

THE IMPACT OF EXPANSION OF TURKISH TREASURY SINGLE ACCOUNT
SYSTEM ON PUBLIC FINANCIAL MANAGEMENT IN TURKEY

THE GRADUATE SCHOOL OF SOCIAL SCIENCES
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TOBB UNIVERSITY OF ECONOMICS AND TECHNOLOGY



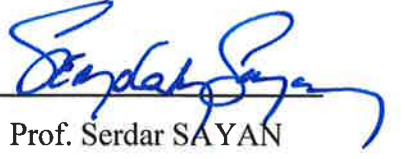
BARIŞ CAN

THE DEPARTMENT OF ECONOMICS
THE DEGREE OF MASTER OF SCIENCE

APRIL, 2018



I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.



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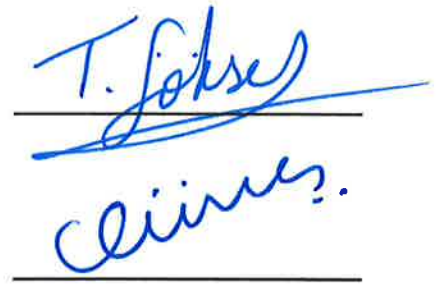
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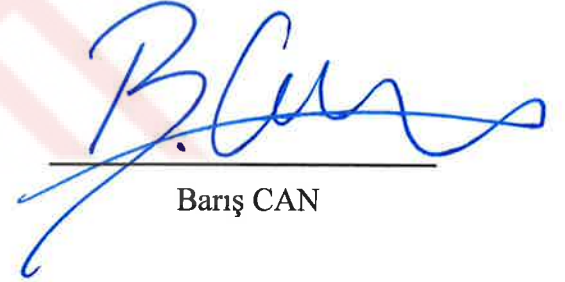
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ABSTRACT

THE IMPACT OF EXPANSION OF TURKISH TREASURY SINGLE ACCOUNT SYSTEM ON PUBLIC FINANCIAL MANAGEMENT IN TURKEY

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Today, the public cash management has gradually been managed more actively and professionally. Some essential reforms should be enacted to transit from traditional to modern cash management approach, extending the scope of Treasury Single Account (TSA) comes first among these reforms. TSA, in the good practices case, has an extensive spectrum including almost all public resources, but it just covers the units of central and local administration in Turkey. In this regard, the scope of TSA in Turkey should be extended to use public resources more efficiently by collecting them in a single center, therefore avoiding unnecessary borrowing and evaluating public funds better through economies of scale.

In the study, the modern cash management is examined at first, then the theoretical framework of TSA is examined. Then, applications of TSA in Turkey over the time are reviewed in chronological order. Moreover, finally, a new extended scope of TSA covering other public institutions is proposed.

The study which assesses the coverage of TSA in Turkey with a new perspective and aims to propose an ideal TSA coverage is believed to contribute to the efforts for the extension of the TSA system as a part of the modernization of the cash management in Turkey.

Keywords: Treasury Single Account, Treasury Cash Management, Target Cash Balance, Public Financial Management, Public Finance.



ÖZ

TEK HAZİNE HESABI SİSTEMİNİN GENİŞLETİLMESİNİN TÜRKİYE KAMU MALİ YÖNETİMİNE ETKİSİ

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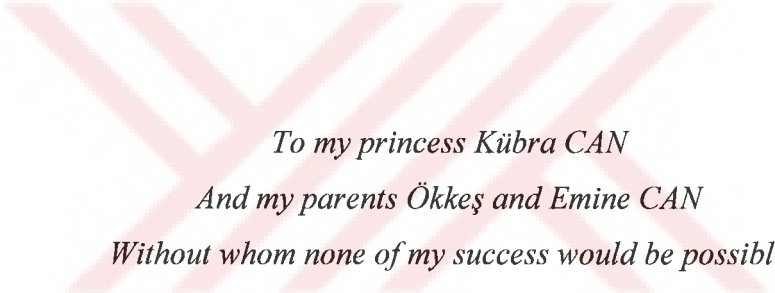
Kamu nakit yönetimi anlayışı giderek daha aktif ve daha profesyonel bir yönetim anlayışına doğru evrilmektedir. Modern nakit yönetimine geçiş için reformların başında Tek Hazine Hesabı (THH) kapsamının genişletilmesi yer almaktadır. İyi ülke uygulamalarında THH neredeyse devletin tüm nakit kaynaklarını kapsayacak kadar geniş kapsamlı iken, ülkemiz THH'sinde kapsam yalnızca genel bütçe kapsamındaki idarelerin merkez ve taşra birimleriyle sınırlıdır. Bu itibarla, kamu kaynağının tek bir merkezde toplanarak daha etkin kullanılmasına, gereksiz borçlanmanın önüne geçilmesine ve kamu kaynağının ölçek ekonomisiyle daha iyi değerlendirilmesine imkan tanıyan Tek Hazine Hesabı sisteminin ülkemiz uygulamasındaki kapsamının genişletilmesi gerekmektedir.

Çalışmada, öncelikle modern nakit yönetimi, sonrasında THH'nin teorik çerçevesi ele alınmıştır. Daha sonra, ülkemiz THH uygulamaları kronolojik sıraya göre incelenmiştir; nihayetinde kamu mali yönetimine ciddi anlamda katma değer sağlayacağı düşünülen THH kapsamının genişletilmesi önerilmektedir.

Ülkemizde olması gereken ideal THH'nin kapsamını öneren bu çalışmanın, ilerleyen dönemlerde nakit yönetiminde modernizasyon çalışmaları çerçevesinde öncelikli olarak ele alınması gereken kamu mali yönetim reformlarından THH'nin genişletilmesi çalışmalarına katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Tek Hazine Hesabı, Hazine Nakit Yönetimi, Hedef Nakit Düzeyi, Kamu Mali Yönetimi, Kamu Maliyesi





*To my princess Kübra CAN
And my parents Ökkeş and Emine CAN
Without whom none of my success would be possible*



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ABBREVIATION LIST

AFT	: Agence France Tresor
APEC	: Asia-Pacific Economic Cooperation
CBRT	: Central Bank of the Republic of Turkey
EEA	: The Exchange Equalisation Account
EFT	: Electronic Fund Transfer
FTSA	: First Treasury Single Account
KBS	: Public Expenditure and Accounting Information System
PEMPAL	: Public Expenditure Management Peer Assisted Learning
PEPS	: Public Electronic Payment System
PFM	: Public Financial Management
RSA	: Regulatory and Supervisory Agencies
SDIF	: Saving Deposit Insurance Fund
SDRs	: Special Drawing Rights
STA	: Single Treasury Account
TL	: Turkish Lira
TSA	: Treasury Single Account
TSCA	: Treasury Single Current Account System
TWF	: Turkiye Wealth Funds
UIF	: Unemployment Insurance Fund
USAID	: United States Agency for International Development
ZB	: Ziraat Bank



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CHAPTER I

INTRODUCTION

TSA system which has been in practice in Turkey since 1972 was initially established upon the need for equilibrating public cash resources in terms of time and place. However, TSA in 1972 was behind the international practices. Since its establishment, TSA system in Turkey has been revised many times to converge to the best international practices. However, there were not seen radical changes on the TSA system until 2007. Essential transformation of TSA in Turkey was realized in 2007 with the establishment of Treasury Single Current Account System (TSCA), and then in parallel with technological improvement, Public Electronic Payment System (PEPS) started to be officially implemented in 2011. However, there is still much progress to be made in Turkish TSA, since it still behind the international good practices because of its limited coverage. It covers only the central and provincial units of general budget institutions. Since the TSA coverage is limited to general budgetary administrations, excluding rest of administrations has led the substantial amount of public cash reserve to be managed outside of the TSA.

In this study, we proposed to expand the current TSA coverage to achieve the ideal TSA system. We believe that extensive TSA coverage facilitates to adopt modern cash management approach and to ensure to manage public resources in the more effective manner. Also, with the extension of TSA, Treasury will have opportunity to manage approximately 2.2-2.7 times more cash reserve than that it currently manages. Moreover, by extension of TSA, overall interest revenue from public deposits will be almost 2.0-2.6 times more than the current one.

In this study, by transforming Miller-Orr cash management model, we introduce new cash management model for governments to make analysis of likely return of extension of TSA. In this regard, we think that this study also makes a significant contribution to field of government cash management.

In this study, it has significantly benefited from work done by international institutions such as the IMF, the World Bank, from the articles and presentations, books, reports, dissertations written in this field, protocols, articles, are used.

The study is organized as follows; the first part is an introduction. In the second part of this study, the concept of cash management, and cash management approaches are addressed. After, aims, characteristics and structure of the cash management approaches and the transition stages of modern cash management are stated in the perspective of a phasing approach. In the third part of the study, TSA concept is explained, and the scope, structure, aims, and features of TSA are revealed and TSA models are classified. Also, TSA systems implemented in Turkey are expressed in chronological order. The scope and functioning of Turkish TSA systems are mentioned. In the last part of this chapter, TSA systems in selected countries are outlined. In the fourth part of the study, the aim of expansion of TSA coverage is stated and our proposal for the new TSA coverage is stated. Besides, budgetary and financial structures of the institutions, which we proposed to include in the new TSA, are analyzed. Moreover, in this part, the impact analysis of extensive coverage of TSA is made, and the expected return with the extension of the scope of TSA is calculated by using our new cash management model created by transforming the Miller-Orr model. The last part of the study touches briefly on the subject regarding the expansion of TSA and its possible contributions to cash and public financial management in Turkey.

CHAPTER II

MODERNIZATION OF CASH MANAGEMENT

2.1. The Notion of Cash Management

Government cash management has many definitions, but it can be defined as activities conducted to offset the government revenues and expenditures in terms of time, amount and place. Storkey (2003) describes government cash management as “cash management is having the right amount of money in the right place and time to meet the government’s obligations in the most cost-effective way”, whereas Williams (2004) defines it as “the strategy and associated processes for managing cost-effectively the government’s short-term cash flows and cash balances, both within government, and between government and other sectors”.

The fundamental objective of cash management is to provide the necessary cash to pay for expenditures when they are due. It is to enable spending agencies to carry out government policies as demanded and when necessary, without the need to impose any expenditure restrictions. Meeting those objectives on time with lowest cost and risk is possible with the adoption of modern cash management approach.

Cash management is different from budget management. While budget management is about ensuring that the budget is managed consistently with the determined financial limits in a certain period (fiscal year), cash management is about ensuring that the government has the liquidity to execute its payments and procuring necessary cash in a most cost-effective manner (Williams 2009).

Budget & Financial Control	Cash Management
✓ Revenue and expenditure budgeting.	✓ Cash flow forecasting.
✓ Control against budget appropriation and warrants.	✓ Maintenance of bank accounts and relationships.
✓ Controllership or financial control over payments and receipts.	✓ Efficient and timely processing of payments and receipts.
✓ Government accounting.	✓ Management of government float and working capital.
✓ Financial reporting.	✓ Minimization of transaction and interest costs.

Table 2.1. Budget Control vs. Cash Management (Storkey 2012-APEC)

The fact that budget and cash management are different does not mean that they work independently from each other. If budget and cash are not managed in coordinately at a certain level, both managements will move away from efficiency.

Budgetary payment process includes execution of the budgetary process, procurement of cash process and payment process. If any information about realized or projected revenue and expenditures are not shared by budget management with the cash management, it will be difficult for cash management to expect the date of cash inflow or outflow and to find the cash needed at the appropriate time with low cost (Can 2017).

Furthermore, the benefit of adopting modern cash management approach is not limited to ensuring effectiveness in budget management. All in all, the adoption of

modern cash management approach enables to save costs, reduce risks, manage cash flows efficiently, and develop coordination between debt, monetary, fiscal policies (Storkey 2003, Williams 2009).

2.2. Government Cash Management Approaches

Government cash management approaches can be examined in two groups, including passive and active. The primary task of government cash management is to equalize cash inflow and outflow regarding time and location. For passive cash management approach, meeting the primary task about which is harmonizing cash flows is enough to achieve cash management purposes. However, for modern cash management approach, it is not enough to meet the only one task and, it is needed to do more to achieve its purposes. While the passive cash management approach reflects the traditional understanding of cash management only which interests to find needed cash to realize budgetary expenditures, active cash management approach has a mission beyond finding the necessary cash to finance the budget expenditures. It focuses on managing and evaluating the cash reserve effectively. Table 2.2 shows the main differences between passive and active cash management approaches.

Passive Approach	Active Approach
✓ Essentially passive. Not evaluate cash reserve in financial or money market in an effective manner.	✓ Managing cash more actively.
✓ Monitoring cash balances, maintaining cash buffer to handle both volatility and unanticipated outflows.	✓ Trying to smooth our daily weekly cash flows by borrowing more active and lending in money markets.
✓ If necessary restraining/slowing expenditures or delaying bill payments – cash “rationing” not cash management. ¹	✓ Allows lower average cash buffer with benefits to other policies.
	✓ Gives tools to protect expenditure plans from cash flow volatility.

Table 2.2. Cash Management Approaches (Cangiano 2017)

2.3. Essential Cash Management Indicators

There is no internationally accepted tool for assessing the status of government cash management performance. Varea and Arosteguiberry (2015) formed a set of indicators that could be used to measure countries' cash management performances. Table 2.3 shows set of indicators which help to make an objective assessment of cash management performance of countries.

¹ Cash rationing is a method used by countries in common. Spending units receive less than the apportioned amount of resources.

Strategic phase or stage to which the indicator corresponds	How the indicator is calculated	Objective of the indicator
Cash flow forecasting	<ul style="list-style-type: none"> • Expenditure paid monthly/ expenditure planned monthly (as a percentage). For this indicator to also cover budget execution, a further sub-indicator might be one in which the denominator is the budget executed monthly. 	<ul style="list-style-type: none"> • Evaluate the quality of the cash plan in relation to the forecast. • Prevent either cash deficits or surpluses. • Budget execution monitoring.
Revenue collection	<ul style="list-style-type: none"> • Amount of revenues captured by the treasury through the Treasury Single Account (TSA)/total amount of revenues received through any account (as a percentage). • Amount of monthly revenues paid by the treasury by electronic means/total amount of monthly revenues paid by the treasury (as a percentage). 	<ul style="list-style-type: none"> • Collect revenues in the quickest way possible and in a timely manner. • Eliminate manual processes that increase transaction costs.

	<ul style="list-style-type: none"> • Time taken to make revenue transfers to the treasury (in days). 	
<p>Execution of Payments</p>	<ul style="list-style-type: none"> • Amount of government payments that the treasury executes through the TSA/amount of government payments made through any account (as a percentage). • Amount of monthly payments by the treasury by electronic means/ the total amount of monthly payments by the treasury (as a percentage). • Time taken by the treasury to make payments to the beneficiary (in days). 	<ul style="list-style-type: none"> • Gain greater control over government expenditure through the TSA. • Improve accounting.

TSA scope	<ul style="list-style-type: none"> • Total of institutions in the TSA/total central government institutions (as a percentage). 	<ul style="list-style-type: none"> • Optimize the TSA's management role to centralize state resources. • Raise awareness of the cash flow of government institutions.
Remuneration of TSA surplus investments	<ul style="list-style-type: none"> • TSA remuneration rate (as a percentage). 	<ul style="list-style-type: none"> • Obtain a return for the opportunity cost of government capital. The central bank prime rate can be used as a reference, although this yield can be significantly limited by the size of the market and prudent management.
Arrears	<ul style="list-style-type: none"> • The balance of arrears. 	<ul style="list-style-type: none"> • Monitor and establish a policy that minimizes the accumulation of arrears.

Table 2.3. Cash Management Indicators (Varea and Arosteguiberry 2015)

2.4. Modern Cash Management

2.4.a. Objectives of Modern Cash Management

The purpose of cash management can be divided into two categories called fiscal and monetary objectives.

Fiscal Objectives	Monetary Objectives
1) Ensure cash is available to line ministries and spending agencies to meet budget obligations and commitments, when due.	1) Neutralize the impact on the domestic banking sector of the government's cash flows.
2) Manage cash effectively	2) With ability forecasting cash flows, prevent effects of sudden and big fluctuations of liquidity in banking sectors.
3) Borrowing to cover expected cash shortfalls, and avoid "idle" balances.	3) Contribution to monetary policy
4) With the aim of optimal investing during periods of surplus.	
5) Minimizing borrowing costs.	

Table 2.4. Cash Management Objectives (Cangiano 2017)

In literature, well-accepted objectives of modern cash management which prominent experts in this field agree on can be listed as follows:

- ✓ Provides cash needed for public expenditures in a timely and cost-effective manner,
- ✓ To devise the strategies for smoothing the cash flows profile, minimizing idle cash balances and reducing borrowing costs,
- ✓ With accurate forecasting of cash flows, it allows lower average cash buffer as a precaution with benefits to other policies and lowers implicit and opportunity cost due to high cash buffer,
- ✓ Reduces liquidity impact from budget deficits/surpluses,
- ✓ Minimizes idle balances and associated costs and maximize returns on them,
- ✓ Gives confidence to the markets by ensuring that budgetary expenditure is smoothly financed avoiding delays,
- ✓ Ensures compliance with the budget implementation,
- ✓ Facilitates financing of public expenditures by using cash management instruments,
- ✓ Prevents liquidity fluctuations in the money market by adoption targeting balance policy.
- ✓ Contributes to development of the money market,
- ✓ Helps to reduce various risks factors such as credit, debt roll-over, liquidity and market risk,
- ✓ Enhanced transparency of government flows,
- ✓ Supports debt management (Bozkurt 2007).

2.4.b. Features of Modern Government Cash Management

Lienert (2009) states that cash management must include the following six fundamental and three desirable features to achieve the objectives mentioned above.

Fundamental Features:

- ✓ Centralization of government cash balances and the establishment of a TSA structure: Consolidating all balances belonging to government daily in TSA which is managed and controlled by treasury is prerequisite to achieve the establishment of modern government cash management. TSA is a system that enables to consolidate all government revenues in a single account and to perform government expenditures from it. TSA paves the way for centralization of government cash balances. Also, implementation of TSA necessitates overnight sweeping of balances of government bank accounts that help to minimize idle cash reserve which is located apart from TSA. To put it more explicitly, TSA impedes debt managers from over-borrowing and enables cash managers to remunerate temporary idle cash by ensuring that all balances accumulated in different bank accounts are sweeping to it at the end of the day (Erdener and Çiçek 2012).
- ✓ Determination of government cash management framework: Specifying which institutions will be covered within government cash management framework and planning how their cash will be managed compliance with their structural differences is significant to ensure effectiveness in government cash management (Erdener and Çiçek 2012).
- ✓ Projecting short-term cash inflows and outflows accurately: Accurate forecasting short-term cash flows is essential for managing cash efficiently

(Storkey 2003). In the event of having quality forecasting system and technical capacity on forecasting, cash managers can make a good projection about cash inflows/outflows (Lienert 2009).

- ✓ Improving transaction processing and accounting capacity: Accurate estimation of public cash inflows and outflows is closely related to the availability of comprehensive data. Also, to make accurate forecasting on short-term cash flows, sufficient historical information on cash flows should be available to use for forecasting. So, there should be adequate infrastructure for processing and modern accounting system recording government cash flows. Also, accounting for all transactions in electronically is vital to achieving fiscal transparency.
- ✓ Information sharing between the Treasury and other related institutions: Through payment/collection process, cash managers and all partners involved in revenue and expenditure process are required to work in coordination in order to ensure effectiveness in cash management. Sharing information produced by partners with the cash management unit provides an opportunity to make better forecasting and better cash plan.
- ✓ Institutional arrangements and determination of responsibilities: Regulations must clearly define the duties and responsibilities of partners involved in cash management to conduct cash management efficiently. For effective cash management, there must also be communication and coordination between cash management unit and other related institutions responsible for budget preparation and management. So, it is critical to define data sharing between actors in cash management and issues regarding how to be managed cash by regulations (Erdener and Çiçek 2012).

Desirable Features:

- ✓ Adoption of modern banking payment and transfer systems: Carrying out transactions on time and electronically is vital for the effectiveness of cash management. Establishing banking system that enables cash transfer (payment, collection) between the treasury-institution-bank-beneficiary increases efficiency in cash management.
- ✓ Using short-term financial instruments for cash management purposes: In modern government cash management approach, it is aimed to determine accurate cash buffer to which cushion adverse effects of fluctuations of cash flows to meet day to day volatility, to cope with forecasting errors, to tide over times of financial stress or crisis.² It is evident that lowering cash buffer to minimum levels makes cash management more vulnerable to cash flow fluctuations. Therefore, it is necessary to develop instruments such as cash management instruments and technical infrastructure to enable cash managers to procure temporary cash from money market to resolve cash deficit or to evaluate cash at money markets in the period when there is cash surplus. That is why using short-term cash instruments is substantial to balance cash flow and also makes a positive contribution to the improvement of money markets.
- ✓ Integration of debt and cash management: There will be a more effective level of balance between risk and cost if there is integration between cash management and debt management or coordination between them. Also, it is essential that there should be coordination between cash managers and other economic actors to development of financial markets (Erdener and Çiçek 2012).

² The minimum level of cash balances to be sure of meeting day to day cash requirements, at all times under all circumstances, taking into account the availability of other liquid resources (Williams 2014)

By taking into international best practice, Williams (2013) constitutes essential features of modern cash management as follows:

- ✓ Centralization of government cash balances and establishment of a TSA,
- ✓ Efficient payment/collection infrastructure and modern electronic-based centralized system to enable to process government transactions with a few handling steps,
- ✓ Establishment of integrated system which enables cash managers to make accurate projections of cash flows,
- ✓ Strong institutional interaction:
 - Information sharing between the cash managers and other economic actors such as revenue-collecting units and spending units,
 - Strong coordination of debt and cash management,
 - Official agreements between the treasury and central bank on information flows and the fulfillment of other responsibilities related to cash management.
- ✓ Use of short-term cash borrowing instruments (treasury bills, repo and reverse repo, term deposits, other instruments) to handle timing mismatches.

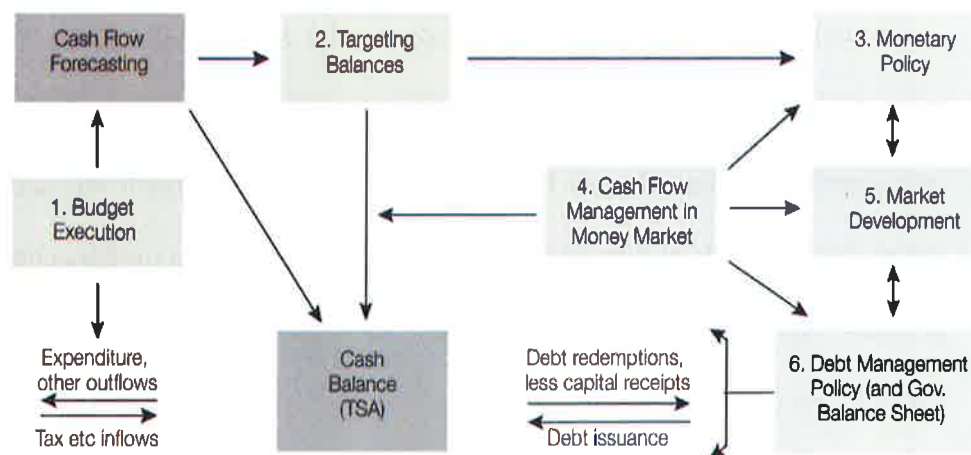
2.4.c. Cash Management's Interactions with Other Economic Actors

Government is one of the leading actors who steer the economy with its policy instruments regarding revenues, expenditures, and debts. As a result of its policies, a considerable amount of cash flows occur between government and other sectors in the economy which in turn might create a substantial impact on the general economic policies. So, governments should work in close interaction with both real and financial sectors of the economy.

Storkey (2003) and Williams (2009) emphasize that adoption of modern cash management approach initiates utilization of public resources and minimizes various risks and supports fiscal, monetary and debt policies. Besides, in addition to above-stated policies, cash management affects liquidity management considerably.

As can be seen in Figure 2.1, budget execution foreshadows prospective public revenues and expenditures. After the budget preparations, public cash management unit starts to forecast the timing of revenues and expenditures to make a good cash plan, target cash balance and give input about cash flow to other policymakers. Moreover, by targeting balance, cash managers manage their balance in the money market. When cash managers have excessive balance compared to target balance, they make use of money like investing it to deposit, etc. On the contrary case, cash managers try to adjust deficit balance by using cash management instruments in the money market. Also, cash managers use them as a tool to eliminate the effect of fluctuations that may be caused by unforeseen cash flows at the target reserve levels. The widespread use of short-term cash management instruments contributes to the development of the money market. Therefore, cash management policy is significant to market development.

Figure 2.1. Cash Management's Interactions with Other Economic Actors (Williams 2009)



Central banks need to interact with cash managers to gain government cash flow information to make their monetary policy operations effectively because of flow of information. Central banks use that information as an input to forecast liquidity inflow or outflow in the market. For central banks, working with cash and debt management is also important since both managements give information on likely policy of public sector which will affect the market. Therefore, to implement their monetary policy effectively, central banks must interact with cash and debt management units.

Moreover, cash flow forecasting and expected target cash balance are essential for debt management as well. Since cash management reflects expected situation of financing needs, it is not wrong to say that debt management could not conduct its strategies independent of cash management's strategies or expected fiscal financing requirements. They prepare their strategic debt plan and financing program in the context of medium-term debt management strategy by taking into account knowledge produced by cash management program about non-borrowing public resources as input.

In addition to forecasting side, when it considers that cash management operations such as short-term cash borrowing are closely interrelated to other actors' policy operations, it is critical to ensure that cash managers' operations do not cut across the monetary policy operations and debt policy operations. So, it is substantial to demarcate responsibilities of actors to avoid any perception of conflicts of interest in market operations.

As it is seen, the fact that cash management decisions have a significant impact on other decision-making units necessitates cash managers to consider liquidity, market, credit, and operational risks when they manage cash. Thus, relevant incumbency

calls for units responsible for management of cash, debt and liquidity to work in coordinately (Erdener et al. 2013).

