Searching for the Optimal Level: Inflation and Price Variability in Turkey

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Abstract

This paper explores the relationship between inflation and relative price variability (RPV) in Turkey for the period 2004-2017 to shed further light on the issue with relatively recent data. For this purpose, we use monthly price data for 12 main item groups and 414 specific items thereof. Analyses show that RPV for the period of interest exhibits large fluctuations, being particularly salient in the categories of communications and food. Regarding the underlying functional form, semi-parametric estimation results indicate a U-shaped relationship between inflation and RPV, where the latter reaches its minimum at an inflation level close to 8 percent.

Keywords: Relative Price Variability, Inflation, Semi-parametric Regression.

JEL Classification: C32, O47.

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1 Introduction

Price stability is the fundamental mission of central banks as inflation is recognized as a phenomenon that generates welfare costs. However, it is not generally clear what price stability refers to. Does it refer to stable and low level inflation? Or does it refer to stable relative price variability (RPV)? This discussion matters because a critical channel through which inflation creates suboptimal outcomes is relative price variability. In other words, behavior of individual prices relative to the overall inflation does matter.[1]

What RPV measures is the degree of discrepancy in a given price distribution, which in turn leads to an inefficient allocation of resources. It is generally asserted that welfare costs of inflation are associated with the lack of a stable RPV. However, it is also widely accepted that the level of inflation is linked to the volatility of RPV. In this regard, it is claimed that high level of inflation creates and/or is associated with high RPV. Therefore, a monetary policy authority that aims at reducing welfare costs of inflation is typically focuses on reducing the level of inflation, which indirectly assumes reducing RPV too. Nevertheless, as is shown by several papers[2] the relationship between the level of inflation and RPV may not be linear as is usually supposed to be. A nonlinear relationship between the inflation level and RPV, on the other hand, brings about the possibility that reducing the level of inflation does not necessarily imply reducing the RPV, hence not necessarily diminishing the welfare costs of inflation. For example, if there exists a U-shaped relationship, the clear implication is that until the minimum is achieved increasing inflation does help dampen the RPV, hence the welfare costs. Only after the inflation level corresponding to the minimum RPV has been achieved, the increase in inflation level exerts its usual welfare reducing effects. Therefore, understanding the functional form between inflation and RPV is critical in terms of shaping and conducting the monetary policy.

This paper's goal is to contribute to the literature by further investigating the functional form of the relationship between inflation and RPV in Turkey between 2003 and 2017 and draw possible recommendations for conducting monetary policy. To this end, we first compute the RPV by using 414 items (see Table 1 below) that constitute consumer price index (CPI) and

[1] Relative inflation variability (RIV) is also a term that refers to the dispersion of individual prices. However, we follow the bulk of the literature and employ the term "relative price variability" for the calculations of the standard deviation of inflation.

[2] See Jaramillo (1999), Nautz and Scharff (2006) and Choi and Kim (2010) among others)

analyze its time path. As the time path reveals, the highly volatile nature of RPV prevails for the whole period. We provide an analysis for the items and categories responsible for these abrupt changes in the RPV. The results suggest that commodity groups such as communication and food and non-alcoholic beverages are on the top of the list with specific items such as fees for phone calls, internet connections and fees paid to specialist doctors, tomato and onion ranked on the very top. Subsequently we attempt to estimate the functional form by employing a semi-parametric framework and find out that a U-shaped relationship between inflation and RPV appears to exist in Turkey for the period between January 2003 and July 2017. Our empirical findings imply that the inflation rate at which the effects of RPV is minimized is close to 8 percent.

The rest of the paper is organized as follows: Section 2 illustrates the related literature. Section 3 discusses data regularities. Section 4 illustrates the methodology employed in the estimation and interprets the findings of the analysis. Concluding remarks follow in Section 5.

2 Literature review

In this respect, several theoretical models address the relationship between inflation and price dispersion. One of them is the menu costs models which refer to the inflexible nature of prices. As changing prices is costly, these models argue that prices change only at discrete intervals. As discussed by Sheshinski and Weiss (1977) and Rotemberg (1983), the optimal policy where adjustment costs exist is described by a sequence of finite intervals during which nominal price is held constant, followed by discrete price adjustments. Thus, this approach relates increased relative price variability to inflation itself, rather than to unanticipated inflation or the change in the inflation (Fischer 1981). Another perspective, which is associated with the menu cost models, elaborates on the asymmetric responses of prices to disturbances. In this approach, prices are assumed to be inflexible downward. As a result, in case of an increase in excess demand, inflation does occur whereas a supply rise does not bring about a price change.

Signal extraction models, which is another theoretical perspective that links inflation and RPV, put unanticipated inflation to the core and deal with imperfect information. Lucas (1973) and Barro (1976) asserted that a higher inflation uncertainty causes misinterpretations of demand

shocks, leading the firms to respond with changes in price rather than in output. This in turn increases RPV. One other argument, which can be considered an extension to the signal extraction models, takes elasticity of supply into account as price elasticities of sectors or firms differ. What this approach basically suggests is that producers adjust their stocks in response to demand shocks in case supply is price elastic. Nevertheless, if supply is relatively inelastic, demand shocks lead to price changes. As a result, firms with higher elasticities adjust prices less in response to realized aggregate demand shocks, causing relative price variability. Hercowitz (1981) and Cukierman (1983) are pioneering studies that shed light on this form of relationship between inflation and RPV.

Last but not least, monetary search models also attempt to establish the link between inflation and RPV. Initiated by Head and Kumar (2005), these models assume that buyers have incomplete information on prices offered by different sellers. In this context, search models indicate that the influence of expected inflation on RPV is not always obvious (Becker and Neutz, 2009). This is because while higher anticipated inflation raises sellers' market power and thus RPV, it also induces search and diminishes sellers' market power, causing a reduction in RPV. The theory implies that the real effects of inflation via its impact on RPV depend on the level of search costs and on the level of market integration (Senapati and Trivedi, 2017).

