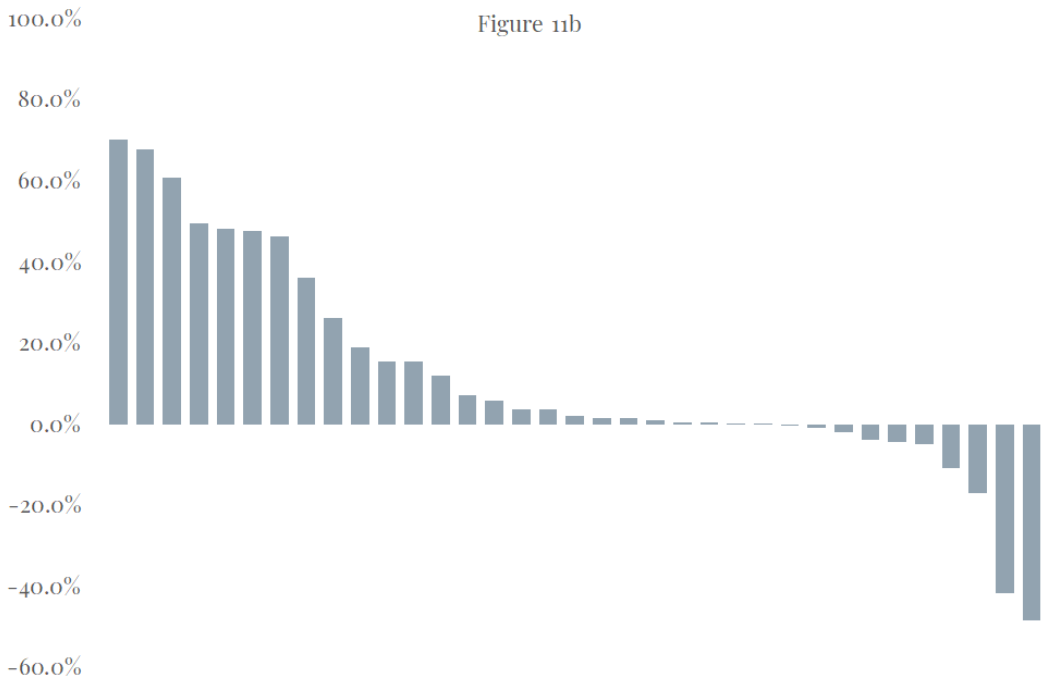


Figure 11b

Each bar represents one customer experience, and a positive bar represents a good Fit and negative one a bad Fit. Note that a bar near zero does not imply a poor fit. There are cases where the impact can be evaluated from a different perspective than Fit, such as regular fixed amount deposit services.

In the large MFI (Figure 11a), out of 33 diarists, 22 were positive Fit, and 11 were negative Fit. They are providing excellent Fits to many customers but there were several cases where the Fit was negative. Looking at the details of the excellent Fits, we found that the combination of loans and savings was successful in several cases, as shown in a previous example (Figure 8). In the negative Fits, there were several cases where loans were taken but not spent. In some of these cases, the loan officer is reported to have pushed loans that the customer did not particularly want, probably for the sake of the loan officer's performance. The dark bars indicate the examples used in the previous sections.

In the small co-op (Figure 11b), out of 35 diarists, 25 were positive Fit, and 10 were negative Fit. They are providing excellent Fits to multiple customers, though there are some negative Fits. Looking at the excellent Fit details, we found several cases where the savings service provided flexibility, allowing diarists to deposit as and when they had large cash inflows. Also, flexibility was observed

in the timing of loans and repayments, where diarists were permitted to repay what they could, whenever they could. There were some cases in the negative Fits where our periodization created the illusion of a negative Fit, which will be discussed in the next section. There were also some cases where it was assumed that the data did not fully capture the transaction.

The Fit for the small co-op was 11.6% on average, higher than the 9.2% of the large MFI. In terms of standard deviation of the Fit, the small co-op provided relative consistency at 27.3%, lower than the large MFI's 30.0%. The thickness of the negative Fit wing in the large MFI may contribute to this difference.

Noise

In the example analysis above, we have aggregated the daily diary data into monthly data for 1) the financial service transactions with the particular MFI, and 2) all other transactions. In other words, we have examined whether the financial service transactions are complementary to the total of other transactions in a given month. However, there are cases where such an aggregation method does not fully capture the Fit, or mis-states it. For example, if a loan is taken out at the end of the previous month to pay for a large expenditure scheduled at the beginning of the next month, the expenditure will appear in our analysis to be offset from the loan inflow by a month, creating the illusion of increased volatility. While there is room for research on analytic methods to reduce the possibility of such differences, it will be difficult to eliminate them. Our next challenge is how to reconsider the issue as statistical noise and confirm whether there is any directional bias and how it can be reduced by increasing the sample size either in terms of number of diarists or time period under consideration. Also, for better measurement of Fit, taking the noise problem into account, it may be possible not only to investigate the frequency or combination of weekly or quarterly aggregation but also to organize them as a transaction linking problem.

Challenges

Perhaps the most significant challenge to the widespread use of the Fit Factor as a quantitative and comparable impact indicator is data collection. The Hrishipara Financial Diaries used in the

analysis kept detailed records of all transactions daily for about 60 diarists. It is easy to aggregate financial services and other transactions and to infer the relationship between them. However, it would be difficult for a financial institution to conduct a similar survey of all its customers because of its cost.

Nevertheless, it should be reasonably simple to discover whether or not there were transactions intended as a counterpart to a relatively large financial service transaction, such as a loan disbursement or a large savings withdrawal, and whether relatively small financial transactions, such as loan repayments and frequent deposits, were carried out smoothly without putting pressure on people's lives. This suggests there is room for research on how to approximate Fit quantitatively and at a low cost.

Summary and Conclusion

Because it is difficult to isolate the impact of a financial service by using measurements of what happened after the service was used, we developed an indicator to evaluate whether the service fits the customer's life and business. We reviewed specific examples of good Fit situations, bad Fit situations, and neither good nor bad Fit situations, respectively. Taking advantage of the quantitative definition, we grouped the results by financial institutions and compared them. Although some noise was observed, our analysis suggests it is nonetheless a useful indicator for comparison across households and across financial services and/or providers. Issues for the future, such as aggregation and data collection, were identified.