2.5. Transition from Traditional Public Cash Management to Modern Public Cash Management

The transition from passive (traditional) cash management to modern cash management is not as easy as it sounds since any changes in cash management can affect not only public institutions but also economic units directly associated with the economy such as the banking sector. Therefore, it is preferable to adopt phasing approach which proposes to switchover from traditional to modern cash management step by step rather than in an instant.

2.5.a. Transitional Stages

Williams (2004) emphasized that effectiveness in cash management can be achieved by keeping the idle reserve at a minimum level, reducing risks including market, credit and operational, and equalizing cash flows in timing and placing.

The possibility of achievement of cash management's objectives depends on how policymakers want to take a firm stand on making reform regarding the transition to modern cash management. However, the degree of determination to make a reform does not mean that reforms should be made immediately. Rather than quickly, transitioned from traditional to a modern one gradually is better in order to prevent likely complications that may arise in the adaptation period.

In literature, although there are different ideas on this subject, the consensus is that transition to modern cash management should be realized in gradually, and the process is to be completed by going through four phases which begin with

establishing TSA, following establishing comprehensive forecasting system, targeting cash level and short-term cash borrowing. In this study, compatible with general opinion, the transition from passive public cash management to modern public cash management is expressed by dividing into four phases.

Phase 1 – Establishing TSA: TSA is defined as “TSA is a bank account or a set of linked bank accounts through which the government transacts all its receipts and payments”. It refers to a unified structure of government bank accounts that consolidates all government revenues and payments. It is also referred as a system that integrates government accounts and sweeps overnight balances of them into a single account. The aim of a TSA practice is managing the government cash resources through the central account and so that providing efficient cash management (Pattanayak and Fainboim 2010, Williams 2010). With TSA, it is aimed to prevent unnecessary borrowing, idle public resources and to achieve maximum efficiency by collecting all balances into a single account and managing that single account. In modern cash management approach, the structure of TSA is pyramidal. The pyramidal accounts structure refers to a structure which is a centralized bottom to top. While all government accounts are located at the bottom of the pyramidal organizational structure, TSA is located at the top of the pyramidal organizational structure.

Having the pyramidal account structure that enables to centralize all government accounts in a single account and to associate accounts with each other is a crucial phase of modern cash management (Bozkurt 2007).

Phase 2 - Preparing cash plans and developing cash management skills: This stage focuses on forecasting that the timing and amounts of large inflows or outflows are as accurate as possible. The establishment of the forecasting system and

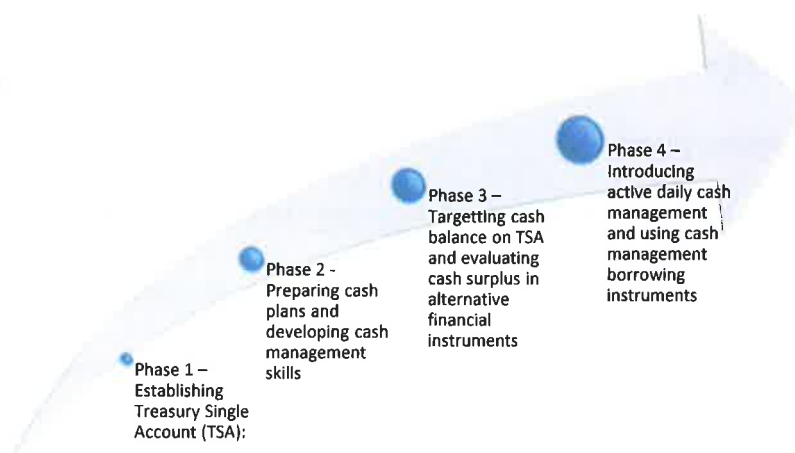
monitoring system which provides for users display of cash flows in detail are essential for modern cash management. And also, for timely payment of budgetary expenses, smoothing cash flows, carrying out other policies effectively, it is vital to make realistic and accurate revenue/expenditures forecasts (Cangöz and Balibek 2012). In this phase, it is aimed to increase the technical capacity to make cash planning which is compatible with budget and to make realistic and accurate cash flow forecasting. Moreover, it is aimed to establish IT systems to monitor public cash revenues/expenditures in detail. Estimation system should be designed to cover both expenditure and revenue estimations produced from lowest level of the unit to highest level of the unit of all institutions. With the robust forecasting infrastructure, prospective expenditures could be estimated in advance, and necessary financing could be provided in advance to allocate the fund for that expenditure and the period from budget and cash realization will be shortened.

Phase 3 – Targetting cash balance on TSA and evaluating cash surplus in alternative financial instruments: In this phase, it is aimed to minimize the adverse effects of public cash flows on money market by targetting balance. Implementation of targetting balance policy provides the opportunity to impede potential risks may come out from cash flow fluctuations, and it contributes to the improvement of efficiency of monetary policy operations by smoothing public cash flows. By doing so, central bank can make open market operations to adjust only market cash flow fluctuations rather than public cash flow fluctuations to achieve its policy (Williams 2004, Mu 2006, Lienert 2009). Moreover, in this stage, it is aimed to remunerate of excess balance with alternative financial instruments. The process of evaluating the cash reserve can be dealt with in two stages. The first is to evaluate the source of the collected public revenues until the stage of transferring them to the treasury accounts

and secondly to evaluate the cash assets received in the treasury accounts in the alternative investment instruments (Williams 2004, Mu 2006).

Phase 4 – Introducing active daily cash management and using cash management borrowing instruments: In modern cash management, it is aimed to minimize any cost arising from idle balance held as a precaution by keeping the cash balance at a minimum. This approach, based on keeping the minimum amount of idle balance, is possible if the cash managers have short-term cash borrowing instruments that will allow them to borrow from the money market if they need it. The short-term financing phase is divided into rough-tuning and fine-tuning in itself. In both phases, short-term instruments are used to minimize balance volatility that may have an adverse effect on targeted balances. In rough-tuning stage, cash managers issue treasury bills so as to offset the liquidity impact of weekly net cash flows and government smooth cash flows. In fine-tuning stages, cash managers focus on daily targets rather than monthly or weekly ones. So fine-tuning draws on a broader range of instruments to smooth more fully government's balance. At this stage, cash managers use more active policies to reach the daily target cash level (Williams 2010).

Figure 2.2. Transition from Traditional Public Cash Management to Modern Public Cash Management



Although in literature the transition from passive cash management to active cash management is expressed as above, there is no need to follow an absolute order in practice. Because, transition process depends on countries distinctive features such as existing cash management framework, technical capacity, having banking and accounting structure, etc.

2.5.b. Challenges for Making Cash Management Reforms

Accomplished cash management ensures public money reaches the right place, at the right time. Reforms to improve cash management set out to make this process more efficient. However, carrying into effect reforms is not as easy as it looks. Lienert (2009) has listed the problems might be faced by particularly underdeveloped and developing countries in the transition to active cash management in the following way.

- ✓ Underdeveloped banking system: Having a widespread nationwide electronic payment/collection and information communication network covering the treasury, central bank, and banking sector is significant regarding cash management effectiveness. In the transition process from traditional to modern cash management, countries must have an adequate banking system, which could meet at least basic needs to be able to implement modern cash management.
- ✓ Multiple government bank accounts: In many countries, units responsible for cash management do have the power to control all government bank accounts. For example, some accounts can be opened outside of the TSA because of nature of expenditures kept confidential for instance spending regarding defense, etc. or due to an authority outside treasury. Besides,

separate accounts out of the TSA may be opened for donations/loans which have been allocated to specific projects. Such practices constrain comprehensiveness of the TSA and contradict modern cash management approaches.

- ✓ Unobserved and unused daily balances in all government accounts: If treasuries of countries are unable to monitor end-of-balances in all government accounts at the end of the day and they do not access these balances for the cash management purposes, effective cash management is not possible. This situation impedes remuneration of the balances with high yield, which leads to opportunity costs.
- ✓ Underdeveloped IT systems: In some countries, besides banking systems, accounting and information systems have not developed sufficiently. With electronic based integrated systems, it can produce rich and quality databases to make reliable projections. So IT system is vital to reach modern cash management.
- ✓ Lack of human capital: In modern cash management approach, cash managers need to be required skilled persons who have the technical capacity to manage government balances with a professional approach. Therefore, it is critical that the cash manager has the technical capacity to be able to find necessary cash at the most reasonable cost and to evaluate the cash surplus with the maximum return. If this necessity provided, leakages associated with poor management can be eliminated.



CHAPTER III

TREASURY SINGLE ACCOUNT SYSTEM

3.1. TSA Concept

From past to present, depending on their sovereign rights, states have collected some revenues such as tax or quasi-tax from their citizens and used these revenues to finance their expenditures. That task is generally performed by government treasuries. When treasuries try to do their mission, they need equalize cash inflow and outflow in view of place and time because collections and disbursements vary from region to region and from time to time. Namely, in some areas, collected revenues can be more than expenditures or vice versa, so this disparity of cash flows needs to be solved in some way.

For effective public services, all disbursements should be made from a single account, and all revenues should be collected under single account regardless of which region/entity collects those receipts. Also, all expenditures should be financed by these resources located in a single account. In this respect, equalization in terms of place is important to achieve aims mentioned above.

Additionally, there can be no total harmony between states' revenue and expenditures in view of time. For example, in Turkey, while some high amount expenditures like salaries are realized on the 15th day of each month, high amount tax revenues such as value-added tax revenues are collected until the 26th day of each month. Naturally, this type of cash flow discordance like Turkey's case may not be valid for all countries. However, it is obvious that most countries' revenues and

expenditures are not coherent with each other in terms of time and place. Given the above considerations, it is clear that states must find a way to solve their cash flows inconsistencies.

In most of the states, treasuries have been authorized to manage public cash resources. Since eliminating timing differences of cash flows is quite important for cash management, by using their power vested in them, treasuries have tried to equalize cash inflows and outflows to manage public cash resources effectively.

In 1806, in order to ensure that the function of balancing public resources in terms of place and time, Count Mollien who is French statesman and advisor of Napoleon suggested an idea that all accounts are collected in one place, and all expenditures are realized from one place (TSA system). Count Mollien did not hold that French treasury was financed by French bankers good even he stated that adoption of this method made French treasury to more susceptible to default risk. For this reason, a system called “Caisse de service” has been established, which mainly based on function in which all incoming government funds can be concentrated and from which all payments can be disbursed (Besette 2011).

Literately, TSA notion can be described as it is an essential tool for consolidating and managing governments’ cash resources. It can be referred as government banking arrangement that unifies government bank accounts. Prominent specialists in cash management field, described TSA as can be seen below.

While Pattanayak and Fainboim described TSA as;

“Based on the principle of unity of cash and the unity of treasury, a TSA is a bank account or a set of linked accounts through which the government transacts all its receipts and payments. The principle of unity follows from the fungibility of all cash

irrespective of its end use. This enables the treasury to delink management of cash from control at a transaction level (Pattanayak and Fainboim 2010)."

Williams (2004) stated it as;

"A TSA is a prerequisite for modern cash management. It involves the consolidation of all government cash balances into a single account, usually and preferably at the central bank consolidation. This allows the MoF to minimize the volume of idle balances in the banking system, with consequent cost savings.³ These derive from the interest saved from using cash surpluses in one area of government activity to cover cash shortages in another. If cash is not consolidated, the extra cash requirement has to be financed by borrowing."

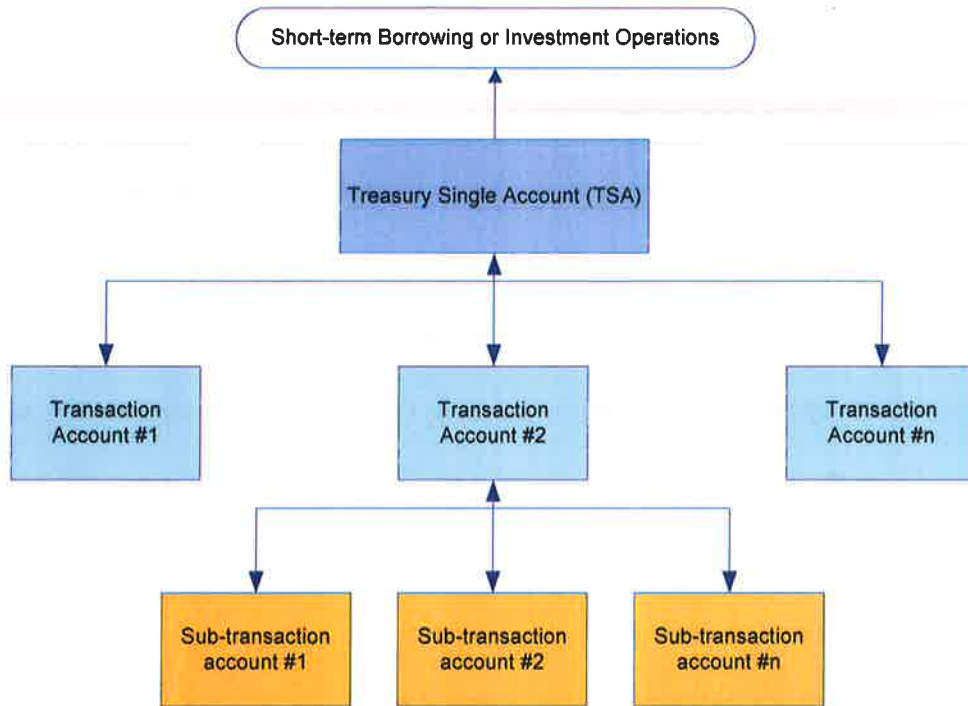
Mu (2006) defined and rendered it as;

TSA is an arrangement which allows for the netting and aggregation of balances and the preparation of consolidated cash flow forecasting. In TSA system, there is pyramidal banking structure which is the linkage between government accounts to ensure that the cash balances that remain in various government accounts at the end of a day are channeled to the main central account (the STA⁴), thereby minimizing the government's cash needs. The basic structure of TSA is that any cash in sub-accounts is swept into the main account, and cash is dispersed from the main account to sub-accounts (Figure 3.1).

³ MOF: Ministry of Finance. Williams assume that MOF is responsible for cash management in his study.

⁴ STA term refers to Single Treasury Account. STA and TSA terms have the same meaning. Although TSA term is generally used in many studies, STA term is rarely seen in some others.

Figure 3.1. The Structure of TSA



According to IMF, TSA is one of the most important tools for reforming Public Financial Management (PFM) systems. TSA can be referred as a banking arrangement system where all incoming government funds can be concentrated and from which all payments can be disbursed. It is based on cash unity principle (World Bank 2012).

TSA is a main bank account which all government receipts, regardless of which entity collects, are transferred into it, and all disbursements are made from it. Actually, in modern cash management, TSA does not mean just a bank account, but it is a system/banking arrangement that can contribute to improve government cash management efficiency by automating processes, enforcing internal controls and by providing timely and reliable information for decision-making. It allows cash management units to observe government's consolidated cash position at the end of each day (Guide to Public Financial Management-USAID 2014).

Besides, according to general opinion, TSA is a crucial phase of the transition to modern cash management because it is the best tool to achieve cash consolidation which is an essential pre-requisite for modern cash management. By making discipline to actors in cash management process, it allows public resources to be managed in more effective manner. In addition to discipline in public financial management, it also helps to develop cash planning, forecasting, and remuneration mechanisms.

With the adoption of comprehensive TSA, cash management units will manage the high amount of public resources. Thus, they are forced to adopt modern cash management approach instead of traditional cash management approach which interest in only finding funds available to execute budget so that they can get optimum utilization from public resources. It forces units which are responsible for cash management to do their task in a professional way so that it can precipitate understanding of modern cash management throughout the country.

In addition to advantages of extensive TSA above-mentioned, TSA is also an essential tool in the transformation to modern cash management approach as Fainboim et al. (2015) said:

“It also acts as a catalyst and facilitator for cash management reform by transformings cash management units and allowing them to go beyond their traditional payer role to perform the functions of a modern financial manager by adopting efficient planning, forecasting, financing and financial investment mechanisms as well as actively managing cash.”

3.2. Characteristic of TSA

According to Pattanayak and Fainboim (2011), a full-fledged TSA needs to have six following main characteristics.

1) Location: In literature, there are three views on where TSA should be operated.

These can be listed as below,

- The TSA and all transaction accounts should be held at the central bank,
- The TSA and all transaction accounts should be held at commercial banks,
- The TSA and some major transaction accounts should be held at the central bank, and most transaction accounts should be held at commercial banks, with the TSA and transaction accounts being linked electronically (Mu 2006).

For some specialist, TSA should be held at commercial banks because they have much bigger networks than the central bank. However, accepted opinion is that TSA should be operated at central bank because compared to private or public commercial bank deposits, keeping resources in the central bank may prevent some risks like counterparty risk, credit risk or moral hazard risk.

Table 3.1 shows both advantages and disadvantages of the TSA in the central bank:

<u>Advantages</u>	<u>Disadvantages</u>
<p>1) Counterparty (credit) risk is minimal.</p> <p>2) There is no moral hazard risk.</p> <p>3) No public commercial bank is placed in an advantageous situation with respect to the rest of the commercial banks.</p> <p>4) If the treasury uses active cash management to maintain low and stable balances at the central bank, the direct monetary impact of the treasury's inflows and outflows is minimal, as is the effort the bank must make (and the lower the costs) to minimize the changes in the banking system's liquidity. The effort and the costs of controlling liquidity, in this case, become the responsibility of the treasury or the Ministry of Finance.</p>	<p>1) Risk of the central bank failing to remunerate the TSA cash balance or setting lower-than-market interest rates (lower than those offered by commercial banks). This disadvantage could be reduced, however, if cash is managed actively by maintaining minimum and stable balances at the central bank and investing excess cash in the commercial banks.</p> <p>2) If the treasury fails to engage in active cash management, its cash movements will have a strong and direct monetary effect on the economy (as it is the most important entity with regard to mobilizing an economy's resources) that will force the central bank to</p>

5) Facilitates coordination between fiscal and monetary policy.	undertake significant open-market operations to control
6) Facilitates cost-effective banking arrangements and rapid settlements. The agreement can be reached for the central bank to act as a clearinghouse for government operations, which can speed up settlements.	bank liquidity, thereby affecting the central bank's financial situation. In this case, the cost and the effort to control liquidity will fall to the central bank. If, as a result of these activities, the central bank suffers losses and these are not covered by the government, the bank's independence will be threatened.

Table 3.1. Advantages and Disadvantages of the TSA in the Central Bank (Fainboim et al. 2015)

2) Timely information: Units which responsible for managing TSA should access to information about government's aggregate cash position on time. With having timely information about the availability of cash, cash management units can determine the net cash position of TSA after the collection or disbursement. Thus, they can make better cash plan, and they can make daily operations in the financial markets.⁵

⁵ Cash management unit may have to borrow money from a short-term credit facility to fund the deficit or may choose to invest the surplus cash into short-term investments in order to raise revenues (i.e., investment income) for the government invest money when there is surplus or borrowing.

3) Timely revenue and payment transactions: It is crucial to minimize time-lag in transactions. In a sense, all transactions should be realized in real-time as possible in ideal TSA system. All collections should be transferred into TSA immediately (at least end of the day) and cash should be disbursed from TSA when expenditures are justified. Reducing time-lag in transactions lowers cost of government.

4) Concentration or unified structure: That is the most important feature of TSA because the unified structure of government bank accounts provides a consolidated view of government cash resources and also allows complete fungibility of all cash resources. Just as centralized debt management, cash management should also be centralized to achieve effective cash and debt management. For this feature of TSA, there should not be any public resources that are beyond the oversight of TSA. This feature does not argue that there should not be opened any transit accounts, on the contrary, it argues that many bank accounts can be opened, as long as they are linked with TSA main accounts. Moreover, the feature argues that all balance of government bank accounts should be swept into the TSA at the end of each day.

For this feature, the treasury should be given the power to observe all bank accounts of public institutions and be authorized to open or close bank accounts within the government treasury. However, having the power to authorize opening and closing of bank accounts does not mean that TSA violates institutions' autonomy in terms of payment/collection process. On the contrary, institutions' appropriation and payment process will also be managed by the institutions. The collection of all accounts in one place guarantees that only cash transactions are made within the scope of TSA. Also, with all accounts held in one place, the

public source can be seen as a holistic view and the optimal level of cash buffer can be determined accurately.

5) Fungibility: The notion of fungibility can be expressed as the ability to use the cash surplus of an entity for meeting cash deficit of the other entity. That feature is prerequisite for TSA because TSA grounds on a theory which all government receipts regardless of which entity collects those receipts are transferred into it and all disbursements are made from it. Cash inflows and outflows can be balanced only if all resources are substituted each other. So, fungibility feature is vital to achieve maximum efficiency in cash management. Besides, accounting and banking systems should be designed to ensure public cash resources can be used interchangeably (regardless of whether they are allocated to a particular payment).

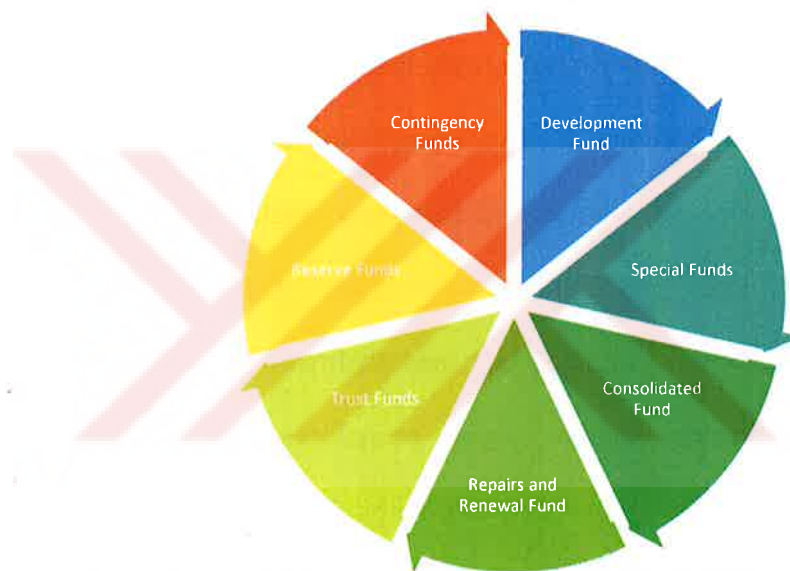
6) Coverage: One of the most important aims of TSA is to ensure full consolidation of cash balances of all government entities. In this regard, TSA coverage should be comprehensive and include all general government cash resources including social security funds and other funds, adding all extra-budgetary funds, autonomous (extra-budgetary) agencies and loans from the multilateral institutions and donor aid resources, excluding government corporations.⁶ A TSA could also be enlarged to cover subnational levels of government and other public institutions by the way of using correspondent accounts.

Comprehensive coverage of TSA enables management of all government cash resources in a centralized manner. More extensive coverage of TSA leads to lower public resources to be managed apart from TSA. Besides, keeping all resources at

⁶ In general state enterprises (businesses) should operate outside the TSA because they work as private corporation so integrated them into TSA may distort them to make their work better.

TSA allows financial transactions to be carried out in a more transparent manner. Having comprehensive coverage of TSA optimizes the cost of government transactions by minimizing the volume and cost of borrowing and lowering any idle balance. Moreover, with extensive TSA, cash management units will access to more cash resources. In the virtue of the scale of economies, comprehensive coverage of TSA ensures that the public source is managed better way by avoiding unnecessary debts (Williams 2013, Fainboim et al. 2015).

Figure 3.2. Ideal Coverage of TSA (PEMPAL 2015)



On the other hand, the function of TSA system should be regulated and supported by legislation because if the function of TSA is guaranteed on a legal basis, TSA system can perform its function effectively. If there is a higher hierarchy of the law that guarantees of the function of the TSA, making an exception in TSA system, which may weaken the operation of a TSA and reduce its benefits, will be more difficult (Fainboim et al. 2015). Notably, the existence of legal regulation of TSA is

even more important in countries where there are a large number of institutions with autonomous structures that may probably object to being inclusive of TSA.

3.3. The Purposes and Advantages of TSA

The aims of TSA, which enables consolidation and optimum utilization of government cash resources, can be listed as follows;

- Enables efficient cash management and ensures effective aggregate control government cash balances,
- Timely payment of public expenditures,
- Collection revenues without delaying,
- Equalization of revenues and expenditures in terms of time and place,
- Allows complete and timely information on government cash resources,
- Helps preparation of accurate and reliable cash flow forecasts,
- Enhances transparency and quality of fiscal data and bank reconciliations,
- Increases fiscal savings or reduces transaction costs (fewer transaction charges, more revenues) within the scope of economies of scales,
- Optimizes the cost of government transactions by minimizing cost of borrowing and opportunity cost of holding idle cash,
- Provides a clear view of national cash situation, financing needs at national level and gives more clarity to public debt management,
- Facilitates efficient payment mechanisms,
- Facilitates timely and more complete accounting statements/reports
- Facilitates accounting of cash flow statements,
- Provides greater transparency in the PFM,

- Provides to manage public resources more efficiently and transparently by monitoring them in a single pool,
- Prevents public cash resources from being idle,
- Improves operational control during budget execution,
- Provides to smooth both regional and temporal cash fluctuations by doing so, it minimizes precautionary reserves against cash flows fluctuations,
- Reduces over-borrowing,
- Gives advantages to central bank to operate monetary policy operations effectively by providing opportunity to follow up cash flows,
- Contributes to improvement of financial markets,
- Provides more accurate accounting and improved reporting,
- Contributes to lower operational risks at a certain level,
- Paves the way transition to modern cash management,
- Regiments government expenditure process and all spending units (Pattanayak and Fainboim 2010, Williams 2013).

On the other hand, benefits of implementing a TSA for government cash management can also be categorized into five areas which are ranged as improved liquidity management, improved payment processing, improved revenue mobilization, improved internal control and improved accountability (Guide to Public Financial Management-USAID 2014).