Inspired from these theories, the impact of inflation on RPV has been extensively questioned in the empirical literature for a number of countries and various periods. In this sense, a considerable body of early research focused on and found out a linear relationship between inflation and RPV. This outcome was explained by the argument that the least distortionary level of inflation is zero (Senapati and Triverdi, 2017). Parks (1978), Domberger (1987), Mizon (1991), Lach and Tsiddon (1992), and Parsley (1996) are among those studies that contributed to the literature with results indicating a positive association between RPV and inflation.

A later direction in the literature, however, has criticized the linearity assumption and investigated the existence of a non-monotonic relationship. Studies such as Jaramillo (1999) for the U.S., Caglayan and Filiztekin (2003) for Turkey, Nautz and Scharff (2006) for the Euro area and Caraballo et al. (2006a) for Spain and Argentina provided evidence in favor of threshold effects and pointed out to different implications in different inflationary contexts. Caraballo et al. (2006b) for Argentina, Peru and Brazil also indicated that inflation regimes matter in explain-

ing the relationship between RPV and inflation. Bick and Nautz (2008) found two significant inflation thresholds and both positive and negative effects of inflation on RPV, suggesting that U.S. inflation should range between 1.8 percent and 2.8 percent. Fielding and Mizen (2008) used non-parametric regression techniques for U.S. data, obtaining a plausible optimal value of inflation in the region of five percentage points. Following studies including Choi (2010) for the U.S. and Japan, Choi and Kim (2010) for the U.S., Canada, Japan as well as Caraballo and Efthimiades (2012) for the Euro area provided evidence on a non-linear relationship between inflation and RPV. For India, Rather, Durai and Ramachandran (2014) and Senapati and Trivedi (2017) exhibited evidencve on a U-shaped relationship, with an optimal inflation rate of 4.5 and 5.5 percent, respectively.

As one of the early works conducted on Turkey, Calayan and Filiztekin (2001) concentrated on the 1948-1997 period and found out a positive association between inflation and relative price variability. On the other hand, Caglayan and Filiztekin (2003) showed a non-linear relation between inflation and RPV for Turkish provinces in the same period. Using highly disaggregated data, Kucuk-Tuger and Tuger (2004) concluded that there was a positive contemporaneous association between RPV and inflation in Turkey for the period between January 1994 and December 2002. More recently, Baglan et al. (2016) reported a hump-shaped relationship for the period 1994-2010 in Turkey based on a semi-parametric estimation. In their analysis for the period between February 2005-November 2015, Yamak et al. (2017) confirmed a U-shaped relationship between inflation and RPV. These studies pointed out that the annualized inflation rate which minimizes relative price variability varies from 4.26% to 4.93%.

3 Data regularities and a preliminary data analysis

Our data cover monthly price indices for Turkey between 2003:01 and 2017:07, which is provided by the Turkish Statistical Institute (TUIK) on their corresponding website.[3] The data include 12 categories of 414 items overall. These categories and the items included in them are illustrated in Table 1.

Table 1 is here

[3] https://biruni.tuik.gov.tr/medas/?kn=84&locale=en

As in Choi (2010) we calculate RPV at time t as the cross sectional standard deviation of prices calculated over the 414 items outlined in Table 1.

$$RPV_t = \sqrt{\sum_{i=1}^{414} \omega_i (\pi_{i,t} - \bar{\pi}_t)^2}, \qquad i = 1, 2, ..., 414. \tag{1}$$

The inflation rate of item i (π_{it}) and the average inflation rate over the 414 items ($\bar{\pi}_t$) are calculated as $\pi_{it} = \ln P_{i,t} - \ln P_{i,t-12}$ and $\bar{\pi}_t = \sum_{i=1}^{N} \omega_i \pi_{it}$, respectively, where P_{it} represents the price index of ith good at time t and ω_i refers to the fixed expenditure weight that sums up to unity.[4] As is clear from the formula above, we calculate year-over-year inflation rates, hence the inflation rates correspond to annual rates in each month.

Figure 1 and 2 illustrate the time series behavior of RPV_t and $\bar{\pi}_t$. As can be seen from the figures, both RVP and inflation register quite erratic changes over the sample period.

Figure 1 are 2 are here

Next we turn our attention into the search of items and item groups that are responsible for the changes in the RPV. To accomplish this task we calculate the average RPV over the sample period. Then we recalculate it by dropping each item listed in Table 1. Table 2 displays the sequence of these average RVPs calculated without the corresponding item indicated. Fee for cellular phone calls is placed on the top of the list which indicates the fact that RPV calculated by using remaining 413 items (after dropping fee for cellular phone calls) corresponds the lowest RPV. Hence price changes originated from from this item have the highest contribution to the swings in RPV among the 414 items. The second and third items on the list (fee for phones calls and fee for internet connection) are again from the telecommunication sector. Table 3 repeats the same calculation with different item categories to make the analysis more traceable. As can be followed from Table 3, the group most significantly contributing to the ups and downs of RPV is communication, which is followed by food and non-alcoholic beverages.

Table 2 and 3 are here

[4] At certain dates the total count of items do not sum up to 414 because either the product is not seasonally available (such as seasonal fruits or clothes), or the item is included only after a certain date by the Turkish Statistical Institute. Therefore we adjusted the ω_i vector with respect to the available items in each month. Also should note that the prices are adjusted by dividing with 1.000.000 for the period before 2005 due to re-denomination by the removal of six zeros from the Turkish lira.

4 Methodology and estimation results

In this paper to estimate the relation between RPV and inflation. For this purpose, we employ a semi-parametric method. Semi-parametric estimation procedures are mainly appealing because they preserve the simplicity of parametric and the flexibility of nonparametric models. They are also more informative than their competitors such as threshold models that impose a piece-wise linear structure on the underlying function. The semi-parametric regression model can be expressed in the following general additive form.

$$y_t = m_1(x_{1t}) + \cdots + m_k(x_{kt}) + \beta_{k+1}x_{k+1t} + \cdots + \beta_n x_{nt} + \epsilon_t. \tag{2}$$

y_t refers to the dependent variable (RPV in our case), $\epsilon_t \sim NID(0, \sigma^2)$ is the disturbance term. k regressors (xs) enter the regression equation nonparametrically whereas the rest is allowed to enter linearly. All regressors are assumed to exert their effect additively. The partial regression functions $m_j(x_{jt})$ are assumed to be smooth, and are to be estimated from the data by fitting a smoother.[5] As mentioned above this combined feature of semi-parametric model brings many advantages together; first the model relaxes linearity assumptions by containing a nonlinear part but also contains linear analysis in itself. Thus features of linear regressions such as dummy variables can be incorporated to the analysis. Second it offers flexibility on adapting various cases which makes it preferable for our case.