Benefit Area	Specific Benefits
Improved Liquidity Management	<ul style="list-style-type: none"> • Effective control over aggregate cash balance • Improved cash visibility • Efficient and timely collection and disbursement processes • Improved debt management (realistic cash flow projection) • Significant cost reduction (transaction processing and interest costs)
Improved Payments Processing	<ul style="list-style-type: none"> • Single disbursement account (centralized TSA) • Low cost transactions • Facilitates payment automation through interfaces to operating systems • Allows utilization of modern payment services such as pre-paid cards, electronic funds transfer and direct deposits • Controlled disbursement accounts
Improved Revenue Mobilization	<ul style="list-style-type: none"> • More efficient collection of government revenue • Improved government services through enhanced transaction recording • Improved cash projection • Improved control against theft and fraud
Improved Internal Control	<ul style="list-style-type: none"> • Simplifies the government cash flow to only a few bank accounts, which means fewer bank reconciliations • Limits other agencies from opening bank accounts • Few individuals have access to checks, wires and other payment instruments • Clear segregation of duties
Improved Accounting Processes	<ul style="list-style-type: none"> • Automation of payments allows real-time recording of cash transactions • Allows automated daily reconciliation • Provides easily accessed audit trails • Increases reliability of accounting data

Table 3.2. The Benefits of Implementing TSA (Guide to Public Financial Management-USAID 2014)

Although the aims of TSA is the same for all countries, the TSA methods chosen to reach that aims can differ from country to country. The difference is mainly due to countries' diversified institutional structures, payment infrastructures, banking structures, accounting structures, IT systems and especially technical capacity (Cangöz 2014). Because of this, it is not possible to mention a single TSA model which is convenient for all countries. For example, in some countries, TSA account is held in the central banks of countries, while in some countries, especially in Latin America, the TSA account is held in public banks. Also, working mechanism of TSA can also differ from country to country. For this reason, in the following section, different TSA models will be described.

3.4. TSA Models⁷

Williams (2010) states that there is no single TSA model that is suitable and best for all countries. Therefore, it is not possible to see a uniform TSA system for all countries. Therefore, there could be observed different TSA systems regarding countries' size, development level of banking systems, managerial styles, etc. In the study, TSA models are categorized into two groups according to banking account structure and managerial structure.

3.4.a. TSA Models by Banking Account Structure

3.4.a.i. TSA Model with a Centralized Bank Account Structure

In centralized bank account structure, the TSA is a single bank account (sometimes with subsidiary ledger accounts) within the central bank in general. Such account/accounts are under the responsibility of a central authority like the treasury and its regional offices, or the relevant budget institutions. In either case, all transactions are monitored, recorded in an advanced accounting system, and managed through a well-developed general banking/accounting system (Pattanayak and Fainboim 2011). Centralized bank account structure is more efficient with real-time payment systems (Cangiano 2017).

⁷ In this study, TSA Models are categorized by using information both international applications and relevant papers.

3.4.a.ii. TSA Model with a Distributed Bank Account Structure

In distributed banking account structure, there are several independent bank accounts, which are generally zero-balance and held in a commercial bank, beyond the TSA main account.⁸ Commercial banks provide banking services and related institutions use their bank accounts to realize their own transactions. Any balances in those accounts are automatically swept into TSA at the end of each day. Namely, individual line agencies are permitted to have separate transaction accounts apart from TSA, and they use those account for their transactions. After transactions, if there remains positive balance in the account, positive balances are swept into TSA. However, if there is no any balance in transaction account and approved payments are made after the fund is transferred to that account by the treasury. The central bank consolidates the balances in all those accounts at the end of each day (Pattanayak and Fainboim 2011).

3.4.b. TSA Models by Managerial Structure⁹

3.4.b.i. Centralized (Active) TSA Model

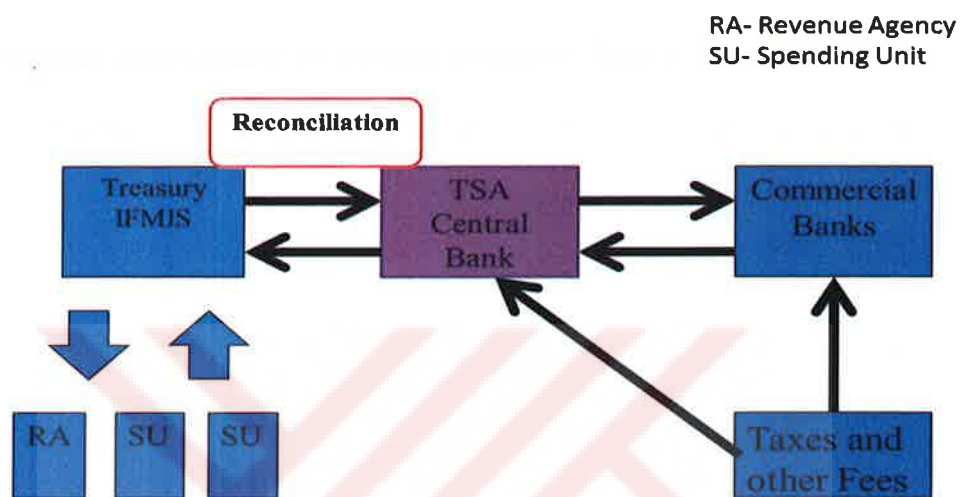
In centralized TSA model, whole authority regarding cash transactions and all operational process of TSA is concentrated at centralized unit such as treasury. In this model, payment requests are prepared by individual budget agencies and sent to treasury for payment. Having cash request and submitting documents to treasury makes treasury responsible to control request and payment process. Namely, treasury is actively involved in all those processes (Allen and Tomassi 2001, Shah 2007). In

⁸ Zero balance account is a bank account of which balances automatically swept off at the end of each day to top account.

⁹ Managerial TSA models were derived from the managerial structure of Treasury models stated in the article entitled "The Evolving Functions and Organization of Finance Ministries" prepared by Allen et al.

the centralized TSA model, all transactions are recognized in general ledger as each spending unit represent a subcomponent of the general ledger (PEMPAL 2015). Centralized TSA model can work with both centralized and distributed banking account structures. In both cases, the TSA main account and transaction accounts are only managed by the treasury or a central authority.

Figure 3.3. The Function of Centralized TSA Model (PEMPAL 2015)



3.4.b.ii. Deconcentrated (Semi-Active) TSA Model

This model can be considered as a transitional model from the passive to the active cash management. The main difference between this model and other TSA models is to which institution and which institution's person responsible payment process. In this model, most of the duties regarding cash are carried out by treasury personnel, who are appointed by treasury to individual budget agencies, on behalf of institutions (Can 2017).

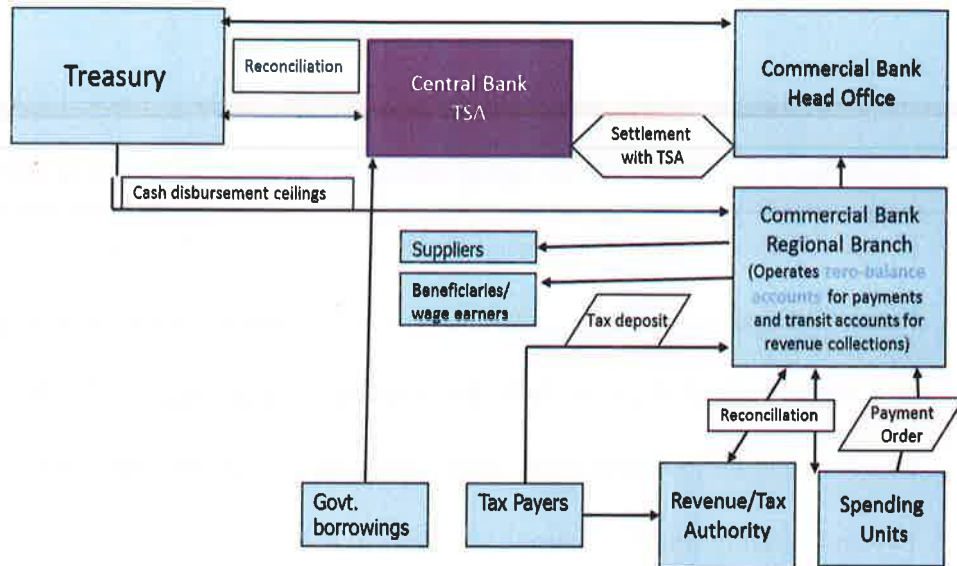
3.4.b.iii. Decentralized (Passive) TSA Model

In the decentralized model, each spending unit carries out its own operations directly and manages their subaccount under TSA instead of treasury. In this model, treasury sets cash ceilings (payment limits) for expenditure units but does not interfere with their cash operations. The payments are directly made to the beneficiaries by these units. As like in other TSA models, there is a sweeping mechanism in this model. Moreover, positive or negative cash balances remaining at the end of the day in the TSA sub-accounts or the transaction accounts are transferred to the TSA main account.

In this model, although cash transaction process is performed by expenditure units directly, treasury takes part in cash management process indirectly. In this model, while treasury makes top-down cash control, spending units carry out almost all tasks related to payment or collection, commitments and accounting processes by themselves and each unit is responsible for their own internal controls. Namely, in this model, cash management responsibilities are shared between treasury and other units. The model can be defined as central cash control with a passive TSA structure (Allen and Tomassi 2001, Shah 2007).

The decentralized TSA model can be seen in countries with either centralized bank accounts structure or distributed bank accounts structure. This model is more widely seen in countries that are geographically difficult to manage from a single center and do not have central payment systems.

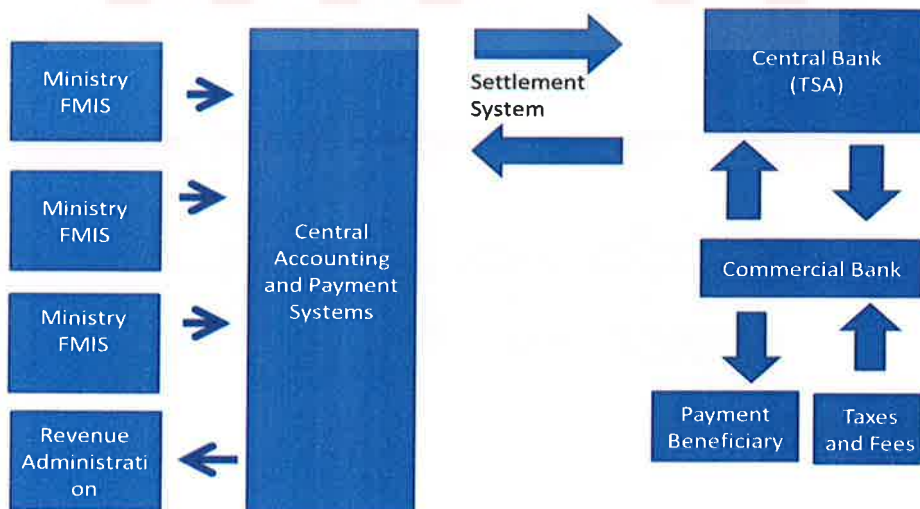
Figure 3.4. The Function of Decentralized TSA Model (Pattanayak and Fainboim 2011)



3.4.b.iv. Hybrid TSA model

This TSA model is a combination of the decentralized and the centralized TSA models. In this model, some TSA operations are carried out by treasury, while others are carried out by expenditure units.

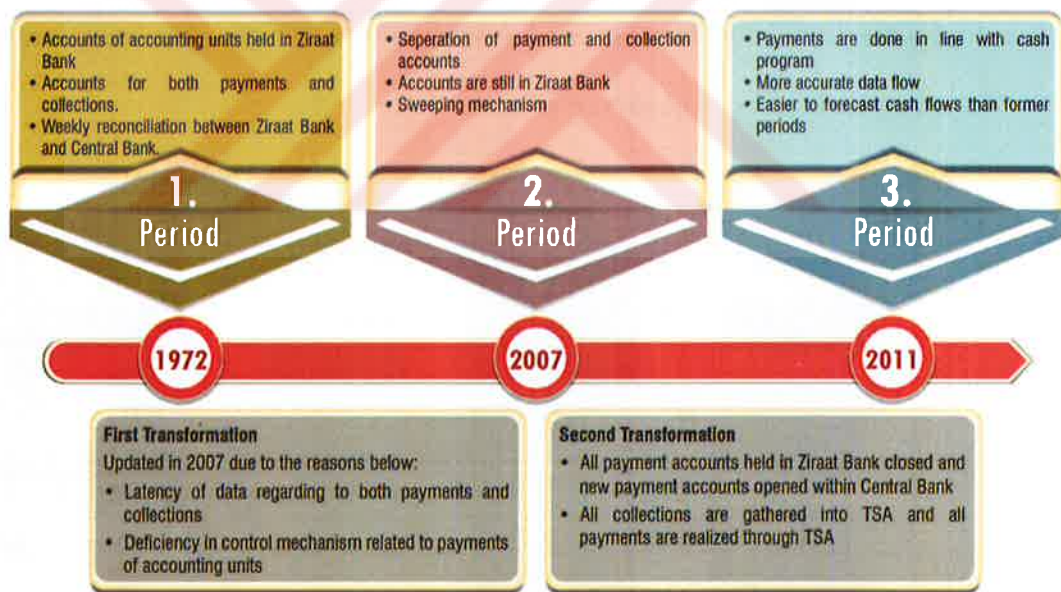
Figure 3.5. The Function of Hybrid TSA Model (PEMPAL 2015)



3.5. TSA Systems in Turkey

TSA system which has been in practice in Turkey since 1972 was initially established upon the need for equilibrating public cash resources in terms of time and place. However, TSA established in 1972 was behind the international practices. In time, TSA system in Turkey has been revised in line with the technological progress, and some radical changes have been taken to converge to the best international practices. Since its foundation, TSA system in Turkey has many small revisions and two outstanding transformations. As seen in Figure 3.6, the evolution of TSA system in Turkey can be summarized in three periods.

Figure 3.6. Transformations of TSA in Turkey (Yaşartürk 2016)



The first transformation was realized in 2007 when First Treasury Single Account (FTSA) system was updated, and new TSA called Treasury Single Current Account (TSCA) established. With TSCA, it was aimed to increase Treasury control over payment and collection processes. However, that aim was not entirely achieved due

to technological impediments. In 2011, through technological advance, the second transformation was realized when Public Electronic Payment System (PEPS) was introduced. With PEPS, payment accounts of spending units transferred from a commercial public bank (Ziraat Bank (ZB)) to the Central Bank of Republic of Turkey (CBRT), and by doing so, the payment structure of the TSA system has become more centralized. Thus, the TSA has become one step closer to international best practices.

3.5.a. Pre-TSA Systems (.... - 1972)

In accordance with the 16th and 18th articles of the Accounting-Public Law No. 1050 and the related articles of the State Accounting Regulation, all collections were being placed into accounting units' teller, and all payments were being made from it.

With reference to those provisions, in the pre-TSA system implementation, accounting units made their payment depending on whether they had cash in their teller or not. Namely, as long as they had money in their teller, they could make their payments. Otherwise, they could not make their payments, and they need to demand cash from the treasuries to make their payments. In the event that some accounting units had money than they needed, they transferred their cash surplus to the Treasury. However, since cash surplus transfer to the Treasury was not scheduled, it could be seen that some accounting units could hold cash quite a while instead of transferring it.

On the other hand, using own cash collections violated the cash concentration features of TSA, and it hampered the Treasury to equalize cash in view of place and time. Since collections and payments were not scheduled on regular time in the pre-TSA system, the Treasury could not entirely fulfill the task of equalization in terms

of time and place. That is why in this system, some accounting units with much more payments than their collections had cash shortage difficulties or vice versa.

That system has been revised in time with the new requirements. Firstly, 18 of central accounting units were authorized to withdraw money from Treasury and make their payments on a daily basis. After that, in parallel with banking sector progress, it was decided to adopt TSA system which was supposed to be a solution to cash shortage problem (Köksal 1989).

3.5.b. First Treasury Single Account System (1972-2007)

On the purpose of timely collection of revenue and realization of expenditures by regional units under the scope of the general budget, FTSA system was initiated in 1972.

The FTSA was adopted for public payments were realized without any delay. After the FTSA system was enacted, units within the scope of FTSA systems were started to make their payments without considering whether they had enough cash in their teller or not.

In the FTSA system, the bank accounts were opened at ZB on behalf of public institutions within the scope of FTSA. These accounts could be utilized both for collections and payments. In other words, accounting units made both collection and payment transactions by using the same bank account.

In the FTSA system, there was a dual banking structure. Both CBRT and ZB were used for transactions. In that time, while treasury accounts and central accounting units' account were located at CBRT, regional units' account was located at ZB which was mainly used as an intermediary in places where the branch of CBRT did not exist.

In the FTSA system, there were no daily cash transfers between the Treasury and accounting units. Cash transfers were realized on a weekly basis after completion of the reconciliation process. In this regard, until cash was transferred to them, accounting units used their funds, which accumulated into their account outside the TSA when their collections were more than their expenditures, to make their payments. When there was no enough fund to make payments, until cash transferring from the Treasury to them, they funded by ZB. In this sense, ZB took a quite important role for working the FTSA system properly.

The FTSA system was based on weekly reconciliation. Reconciliation between accounting units and banks where accounting units' account was held were conducted for all realized transactions within settlement periods including time from Thursday to following Wednesday (06.30.1972 dated and 31109 numbered Directorate of Treasury and General Secretariat of International Economic Cooperation¹⁰ official letter). After the reconciliation period was over, netting balances and corrections related to transactions were carried out. After those processes were completed, whether the Treasury was debtor or creditor was determined. In the situation of that the Treasury was debtor (creditor), the cash was transferred from the Treasury to ZB (from ZB to Treasury). Albeit reconciliation period covered seven days, in practice, it was seen that overall reconciliation process could extend up to twelve days (Karabulut 2013).

Limitations of FTSA systems can be listed as below;

- The FTSA coverage was composed of regional units under the scope of the general budget, so it was behind best international practices in view of coverage.

¹⁰ Hazine Genel Müdürlüğü ve Milletlerarası İktisadi İşbirliği Teşkilatı Genel Sekreterliği (HAZMİİT)

- As above mentioned, in the FTSA system, when accounting unit had balance from collections, that balance was used for its payments without Treasury's control. Besides, accounting units could continue to send payments even if it did not have a balance on its account. That implementation prevented the Treasury to predict public collections and public expenditures in view of amount and time.
- The absence of an automatic sweeping mechanism in the system had also adversely affected cash management. Although the Treasury requested from accounting units to transfer their surplus to the account of Treasury, a regular transfer system did not occur.
- Accounting units within the scope of FTSA system could make their payments even they did not have enough cash since ZB funded them when they did not have enough cash. This made the intermediary bank more vulnerable to cash/credit riskiness. And also, this implementation made the Treasury more passive in the sense of cash management, because it prevented to Treasury to control over public resources.
- That reconciliation period took a long time impeded the Treasury to get information on transactions carried out. It also impeded to predict cash movements in a healthy manner.

3.5.c. Treasury Single Current Account System (2007-2011)

From 1972 to 2007, the TSA system has been revised many times in order to converge to international best practices, but the actual transformation was realized after the adoption of TSCA system, which started to be implemented in 2007. Actually, the studies regarding new TSA was started in 2006, but the designation of

new TSA and organization of its framework was concluded one year later. In 2007, new TSA system named as TSCA system was put into practice with a protocol signed among the Treasury, CBRT, and Ministry of Finance. Since CBRT did not have widespread branches and sufficient technical infrastructure to carry out the system, ZB was authorized with protocol, signed among the Treasury, ZB, and Ministry of Finance, to perform the TSCA system.

Although there were radical changes in the TSCA system compared to the FTSA system, unfortunately, duality payment structure for central and regional units was continued. Therefore, in this study, the TSCA system is analyzed in two parts. First is about regional accounting units and second is about central accounting units.

Compared to the FTSA system, in the TSCA system there were radical changes regarding the functions of regional accounting units. First, with the TSCA, prior accounts used by regional units both for collections and payments were closed and instead, two separate accounts were opened at ZB for each regional accounting units to make their transactions. Second, with the TSCA system, payment and collection accounts were separated from each other, thus accounting were entitle to spend only cash in their payment accounts instead of collection accounts. With this system, all collections were gathered in the main collection account held in ZB and then those collections were transferred to TSA. Third, with this system, it was not allowed to be made any payment by accounting units unless there was no sufficient cash in their payment accounts. As long as there was some cash in their payment accounts, cash was transferred to the beneficiary accounts through ZB. Thus, it can easily say that the Treasury with TSCA system could control over cash flows better than before. In the event of problems in the payment process, the cash to be transferred was returning to the related payment account and then was swept back to TSA.

There were also radical changes to the central accounting units. First, with the adoption of TSCA system, each central accounting units started to have three separate accounts in the CBRT called as domestic payment account, external payment account, and collection account. Central units made their all transactions by using these three accounts. Second, with the adoption of TSCA system, accounting units had the opportunity to transmit cash requests to the Treasury through the electronic accounting system of Say2000i.¹¹ Moreover, the Treasury had the opportunity to transfer required cash to accounting units' account according to cash plan and program prepared based on those units' cash demands. Third, there was a sweeping mechanism also for central unit's accounts, but it was slightly different from regional accounting unit process one. In central accounting unit process, firstly the collections were accumulated in the collection accounts at CBRT rather than at ZB, and then those gathered collections were transferred to the TSA on the same day or following day.

3.5.d. Public Electronic Payment System (2011-...)

In time, in parallel with technological improvement, the payment system has been revised for managing cash efficiently. Public Electronic Payment System (PEPS) started to be officially implemented in 2011 with the promulgation of the regulation regarding PEPS in the Official Gazette.

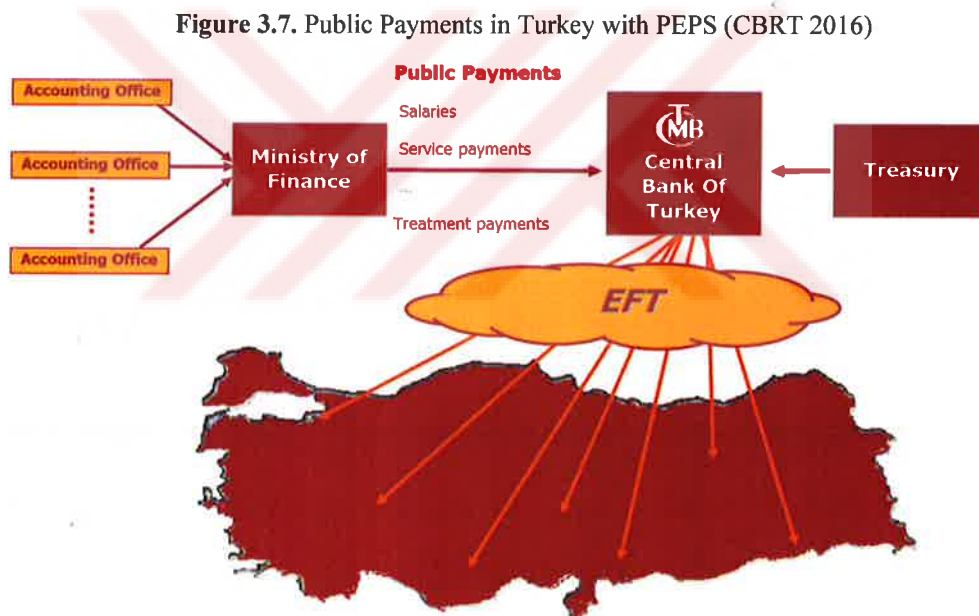
With PEPS, it is aimed to make payments on time and set the ground for making the transactions that were made by hand in the past electronically. PEPS is developed to transfer public payments electronically. The process is fully automated, including the production of bookkeeping records, creation and sending of EFT messages. It

¹¹ Say2000i is an accounting automations system in Turkey.

also provides the user with the real-time inquiry of payment status, bank statements and receipts electronically.

PEPS introduced some important renewals for the public payment system. First, payment accounts in ZB were closed, and those accounts have been opened in CBRT. Thus, electronic connection between spending units and ZB were terminated, and the payment instructions started to be made via CBRT. Second renewal is that the tax offices not included in TSCA started to be included in the scope of TSA via PEPS. Third and the most important renewal is that PEPS abolished dual payment structures used for central accounting units and regional accounting units.

The function of PEPS can be showed and summarized as below;



Spending units send payment document to accounting offices. Accounting offices recognize payment document and demand cash from Treasury by using the Public Expenditure and Accounting Information System (KBS)¹² software system provided

¹² KBS can be defined as an automation system in which the financial transactions of spending and accounting units are collected. It covers budget process, appropriation, accrual, expenditure, accounting, reporting and monitoring all stages, final accounts. It is controllable, convenient for internal control and electronic audit, and is operated in a rapid and reliable environment.

by the Ministry of Finance. They create payment orders by KBS. The system uses PEPS web services at the background to transfer and track the status of the payment orders. At each day, according to its cash plan and program, the Treasury sends its payment orders to CBRT which distributes the necessary amount of money for accounting offices to make their daily payments. After the Treasury payments are completed, the accounting offices have the money, and their payments are sent electronically all around Turkey by Electronic Funds Transfer (EFT) system.

On the revenue side, with the new system, all revenues which are tax and non-tax are transferred to Treasury accounts held at the CBRT. However, transfer time from collection to Treasury accounts vary by collection methods. For instances, while central accounting units, authorized grand tax offices transfer their collections directly to the TSA, other tax offices and local accounting units transfer their collections indirectly. They transfer their collections to relevant accounts at ZB firstly. Then, collections received until 17:00 via EFT/transfers of accounting units/tax offices are transferred to the TSA by ZB within the same day. Collections received after 17:00 are transferred next morning until 9:30. On the other hand, while the revenues collected by accounting units and tax offices are transferred to the TSA at the same day or following day as the mentioned above, the banks' collections are transferred with delay. The lagged transfers of banks' collections impede TSA efficiency.

➤ The structure of TSA is fully central, and it contains regional sub-accounts and units. Regional Treasury units meet all cash demands by public institutions via regional sub-accounts. Any balances in TSA's regional sub-accounts are being swept away to TSA main accounts at the end of the day.

3.6.b. United Kingdom

➤ TSA is held at the central bank. However, sub-accounts of TSA can be held at commercial banks.

➤ The coverage of TSA is composed of central government budget and non-budgetary funds. Such public institutions like state economic enterprise and local administrations are held to exclude from TSA.

➤ There are four main accounts in the UK. Those are called Consolidated Fund, National Fund, Contingencies Fund and Exchange Equalisation Accounts respectively. While the Consolidated Fund used to receive government receipts which fund is used for making public payments, the National Loans Fund is used for government borrowing and lending transactions. Moreover, Contingencies Fund is used to meet temporary cash deficiencies. And lastly, The Exchange Equalisation Account (EEA) is used for “checking undue fluctuations in the exchange value of sterling” and it is used to “secure the conservation or disposition in the national interest of making payments abroad; and for certain purposes arising out of the UK's membership of the IMF”. It holds the UK's reserves of gold, foreign currencies and Special Drawing Rights (SDRs) (Contingencies Fund Account-National Audit Office 2015).

- Any surplus of those funds can be used for meeting one another's deficit in the event funding gap. For example, the excess funds in the Consolidated Fund are transferred to the National Debt Fund so that unnecessary debts are prevented.

3.6.c. Australia

- While TSA is located at the central bank, spending units have accounts in commercial banks.
- Australia has a hybrid TSA structure which hosts centralized and decentralized system.
- The coverage of TSA is limited to general administration sector.
- In accordance with cash demands from spending units, cash transfer is made from TSA to subaccounts (spending units' accounts). Any balances in these accounts are swept into main accounts at the end of the day, and the swept resources are transferred to the same accounts the next day.

3.6.d. Sweden

- In Sweden, there is a decentralized TSA system.
- TSA is managed by the debt office and is held by central bank
- TSA covers central government administrations and social security fund.
- In Sweden, there are about 270 central government authorities and each authority can open accounts on its own behalf in different banks. Each authority can make a payment in return for transactions they make through that accounts.
- The bank accounts of the authorities are accumulated in the main accounts at which are located commercial banks and are balances are reconciled with the TSA in the central bank. That operation is repeated three times a day.

- Accounts held in commercial banks are zero-balance accounts. At the end of the day, any balances in these accounts are swept into TSA. Interests are earned on cash resources which are held by the central bank.

3.6.e. New Zealand

- In New Zealand, there is a central TSA system.
- While TSA covers general government administrations, such public institutions like state economic enterprise are excluded from TSA.
- Though TSA is held in the central bank, in accordance with chosen payment methods, different banks can be used. For example, while wholesale payments are made via central bank, retail payments are made through commercial banks. However, whatever banks are chosen for any payment, at the end of the day, all balances are swept into TSA.

3.6.f. Brazil

- In Brazil, there is a central TSA system, and TSA is held at the central bank.
- TSA covers federal government and social security institutions. Besides those institutions, it also covers foreign currency special accounts opened for the purposes of foreign credits, etc.
- Apart from main TSA account, each state has its own TSA. All revenue collections through those TSA accounts are transferred to TSA main account on the same day. Interest is earned from accounts which are located at the central bank.

- There is a central payment system, so all payments are made by Treasury directly. Payment and collections transactions are made through public banks. In some exceptional cases, commercial banks are also used for those transactions.

3.6.g. Russian Federation

- Russian Federation has a central TSA system.
- TSA covers general government administrations, and TSA is located at the central bank of Russia. In addition to TSA, regional Treasury units have collection and payment accounts at the central bank.
- Upon cash request of regional Treasury units, cash transfers are made from TSA to regional Treasury units' payment accounts. Following the transfer, they use their accounts to make payment to beneficiaries. Namely, regional Treasury units generally make direct payments to beneficiaries rather than indirect payments which payments are made by regional Treasury units to spending units and then spending unit make payment to beneficiaries. However, in some exceptional cases, there can be seen indirect payments.
- Treasury funds are remunerated by using repo/reverse repo transactions.



CHAPTER IV

THE ANALYSIS OF EFFECT OF EXPANSION OF TURKISH TREASURY SINGLE ACCOUNT SYSTEM ON PUBLIC FINANCIAL MANAGEMENT IN TURKEY

4.1. The Purposes of Expansion of the TSA in Turkey

In many country practices, TSA covers not only the central government but also all government cash resources including general budget institutions, special budget institutions, regulatory bodies, social security institutions, public economic enterprises, revolving funds, special accounts, extrabudgetary funds and other public institutions. However, TSA coverage in Turkey is limited only with the central and provincial units of general budget institutions. Since the TSA coverage in Turkey is limited to general budget administrations, not covering special budget or other administrations, the substantial amount of public cash resources has been managed outside of the TSA, thereby out of control of the Treasury. In this context, TSA coverage in Turkey should be extended so that substantial amount of government cash resources can be managed in centrally and efficiently.

Besides, having extensive TSA is crucial to overcome the shortcomings of current practice and to achieve the ideal TSA management model as required by modern cash management. As short, in literature, it is alleged that extensive TSA ensures that public resources are managed more effectively.

The scope of existing TSA in Turkey should be extended for the three primary purposes mentioned below:

- ✓ Enabling public resources to be utilized more efficiently through economies of scale by collecting them in a single pool,
- ✓ Reducing and avoiding unnecessary borrowing by allowing the Treasury to use substantial amount of cash,
- ✓ Ensuring that public resources are remunerated with the appropriate instruments with the optimum rate of return (Can 2017).

4.2. Coverage

Having the extension of coverage of TSA is crucial to reach effective public financial management. The creation/extension of TSA should be a significant undertaking, especially, for those countries that have traditionally dispersed cash management structure.

In literature, there is a prevailing view that the ideal coverage of TSA should be extensive as possible to cover all public accounts except public enterprises' account which should be excluded from the scope of TSA since public enterprises perform their activities in more market-oriented manner.

Given examples of international best practices in view of TSA, the general approach is that TSA coverage should be adjusted to cover general government sector, or at least central government sector (Figure 4.1). Also, all accounts (project accounts, special accounts, etc.) should be assessed within the TSA system regardless of which purposes they are opened. Moreover, in many country practices, we see that TSA covers not only the central government but also social security institutions, public economic enterprises, revolving funds, special accounts,

extrabudgetary funds and other state institutions and organizations. Since Turkey's TSA coverage is limited only with the central and provincial units of general budget institutions, compared to selected countries, it falls behind them in view of the coverage of TSA (Can 2017).

Figure 4.1. Selected Countries' TSA Scope



*Russian Federation is planning to manage local administrations' cash balance within the scope of TSA in 2019.

Before reviewing Turkey's TSA coverage, we need to analyze the financial structure of Turkish Public Sector at first. Public institutions in Turkey are classified as; general government administrations and state-owned enterprises (Figure 4.2). However, Law No 5018, known as Public Financial Management and Control Law, dated on December 10, 2003, has recognized a sectoral classification for general government sector in accordance with international standards. According to Law No. 5018, general government sector in Turkey consists of central government administrations, social security institutions, and local administrations. The central government is also composed of three subgroups that are i) general budget

institutions categorized in Law No. 5018 as chart I, ii) special budget institutions categorized in Law No. 5018 as chart II and iii) regulatory and supervisory agencies categorized in Law No. 5018 as chart III, respectively.

In addition to recognizing a sectoral classification for the general government sector, Law No. 5018 has also regulated unity of Treasury by Article 6 which paves the way implementation of the TSA as seen below.

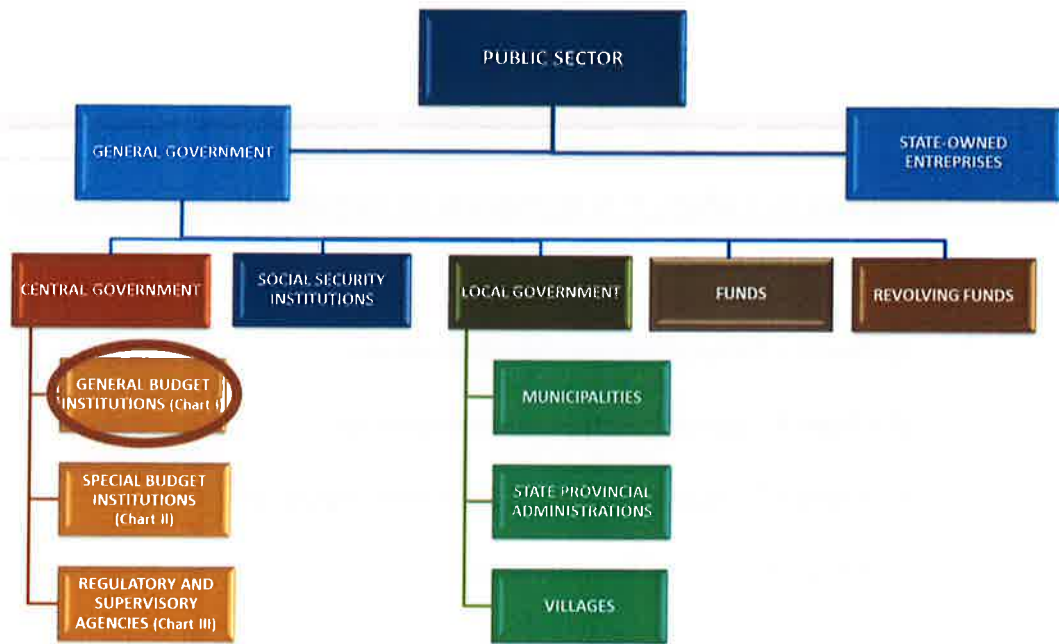
“The revenues, expenditures, collections, payments, cash planning and debt management of public administrations within the scope of central government shall be administered so as to ensure the unity of treasury.

All revenues of public administrations defined in chart I of this Law shall be deposited to the Treasury cash offices, and their expenditures shall be paid thereof. These administrations shall not have their own cash offices.

..... Upon receiving opinions of the Undersecretariat of Treasury and Central Bank of Turkey, the Ministry of Finance is authorized to determine procedures and principles for expansion of the scope of this implementation in a way to cover other public administrations within the scope of the general government into this implementation.”

Albeit Article 6 of the Law guarantees implementation of the TSA, it constrains the coverage of TSA. According to this Law, the TSA could be applied only to general budget institutions.

Figure 4.2. The Structure of Public Sector in Turkey



○ The circle represents coverage of TSA in Turkey

As depicted in Figure 4.2, the public sector in Turkey is divided into two parts as general government sector and state-owned enterprises. Taking into the structure of public sector in Turkey, the TSA could be extended to cover almost all general government sector; however, the scope of TSA in Turkey is quite narrow.

Moreover, existing narrow scope of the TSA is further shrunk by special laws and agreements, which allow public institutions to open bank account out of the TSA, and some protocols which allow banks to collect public revenues on behalf of the government and transfer their collections with a delay to TSA. For example, in accordance with revenues collection protocols, signed among Ministry of Finance and banks, banks can collect money on behalf of the government and keep those collections for a while (approximately 3,7 days) instead of transferring to Treasury simultaneously in response to providing collection services in the name of government.¹³ The Treasury does not pay any bank charge in response to collection services since commercial banks keep their collected cash amounts for a while. As a

¹³ This information is obtained from PEMPAL Virtual Library.

result, these kinds of protocols result in the substantial amount of public resources to be managed out of the scope of the TSA for a while (PEMPAL 2016, Can 2017).

Considering revenue and expenditure structure and budget types of public institutions in Turkey, it is appropriate to include following institutions within the scope of the TSA system:

- i) Chart I - General Budget Administrations
- ii) Chart II - Special Budget Administrations
- iii) Chart III - Regulatory and Supervisory Agencies
- iv) Chart IV - Social Security Institutions
- v) Extra-Budgetary Funds (Exclude Unemployment Insurance Fund (UIF), Saving Deposit Insurance Fund (SDIF) and Turkiye Wealth Funds (TWF)
- vi) Revolving funds and special accounts opened by institutions should also be included in the TSA system.

On the other hand, we do not propose to evaluate some public institutions' accounts within the framework of the TSA. Main reasons for why we exclude them will be expressed in detail in later. These institutions can be listed as:

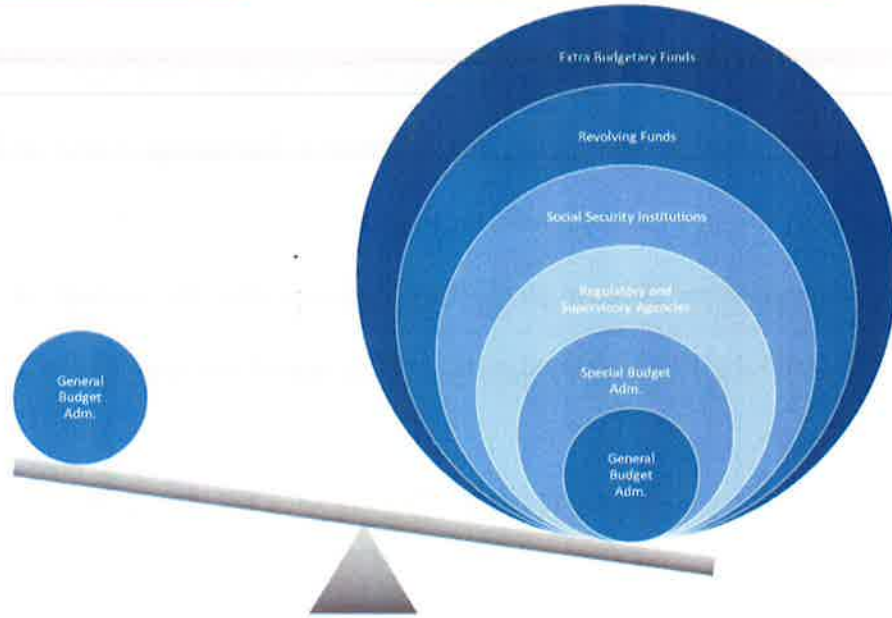
- i) Local Administrations
- ii) State-Owned Enterprises
- iii) Public Banks and Other Public Enterprises
- iv) UIF, SDIF, and TWF
- v) Other Public Institutions and Organizations (such as Natural Disaster Insurance Institution (TCIP), Agricultural Insurance Pool (AIP), etc.).

Even though we do not suggest including some institutions in the TSA system, the recommended new TSA system is sufficiently extensive compared to the current TSA (Figure 4.3).

Figure 4.3. Comparison Between Current and Proposed TSA Systems

Existing scope of TSA in Turkey

Recommended scope of TSA in Turkey



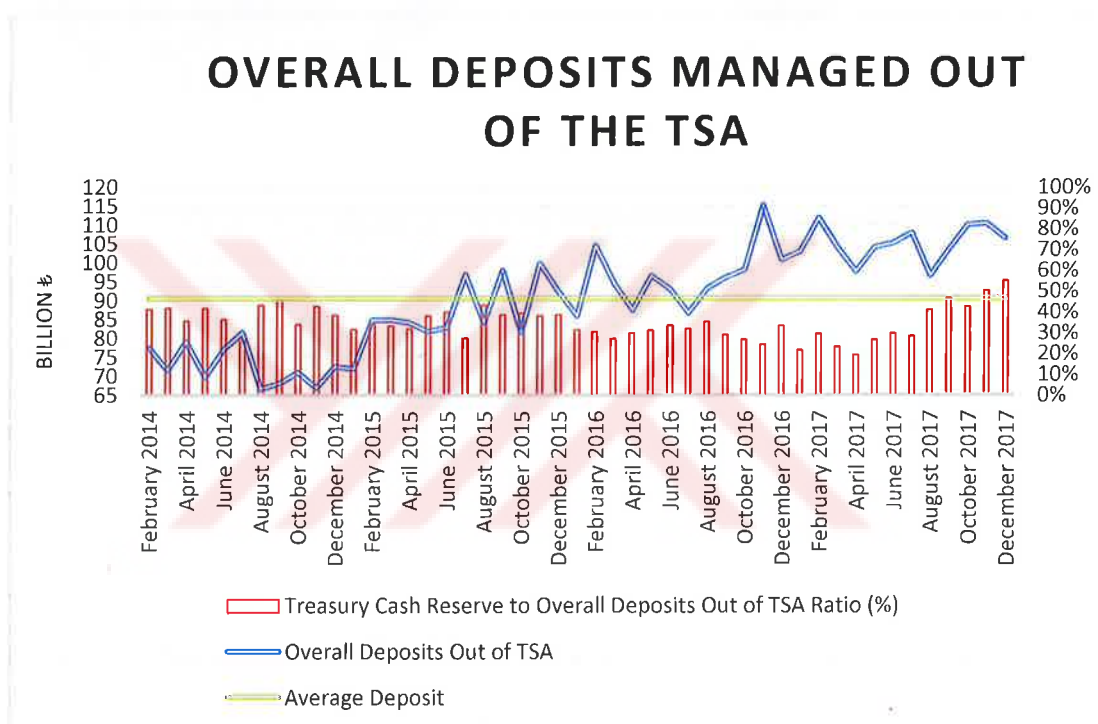
Graph 4.1 shows the evolution of the overall public deposits managed out of the TSA system during 2014-2017.¹⁴ According to the Deposits and Securities Statistics of Institutions within the Scope of General Communiqué for Public Treasurership, total deposits (as of the last business day of each month) out of the scope of the TSA was approximately ₺ 90.5 billion on average.¹⁵ During the period 2014-2017, total deposits managed out of the scope of the TSA fluctuated between ₺ 115.2 billion and ₺ 66.5 billion (Graph 4.1).¹⁶ Total deposits managed out of the scope of the TSA but recommended to be included in the TSA was ₺ 53.6 billion on average. During the four-year period, total deposits, currently managed out of the scope of the TSA but

¹⁴ In this study, we analyze public deposits from February in 2014 to December in 2017 since statistic which indicate financial resources of the public institutions as deposits have been disseminated monthly since February, 2014.

¹⁵ In this chapter, used data regarding deposits of institutions are on monthly basis and cover the period 2014-2017. These data, which reflect deposits of institutions at the last business day of relevant months, indicate the financial resources of public institutions which are held at current and/or participation accounts denominated in Turkish Lira and in foreign currency.

¹⁶ The total deposits represented in Graph 4.1 may be overrated since the total deposits might include some collections of Revenue Administrations which are later transferred to TSA. So, to determine net amount, which managed out of TSA, deposits of Revenue Administrations should be weeded up from total deposits.

recommended to be managed within the scope of the TSA, had a similar pattern with total deposits represented in Graph 4.1. Starting with ₦ 43.5 billion at the beginning of the four-year period, the total deposits ended up with just over ₦ 66 billion. Total deposits for the four years had followed a fluctuating course within the range of ₦ 38.2 billion - ₦ 73.8 billion. Especially, total deposits had remained above the average since August 2016. This indicates that the amount of cash reserve held beyond the TSA system significantly increased recently (Graph 4.2).¹⁷

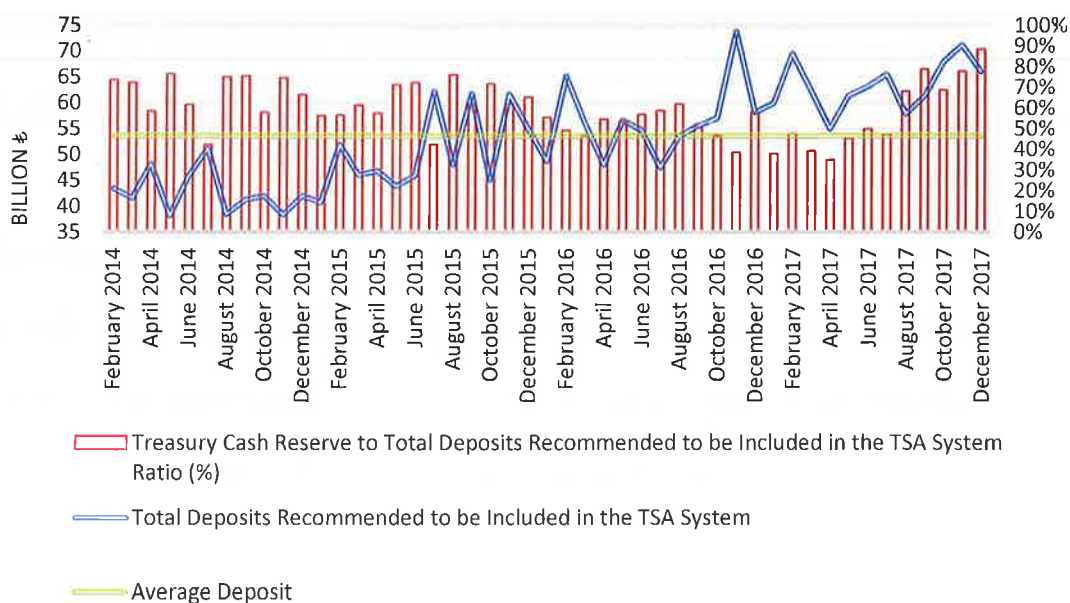


Graph 4.1. Overall Deposits Managed Out of the Scope of the TSA

As we understand from Graph 4.2, there is a substantial amount of cash reserve that could be managed by the Treasury following the suggested the extension of the current TSA system. The standard deviation of that amount over the four years is calculated as ₦ 9.6 billion.

¹⁷ The total deposits represented in Graph 4.2 may be overrated since the total deposits might include some collections of Revenue Administrations which are later transferred to TSA. And they also include deposits of UIF and SDIF. So, to determine net amount, which will be managed by Treasury if scope of TSA is extended, deposits of Revenue Administrations, of UIF and of SDIF should be weeded up from total deposits.

TOTAL DEPOSITS RECOMMENDED TO BE INCLUDED IN THE TSA



Graph 4.2. Total Deposits Recommended to Be Included in the TSA

4.2.a. Financial Position of Institutions Recommended Being in the TSA Scope

4.2.a.i. General Budget Administrations (Chart I)

General budget refers to the budgets of public administrations, which are included in the chart I of Law No 5018, known as Public Financial Management and Control Law, dated on December 10, 2003, and which are under the legal entity of the government. General budget administrations do not have their own revenues obtained from general budget administrations' activities, such as public duties and services (Public Financial Management and Control Law 2003 (No.5018)).

The fundamental duty of general budget administrations is to provide public goods and services to their citizens in the best way. Since they do not reacquire own revenue in return for their services, the cost of providing services is met with their appropriation allocated within the budget of public administrations instead of their

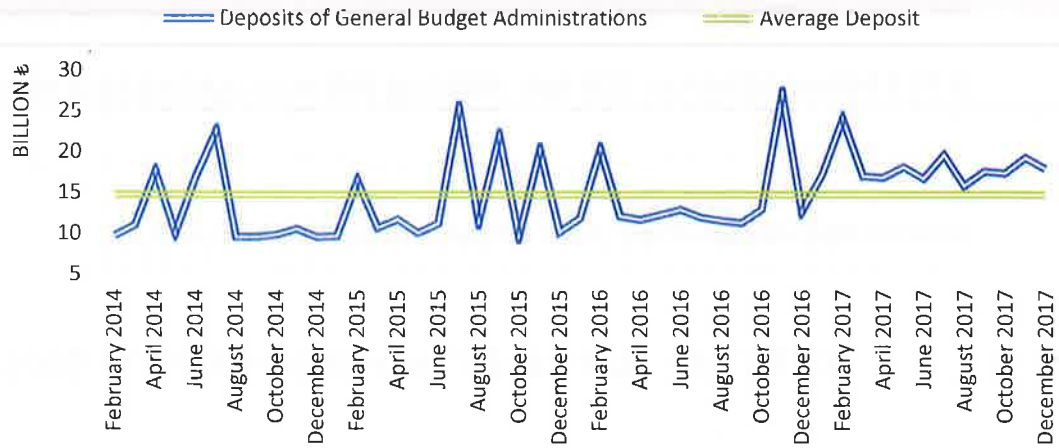
own revenue. In short, revenues or collections of those administrations are recorded as general budget revenues instead of their own revenues and expenditures of those administrations are financed by the Treasury.

Naturally, since they do not have own revenues and their expenditures are met by the Treasury, there should not be any bank accounts belonging to general budget administrations apart from the TSA. In general, respective administrations have payment and collection accounts held at CBRT or ZB. However, such administrations may open special accounts excluded from the TSA in case of permission of relevant legislation and subject to the approval of the Treasury and Ministry of Finance.

The pattern of total deposits (as of the last business day of each month) of general budget administrations managed out of the scope of the TSA is shown in Graph 4.3. We observe that during 2014-2017, the average amount of deposits of general budget administrations out of the scope of the TSA was approximately ₺ 14.7 billion. Over the four-year period, total deposits reached a peak (₺ 27.2 billion) in November 2016, whereas they bottomed out (₺ 9.6 billion) in December 2014. Although deposits of general budget administrations are managed within the scope of the TSA, a substantial amount ₺ 14.7 (approximately) billion per month is excluded from the TSA based on special laws and agreements which allow to these institutions to open accounts out of the scope of the TSA (Graph 4.3).¹⁸

¹⁸ Data regarding General Budget Administrations includes data regarding deposits of Revenue Administrations. These deposits actually are not out of scope of TSA; however, sometimes transferring collections from Revenue Administration to TSA are realized with delay because of some banking protocols. So, these deposits are sometimes quite high before transferred to TSA. In this context, to make more accurate analysis, there need to be weeded up those deposits of Revenue Administrations from General Budget Administrations.

GENERAL BUDGET ADMINISTRATIONS*



*Undersecretariat of Turkish Treasury is excluded.