In this study, when analyzing the effect of inflation on RPV we use different combinations of lagged RPV and inflation series as the additional regressors. We consider the above partially linear regression model in which $\bar{\pi}_t$ has an unknown functional form whereas other regressors enter the model linearly. We estimate the following model:

[5]There are a bunch of methods for estimating nonparametric and semi-parametric regression models such as local averaging, kernel estimations or local polynomial regressions. But among them, smoothing spline method leaps out because of its ease of adaptiveness to different types such as additive nonparametric and semi-parametric models. Instead of fitting a local polynomial regression, it optimizes an explicit function, *penalized sum of squares*, to find best fit and offers a certain advantage over others. The estimation for generalized additive models is accomplished using spline smoothers as described in Wood (2004, 2006, 2011) which also features automatic selection of smoothing parameters and carried out by using mgvc package in R (The name of the package comes from the method employed to pick the smoothing parameters: **m**ultiple **g**eneralized **c**ross-**v**alidation, see also Fox and Weisberg (2011)).

$$\text{RPV}_t = \alpha + m(\bar{\pi}_t) + \sum_{j=1}^{p} \text{RPV}_{t-j} + \sum_{j=1}^{p} \bar{\pi}_{t-j} + \epsilon_t \tag{3}$$

where p and q are the maximum number of lag terms allowed. In the search for the "best" model we use Akaike Information Criteria (AIC). The above model is estimated for all possible lag combinations of RPV_t and $\bar{\pi}_t$ by setting the maximum lag order to $p = 6$. The minimum AIC score is obtained when $p = 1$ and $q = 6$. Obviously in this estimated model, the partial regression function, $m(\bar{\pi}_t)$, where the effect of inflation on RPV is captured non-parametrically, is our main interest. The estimation results of $m(\bar{\pi}_t)$ along with the 95 percent confidence bands (dotted lines), are illustrated in Figure 3.

Figure 3 is here

Figure 3 clearly shows the nonlinear nature of the effect of inflation on RPV as a clear U-shaped relation becomes apparent in the figure. The relation indicates that as inflation increases RPV decreases up to the point where the inflation attains 7.8 percent on an annual basis. From that level onwards, RPV ceases to decrease and start to increase.

The remaining parameter estimates of the model are given below. As can be followed, all the remaining (linear) parameters are statistically significant.[6]

	Estimate	Std. Error	p-value
α	0.093	0.017	2.55e-07 ***
RPV_{t-1}	0.700	0.046	$<$ 2e-16 ***
$\bar{\pi}_{t-6}$	-0.225	0.123	0.0693*

5 Conclusions

In this paper we analyze the relationship between inflation and RPV in Turkey to be able to draw some possible recommendations for conducting monetary policy. The RPV computed by using 414 commodity items that constitute CPI appears to be highly volatile and registers large swings for the period of analysis. The results suggest that item categories such as communications and food and non-alcoholic beverages are on the top of the list and mostly responsible for this roller

[6] *** and * refer to significance at 1 and 10 percent levels.

coaster nature of RPV. In this sense, the fact that the appearing items have comparatively high weights in the inflation basket also contributes to the related dispersions.

Telecommunications sector, in particular, draws attention with its three specific items ranking uppermost on the list: Fee for cellular phone calls creates the highest dispersion in the dataset, followed by fee for phone calls and internet connections, respectively. At this point, the frequent below-the-average inflation rates observed in the sectoral category throughout the data period bring up a viewpoint regarding the impact of market structure on RPV. The intuition here is that, considering the fast development and competition in the sub-areas of mobile lines and Internet in Turkey, the oligopolistic features in the industry might have played a role in the relevant pricing behavior. As for the landline phone calls, on the other hand, demand that weakened over the years in the country implies another story. In this framework, we believe that analyzing the role of market structure to understand price dispersions deserves further attention and research in general.

Our results also indicate that an apparent U-shaped relationship between inflation and RPV prevails in Turkey. The estimated relationship implies that the inflation rate at which RPV is at its minimum is close to 8 percent. We hope that these findings provide useful information to the Central Bank in terms of inflation targeting as well as items and groups that should be taken into consideration for controlling the welfare cost of inflation.