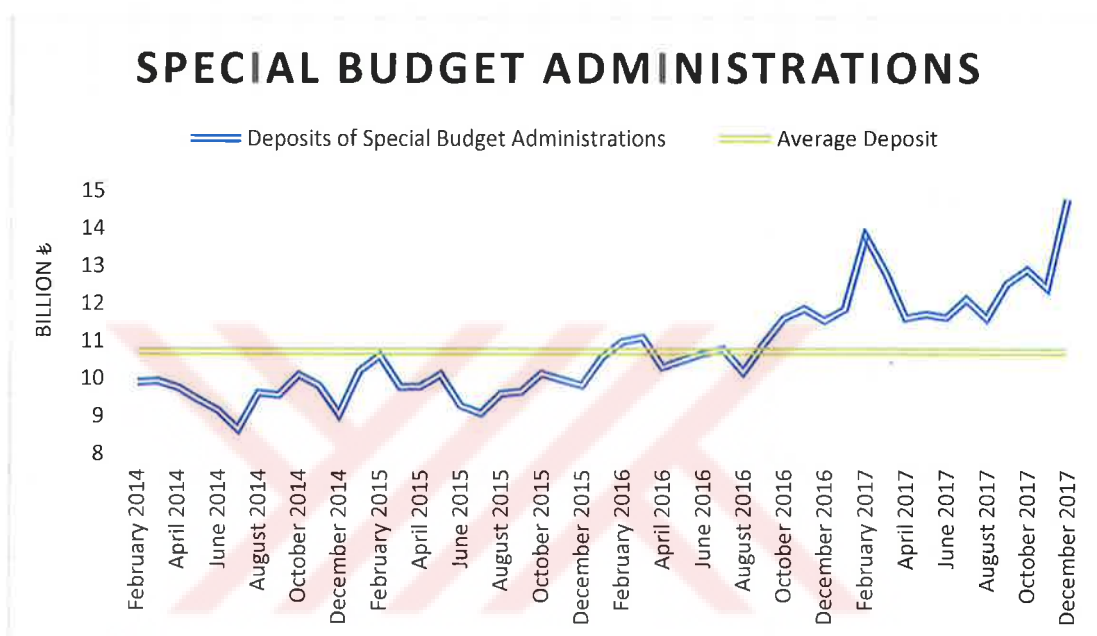
Graph 4.3. Deposits of General Budget Administrations

4.2.a.ii. Special Budget Administrations (Chart II)

Law No. 5018 describes special budget as “*Special budget refers to the budget of each public administration, which is included in chart II of this Law and established as affiliated or related to a ministry for the performance of a defined public service, to which revenues are allocated, and which is authorized to spend from such revenues, with the establishment and operation principles arranged through special law.*” (Public Financial Management and Control Law 2003 (No.5018)).

Since special budget administrations have their own revenue, their expenditures are supposed to be covered by their income. However, many special budgetary administrations are unable to cover their expenditures with own incomes. So, in addition to own revenues, these administrations receive specific appropriations in the name of Treasury aid, which are like transfers from the general budget to specific budget and are allocated for these administrations in the budgets of the relevant ministries.

The pattern of total deposits (as of the last business day of each month) of special budget administrations is depicted in Graph 4.4. We observe that during 2014-2017, the average amount of deposits of special budget administrations was approximately ₺ 10.7 billion. Moreover, this item started to follow an upward trend recently. Over the four-year period, total deposits reached a peak (₺ 14.8 billion) in December 2017, whereas they bottomed out (₺ 8.6 billion) in July 2014 (Graph 4.4).



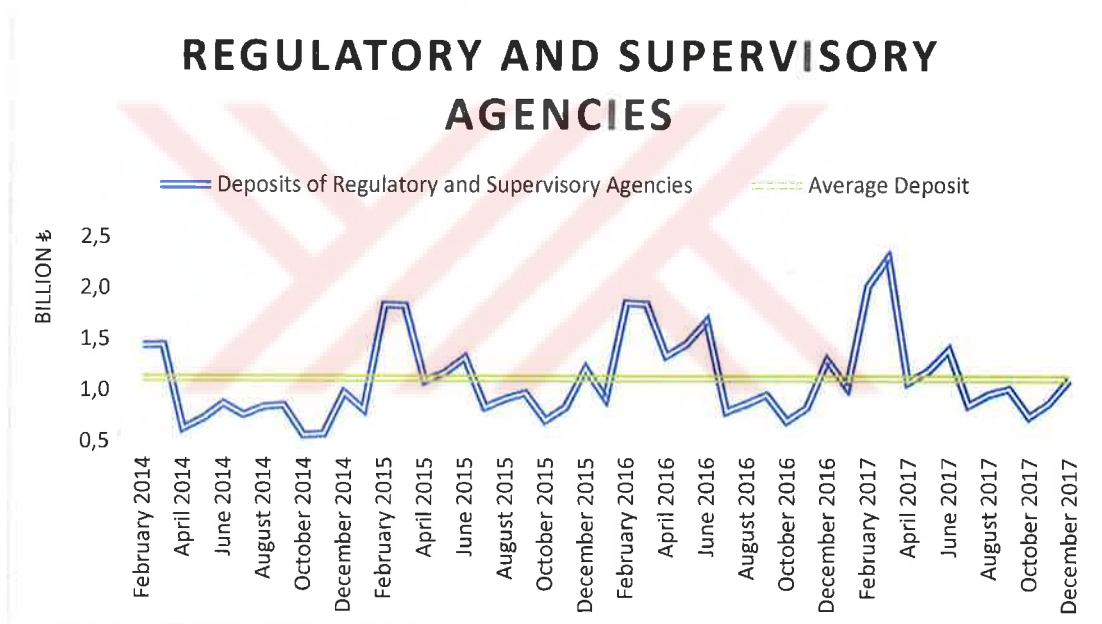
Graph 4.4. Deposits of Special Budget Administrations

4.2.a.iii. Regulatory and Supervisory Agencies (Chart III)

Regulatory and supervisory agencies (RSAs), which are included in chart III of Law No. 5018, are established in order to regulate different types of markets and supervise and monitor market activities in accordance with regulations. Law No. 5018 defines their budget as “Regulatory and supervisory agency budget is the budget of each regulatory and supervisory agency, which is included in chart III of this Law and established in the form of board, agency or supreme board by special laws.” (Public Financial Management and Control Law 2003 (No.5018)).

RSAs have their own incomes like special budget administrations. They can use their revenues obtained from their activities for their expenditures. Besides, in accordance with the 78th article of Law no. 5018, any RSA with cash surplus has to transfer that surplus to Treasury accounts each quarter.¹⁹

The pattern of total deposits (as of the last business day of each month) of the RSAs recommended to be included in the TSA is shown in Graph 4.5. Over the four-years, the average value of deposits of the RSAs revolved around approximately ₺ 1.1 billion. In that period, total deposits reached a peak (₺ 2.3 billion) in March 2017, whereas it bottomed out (₺ 0.6 billion) in October 2014 (Graph 4.5).



Graph 4.5. Deposits of Regulatory and Supervisory Agencies

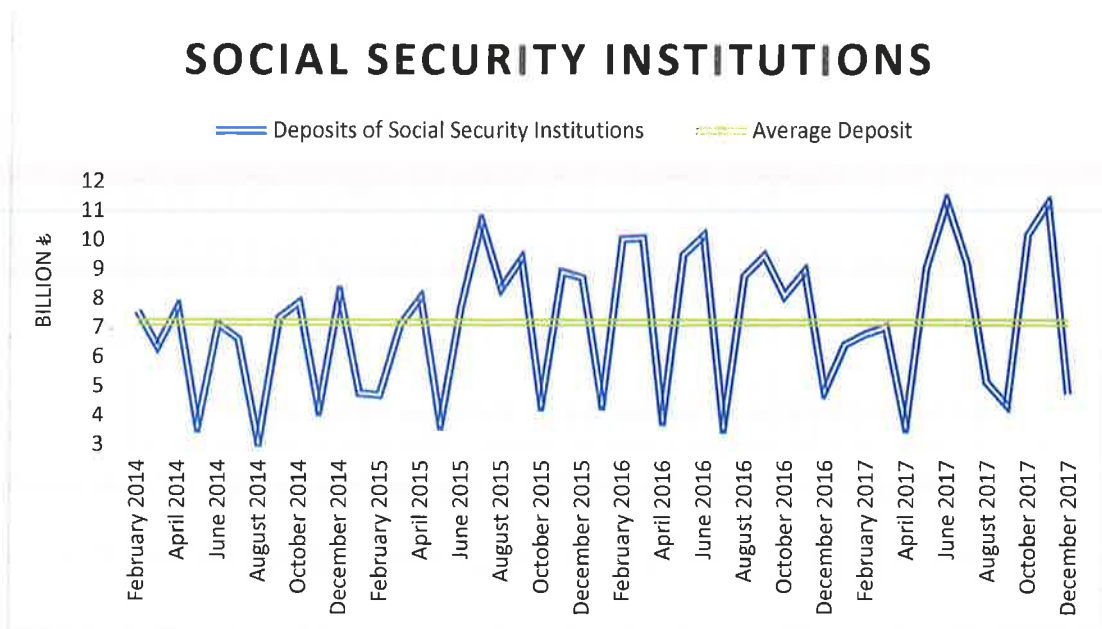
¹⁹ This article states that “Revenue surplus of the RSAs for each quarter shall be transferred to the general budget until the fifteenth of the following month ... If those amounts are not paid on time, the unpaid amounts are monitored and collected with a late payment interest charged according to the provisions of the Law No. 6183.”

4.2.a.iv. Social Security Institutions (Chart IV)

Social security institutions refer to public institutions defined in chart IV of Law No. 5018. “Social security institution budget refers to the budget of each public administration, which is included in chart IV and established by law to provide social security services.” (Public Financial Management and Control Law 2003 (No.5018)).

Social security institutions aim to help citizens who are retired or unemployed, etc. Social security institutions have own revenues like special budget administrations and RSAs. The main revenues of those institutions can be expressed as social security premiums, social security contributions, etc. However, like many special budgetary administrations, social security institutions are also unable to cover their expenditures with own incomes. So, in addition to own revenues, these institutions receive specific appropriations in the name of Treasury aid to make their expenditures on time.

The evolution of total deposits (as of the last business day of each month) of the social security institutions is figured out in Graph 4.6 for the 2014-2017 period. The average amount of deposits of the social security institutions was approximately ₺ 7.2 billion. During the four-year period, the trend of total deposits exhibited sharp fluctuations. The gap between the peak (₺ 11.4 billion) and through (₺ 3.1 billion) of deposits of social security institutions was roughly ₺ 8.3 billion (Graph 4.6)



Graph 4.6. Deposits of Social Security Institutions

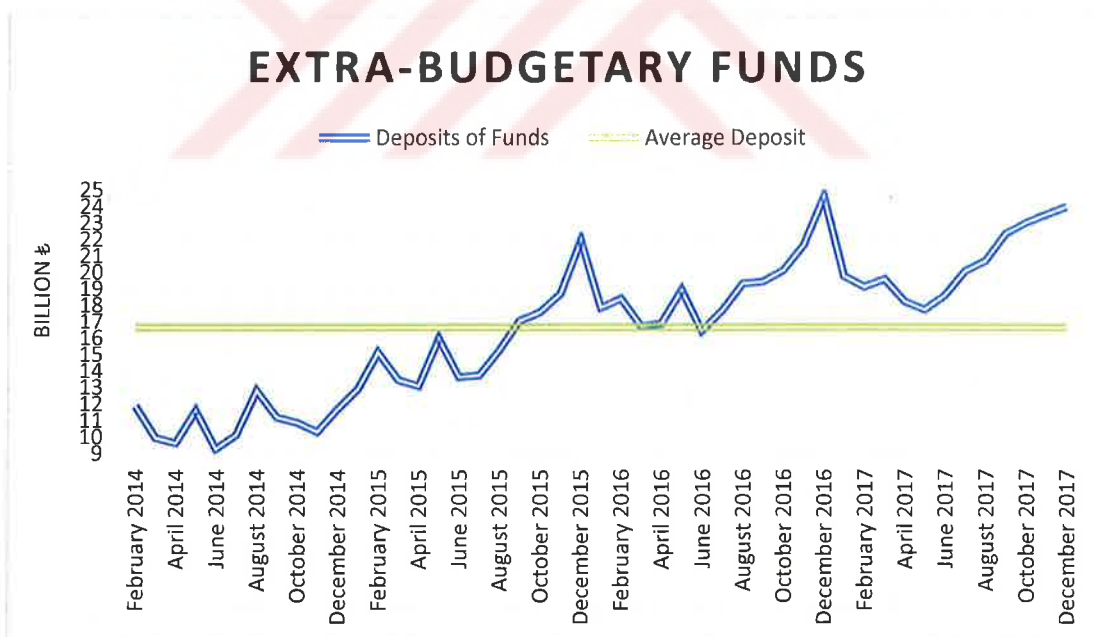
4.2.a.v. Extra-Budgetary Funds

The extra-budgetary funds (EBFs) refer to public resources and government transactions that are not included in the annual budget. They generally have a legal status independent of government ministries and departments (Allen and Radev 2006). Extra-budgetary funds are created for different purposes. For example, they may be created to support development programs and reduce the impact of volatile revenue on the economy, etc. In Turkey, there are several extra-budgetary funds used for different purposes such as Defence Industry Support Fund, Privatization Fund, Turkiye Wealth Fund, etc.

In international good practices, it seems that most of the extra-budgetary funds are included in the TSA, which are mainly set up for the financing of current expenditures. However, it is recommended to exclude some EBFs from the TSA, which have a potential to make a long-term investment. Especially, sovereign wealth funds should be excluded from the TSA because such funds can invest in financial

instruments which offer much higher returns and with low-risk levels. Compared to sovereign welfare funds, a typical TSA can use its resources in limited investment instruments. In this respect, it is better to manage these funds with a separate investment strategy rather than within the scope of TSA. Consequently, EBFs like UIF, SDIF, and TWF should be excluded from TSA in Turkey. However, the rest of the funds should be evaluated within the scope of the TSA.

The pattern of total deposits (as of the last business day of each month) of the EBFs is shown in Graph 4.7. The average value of deposits of the EBFs was roughly ₺ 16.6 billion. During the four-year period, total deposits exhibited a significant upward trend with fluctuations around this trend. Furthermore, over the four-year, total deposits reached a peak (₺ 24.6 billion) in December 2016, whereas they bottomed out (₺ 9.2 billion) in June 2014 (Graph 4.7).

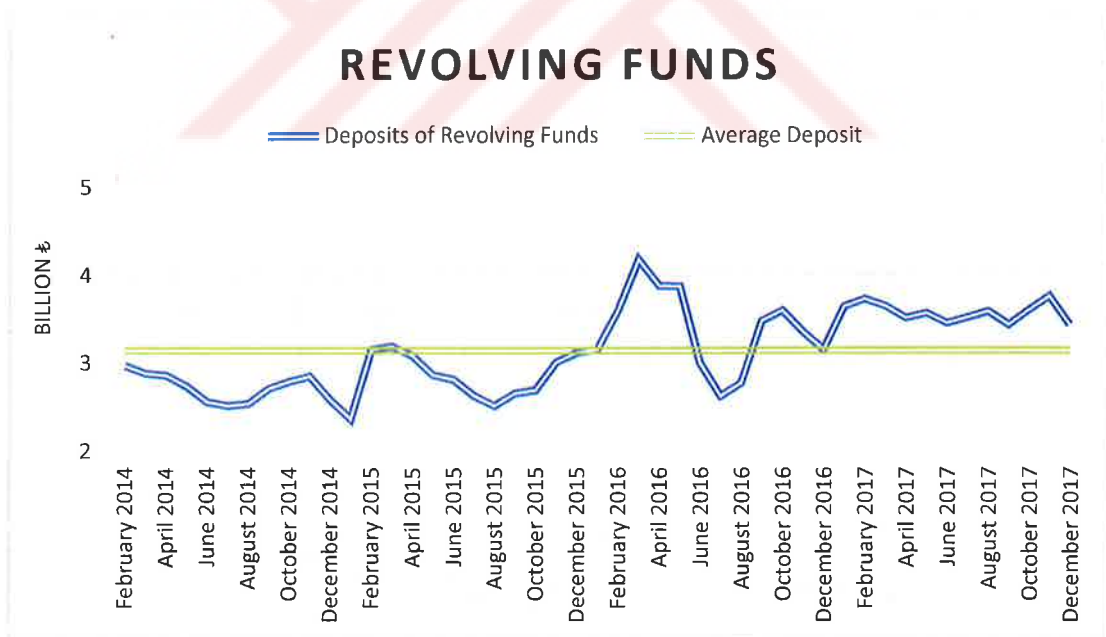


Graph 4.7. Deposits of Extra-Budgetary Funds

4.2.a.vi. Revolving Funds

Revolving funds can be defined as the enterprises that are aiming to evaluate the excess capacity arising from the fulfillment of the essential public services of the public administrations within the scope of general government and to provide additional income to the state. In Turkey, revolving-funded enterprises can operate in many different fields such as health (mainly), education, agriculture, etc.

The pattern of total deposits (as of the last business day of each month) of revolving funds is shown in Graph 4.8. The average amount of deposits of the revolving funds over the 2014-2017 period was approximately ₺ 3.1 billion. During this four-year period, total deposits of revolving funds fluctuated mildly around this trend. The total deposits of revolving funds reached a peak (₺ 4.2 billion) in March 2016, whereas they bottomed out (₺ 2.4 billion) in January 2015 (Graph 4.8).



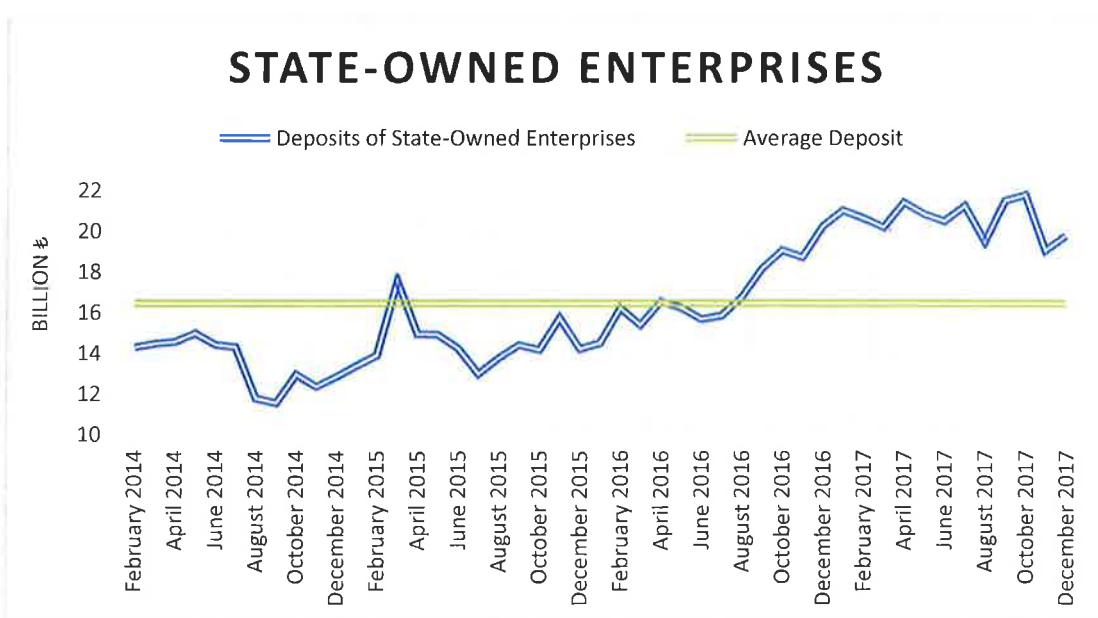
Graph 4.8. Deposits of Revolving Funds

4.2.b. Financial Position of Institutions Recommended Being Out of Scope of the TSA

4.2.b.i. State-Owned Enterprises

State-owned enterprises should be excluded from TSA because they should perform their activities according to market rules. In accordance with this principle, they should take their own decisions independently, and they manage their cash flows accordingly. Since they are subject to market conditions, including them in TSA could mitigate their effectiveness. Thus, these institutions' reserve should not be evaluated within the scope of TSA (Pattanayak and Fainboim 2010).

The pattern of total deposits (as of the last business day of each month) of state-owned enterprises over the 2014-2017 period is shown in Graph 4.9. The average value of deposits of the state-owned enterprises was approximately ₪ 16.4 billion. During the four-year period, the total deposits of state-owned enterprises reached a peak (₪ 21.7 billion) in October 2017, whereas they bottomed out (₪ 11.5 billion) in September 2015 (Graph 4.9).



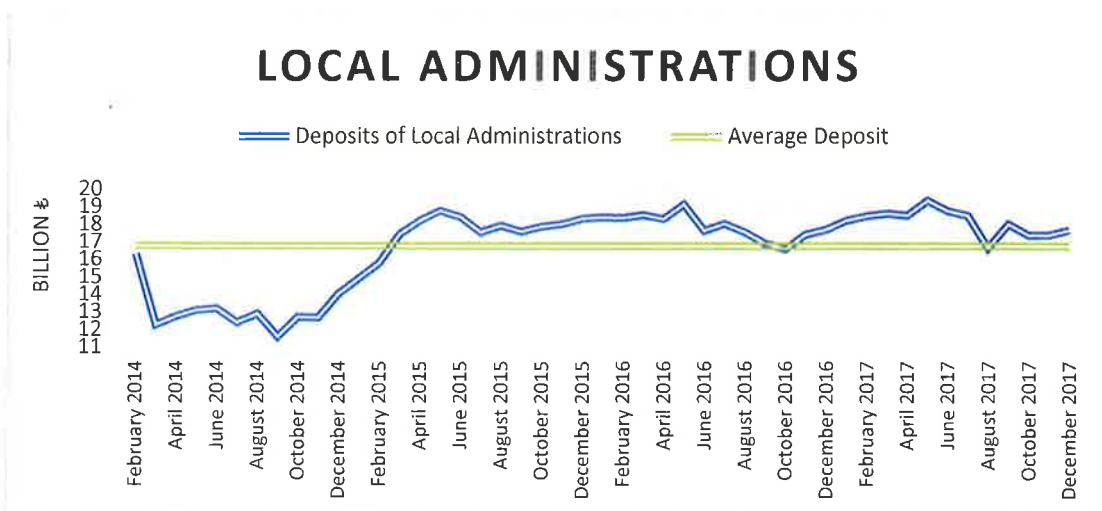
Graph 4.9. Deposits of State-Owned Enterprises

4.2.b.ii. Local Administrations

In Turkey, local administrations are composed of three types of local governments such as municipalities, special provincial administrations, and villages. Their organization, functions, and powers are governed by the law in accordance with the principle of decentralization. Their decision-making bodies elected by the electorate. They are responsible for fulfilling public services like land development, water, and sewer, waste management, cemeteries, and fire-fighting, etc.

While local administrations' revenues are determined by the central government by the budget law, their expenditures are approved and implemented by an assembly of these local administrations. Therefore, to ensure their functions to be carried out practically, it is better to exclude those administrations from the TSA system which are autonomous from the political point of view.

For the 2014-2017 period, the evolution of total deposits (as of the last business day of each month) of local administrations is shown in Graph 4.10. The average amount of deposits of local administrations was approximately ₺ 16.7 billion. During the four-year period, the total deposits of them reached a peak (₺ 19.4 billion) in May 2017, whereas they bottomed out (₺ 11.6 billion) in September 2014 (Graph 4.10).



Graph 4.10. Deposits of Local Administrations

4.3. The Analysis of Effect of Expansion of the TSA Coverage on Public Financial Management

With the adoption of extensive TSA system, the Treasury is supposed to make public cash management more effective in two ways. First, by expanding the scope of the TSA, the Treasury will have the opportunity to manage a considerable amount of public cash resources without bearing cost. Thus over-borrowing will be reduced, cost of borrowing as well. Moreover, by the enlargement of the TSA, holding cash which is idle against possible risks will be minimized since the amount proposed to be included in the TSA is more stable than the current Treasury cash reserve which will render total cash flows more stable. Second, due to scale of economics, it may be possible to obtain a higher return on extended resources of the TSA. Also, the Treasury could manage public cash resources much better than other public institutions because of having better know-how in the field of the financial sector (Can 2017).

Before making impact analysis on likely effects of the expansion of the TSA on public financial management, we need to find which cash level the Treasury should determine as target cash balance. Only then, we could calculate probable extra revenue obtained from surplus resources. Since targetting balance is vital for our analysis, we review the literature on the subject of cash management to pin down proper model for our analysis.

4.3.a. Literature Review

In literature, there have been many studies to understand the reasons that firms maintain cash resources although cash resources pay no interest. Understanding reasons of motivations for holding cash are critical to better financial management. Brealey and Myers (2005) have stated that there are four main motivations for maintenance of cash balance.

The first is a transactions motive. Firms/governments hold cash to fulfill commitments because of temporal mismatch between cash inflows and outflows. There is a positive correlation between volume of transactions and holding cash resources. Treasuries generally hold a considerable amount of cash to fulfill obligations stemming from regular transactions such as paying salaries and servicing debt of the public sector.

The second is a precautionary motive. Cash is held to dilute unexpected cash flows on cash balance and to meet unexpected cash needs. Cash is held as a cushion to cope with forecasting errors, cash flow volatility and to tide over time of financial stress (Williams 2016). There is a negative correlation between quality of cash forecasting and holding cash with precautionary motive. As the quality of cash forecasting increases, holding cash with precautionary motive decreases.

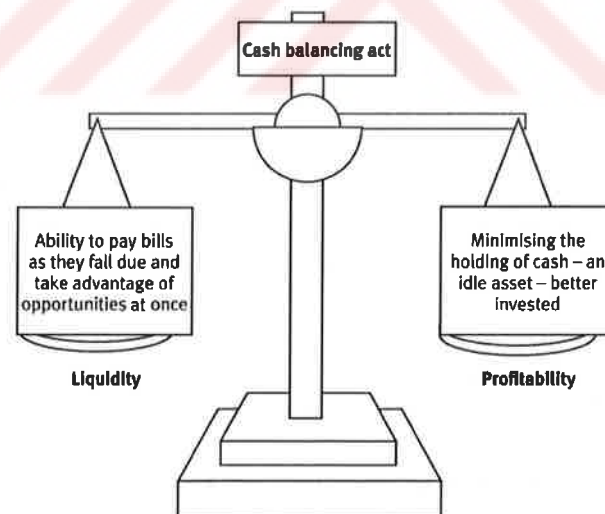
The third is a speculative motive. It refers to maintaining cash balance to take advantages of opportunities to obtain a high return. In general, government treasuries do not manage their cash with speculation. Instead, they aim to manage public resources at minimum cost, that is why speculative motive is not the source of motivation for maintenance cash for government cash management.