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Table 1: List of Items

Item Category (# of items)	Item Names
Food and Non-Alcoholic Beverages (125)	Rice, Wheat flour, Baby food, Boiled and pounded wheat, Bread, Biscuit, Cracker, Wafer, Cream-cake and patisserie, Cake, Dessert, Thin dough, Macaroni, Wermicelli, Cereal, Veal, Mutton, Poultry, Offal, Garlic-flavored sausage, Sausage, Salami, Fresh fish, Milk, Yoghurt, White cheese, Kasar cheese, Tulum cheese, Cream cheese, Egg, Butter, Margarine, Olive oil, Sun-flower oil, Corn oil, Orange, Grape, Pear, Quince, Strawberry, Apple, Plum, Water melon, Melon, Apricot, Cherry, Kiwi, Lemon, Tangarine, Banana, Pomegranate, Peach, Almond, Walnut (without shells), Hazelnut (without shells), Pistachio, Peanuts, Roasted chick-pea, Sun flower seed, Pumpkin seed, Raisin, Dried apricot, Sweet green pepper, Stuff pepper, Green pepper, Tomatoe, Green bean, Carrot, Spinach, Zucchini, Cauliflower, Onion, Cabbage, Red cabbage, Mushroom, Lettuce, Parsley, Eggplant, Leek, Cucumber, Garlic, Radish, Green onion, Potatoe, Dry bean, Chickpea, Lentils, Other pulse, Canned vegetables, Tomato sauce, Olive, Chips and appetizers, Granulated sugar, Cube sugar, Jam, Honey, Grape molasses, Halvah, Tablet of chocolate, Chocolate cream, Turkish delight, Chewing gum, Holiday candy, Ice-cream, Condiment-spices, Salt, Baking powder, Vinegar, Catchup, Mayonnaise, Sesame oil, Packaged soup, Pudding, Turkish Coffee, Ready-made coffee, Tea, Herbal tea, Cocoa, Cocoa beverages, Water, Mineral water, Carbonated fruity beverages, Coke, Ayran, Fruit Juice
Alcoholic Beverages and Tobacco (5)	Raki, Whisky, Wine, Beer, Cigarettes
Clothing and Footwear (61)	Cotton fabric, Mixture fabrics, Men's anorak coat, Men's coat, Men's suit, Men's jacket, Men's trousers, Men's pullover, Men's shirt, Men's sweatshirt, Men's t-shirt, Men's tracksuit, Men's pijamas, Men's underwear, Men's socks, Women's raincoat, Women's coat, Dress, Women's jacket, Skirt, Women's trousers, Women's cardigan, Women's pullover, Women's shirt, Women's t-shirt, Women's tracksuit, Women's pijamas, Women's underwear, Women's socks, Children's coat, Children's trousers, Children's pullover, Children's shirt, Children's sweatshirt, Children's t-shirt, Children's tracksuit, Children's pijamas, Children's underwear, Children's socks, Overalls for baby, Baby's pyjamas, Baby's underwear, Knitting wool, Tie, Belt, Scarf, Suit Repair, Dry cleaning, Men's footwear, Men's boots, Men's sport shoes, Women's footwear, Women's boots (with strings), Women's boots, Women's sport shoes, Slipper for woman, Children's footwear, Children's boots, Children's sport shoes, Men's footwear repair, Women's footwear repair
Housing, Water, Electricity, Gas and Other Fuels (12)	Actual rent, Expenditure on wall covering (die), Expenditure on floor covering (wall tiling), Windowpane (PVC), Plumbing items, Water fee, Electricity fee, Natural gas, Natural gas subscription fee, Tube gas, Coal price, Firewood price
Furnishings, Household Equipment, Routine Maintenance of the House (61)	Table, Chair, Bedroom furniture, Single bed, Double bed, Bed base, Teenager room furniture, Living room furniture, Dining room furniture, Sofa, Nesting table, Carpet, Curtain, Roller curtain, Tulle, Household textile fabrics, Bed cover, Quilt, Blanket, Bed clothes, Pillow, Towel, Refrigerator, Refrigerator No-Frost, Deep freeze, Washing machine, Dish washing machine, Oven, Furnace with gas, Furnace with oven, Air conditioner, Stove, Flash heaters, Combi boiler, Aspirator, Vacuum cleaner, Blender, Toster, Water heaters, Iron, Repair of household appliances, Glass household utentsils, Porcelain household utensils, Steel kitchen utentils, Other steel kitchen utentils, Teflon household utentils, Plastic household utentils, Other non-electrical appliances, Battery, Electric bulb, Door fittings, Stove equipments, Detergents (for laundry), Dishwasher detergents, Disinfectants and insecticidies, Articles for cleaning, Sponge for dish washing, Aluminium and strech foil, Kitchen paper and napkins, Maid and cleaners' fee, Carpet and other floor coverings cleanings
Health (16)	Medicines, Clinical thermometer, Corrective eye-glasses, Contact lense, Therapeutic appliances, Fees paid to specialist doctor, Dentist fee (Pulling), Dentist fee (Filling), X-ray fee, Ultrasound fee, MR fee, Laboratory analysis fee, Hospital bed fee, Surgical operation fee, Natural childbirth fee, Cesarean section fee
Transport (30)	Automobile (Diesel), Automobile (Gasoline), Scooter, Bicycle, Spare parts and accessories, Products for maintanence of transport equipments, Petrol, Liquid petroleum gas (LPG), Diesel, Motor oil, Maintenance and repairs equipment and service for vehicle, Maintenance and repairs service for vehicle, Hire of car fee, Car park fee, Tolls, Bridge fare, Driver course fare, Train fare (inter-urban), Underground fare, Tram fare, Train fare (intra-urban), City bus fare(inter-urban), Mini bus fare, Transportation service fee to school, Taxi fare, Bus fare (intra-urban), Airplane fare, Boat fare, Cargo fee, Transportation fee
Communications (8)	Payment for delivery of parcell, Phone machine, Spare parts for telehone (SIM card, battery), Repair of phone machines, Fee for phone calls, Fee for cellular phone calls, Subscription costs of telephone, Fee for internet connection
Recreation and Culture (42)	Television, Camera, PC and Laptop, PC equipments, Tablet (PC), Maintenance and repairs for audio-visiual equipments- equipment and service, Maintenance and repairs for audio-visiual equipments-service, Music equipment (flute), Children's toys, Game console, Items for sport and recreation (soccer ball), Veterinary fee, Fee paid for watching sport games (football), Renting of mini football fields, Film development, Fee paid for having pictures taken, Cable TV service fee, Cinema, Theather, Other recreational and cultural services (Internet cafe), Horse racing, Lottery (Number 10), National lottery, Lotto, Lottery game (Iddaa), Lottery (Chance Ball), Super Lotto, Children books, Test books, Other books, Newspapers, Magazines, Notebook, Pencil, Box of coloured pencils for painting, Stationery papers, Other stationery, Package holidays weekend, Package holidays for one week and more, Package holidays (abroad), The pilgrimage to Mecca, Umrah Fee
Education (6)	Kindergarten fees, Private school fees (primary), Private school fees (secondary), Private university fee, University fee, Courses language education
Hotels, Cafes and Restaurants (16)	Soups, Cold meals, Broiled meat (kebap), Flat bread (pide, lahmacun), Steak tartar a la turca, Doner in bread, Hamburger and sandwiches, Pizza, Patisserie products served, Desserts in restaurants, Hot drinks served, Cold drinks served, Ayran served, Raki and beer served, Hotel charge, Accomodations services of boarding universities
Miscellaneous Goods and Services (32)	Men's hairdressing, Women's hairdressing, Manicures and beauty service, Hair care appliances, Shaving articles, Articles for dental hygiene, Toilet soap, Bath soap, Perfume, Deodorants, Cologne, Body cream and lotion, Make-up products, Hair care products, Toilet paper, Paper tissue, Baby napkin, Hygiene pad for women, Jewellery (Gold), Travel goods, School bag, Umbrella, Baby carriage and car seat, Crche and day-care center, Insurance connected with fire, burglary and natural disasters, Insurance connected with health, Insurance connected with transport, Banking service, Fees for legal service, Fees for transportation vehicle, Attorney fee, Payment for photocopies

Table 2: RPVs without specific item

Category	RPV	Category	RPV
Fee for cellular phone calls	15.399	Other stationery	23.246
Fee for phone calls	21.522	Insurance connected with transport	23.247
Fee for internet connection	22.818	Rice	23.247
Fees paid to specialist doctor	23.080	PC and Laptop	23.247
Tomato	23.080	Dry bean	23.248
Television	23.096	Water	23.248
Onion	23.117	Repair of household appliances	23.249
Natural gas	23.118	PC equipments	23.249
Diesel	23.127	Garlic	23.249
Phone machine	23.133	Camera	23.249
Jewellery (Gold)	23.169	Hot drinks served	23.249
Potato	23.170	Dish washing machine	23.250
Liquid petroleum gas (LPG)	23.171	The pilgrimage to Mecca	23.250
Electricity fee	23.173	Paper tissue	23.250
Other health items	23.176	Blender	23.250
Petrol	23.178	Maintenance and repairs equipment and service for vehicle	23.251
Private school fees (secondary)	23.179	Tomato sauce	23.251
Packaged soup	23.181	Toilet paper	23.251
University fee	23.183	Articles for cleaning	23.251
Cable TV service fee	23.187	Green bean	23.251
Fee paid for watching sport games (football)	23.188	Spare parts for telehone (SIM card, battery)	23.251
Laboratory analysis fee	23.189	Refrigerator	23.252
Airplane fare	23.190	Cold meals	23.252
Egg	23.196	Hospital bed fee	23.252
Dentist fee (Filling)	23.197	MR fee	23.253
Actual rent	23.199	Fresh fish	23.253
Automobile (Diesel)	23.200	Flat bread (pide, lahmacun)	23.253
Medicines	23.200	Orange	23.253
Veal	23.200	Women's t-shirt	23.254
Lemon	23.206	Doner in bread	23.254
Fees for legal service	23.208	Tangarine	23.254
Plumbing items	23.213	X-ray fee	23.254
Mutton	23.215	Sofa	23.254
Water fee	23.221	Dining room furniture	23.254
Poultry	23.221	Hotel charge	23.254
Sun-flower oil	23.223	Baby napkin	23.254
Bread	23.225	Lettuce	23.254
Cucumber	23.226	Other books	23.254
Automobile (Gasoline)	23.229	Men's footwear	23.255
Olive oil	23.229	Sweet green pepper	23.255
Baking powder	23.231	Milk	23.255
Stationery papers	23.231	Raki	23.255
Driver course fare	23.235	Coke	23.255
Table	23.235	Olive	23.255
Green pepper	23.237	Boiled and pounded wheat	23.255
Eggplant	23.238	Ultrasound fee	23.256
Tube gas	23.239	Newspapers	23.256
Detergents (for laundry)	23.239	Zucchini	23.256
Cigarettes	23.239	Garlic-flavored sausage	23.256
Pudding	23.239	Transportation service	23.256
White cheese	23.240	Kindergarten fees	23.256
Bedroom furniture	23.240	Hair care products	23.256
Dentist fee (Pulling)	23.241	Yoghurt	23.256
Coal price	23.241	Honey	23.256
Apple	23.241	Men's hairdressing	23.256
Living room furniture	23.242	Air conditioner	23.256
Hazelnut (without shells)	23.242	Men's trousers	23.257
Washing machine	23.243	Tea	23.257
Water melon	23.243	Hamburger and sandwiches	23.257
Dishwasher detergents	23.244	Peach	23.257
Surgical operation fee	23.244	Wheat flour	23.257
Lentils	23.244	Stuff pepper	23.257
Ready-made coffee	23.244	Accomodations services of boarding universities	23.257
Mini bus fare	23.244	Natural childbirth fee	23.257
Aluminium and strech foil	23.245	Banana	23.257
Vacuum cleaner	23.246	Expenditure on wall covering (die)	23.257
Chair	23.246	Private school fees (primary)	23.257
Broiled meat (kebap)	23.246	Renting of mini football fields	23.257
Refrigerator No-Frost	23.246	Maintenance and repairs service for vehicle	23.257

Table 2: RPVs without specific item (continued)