Fourth and the last one is a motivation for bank reciprocity. Cash held to meet requirements of some banks as compensations. This motivation is valid for firms but

not for government treasuries. Like speculative motivation, holding cash for bank reciprocity is not the source of motivation for government cash management.

As government treasuries do not manage their cash with speculative motive, following questions come to mind. For example, “How do they evaluate their cash surplus?” or “Which criteria they consider when evaluating their cash?” Actually, like in private sector, cash managers in government sector should choose from a range of options to select the most appropriate source of investment. Before evaluating cash surplus, they consider following criteria: liquidity, risk and profitability. Among these criteria, riskless is priority criterion since public resources should not be invested in risky instruments. And then, treasuries should make an investment decision by considering the balance between liquidity and profitability (Figure 4.4).

Figure 4.4. Cash Balancing Act (Kaplan 2012)



To make impact analysis on likely effects of the expansion of the TSA on public financial management, we use optimizing cash balance models. With this aim, we review some cash management models. There is a wealth of literature on cash management (Table 4.1). Evidently, various cash management models are used for

different purposes. Reviewing them, we see that although there are various complicated cash management models established to produce a more realistic approach to cash management, the applicability of some of them are quite hard. Thus, we try to choose a cash management model that can meet our needs and can achieve a reasonable degree of realism without too complex.



Authors	Research Summary
Baumol (1952)	Proposes that the available cash balance is a commodity inventory
Tobin (1956)	Adjusts the Baumol model, so the number of transactions becomes a positive integer value
Miller and Orr (1966)	Analyze the cash balance as having a random variable with an irregular fluctuation and proposed a stochastic model for managing the cash balance
Whalen (1966)	Presents a model based on the concept of inventory considering the cost of illiquidity, the opportunity cost of maintaining a precautionary cash balance and the average volume and variability of inflows and outflows
Daellenbach (1974)	Concludes that in cases where cash flows are non-stationary series, the optimization models cannot make significance gains if the transfer costs are low
Gregory (1976)	Presents a survey by the models until the mid-1970s focused on variants of the Miller and Orr (1966)
Tapiero and Zuckerman (1980)	Present a stochastic model based on the premise that cash inflows and outflows have random behavior
Milbourne (1983)	Presents a model separating the transfer costs into two categories, in other words, cost for currency units to adjust the cash balance up and cash balance down
Srinivasan and Kim (1986)	Present the principles of deterministic models until the mid- 1980s
Smith (1986)	Develops a stochastic dynamic model, considering the cash flow as a diffuse process
Ogden and Sundaram (1998)	Propose the utilization of a credit line if the firm gets a cash deficit considering an interest rate associated with this credit line and the assumptions of Baumol
Pacheco et al. (2000)	Develop a genetic algorithm to determine investments in financial products available on the market based on the projected cash flow
Hinderer and Waldmann (2001)	Propose the utilization of Markov chains in the problem
Barbosa and Pimentel (2001)	Develop and applied a model in civil construction projects very successfully
Baccarin (2002)	Proposes a modelling variation that changes the focus of the optimization problem
Premachandra (2004)	Shows a model considering the assumptions of normal distribution of net cash flows and that the fixed transfer costs are relaxed in order to obtain a model closer to reality
Volosov et al. (2005)	Develop a stochastic programming model in two states, based on scenario trees, for the problem of cash balance
Yao et al. (2006)	Show a single-period model, considering the demand for money according to fuzzy logic concepts, for the problem of cash balance
Gormley and Meade (2007)	Propose the utilization of dynamic policy for cash balance that minimizes transfer costs when cash flows are not independent or identically distributed in a general cost structure
Liu and Xin (2008)	Propose an adaptive algorithm with characteristics of changing the management policies at the beginning of each period to know the upper and lower demands for money
Baccarin (2009)	Presents a standard n-dimensional Wiener process using the impulse control method, for the problem of cash balance
Mierzejewski (2010)	Develops a stochastic model considering the premise of the demand for cash balance with normal distribution and applied the value at risk (VaR)
Melo and Biliich (2011)	Propose the use of dynamic programming to minimize the cost of cash, considering the cost de rupture cash

Table 4.1. Selected Studies on Stochastic Cash Flow Management Models (M.B. da Costa Moraes et al. 2015)

4.3.a.i. Baumol Cash Management Model

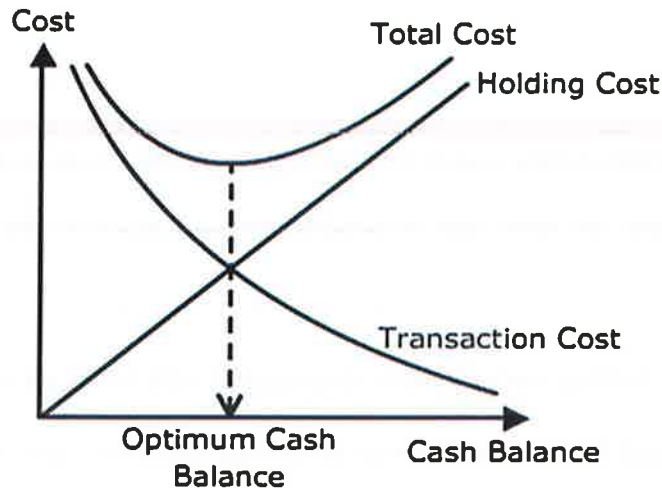
Baumol (1952) suggested that cash may be managed in the same way as any other inventory and he asserted that a cash inventory is an inventory of a specific form of exchange. According to him, the Economic Order Quantity (EOQ) model of inventory management could be applied to cash management.²⁰ He argues that benefit and cost of holding cash could be determined with EOQ, as in the inventory model which is used for finding optimal inventory stock in view of cost-volume relationships. In this regard, he developed a cash management model based on the EOQ.

In the Baumol model, the opportunity cost of holding cash (the interest forgone on marketable securities) is balanced against the fixed cost of transferring marketable securities to cash, or vice-versa. The Baumol model tries to find a correct balance by combining opportunity cost and transaction cost so as to minimize the total cost of holding cash. For this model, the optimum cash level is that level, where opportunity cost and transaction cost intersect each other (Baumol 1952, Ross et al. 2010).²¹

As cash balance increases, transaction cost decreases while holding cost increases or vice versa. The optimal size of cash balance is the level where the total cost curve attains at a minimum level (Graph 4.11).

²⁰ Economic order quantity (EOQ) is an equation for inventory that determines the ideal order quantity a company should purchase for its inventory given a set cost of production, demand rate and other variables.

²¹ In the Baumol model, non-interest cost of borrowing or withdrawal cost is represented with “broker’s fee” term. In some studies, trading cost or transaction cost are used instead of this term. In our study, we use the term “transaction cost”.



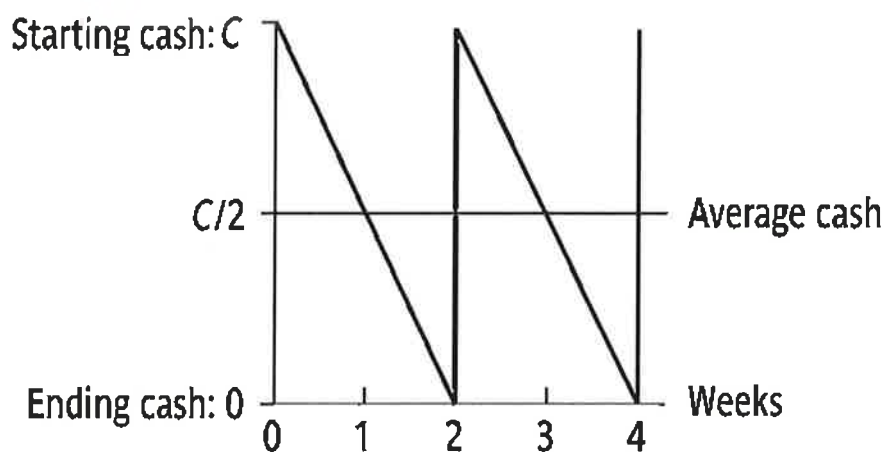
Graph 4.11. Determination of Optimum Cash Balance in Baumol Model

The Baumol model is based on the following assumptions: (i) that there are only two assets which are cash that earns a nominal return of zero and bonds that earn an interest rate i ; (ii) that cash is demanded only for transactions, and there are no precautionary and speculative demands for cash; (iii) that transactions are perfectly foreseen and occur in a steady state; (iv) that the model is static, namely, individual has a constant disbursement rate in the course of a given period; (v) that individual receives income at the beginning of every period, and there are no cash receipts during the projected period; (vi) that transfers between two assets take place instantaneously; (vii) that transfer fee between two assets are constant independent of size of the transfer; and that the interest rate is also assumed to be constant; (viii) that an individual does not hold cash as buffer stock (Baumol 1952).

The model supposes that in a given period, an individual withdraws/receives cash in lots of C dollars spaced evenly throughout the period and pays out T , which is predetermined and represents the value of transactions, dollars in a steady stream throughout the period. Moreover, each time he obtains cash either borrowing it or withdrawing it from investment; he must pay a fixed fee of b dollars. He makes T/C withdrawals over the course of the year.

In this model, if he does not have enough cash, he will sell his securities to establish cash balance (selling securities increases transaction cost of the firm). In response, if he has a cash surplus, he will not be required to sell securities but, at this time, he will bear the opportunity costs of holding cash. However, since the model based on the assumption of zero lead-time, it does not make sense that households hold cash buffer stock with precautionary motive because cash earns a nominal return of zero. They demand cash only when making a payment, and their cash demand equals to how much they spend. Thus, cash flows fluctuate between the starting point and ending point.

For the Baumol model, at the beginning of each period t , an individual starts with C amount of cash and spends it at a constant rate throughout t . When he runs out of cash, he makes a transaction to replace his cash with C . Since he does not hold cash when needed, he withdraws C amount of cash which is equal to the amount that he spends. As a result, his average cash balance is $C/2$ (Graph 4.12).



Graph 4.12. Cash Flows in Baumol Model (Ross et al. 2010)

The Baumol model aims to determine optimal cash level at minimum cost. The mathematical notation of the model can be illustrated as below;

$$\text{Transaction Cost} = \frac{bT}{C} \quad (1)$$

$$\text{Opportunity Cost of Holding Cash} = \frac{iC}{2} \quad (2)$$

where b = fixed cost per each transaction; T = demand for cash expected to be used in a certain period; C = initial cash balance; i = bond interest rate; $C/2$ = average cash balance.

The total cost is the sum of transaction and opportunity cost of holding cash:

$$\text{Total Cost} = \frac{bT}{C} + \frac{iC}{2} \quad (3)$$

To find optimum value of cash balance C^* , we take the derivative of total cost:

$$-\frac{bT}{C^2} + \frac{i}{2} = 0$$

And, we obtain the optimum value of C^* by

$$C^* = \sqrt{\frac{2bT}{i}} \quad (4)$$

However, there are some questions whether a firm, in the real world, can determine its optimal cash level by using the Baumol model. Namely, in time, some questions about the range of applicability of the model has been raised. Since the assumptions of the model are compatible static world and based on the certainty of cash flows (constant disbursement rate and disallowing of cash receipt in a given period), they apply reasonably to much of salary earnings households, but not to business firms. Cash flow pattern of business firms is more complex in fact. Thus, the assumptions underlying the Baumol model are not enough to determine optimal cash balance for firms (Miller-Orr 1966).

4.3.a.ii. Miller Orr Cash Management Model²²

M. H. Miller and Daniel Orr (1966) expanded on the Baumol model and developed a stochastic model called as Miller-Orr model for firms with uncertain cash inflows and cash outflows. The Miller-Orr model tries to help firms managing their cash balance which could not predict day-to-day cash inflows and outflows clearly.

Like the Baumol model, the Miller-Orr model also takes into account total cost which composed of the opportunity cost of holding cash and transaction cost, but it tries to find optimal cash balance range rather than a single point.

Unlike the Baumol model based on the assumption cash flows' pattern are completely deterministic, the Miller-Orr model considers net cash flows are uncertain and completely stochastic and is based on the assumption that daily cash flows vary according to a normal probability distribution with known variance (Mullins and Homonoff 1976).

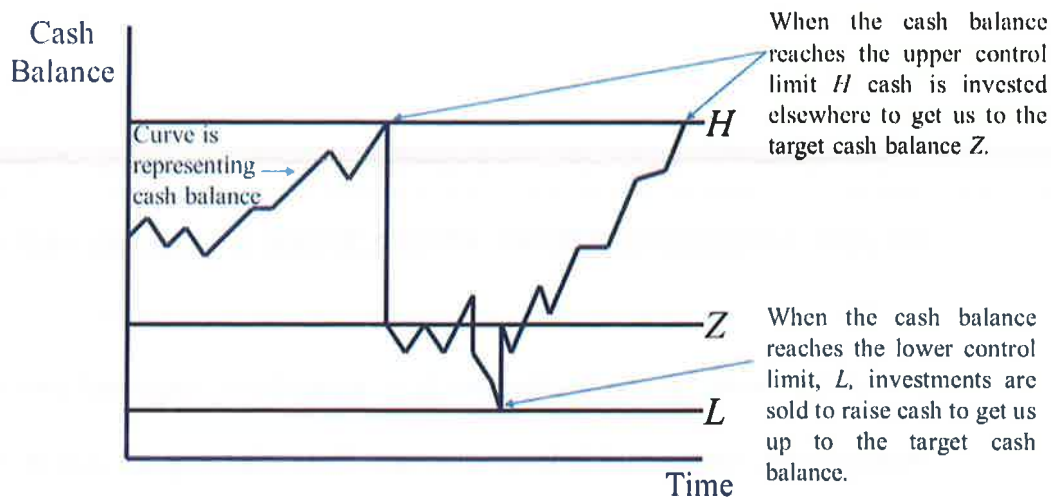
The Miller-Orr model based on following assumptions (i) that there are two assets setting which one is firms' cash balance that whose yield is zero and the other one is portfolio of liquid asset such as bonds whose yield is greater than zero; (ii) that there is no cash buffer stock, which is cash reserve allocated for avoiding runout risks, since transfers between two assets take place instantaneously with a fixed cost, regardless of the direction and the size of the transfer; (iii) that minimum cash level which restricts the probability of cash shortage is set as completely exogeneous by a firm; (iv) that cash inflows/outflows are changed on a daily basis and firms' net cash flows are not predicted with certainty (net cash flows are entirely stochastic) because cash moves randomly; (v) that behavior of cash flows can be categorized as a

²² This section draws heavily on Miller and Daniel Orr 1966.

sequence of independent “Bernoulli trials”;²³ (vi) that as number of observations increases, the distribution of daily net cash flows will be normally distributed and expected net cash flow will be zero; (vii) that standard deviation of daily net cash flow is known; (viii) that the cost per transaction of buying and selling marketable securities is assumed to be fixed; and the percentage opportunity cost of holding cash is equal to the daily interest rate on marketable securities; (ix) that firm has a two-parameter control limit policy called as “simple policy” that allows its cash balance to wander within upper and lower limits.

As seen in the Graph 4.13, in the Miller-Orr model, firm sets two control limits- the upper control limit (h) and the lower control limit (l) along-with return-point (z). The spread between these limits is affected by transaction cost, interest rate and variability of daily cash balance. The model argues that a firm implementing simple policy should not make any transactions to adjust its cash balance as long as its cash balance wanders between upper limits and lower limits. When the cash balance reaches h , the amount of cash ($h-z$) should be transferred to marketable securities. After that, cash balance will decrease to z . When the cash balance falls to l , the firm should sell ($z-l$) securities to adjust its cash balance to z . In any case, cash balance returns to z (Miller-Orr 1966).

²³ Bernoulli trails are defined as independent trails which are repeated, and which have only two possible outcomes - success and failure. In the Miller-Orr model, there are two outcomes that cash either increases or decreases.



Graph 4.13. Cash Flows in Miller-Orr Cash Management Model (Ross et al. 2010)

In the Miller-Orr model, cash flows move randomly. The probability of cash flows' direction is explained by Bernoulli trials. For the model, cash balance moves by m dollars upward with probability (p), or downward with probability ($q = 1 - p$). The mean of the distribution of changing of cash balance is $\mu_n = ntm(p - q)$ and the variance of the distribution of changing of cash balance is $\sigma_n^2 = 4ntpqm^2$, where n refers days and $1/t$ refers small fractions of a working day.

In the simplest versions of the Miller-Orr model, there is a zero-drift case in which the probability of either increasing (p) or decreasing (q) of firms' cash balance is equal ($p=q=1/2$). For this case, $\mu_n = 0$, $\sigma_n^2 = ntm^2$ and $\sigma^2 = \frac{\sigma_n^2}{n} = m^2t =$ the variance of daily changes in the cash balance.

By depending on above assumptions, the Miller Orr model tries to solve firms' optimal cash balance as a range of values. The Miller-Orr model tries to find two main points which are return point and upper limit after the lower limit is set by management. The lower limit is set exogenously, which depends upon to what extent firm consents to take a cash shortage risk and how much cash it is willing to hold as

a buffer.²⁴ The model argues that firm can determine its return point and upper limit by considering transaction cost, the variability of cash flows and interest rates.

The Miller-Orr model aims to determine optimal cash values of limits, providing the most advantageous trade-off between interest loss on idle cash and the cost involved in transfers of cash to and from the portfolio, at minimum cost. Thus, in the Miller-Orr model, a firm's objective is to minimize its expected cost of per day of managing the firm's cash balance over any finite planning horizon of T days, which is expressed in the equation (5) with respect to the control variables which are the upper limit on cash holdings, h , and the intermediate return point, z .

Objective function of a firm in the Miller-Orr model is that;

$$\mathcal{E}(c) = \gamma \frac{\mathcal{E}(N)}{T} + \nu \mathcal{E}(M) \quad (5)$$

where $\mathcal{E}(c)$ = the expected cost of managing cash per day $\mathcal{E}(N)$ = the expected number of portfolio transfer during the period; γ = fixed cost per each transaction; $\mathcal{E}(M)$ = the average cash balance; ν = the daily rate of interest earned from the marketable securities; T = days.

In this model, to find the minimum expected long-run average cost of managing firm's cash balance, it is required to take the derivate of it with respect to decision variables z and h . However, before taking the derivation, firstly, the expected number of transfers per day $\left[\frac{\mathcal{E}(N)}{T}\right]$ should be expressed in terms of h and z . In this regard, number of transfers is expressed in terms of average time interval at first and then the average time interval is expressed in terms of h and z . The transformation process

²⁴ In the Miller-Orr model, a value of cash buffer stock is usually set so that chance that cash balance falls below 0 is less than 2.5% or 0.5%.

between number of transfers and decision variables is completed by means of Wald and Feller solutions.

The model assumes that the distribution of successive time intervals $x_1, x_2 \dots$ (in days) between portfolio transfers have mean D and finite variance; and T is fixed planning horizon and N is a random variable. Then,

$$x_1 + x_2 + \dots + x_N \leq T < x_1 + x_2 + \dots + x_N + x_{N+1}$$

Taking expectations,

$$\mathcal{E}(x_1 + x_2 + \dots + x_N) \leq T < \mathcal{E}(x_1 + x_2 + \dots + x_N + x_{N+1})$$

Then by using Wald solution, we find that,

$$D * \mathcal{E}(N) \leq T < D * \mathcal{E}(N) + D \text{ where } \mathcal{E}(x_1 + \dots + x_N) = \mathcal{E}(x) * \mathcal{E}(N) = D * \mathcal{E}(N)$$

This implies that

$$\frac{1}{D} - \frac{1}{T} < \frac{\mathcal{E}(N)}{T} \leq \frac{1}{D} \quad (6)$$

Equation (6) shows the relationship between a number of transfers and duration of transfers. For the equation (6), as T increases, $\mathcal{E}(N)/T$ approaches $1/D$.

After finding expression for $\mathcal{E}(N)/T$ in terms of D , we try to find the expression for D in terms of decision variables. For this aim, we use Feller probability approach since Feller, especially for a zero-drift case ($p=q=1/2$) Bernoulli random walk, could prove that duration of the walk is a random variable and that the expected value of duration D with respect to h and z . On the assumption that cash balance starts with z and then moves to either h or l .²⁵ Thus, the expected value of duration in terms of number of trials can be written as:

$$D(z, h) = (z)(h - z) \quad (7)$$

²⁵ Since transfers are regarded as taking place instantaneous, lower limit is set as zero in the Miller-Orr model.

To express the expected duration in days and in dollars, in the equation (7), h and z unit steps are defined in dollars with $z' = z \cdot m$ and $h' = h \cdot m$ where m = daily cash flows in dollars, and time unit is converted to day by dividing t , which is the number of operating cash transactions per day.

$$D(z', h') = \frac{(z')(h' - z')}{m^2 t} \quad (8)$$

Since we know that $\mathcal{E}(N)/T$ approaches $1/D(z, h)$ with a large T , the transfer cost of the equation (1) can be written as product of γ and the reciprocal of the right-hand side (8).

$$\gamma D(z', h') = \gamma \frac{T}{\mathcal{E}(N)} = \gamma \frac{(z')(h' - z')}{m^2 t}$$

The first part of equation (1) which is $\gamma \frac{\mathcal{E}(N)}{T}$ can be written in terms of h and z as stated in the equation (9).²⁶

$$\gamma \frac{\mathcal{E}(N)}{T} = \gamma \frac{m^2 t}{(z)(h - z)} \quad (9)$$

Now, we try to express the second term $[\nu \mathcal{E}(M)]$ in equation (1) in terms of decision variables. With this aim, the model tries to define $\mathcal{E}(M)$ in terms of decision variables. Firstly, we try to pin down the probability of that cash balance contains absolutely x units within the upper-lower limit.

Let be $f(x, t)$ be the probability of holding x dollars at t .

$$f(x, t) = pf(x - 1, t - 1) + qf(x + 1, t - 1) \quad x \neq z \text{ and } l + 1 \leq x \leq h - 1$$

This holds for all x that is not for z, h, l . There are four probabilities of getting to target cash balance.

²⁶ In the Miller-Orr model, the primes on z and h are omitted to simplify the notation since presence of m and t indicates that the equation is expressed in dollars so it is not necessary to define h and z with primes to expressed them in dollars.

$$f(z, t) = pf(z - 1, t - 1) + qf(z + 1, t - 1) + pf(h - 1, t - 1) + qf(l + 1, t - 1) \quad (10)$$

Equation (10) says that firm could have $z-1$ cash with p , or firm could have $z+1$ cash with q . And also, the firm could have $h-1$ cash and hit its cash to h with p . In this case, firm reduces its cash to z by buying bonds. Conversely, the firm could have $l+1$ cash and hit its cash to l with q . In this case, firm reduces its cash to z by buying bonds increases its cash by selling bonds.

Since M is the mean of steady-state of distribution of cash holdings, the probability of that cash balance contains absolutely x units could be written as;

$$f(x) = pf(x - 1) + qf(x + 1) \quad x \neq z \text{ and } l + 1 \leq x \leq h - 1 \quad (11)$$

with boundary conditions

$$f(z) = p[f(z - 1) + f(h - 1)] + q[f(z + 1) + f(l + 1)] \quad (12)$$

and $f(l) = 0, f(h) = 0 \quad (13)$

and the density condition $\sum_{x=0}^n f(x) = 1 \quad (14)$

For zero-drift case ($p=q=1/2$), by using second-order difference equations, the solution is that;

$$f(x) = \begin{cases} A_1 + B_1x, & l < x < z \\ A_2 + B_2(h - z), & z < x < h \end{cases} \quad (15)$$

Since the equation (11) is linear and boundary conditions indicates that the distribution of cash holdings is of discrete triangular form with base $h-l$ and mode z . According to triangular distribution, the height of distribution is $2/(h - l)$, and the mean of the distribution is calculated as;

$$\mathcal{E}(M) = (h + z + l)/3 \quad (16)$$

After rewriting the first part of the equation (5), we can write the second part of equation (5) in terms of h and z . Thus, the objective function of firms is stated as;

$$\min_{z,z} \mathcal{E}(c) = \frac{\gamma m^2 t}{zZ} + \frac{\nu(Z + 2z)}{3} \quad \text{where } Z = h - z \quad (17)$$

Taking derivation of $\mathcal{E}(c)$ with respect to z and Z ;

$$\frac{\partial \mathcal{E}(c)}{\partial z} = -\frac{\gamma m^2 t}{z^2 Z} + \frac{2\nu}{3} = 0 \quad (18)$$

$$\frac{\partial \mathcal{E}(c)}{\partial Z} = -\frac{\gamma m^2 t}{Z^2 z} + \frac{\nu}{3} = 0 \quad (19)$$

And (18) and (19) imply that,

$$z = \sqrt{\frac{3\gamma m^2 t}{2\nu Z}} \quad \text{and} \quad Z = \sqrt{\frac{3\gamma m^2 t}{\nu z}}$$

And let A denote $\frac{3\gamma m^2 t}{\nu}$, and combining Z into z ;

$$z = \sqrt[2]{\frac{A}{2^2 \sqrt{\frac{A}{z}}}} = \frac{\sqrt[4]{z}}{\sqrt{2}} \sqrt[2]{\frac{A}{\sqrt{A}}}$$

$$\sqrt[4]{z^3} = \left(\frac{1}{\sqrt{2}}\right) \sqrt[4]{A}$$

The optimal values for z will be

$$z^* = \left(\frac{A}{4}\right)^{\frac{1}{3}} \quad \text{where } A = \frac{3\gamma m^2 t}{\nu}$$

$$z^* = \left(\frac{3\gamma m^2 t}{4\nu}\right)^{\frac{1}{3}} \quad (20)$$

And by following same steps for Z , the optimal values for Z and h will be

$$Z^* = 2z^* \quad (21)$$

$$h^* = 3z^{*27} \quad (22)$$

By combining (20) and (22) into (16), the firm's optimal average cash balance is stated in terms of cost parameters as:

$$\bar{M}^* = (h^* + z^*)/3$$

$$\bar{M}^* = \left(\frac{3 \left(\frac{3\gamma m^2 t}{4v} \right)^{\frac{1}{3}} + \left(\frac{3\gamma m^2 t}{4v} \right)^{\frac{1}{3}}}{3} \right)$$

$$\bar{M}^* = \frac{4}{3} \left(\frac{3\gamma m^2 t}{4v} \right)^{\frac{1}{3}} = \frac{4}{3} \left(\frac{3\gamma}{4v} \sigma^2 \right)^{\frac{1}{3}} \quad (23)$$

Equation (20) and (23) imply that if the variability of daily cash flows, transaction cost of buying and selling securities are high, firms will tend to maintain higher average cash balance for not to bear the high cost of finding cash; otherwise, it will tend to lower average cash balance. On the contrary, if the interest rate is high, then target cash level will be determined at a lower level; otherwise, target cash level will be set at a higher level. This deduction from the equations is consistent with the Baumol model.