Category	RPV	Category	RPV
Chickpea	23.257	Bath soap	23.260
Plastic household utentils	23.257	Tablet of chocolate	23.260
Oven	23.257	Condiment-spices	23.260
Glass household utentsils	23.257	Chips and appetizers	23.260
Women's pullover	23.257	Cream-cake and patisserie	23.260
Windowpane (PVC)	23.257	Bicycle	23.260
Walnut (without shells)	23.258	Disinfectants and insecticidies	23.260
Pistachio	23.258	Dessert	23.260
Bus fare (intra-urban)	23.258	Salami	23.260
Macaroni	23.258	Double bed	23.260
Maid and cleaners' fee	23.258	Iron	23.260
Expenditure on floor covering (wall tiling)	23.258	Corn oil	23.260
Maintenance and repairs for audio-visiual equipments-equipment and service	23.258	Carrots	23.260
Cauliflower	23.258	Furnace with oven	23.260
Cesarean section fee	23.258	Offal	23.260
Repair of phone machines	23.258	Kitchen paper and napkins	23.260
Tulle	23.258	City bus fare(inter-urban)	23.260
Taxi fare	23.258	Single bed	23.260
Kasar cheese	23.258	Halvah	23.260
Spinach	23.258	Maintenance and repairs for audio-visiual equipments-service	23.260
Pear	23.258	Patisserie products served	23.260
Fees for transportation vehicle	23.258	Parsley	23.260
Peanuts	23.258	Manicures and beauty service	23.260
Children's trousers	23.258	Insurance connected with health	23.260
Beer	23.258	Nesting table	23.260
Green onion	23.258	Leek	23.260
Men's shirt	23.258	Wafer	23.260
Make-up products	23.258	Magazines	23.260
Courses for non-determined education level	23.258	Porcelain household utensils	23.260
Hire of car fee	23.258	Knitting wool	23.260
Margarine	23.259	Children's t-shirt	23.260
Combi boiler	23.259	Carpet	23.260
Insurance connected with fire, burglary and natural disasters	23.259	Firewood price	23.260
Plum	23.259	Lotto	23.260
Sun flower seed	23.259	Body cream and lotion	23.260
Women's trousers	23.259	Tulum cheese	23.260
Bed clothes	23.259	Electric bulb	23.260
Dried apricot	23.259	Game Console	23.260
Cherry	23.259	Payment for photocopies	23.260
Raki and beer served	23.259	Furnace with gas	23.260
Water heaters	23.259	Transportation fee	23.260
Men's sport shoes	23.259	Children's pullover	23.260
Ice-cream	23.259	Private university fee	23.260
Women's footwear	23.259	Scarf	23.260
Towel	23.259	Door fittings	23.261
Umrah fee	23.259	Horse racing	23.261
Children books	23.259	Men's underwear	23.261
Holiday candy	23.259	Fruit Juice	23.261
Shaving articles	23.259	Children's socks	23.261
Butter	23.259	Carbonated fruity beverages	23.261
Boat fare	23.259	Children's sport shoes	23.261
Package holidays (abroad)	23.259	Package holidays for one week and more	23.261
Biscuit	23.259	Hygiene pad for women	23.261
Skirt	23.259	Articles for dental hygiene	23.261
Corrective eye-glasses	23.259	Women's raincoat	23.261
Granulated sugar	23.259	Men's t-shirt	23.261
Women's shirt	23.259	Grape molasses	23.261
Quince	23.259	Toilet soap	23.261
Cabbage	23.259	Children's tracksuit	23.261
Women's underwear	23.260	Package holidays weekend	23.261
Women's hairdressing	23.260	Children's footwear	23.261
Spare parts and accessories	23.260	Chocolate cream	23.261
Soups	23.260	Crche and day-care center	23.261
Men's suit	23.260	Men's pullover	23.261
Therapeutic appliances	23.260	Raisin	23.261
Grape	23.260	Motor oil	23.261
Melon	23.260	School bag	23.261
Travel goods	23.260	Women's coat	23.261
Bed base	23.260	Toster	23.261

Table 2: RPVs without specific item (continued)

Category	RPV	Category	RPV
Perfume	23.261	Carpet and other floor coverings cleanings	23.262
Hair care appliances	23.261	Men's boots	23.262
Other steel kitchen utentils	23.261	Jam	23.262
Cake	23.261	Cargo fee	23.262
Children's toys	23.261	Quilt	23.262
Baby food	23.261	Thin dough	23.262
Roasted chick-pea	23.261	Lottery (Chance Ball)	23.262
Men's jacket	23.261	Cereal	23.262
Slipper for woman	23.261	Contact lense	23.262
Scooter	23.261	Ayran	23.262
Pumpkin seed	23.261	Whisky	23.262
Strawberry	23.261	Mushroom	23.262
Women's sport shoes	23.261	Other recreational and cultural services (Internet cafe)	23.262
Turkish Coffee	23.261	Children's underwear	23.262
Super Lotto	23.261	Baby's pyjamas	23.262
Children's shirt	23.261	Children's pijamas	23.262
Pencil	23.261	Children's boots	23.262
Apricot	23.261	Baby carriage and car seat	23.262
Steel kitchen utentils	23.261	Turkish delight	23.262
Car park fee	23.261	Salt	23.262
Flash heaters	23.261	Belt	23.262
Notebook	23.261	Cream cheese	23.262
Items for sport and recreation (soccer ball)	23.261	Mixture fabrics	23.262
Bed cover	23.261	Women's boots	23.262
Men's socks	23.261	Children's sweatshirt	23.262
Teenager room furniture	23.261	Deodorants	23.262
Ayran served	23.261	Sesame oil	23.262
Theather	23.261	Fee paid for having pictures taken	23.262
Cinema	23.261	Pizza	23.262
Red cabbage	23.261	Payment for delivery of parcell	23.262
Natural gas subscription fee	23.261	Men's pijamas	23.262
Cracker	23.261	Teflon household utentils	23.262
Aspirator	23.261	Box of coloured pencils for painting	23.262
Canned vegetables	23.261	Kiwi	23.262
Stove	23.261	Sponge for dish washing	23.262
Women's cardigan	23.261	Radish	23.262
Sausage	23.261	Music equipment (flute)	23.262
Wermicelli	23.261	Chewing gum	23.262
Women's tracksuit	23.261	Umbrella	23.262
Tablet (PC)	23.261	Steak tartar a la turca	23.262
Other pulse	23.261	Men's sweatshirt	23.262
Mineral water	23.261	Cold drinks served	23.262
National lottery	23.261	Tie	23.262
Men's tracksuit	23.261	Products for maintanence of transport equipments	23.262
Wine	23.261	Pillow	23.262
Cotton fabric	23.261	Tolls	23.262
Cube sugar	23.261	Cologne	23.262
Women's socks	23.261	Cocoa	23.262
Train fare (intra-urban)	23.261	Catchup	23.262
Suit Repair	23.261	Vinegar	23.262
Subscription costs of telephone	23.261	Train fare (inter-urban)	23.262
Blanket	23.261	Veterinary fee	23.262
Almond	23.261	Desserts in restaurants	23.262
Overalls for baby	23.261	Herbal tea	23.262
Curtain	23.261	Dress (single piece)	23.262
Dry cleaning	23.261	Underground fare	23.262
Women's pijamas	23.261	Lottery (Number 10)	23.262
Banking service	23.261	Cocoa beverages	23.262
Women's footwear repair	23.261	Children's coat	23.262
Women's boots (with strings)	23.262	Film development	23.262
Other non-electrical appliances	23.262	Mayonnaise	23.262
Stove equipments	23.262	Bridge fare	23.262
Household textile fabrics	23.262	Men's anorak coat	23.262
Women's jacket	23.262	Lottery game (Iddaa)	23.262
Baby's underwear	23.262	Tram fare	23.262
Men's coat	23.262	Attorney fee	23.262
Pomegranate	23.262	Roller curtain	23.262
Men's footwear repair	23.262	Freezer	23.262
Battery	23.262	Test book	23.262

Table 3: RPVs without specific category

Category	RPV
Communications	12.649
Food and Non-Alcoholic Beverages	21.706
Health	22.659
Transport	22.674
Recreation and Culture	22.791
Housing, Water, Electricity, Gas and Other Fuels	22.807
Furnishings, Household Equipment, Routine Maintenance of the House	22.912
Miscellaneous Goods and Services	23.020
Education	23.083
Clothing and Footwear	23.176
Hotels, Cafes and Restaurants	23.179
Alcoholic Beverages and Tobacco	23.227

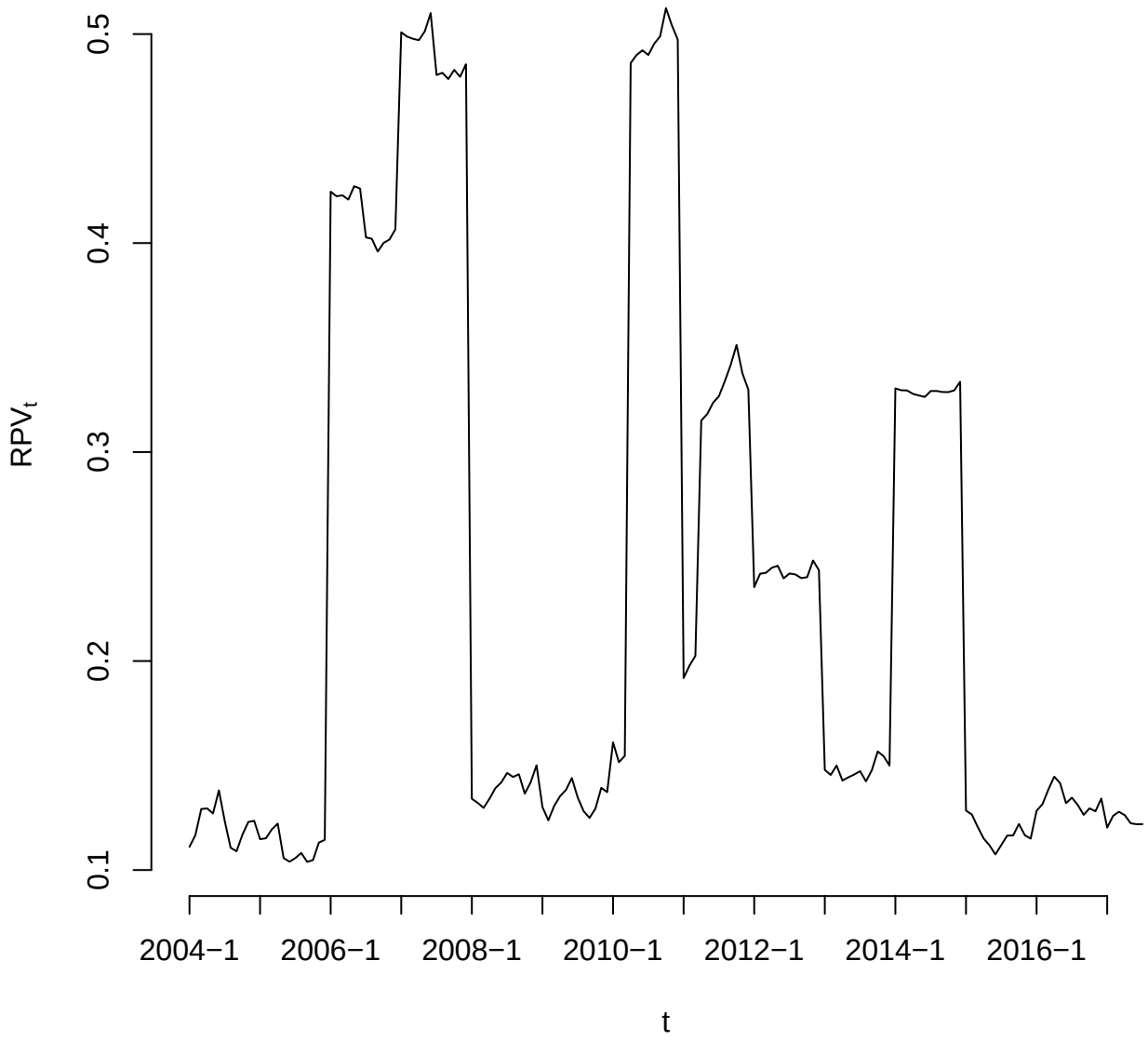

Figure 1: Relative Price Variability

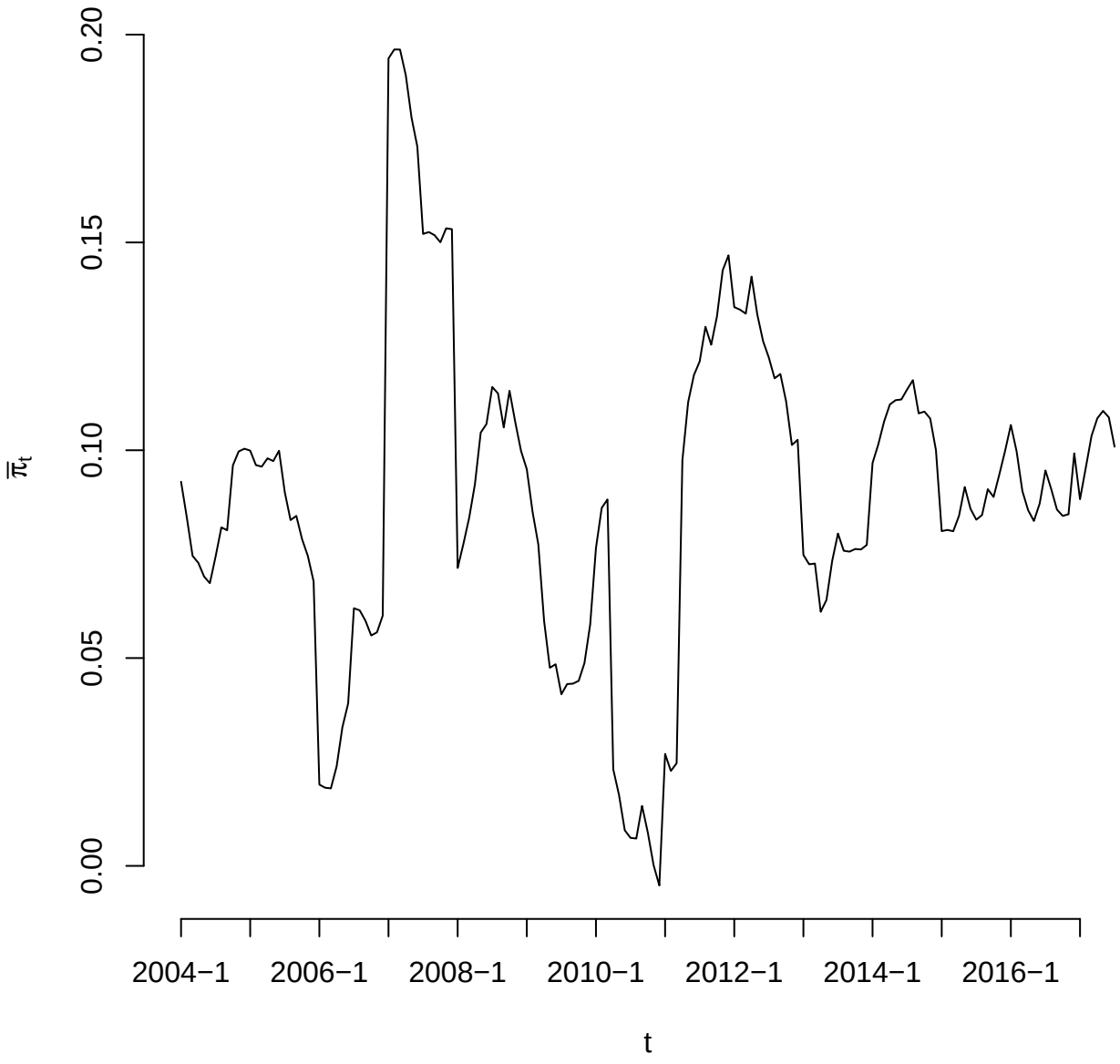

Figure 2: Inflation

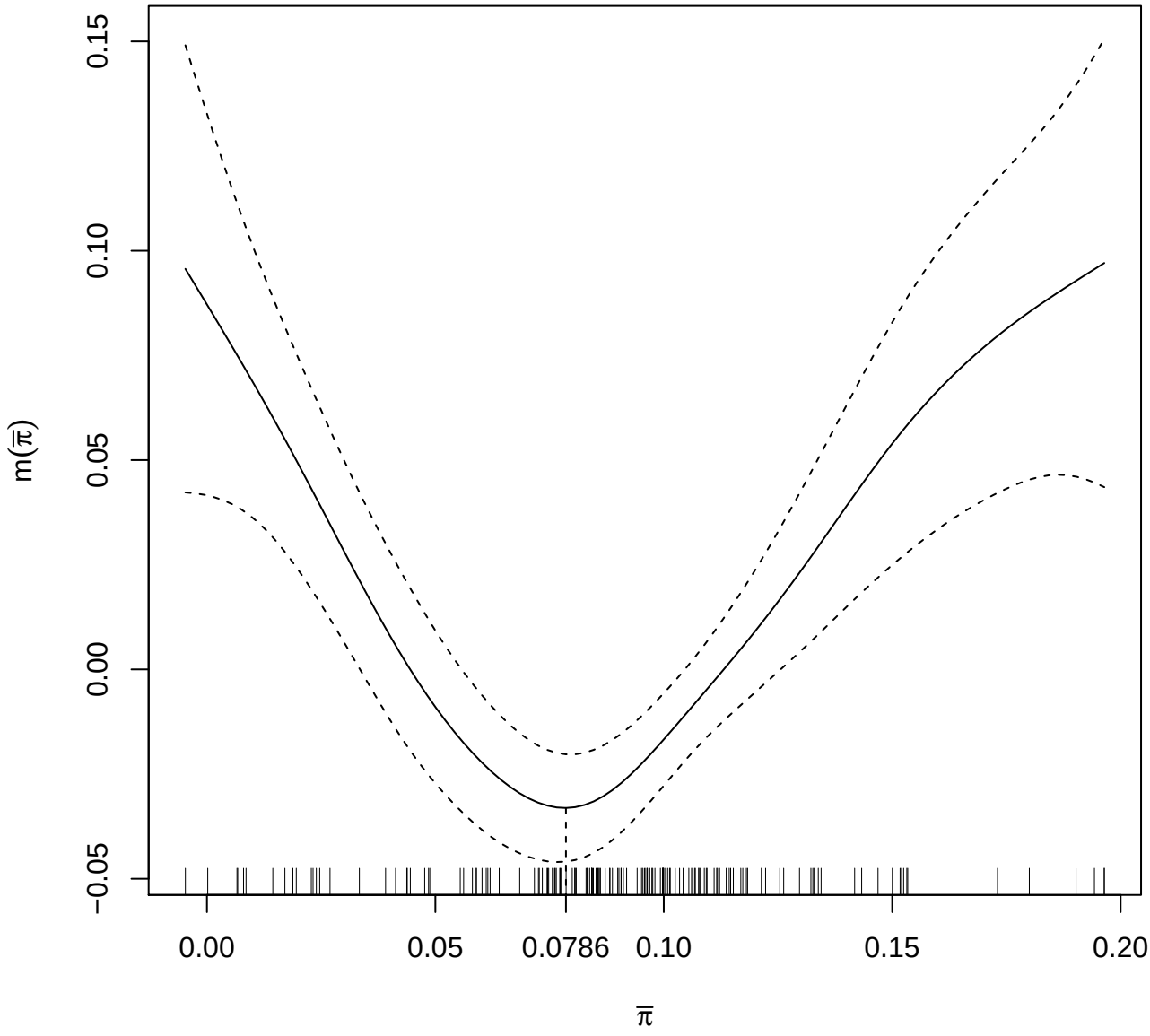

Figure 3: Partial regression function of $\bar{\pi}$