The benefits of this model can be summarized as;

- ✓ Allows for net cash flows moving randomly,
- ✓ Transfers can take place at any time and are instantaneous with a fixed transfer cost.
- ✓ Produce control limit can be used as the basis for balance management.

²⁷ In this equation, upper limit is equal to spread between upper and lower limit since lower limit is set as 0. Actually, the model argues that spread should be equal to three times of return point.

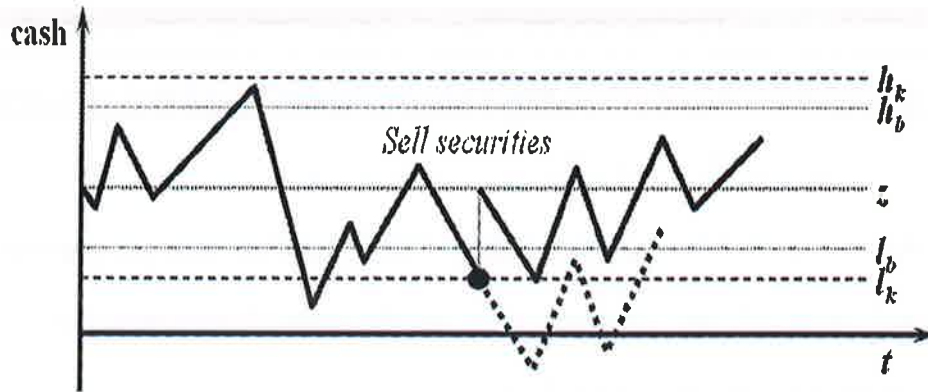
However, as like in the Baumol model, there are some limitations in the Miller-Orr model as well. It also overlooks the fact cash manager exercises over the disbursement, and there is a high degree of certainty in the short-term prediction of cash requirement. And also, it limits the use of cash only to marketable securities and thus ignoring other useful instruments.

4.3.a.iii. Stone Cash Management Model

The Stone model is a modification of the Miller-Orr model. It is separated from the Miller-Orr model in view of foreseeability of cash flows. For Stone (1972), firm could forecast some short-term cash flows, if not all of them. He alleged that firm could predict short-term cash flows whereas it could not forecast long-term cash flows, for a period longer than roughly 14 days. Thus, he suggests that by taking into account its short-term forecast, the firm can deduce whether it needs to take action to adjust its cash level in advance.

In the Stone model (1972), there are four limits, external upper (h_k), internal upper (h_b) and external lower (l_k), internal lower (l_b). In the Stone model, external upper and external lower limits are same with upper and lower control limits as in the Miller-Orr model. However, these control limits do not trigger cash manager to make reaction, instead they work as a signal for reaction. For him, cash manager should not make transactions to adjust his firm's cash level when his firm's daily cash flows surpass its external upper (lower) limit. Instead, he should make analysis for cash flows of upcoming few days since the direction of the next days' cash flows may be just the opposite and cash level may return to within internal limits by itself. After making analysis for future cash flows, if he thinks cash level continues to surpass internal upper (lower) limits, he should make an action to restore his firm's cash balance to its target level (z). Stone allege that by adoption that policy, firm may

prevent unnecessary transactions costs and saves on transaction costs (Stone 1972, Michalskial 2009).



Graph 4.14. Cash Flows in Stone Model (Stone 1972)

4.3.b. Data

This section presents the data used in the analysis. In this study, we used data have a daily, monthly frequency and the sample period covers from February 3, 2014 to December 31, 2017. The data is mainly obtained from three sources: Undersecretariat of Turkish Treasury, the Central Bank of the Republic of Turkey, Ministry of Finance.

In this study, we used data regarding Treasury reserves, other public resources, Treasury cash realizations and data of the general government budget realizations as an input, and also used following data; weighted average interest rates for deposits in Turkish Lira, CBRT's policy interest rates, average cost of domestic cash borrowing, interbank repo rates. Data regarding Treasury reserves²⁸ are procured from CBRT's analytical balance sheet published on a daily basis on the website (www.tcmb.gov.tr), and data regarding other public resources and Treasury cash realizations are procured from "Deposits and Securities Statistics of Institutions

²⁸ Treasury cash reserve Sum of Data of Deposits of Public Sector and Public Sector and Other FX Deposits are used as Treasury reserves.

within the Scope of General Communiqué for Public Treasurership” and “Treasury Cash Realizations Statistics”, respectively, published on a monthly basis on the website (www.treasury.gov.tr). Data of the general government budget realizations are acquired from “General Government Statistics” published on a monthly basis on the website (www.muhasabat.gov.tr). Data of weighted average interest rates for deposits in Turkish Lira and data of CBRT’s policy rates are acquired from CBRT and data of an average cost of domestic borrowing are acquired from Undersecretariat of Turkish Treasury.



Graph 4.15. Public Deposits (CBRT)

4.3.c. Estimation Method & Results

We try to estimate likely effects of the expansion of the TSA system to public financial management with working capital management approach.²⁹ In working capital management approach, there are two main goals. The first goal is related to the determination of optimal cash balance and the second one is relevant to the remuneration of cash surplus with most productive instruments.

In this regard, at first, we aim to find an answer to the question which is “What would be the optimal cash level for the Treasury with current TSA?” And then we try to seek an answer to another question which is “What would be the optimal cash level for the Treasury if it had the extensive TSA as large as we proposed?” And then, we try to find an answer to the last question which is “In either case, what would be the possible return if cash surplus was remunerated in the market conditions?”

To answer questions, we dwelled on some operating cash management models. Among them, we eliminated the Stone model since the model relies on forecasting of cash flows, but we do not have any data for forecasting cash flows. We also eliminated the Baumol model because of its underlying assumptions not compatible with reality. Lastly, we decided to use the Miller-Orr model to determine optimal cash balance as a range of values since it is applicable and straightforward; and it could overcome the shortcomings encountered in other models.

In this study, we take a basis the structure of the Miller-Orr model, but our method of finding target balance as a range of values is slightly different from that of the Miller-Orr model. Our model differs from the Miller-Orr model in two points: i)

²⁹ Working capital approach is about the management of the short-term investment and financing of a company.

we try to estimate optimal cash balance as a range of values for the Treasury whereas the Miller-Orr model tries to find optimal cash balance for firms. It would not be wrong to say that compared to the private sector, cash is more cautiously managed in the public sector in general. In this regard, we modified target cash balance the equation in the Miller-Orr model a bit. ii) the policy adopted or instruments used in the cash management are slightly different from that of the Miller-Orr model. As mentioned before, according to Miller-Orr model, the firm adopts “simple policy” and it has two options when implementing its simple policy. For example, if there is cash surplus, he buys securities; in case of cash shortage, he sells his securities. However, in our analysis, Treasury adopts “government cash management policy.” According to government cash management policy, if the Treasury has cash surplus, it invests its cash surplus on short-term deposits account with (1-month maturity) instead of buying securities as in the Miller-Orr model; or if the Treasury faces cash shortage problem, it issues short-term cash borrowing instrument (1-month maturity at most) instead of selling securities as in the Miller-Orr model. As a short, the firm faces a trade-off between opportunity cost of holding cash and transaction cost in the Miller-Orr model, whereas Treasury faces a trade-off between opportunity cost of holding cash and short-term cash borrowing cost in our model.

Our model based on following assumptions: (i) that the Treasury is responsible for managing cash, and it tries to determine optimal cash level as a range of values; (ii) that Treasury’s cash reserves are not kept idle since the Treasury’s cash reserves held in demand deposit account are remunerated on a daily basis with the interest rates which equal to CBRT’s policy rates, and Treasury also evaluates its cash on the time deposit accounts whose yield equal to weighted average interest rates for deposits in

₺; and when it needs cash, it borrows cash on money market;³⁰ (iii) that the Treasury manages its cash prudently, so it holds prudential cash reserve, referred as k_b ; (iv) that the Treasury sets the minimum cash level covering its compulsory expenses and prudential cash reserve; (v) that the Treasury is credible, and it could borrow cash easily on money market at the beginning of the month (with maximum 30 day maturity) by bearing cash borrowing cost (*DCBC*) that is not fixed and depends on average rate of cost of domestic cash borrowing, referred as (i_b) ; (vi) that the opportunity cost of holding cash is equal to the net interest rates that is greater than or equal to zero (the weighted average interest rates for deposits in ₺ minus CBRT policy interest rates)³¹; (vii) that the Treasury remunerates its cash surplus with short-term 1-month time-deposit accounts on the weighted average deposit interest rate and cash balance of Treasury demand deposit accounts is remunerated by one week repo interest rate (CBRT's policy rate) on an overnight basis; (viii) that the Treasury remunerates its cash surplus at the beginning of the month, and its interest revenues from investment are accumulated at the beginning of the next month; (ix) that the Treasury does not pay any expenses in response to remuneration transactions; (x) that net cash flows are entirely stochastic; (xi) that behavior of cash flows can be categorized as a sequence of independent “Bernoulli trials”; (xii) that as number of observations increases, the distribution of daily net cash flows will be normally distributed and expected net cash flow will be zero; (xiii) that standard deviation of daily net cash flow is known; (xiv) that the Treasury implies policy called as “government cash management policy” that allows its cash balance to wander within

³⁰ In this study, weighted average interest rates for deposits in ₺ refers weighted average interest rates up to one-month deposits in ₺.

³¹ During 2014-2017, net interest rates have usually been greater than zero. However, they have fallen below zero for some months. In the study, net interest rates which is negative have taken as 0.

upper and lower limits; and when the Treasury has cash surplus or shortfall, it evaluates or borrows cash in line with assumptions of (v) and (viii).

To find optimal target cash reserve for the Treasury as a range of values, we applied following steps; we determined lower limit at first. Next, we estimated standard deviations of daily cash flows, and then we calculated spread as a range of values for the Treasury cash reserve by considering borrowing cost, the opportunity cost of holding cash and variance of cash flows.³² After the calculation of the spread, we determined target cash reserve for the Treasury and then set an upper limit. And after that, we calculated net interest return of Treasury to evaluate likely effects of the expansion of the TSA system.

The Treasury tries to minimize its expected the cost of managing its cash balance per day during the T days. Its objective function is slightly different from that of the Miller-Orr model because of our assumptions that the cost of transference cash to time-deposit account is \emptyset but the cost of finding cash is equal to $DCBC$.

$$\mathcal{E}(c) = DCBC \frac{\mathcal{E}(N_1)}{T} + \emptyset \frac{\mathcal{E}(N_2)}{T} + netR \mathcal{E}(M)$$

where $\mathcal{E}(N_1)$ = the expected number of short-term cash borrowing during the period; $DCBC$ = the monthly average cost of domestic cash borrowing cost³³; $\mathcal{E}(N_2)$ = the expected number of remuneration transactions during the period; \emptyset = fixed cost per each remuneration transaction; $netR$ = the net interest rate where $netR = i_w - i_{pr}$, i_w = weighted average deposit interest rate and i_{pr} = CBRT's policy rate.

We assume that \emptyset is zero. Thus, we use our modified expected cost equation (24) in the most of subsequent discussion in this study.

³² Cash spread refers cash interval between lower and upper bounds.

³³ $DCBC$ refers the amount of that the monthly average cost of domestic cash borrowing cost times monthly standard deviation of Treasury cash reserve.

$$\varepsilon(c) = DCBC \frac{\varepsilon(N_1)}{T} + netR \varepsilon(M) \quad (24)$$

We modified the equation (22) and generated cash spread equation for the Treasury as below;

$$S = 3 \left[\frac{3(DCBC)[Var.(TCR)]}{4 * netR} \right]^{\frac{1}{3}} \quad (25)$$

where S (*spread*) = cash range between lower and upper limit; $Var(TCR)$ = the variance of Treasury cash reserve.

After calculating spread, then by using the Miller-Orr model, we calculated optimal Treasury target cash balance as;

$$TTCR = \left[\frac{3(DCBC)[Var.(TCR)]}{4 * netR} \right]^{\frac{1}{3}} + L \quad (26)$$

where $TTCR$ = Treasury target cash balance and L = minimum cash level determined by cash manager.

In our model, the lower limit is determined exogenously as in the Miller-Orr model. For our model, the Treasury keeps lower limit for cash management purposes to control; i) time differences between cash inflows and outflows ii) revenue-based deviations iii) expenditure-based deviations iv) re-financing risk and v) short-term bond auction volatilities. In this regard, we take lower limit (L) for the Treasury with current TSA as sum of compulsory payment of general budget (CP^{GB}), which is composed of personnel expenditures (PE^{GB}), premiums to Social Security Agencies (P^{GB}), transfers to social security institutions (TR^{GB}) and interest expenditures (INE) plus prudential cash reserve (kb) held by Treasury in order to avoid default-risk.

$$L = \sum_{t=1}^n (CP_t^{GB} + kb_t) \quad (27)$$

where $CP_t^{GB} = PE_t^{GB} + P_t^{GB} + TR_t^{GB} + INE_t$

We assume that the Treasury holds prudential cash reserve to be used in case it could not pay off its debt payment by borrowing. Under the assumptions, prudential cash reserve is calculated as;

$$kb = \sum_{t=1}^n (PP_t - \beta * DB_t) \quad (28)$$

where PP_t = monthly cash amount of debt services in principal; β = the coefficient of deviation from borrowing projections (assuming that the Treasury could borrow from the market at least half of its projections released in the financing program even in the worst-case scenario. Thus, β is assumed to be 1/2); DB_t = monthly cash borrowing.

After setting Treasury target cash balance, upper limit (H) is calculated as;

$$H = L + S \quad (29)$$

We also calculated average cash balance (A) in the same way as in the Miller-Orr model and the monthly average of daily Treasury cash reserve ($AVTCR$) by using daily Treasury cash reserve.

Finally, we tried to calculate what the net interest return obtained by the Treasury would be if it applied the government cash management policy. According to this policy, if Treasury's $AVTCR$ is higher than the upper limit, ($AVTCR - TTCR$) cash amount is invested on short-term time-deposit account with (1-month maturity), and by doing so, Treasury cash level will go down to $TTCR$. On the contrary, if Treasury's $AVTCR$ is below than lower limit, the Treasury borrows ($TTCR - AVTCR$) amount of cash, and by doing so, Treasury cash level will go up to $TTCR$. Under the

assumption that the Treasury applied government cash management policy, we calculated expected Treasury's net interest revenue on its deposits as;

$$\mathcal{E}(NIR) = \mathcal{E}(IR_{GCM}) - IR_R^{GB} \quad (30)$$

where $\mathcal{E}(NIR)$ = the expected net interest revenue on deposit; $\mathcal{E}(IR_{GCM})$ = the expected interest revenue on deposit if the Treasury adopted government cash management policy; IR_R^{GB} = realized interest revenue on deposit of general budget.³⁴

The expected interest revenue on deposit is calculated as in the equation (31);

$$\mathcal{E}(IR_{GCM}) = \begin{cases} \sum_{t=1}^n \left(\left[\frac{(AVTCR_t - TTCR_t) * i_t^w}{12 * 100} \right] + \left[\frac{TTCR_t * i_t^{pr}}{12 * 100} \right] \right), & H_t < AVTCR_t \\ \sum_{t=1}^n \left(\frac{AVTCR_t * i_t^{pr}}{12 * 100} \right), & L_t < AVTCR_t < H_t \\ \sum_{t=1}^n \left(\left[\frac{TTCR_t * i_t^{pr}}{12 * 100} \right] - \left[\frac{(TTCR_t - AVTCR_t) * i_t^b}{12 * 100} \right] \right), & AVTCR_t < L_t \end{cases}$$

According to our study results, during 2014-2017, if the Treasury adopted the “government cash management policy,” it would determine its target cash reserve as ₦ 24.0 billion on average and its cash lower and upper bound as ₦ 23.2 billion, ₦ 25.6 billion on average, respectively. During the four-year period, the Treasury would let its cash balance (₦ 24.0 billion on average) to oscillate between lower and upper bounds (Graph 4.16) (Table 4.2).

Also, the result shows that during the four-year, if the Treasury implemented the government cash management policy, the Treasury would have earned approximately ₦ 4.3 billion additional interest revenue on its deposits with bearing roughly ₦ 0.3 billion additional borrowing cost (Table 4.3).

³⁴ To identify additional interest revenue on deposit of Treasury to be gained by adoption government cash management policy, we subtracted realized interest revenue on deposit of Treasury. Realized interest revenue on deposit is acquired from “General Budget Statistics”.

Treasury Cash Reserve Interval with Current TSA

— Lower Limit (L) — Upper Limit (H) — Treasury Target Cash Reserve (TTCR)



Graph 4.16. Treasury Cash Reserve Interval with Current TSA

Miller-Orr Analysis for Treasury Current Cash Reserve																
Miller-Orr Study Analysis	Spread (S)	Compulsory Payments of General Budget (CP)	ktb	Lower Limit (L)	Treasury Target Cash Reserve (TTCR)	Upper Limit (H)	Average Cash Balance Calculated by Miller-Orr Model (A)	Average Cash Balance in Fact (AVTCR)	Cash Amount Outside of Cash Balance Range	Cash Amount Proposed to be Invested on Time-Deposits	Cash Amount Proposed to be Borrowed by Short-Term Borrowing Instruments	Cost of Borrowing Cash Amount	Interest Revenue on Time-Deposit	Interest Revenue on Current Accounts	Total Interest Revenue on Deposit	Average Cash Amount After Adoption of Govt Cash Management Policy
Feb 14	1.928	16.685	8.082	24.767	25.410	25.696	25.624	32.003	5.308	6.593	0	0	52	212	264	25.410
March 14	2.320	18.271	7.407	25.678	26.452	27.999	26.709	30.277	2.278	3.825	0	0	32	220	252	26.452
April 14	2.133	18.185	6.828	24.724	26.145	26.145	24.961	28.399	2.654	3.676	0	0	30	206	236	24.724
May 14	2.602	18.949	3.179	22.128	22.995	24.730	23.284	29.382	4.652	6.387	0	0	49	182	231	22.995
June 14	3.716	15.676	10.007	25.683	26.611	28.468	26.921	28.428	0	0	0	0	0	207	207	28.428
July 14	3.117	20.566	6.028	26.594	27.633	29.711	27.979	28.434	-4.761	0	5.799	43	0	0	0	26.594
August 14	2.685	14.642	5.697	20.339	21.234	25.023	21.532	28.778	7.545	0	0	0	50	146	196	21.234
September 14	2.372	20.221	4.308	24.529	25.320	26.901	25.320	31.302	4.401	5.962	0	0	42	174	216	25.320
October 14	1.691	19.792	3.996	22.889	23.452	24.580	23.640	24.451	0	0	0	0	0	168	168	24.451
November 14	1.771	15.860	-5.20	15.340	15.930	17.111	16.127	28.709	11.598	12.779	0	0	90	110	199	15.930
December 14	2.787	11.345	17	11.363	12.292	14.149	12.601	13.951	15.809	15.809	0	121	85	206	206	12.292
Av. - 2014	2.381	17.250	4.830	22.120	22.914	24.501	23.178	28.333	4.131	5.690	42	155	198	204	204	23.075
January 15	1.997	22.094	2.317	24.411	25.077	26.409	25.299	23.067	-1.344	0	2.010	13	0	0	0	24.411
Feb 15	1.638	19.802	3.083	22.885	23.431	24.523	23.613	29.270	4.747	5.839	0	43	146	189	23.431	
March 15	2.057	17.582	7.839	25.421	26.106	27.477	26.335	28.451	9.74	2.345	0	18	163	181	26.106	
April 15	980	21.778	3	21.781	22.108	22.761	22.217	27.060	4.299	4.952	0	38	138	176	22.108	
May 15	1.699	17.310	4.687	21.997	22.563	23.696	22.752	31.475	7.779	8.912	0	68	141	209	22.563	
June 15	1.410	14.636	4.383	19.019	19.489	20.429	19.645	33.414	12.986	13.925	0	110	122	232	19.489	
July 15	3.627	23.359	-1.62	23.196	24.405	26.823	24.808	26.506	0	0	0	0	166	166	26.506	
August 15	2.851	18.274	2.324	20.598	21.548	23.449	21.865	36.701	15.153	15.153	0	117	135	252	21.548	
September 15	2.935	24.549	-1.191	23.359	24.337	26.293	24.663	38.196	11.903	13.859	0	117	152	269	24.337	
October 15	1.652	16.270	4.695	20.365	21.516	22.617	21.699	32.548	9.931	11.032	0	91	134	225	21.516	
November 15	1.478	17.907	8.95	18.602	19.295	20.280	19.459	38.409	18.130	18.115	0	158	121	278	19.295	
December 15	2.597	13.548	3.021	16.569	17.435	19.166	17.723	36.115	16.949	18.680	0	159	109	268	17.435	
Av. - 2015	2.077	18.926	2.658	21.584	22.276	23.660	22.506	31.768	8.300	9.484	167	1	77	127	204	22.395
January 16	1.878	26.512	5.258	31.770	32.396	33.648	32.604	27.279	-4.491	0	5.117	46	0	0	0	31.770
Feb 16	1.612	21.506	7.981	29.488	30.025	31.099	30.204	31.867	1.842	1.842	0	15	188	203	30.025	
March 16	2.087	25.666	-2.456	23.210	23.906	25.298	24.138	26.050	7.53	2.144	0	18	149	168	23.906	
April 16	1.076	19.676	9.89	20.665	21.024	21.741	21.143	26.292	4.551	5.268	0	43	131	175	21.024	
May 16	1.937	21.787	-1.709	20.078	20.723	22.015	20.939	30.354	8.339	9.631	0	77	130	207	20.723	
June 16	2.151	20.054	-840	19.214	19.931	21.365	20.170	31.348	9.983	11.417	0	89	125	214	19.931	
July 16	1.745	22.568	3.478	26.046	26.627	27.990	26.821	28.047	2.56	1.419	0	75	166	177	26.627	
August 16	2.608	22.829	-610	22.219	23.088	24.827	23.378	33.164	8.337	10.076	0	75	144	219	23.088	
September 16	4.379	26.887	8.630	35.517	36.977	39.896	37.463	38.278	-7.239	0	8.699	66	0	0	0	35.517
October 16	2.646	18.813	-2.285	16.528	17.410	19.174	17.704	26.383	7.208	8.972	0	66	109	175	17.410	
November 16	2.567	22.387	3.073	25.460	26.316	28.027	26.601	28.413	3.87	2.098	0	15	175	191	26.316	
December 16	5.158	17.049	2.781	19.830	21.549	24.988	22.122	33.862	8.874	12.313	0	90	144	234	21.549	
Av. - 2016	2.487	22.145	2.024	24.169	24.998	26.656	25.274	29.278	3.144	5.432	9	42	122	163	163	24.824
January 17	2.467	28.857	-2.193	26.663	27.486	29.130	27.760	22.838	-3.825	0	4.647	41	0	0	0	26.663
Feb 17	3.395	27.646	2.337	29.983	31.115	33.378	31.492	33.150	0	0	0	0	221	221	33.150	
March 17	2.890	29.552	4.717	34.269	35.233	37.160	35.554	24.593	-9.676	0	10.640	97	0	0	0	34.269
April 17	1.646	23.919	-3.233	20.686	21.235	22.332	21.418	18.936	-1.750	0	2.299	21	0	0	0	20.686
May 17	2.522	21.693	-2.969	18.723	19.564	21.245	19.844	27.732	6.487	8.168	0	73	130	203	19.564	
June 17	2.574	25.067	1.259	26.326	27.183	28.899	27.469	31.569	2.670	4.366	0	40	181	221	27.183	
July 17	2.063	23.447	7.718	31.165	31.852	33.227	32.081	31.095	-6.9	0	757	7	0	0	0	31.165
August 17	2.035	25.165	-2.953	22.212	23.022	24.246	23.116	39.314	15.068	16.424	0	149	153	302	22.890	
September 17	1.031	27.876	-4.998	22.679	23.022	23.710	23.137	48.467	24.757	0	0	0	153	388	23.022	
October 17	2.110	21.536	3.115	24.651	25.354	26.761	25.589	46.866	20.095	20.095	0	204	169	373	25.354	
November 17	2.107	23.712	-1.330	22.382	23.084	24.489	23.318	55.693	31.204	32.608	0	312	154	466	23.084	
December 17	4.010	17.932	2.356	20.288	21.625	24.298	22.070	58.833	34.535	37.208	0	357	144	501	21.625	
Av. - 2017	2.404	24.583	3.19	25.002	25.804	27.406	26.070	36.590	9.958	12.145	1,529	14	114	109	223	25.721
2017/2018	2.339	20.939	2.407	23.242	24.021	25.578	24.280	31.659	8.431	8.231	860	7	69	178	197	24.024
Total											33,968	333	3,258	8,004	8,263	

Table 4.2. Miller-Orr Analysis for Current Treasury Cash Reserve

Million ₺

	Expected Interest Revenue If Treasury Adopted "Gov't Cash Management Policy"	Realized Interest Revenue	Expected Net Interest Revenue
2014	2.134	741	1.393
2015	2.434	1.114	1.319
2016	1.850	1.061	789
2017	2.511	1.723	787
Total	8.928	4.640	4.289

Table 4.3. Estimated Extra Interest Revenue on Current Deposit of Treasury

If the Treasury had the extensive TSA coverage as we proposed, new reserve to be managed by Treasury would be more stable than Treasury current reserve. To analyze likely effects of the extension of TSA, we applied same procedures for the new reserve to be managed by the Treasury after the extension of TSA system. Thus, we used the same equations as seen below;

$$S_{tsa} = 3 \left[\frac{3(DCBC)[Var.(TCR_{tsa})]}{4 * netR} \right]^{\frac{1}{3}} \quad (32)$$

where S_{tsa} = spread for the new TSA cash reserve; $Var(TCR_{tsa})$ = the variance of Treasury cash reserve with the new TSA.

$$TTCR_{tsa} = 3 \left[\frac{3(DCBC)[Var.(TCR_{tsa})]}{4 * netR} \right]^{\frac{1}{3}} + L_{tsa} \quad (33)$$

where $TTCR_{tsa}$ = Treasury target cash reserve with the new TSA; L_{tsa} = lower limit for the new TSA cash reserve.

As the new TSA covers more institutions than the current one, its compulsory payments and thereby its lower limit should be set higher. Thus, we calculated lower limit for the Treasury with the new TSA (L_{tsa}) by using the same equation (27) as

sum of compulsory payment of all institutions included in the new TSA (CP^{tsa}), which is composed of personnel expenditures (PE^{tsa}), premiums to Social Security Agencies (P^{tsa}), transfers to Households from Social Security Agencies (TRH^{tsa}) and interest expenditures (INE), plus prudential cash reserve (kb).

$$L_{tsa} = \sum_{t=1}^n (CP_t^{tsa} + kb_t) \quad (34)$$

where $CP_t^{tsa} = PE_t^{tsa} + P_t^{tsa} + TRH_t^{tsa} + INE_t$

After setting Treasury target cash balance with the new TSA, upper limit (H_{tsa}) is calculated as;

$$H_{tsa} = L_{tsa} + S_{tsa} \quad (35)$$

We also calculated average cash balance (A_{tsa}) in the same way as in the Miller-Orr model and the monthly average of daily Treasury cash reserve with the new TSA ($AVTCR_t^{tsa}$) by using daily Treasury cash reserve plus institutions' cash reserve to be managed in the new TSA.

We calculated expected the new TSA's net interest revenue on deposit as;

$$\mathcal{E}(NIR^{tsa}) = \mathcal{E}(IR_{GCM}^{tsa}) - IR_R^{tsa} \quad (36)$$

where $IR_R^{tsa} = IR_R^{GB} + IR_R^{SB} + IR_R^{RSAs} + IR_R^{SS} + IR_R^{EBFs} + IR_R^{RVF}$

where $\mathcal{E}(NIR)$ = the expected net interest revenue on deposit; $\mathcal{E}(IR_{GCM})$ = the expected interest revenue on deposit if the Treasury adopted government cash management policy; IR_R^{tsa} = realized interest revenue on deposit of all institutions within the new TSA, which comprises IR_R^{SB} = realized interest revenue on deposit of special budget administrations; IR_R^{RSA} = realized interest revenue on deposit of RSA; IR_R^{SS} = realized interest revenue on deposit of social security institutions; IR_R^{EBFs} =

realized interest revenue on deposit of EBFs; IR_R^{RVF} = realized interest revenue on deposit of revolving funds.³⁵

The expected interest revenue on deposit is calculated as in the equation (37);

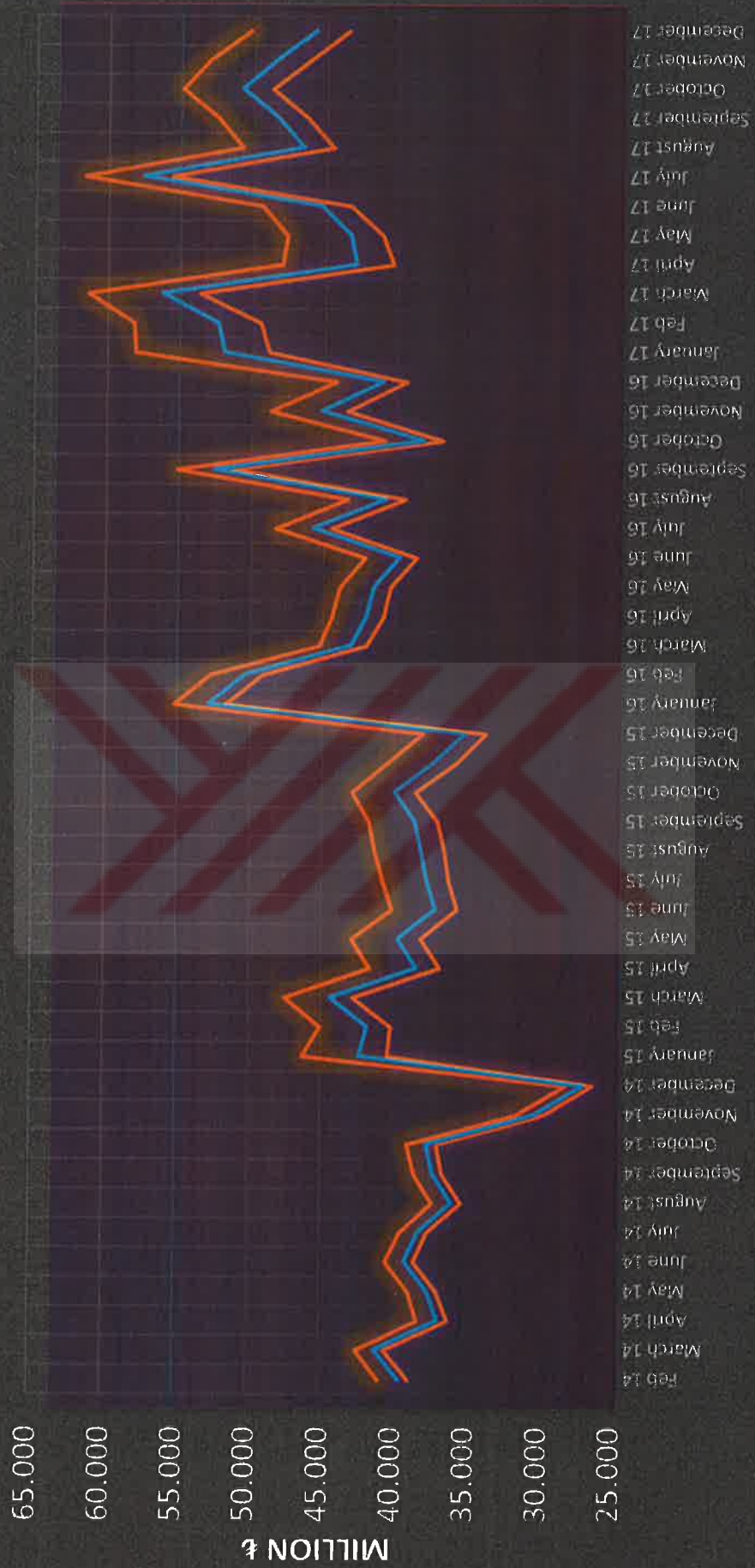
$$\mathcal{E}(IR_{GCMP}^{tsa}) = \begin{cases} \sum_{t=1}^n \left(\left[\frac{(AVTCR_t^{tsa} - TTCR_t^{tsa}) * i_t^w}{12 * 100} \right] + \left[\frac{TTCR_t^{tsa} * i_t^{pr}}{12 * 100} \right] \right), & H_t^{tsa} < AVTCR_t^{tsa} \\ \sum_{t=1}^n \left(\frac{AVTCR_t^{tsa} * i_t^{pr}}{12 * 100} \right), & L_t^{tsa} < AVTCR_t^{tsa} < H_t^{tsa} \\ \sum_{t=1}^n \left(\left[\frac{TTCR_t^{tsa} * i_t^{pr}}{12 * 100} \right] - \left[\frac{(TTCR_t^{tsa} - AVTCR_t^{tsa}) * i_t^b}{12 * 100} \right] \right), & AVTCR_t^{tsa} < L_t^{tsa} \end{cases}$$

According to our analysis, during 2014-2017, if the Treasury had the new TSA, as we proposed, and implemented the “government cash management policy”, it would determine its target cash balance as ₦ 42.4 billion on average and its cash lower and upper bound as ₦ 40.9 billion, ₦ 45.4 billion on average, respectively. During the four-year period, the Treasury would let its cash balance (₦ 42.4 billion on average) to oscillate between lower and upper bounds (Graph 4.17) (Table 4.4).

³⁵ To identify additional interest revenue on deposit to be gained by adoption government cash management policy, we subtracted realized interest revenue on deposit. Realized interest revenue on deposit is acquired from “General Government Statistics”. However, since we could not reach the realized interest revenues on deposit of revolving funds and extra-budgetary funds, and the fourth quarter realized interest income on deposit of social security institutions we hypothetically calculated those funds’ interest revenues based on their deposits.

Treasury Cash Reserve Interval with New TSA

— Lower Limit (L) — Upper Limit (H) — Treasury Target Cash Reserve (TTCR)



Graph 4.17. Treasury Cash Reserve Interval with New TSA

Also, the result shows that during the four-year, if the Treasury adopted the “government cash management policy,” the Treasury would have earned approximately ₺ 17.4 billion (roughly yearly 4.3 billion ₺) additional interest revenue on its deposit without bearing additional borrowing cost (Table 4.5).

Million ₺

	Expected Interest Revenue If Treasury Adopted "Gov't Cash Management Policy"	Realized Interest Revenue	Expected Net Interest Revenue
2014	5.849	1.989	3.859
2015	7.137	2.879	4.258
2016	7.252	3.328	3.924
2017	9.477	4.081	5.396
Total	29.715	12.277	17.437

Table 4.5. Estimated Extra Interest Revenue on Deposit of Treasury with New TSA

The result is striking since it showed that during the four-year period, the Treasury with the new TSA could earn significant amount interest income on deposits than the current one. However, it is worth noting again that in this study, we may have calculated the expected revenue more than it should be because of the weakness of our assumptions. Our assumptions are i) that we supposed the Treasury with the new TSA remunerated its deposits with market rates, but the Treasury might decide to remunerate its surplus with lower rates than the market rates to favor markets by subsidizing public banks (in this case, the expected revenue would certainly be lower than that we calculated); ii) that we supposed Treasury cash reserve was equal to the amount of public deposits which was held in CBRT, but Treasury cash reserve was, in fact, lower than public deposits held in CBRT, since in addition to the Treasury, other public institutions had deposit account in CBRT; iii) that we supposed the Treasury would manage approximately 85 billion ₺ with the new TSA, but the

amount must be lower in fact since we could not decompose the deposits of UIF, SDIF, Revenue Administrations from the new TSA's deposits;³⁶ iv) that we suppose the Treasury would not change its borrowing strategies, but it would probably change its borrowing strategy if it had strong cash reserve (for example, it would borrow less so Treasury's cash reserve might be less than that we analyzed); v) that we used the monthly data of deposits of new TSA (as of a last working day of the relevant month) since we do not have daily data regarding deposits of the new TSA.

To make a more realistic estimation, we take into account other scenarios; the new TSA with lower interest rates, revised new TSA (the more realistic amount of deposits of TSA) with weighted average deposit interest rate, and revised new TSA with lower interest rates.

The scenario is that the Treasury with the new TSA remunerated its surplus with time-deposits with the interest rates (approximately 70% of the weighted average deposit interest rate) which is lower than the market rates to favor markets by subsidizing public banks. For this scenario, the average additional expected revenue on its deposits without bearing additional borrowing cost would be approximately 3.2 billion ₺ (Table 4.6). However, the estimation still might be higher than it should be.

³⁶ The data regarding deposits of UIF, SDIF, Revenue Administrations is not published so we could not decompose the deposits of them, but they probably have a significant amount of deposits.

Million ₺

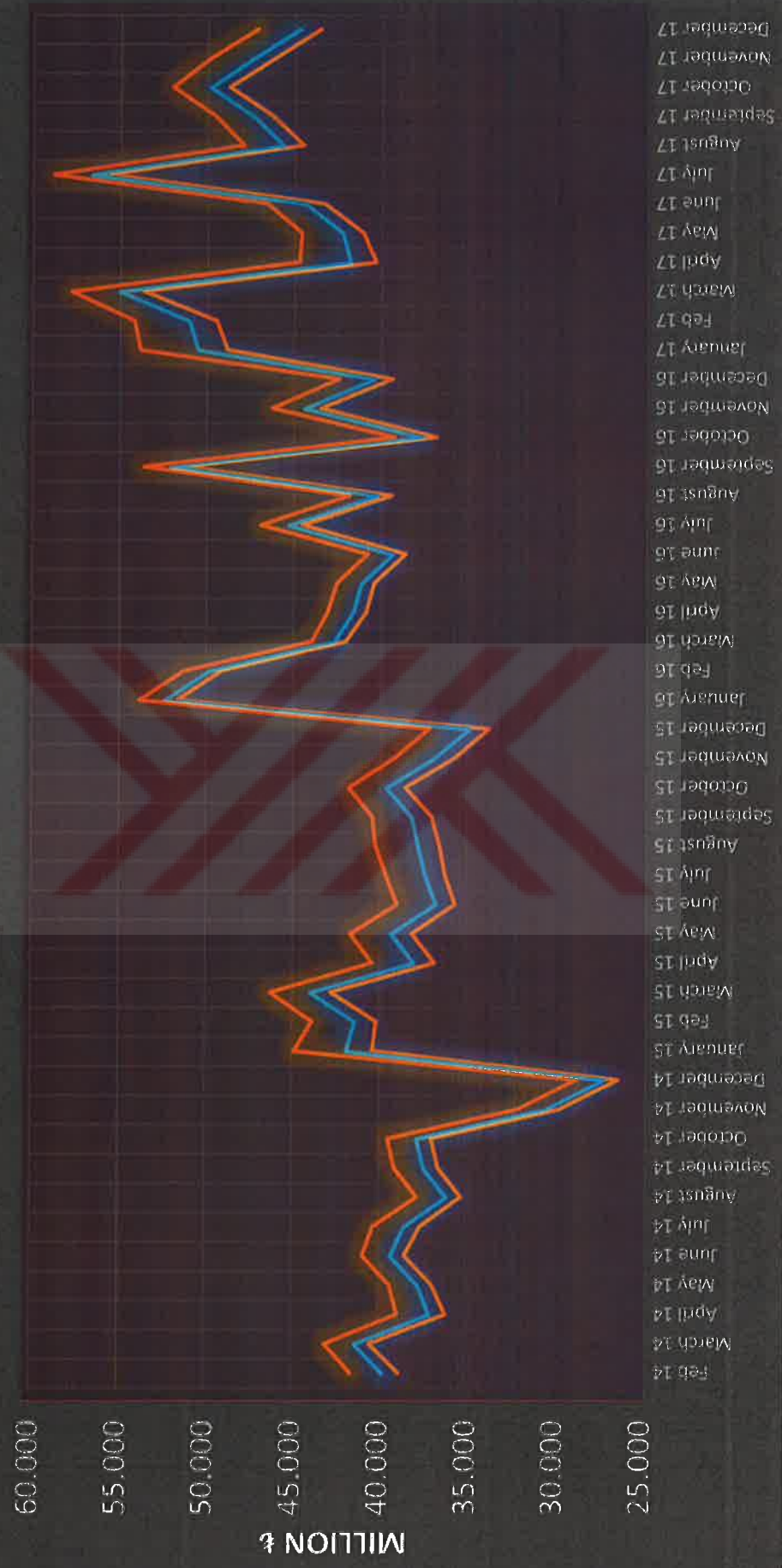
	Expected Interest Revenue If Treasury Adopted "Gov't Cash Management Policy"	Realized Interest Revenue	Expected Net Interest Revenue
2014	4.984	1.989	2.995
2015	5.874	2.879	2.996
2016	6.079	3.328	2.751
2017	7.803	4.081	3.722
Total	24.740	12.277	12.464

Table 4.6. Estimated Extra Interest Revenue on Deposit of Treasury with New TSA with Lower Interest

The other scenario is that the Treasury managed the deposit of "revised" new TSA instead of the deposit of new TSA. The revised new TSA is obtained by subtracting the the amount of deposits of UIF, SDIF and Revenue Administration from the new TSA. (We assumed the amount of deposits of UIF, SDIF and Revenue Administration is approximately 15 billion ₺ by taking into consideration their financial resources.) According to this scenario (the Treasury with the revised new TSA manage approximately 70 billion ₺), during 2014-2017, if the Treasury implemented the "government cash management policy", it would determine its target cash balance as ₺ 41.9 billion on average and its cash lower and upper bound as ₺ 40.9 billion, ₺ 44.0 billion on average, respectively. During the four-year period, the Treasury would let its cash balance (₺ 41.9 billion on average) to oscillate between lower and upper bounds (Graph 4.18) (Table 4.7).

Treasury Cash Reserve Interval with Revised New TSA

— Lower Limit (L) — Treasury Target Cash Reserve (TTCR) — Upper Limit (H)



Graph 4.18. Treasury Cash Reserve Interval with Revised New TSA

Miller-Orr Analysis for Treasury Cash Reserve with Revised New TSA																
Miller-Orr Study Analysis	Spread (S)	Compulsory Payments (CP)	kb	Lower Limit (L)	Treasury Target Cash Reserve (TTCR)	Upper Limit (H)	Average Cash Balance Calculated by Miller-Orr Model (A)	Average Cash Balance in Fact (AVTCR)	Cash Amount Outside of Cash Balance Range	Cash Amount Proposed to be Invested on Time-Deposits	Cash Amount Proposed to be Borrowed by Short-Term Cash Borrowing Instruments	Cost of Borrowing Cash Amount	Interest Revenue on Time-Deposit	Interest Revenue on Current Accounts	Total Interest Revenue on Deposit	Average Cash Amount After Adoption of Gov't Cash Management Policy
Feb 14	2,746	30,743	8,082	38,825	39,741	41,571	40,046	66,597	25,026	26,856	0	0	214	331	545	39,741
March 14	2,564	33,092	7,407	40,500	41,354	43,064	41,639	62,656	19,593	21,302	0	0	179	345	523	41,354
April 14	2,761	30,326	5,828	36,155	37,075	38,916	37,382	67,815	28,899	30,740	0	0	251	309	560	37,075
May 14	2,430	33,744	3,179	36,923	37,733	39,352	38,002	58,985	18,633	21,253	0	0	164	299	463	37,733
June 14	2,410	28,492	10,007	38,499	39,303	40,909	39,570	59,078	18,169	19,776	0	0	144	287	431	39,303
July 14	2,725	31,564	6,028	37,592	38,500	40,317	38,803	51,600	11,283	13,100	0	0	89	265	353	38,500
August 14	2,496	29,584	5,697	35,281	36,112	37,776	35,390	57,739	19,963	21,626	0	0	144	248	393	36,112
September 14	2,525	32,274	4,308	36,582	37,424	39,107	37,704	63,296	24,189	25,872	0	0	181	257	438	37,424
October 14	2,495	33,891	3,096	36,987	37,819	39,482	38,096	56,586	17,104	18,767	0	0	131	260	391	37,819
November 14	2,389	30,146	-520	29,626	30,422	32,015	30,688	56,986	24,982	26,575	0	0	186	209	396	30,422
December 14	2,383	26,249	17	26,266	27,064	28,659	27,329	60,025	31,367	32,962	0	0	253	186	439	27,064
Av. - 2014	2,539	30,919	4,830	35,749	36,585	38,288	36,877	60,125	21,837	23,530	0	0	176	272	448	36,585
January 16	4,491	38,064	2,317	40,381	41,878	44,872	42,377	54,298	9,426	12,420	0	0	91	270	361	41,878
February 16	3,676	37,093	3,063	40,176	41,401	43,852	41,810	65,822	21,970	24,421	0	0	179	259	435	41,401
March 16	3,469	34,949	7,839	42,788	43,944	46,257	44,330	65,004	18,747	21,059	0	0	160	275	435	43,944
April 16	3,577	36,827	3	36,830	38,022	40,407	38,420	64,365	23,958	26,343	0	0	202	238	440	38,022
May 16	3,538	33,441	4,687	38,129	39,308	41,666	39,701	66,063	24,398	26,755	0	0	205	246	451	39,308
June 16	3,342	31,272	4,383	35,655	36,769	38,997	37,140	70,072	31,074	33,303	0	0	264	230	494	36,769
July 16	3,390	36,402	-162	36,240	37,370	39,630	37,747	66,016	26,386	28,648	0	0	227	234	461	37,370
August 16	3,676	34,228	2,324	36,552	37,777	40,228	38,186	76,085	35,857	38,308	0	0	297	236	533	37,777
September 16	3,411	38,209	-1,191	37,018	38,155	40,429	38,534	80,085	39,656	41,930	0	0	354	238	592	38,155
October 16	3,250	33,825	4,695	38,520	39,603	41,770	39,964	68,747	26,977	29,144	0	0	240	248	487	39,603
November 16	3,457	34,807	895	35,702	36,854	39,159	37,238	80,240	41,081	43,385	0	0	358	230	588	36,854
December 16	3,427	30,703	3,021	33,723	34,866	37,151	35,247	81,644	44,493	46,778	0	0	399	218	617	34,866
Av. - 2016	3,559	34,985	2,658	37,643	38,829	41,201	39,224	69,870	28,668	31,041	0	0	248	243	491	38,829
January 17	2,167	46,382	5,258	51,639	52,362	53,807	52,603	65,856	12,050	13,495	0	0	113	327	440	52,362
February 17	7,140	41,125	7,981	49,106	49,820	51,247	50,058	77,705	26,459	27,886	0	0	234	311	545	49,820
March 17	1,954	44,441	-2,456	41,984	42,636	43,938	42,853	70,677	26,738	28,041	0	0	240	266	507	42,636
April 17	2,224	39,823	989	40,812	41,553	43,035	41,800	63,783	20,748	22,230	0	0	182	260	442	41,553
May 17	2,152	42,078	-1,709	40,368	41,086	42,521	41,325	75,853	33,332	34,767	0	0	279	257	536	41,086
June 17	2,185	39,399	-840	38,559	39,287	40,744	39,530	74,560	33,816	35,272	0	0	276	246	521	39,287
July 17	2,411	40,982	3,478	44,460	45,263	46,871	45,531	63,917	17,046	18,654	0	0	142	283	425	45,263
August 17	2,444	39,977	-610	39,367	40,181	41,811	40,463	74,405	32,594	34,223	0	0	254	251	505	40,181
September 17	2,326	42,636	8,630	51,266	52,041	53,592	52,300	71,673	18,082	19,632	0	0	147	325	472	52,041
October 17	2,424	39,093	-2,285	36,809	37,617	39,233	37,886	70,550	31,317	32,933	0	0	244	235	479	37,617
November 17	2,801	40,361	3,073	43,433	44,367	46,235	44,678	74,061	27,826	29,594	0	0	218	296	514	44,367
December 17	3,083	36,559	2,781	39,340	40,368	42,424	40,711	79,167	36,743	38,799	0	0	283	269	552	40,368
Av. - 2017	2,359	41,071	2,024	43,095	43,882	45,455	44,144	71,851	26,396	27,969	0	0	218	277	495	43,882
January 18	4,984	51,032	-2,193	48,839	50,500	53,822	51,053	70,560	16,737	20,060	0	0	148	337	485	50,500
February 18	4,726	47,113	2,337	47,113	51,026	54,177	51,551	81,962	30,936	33,260	0	0	234	340	574	51,026
March 18	4,177	48,893	4,717	53,610	55,002	57,787	55,466	73,284	15,498	18,282	0	0	147	367	513	55,002
April 18	4,390	43,547	-3,233	40,315	41,778	44,704	42,266	61,351	16,646	19,573	0	0	165	279	443	41,778
May 18	3,539	44,024	-2,969	41,055	42,234	44,594	42,628	75,460	30,866	33,225	0	0	296	282	577	42,234
June 18	3,309	42,013	1,259	43,272	44,375	46,581	44,743	81,686	35,105	37,310	0	0	342	295	638	44,375
July 18	3,277	47,839	7,718	55,557	56,649	58,934	57,014	81,465	22,630	24,815	0	0	231	378	608	56,649
August 18	3,436	47,434	-2,963	44,480	45,626	47,917	46,008	84,551	36,634	38,925	0	0	354	304	658	45,626
September 18	3,285	51,257	-4,998	46,259	47,354	49,544	47,719	78,946	29,402	31,592	0	0	291	316	607	47,354
October 18	3,257	45,618	3,115	48,733	49,819	51,991	50,181	83,725	31,734	33,906	0	0	322	332	654	49,819
November 18	3,694	47,463	-1,330	46,133	47,365	49,827	47,775	93,366	43,529	45,991	0	0	440	316	756	47,365
December 18	3,601	41,157	2,356	43,513	44,713	46,114	45,114	91,951	44,837	47,238	0	0	453	298	752	44,713
Av. - 2018	3,806	46,449	319	46,768	48,037	50,574	48,460	79,858	29,284	31,821	0	0	285	320	605	48,037
Average	3,077	38,514	2,407	40,821	41,947	43,999	42,289	70,648	26,647	28,698	0	0	211	272	451	41,947
Total													10,246	19,898	24,931	

Table 4.7. Miller-Orr Analysis for Treasury Cash Reserve with Revised New TSA

According to this scenario, the result shows that during the four-year, if the Treasury adopted the “government cash management policy” and the Treasury remunerated its surplus with weighted average deposit interest rates, additional the average expected revenue on its deposits would be approximately 3.7 billion ₪ without bearing additional borrowing cost (Table 4.8).

Million ₪

	Expected Interest Revenue If Treasury Adopted "Gov't Cash Management Policy"	Realized Interest Revenue	Expected Net Interest Revenue
2014	4.931	1.548	3.384
2015	5.897	2.131	3.766
2016	5.938	2.440	3.497
2017	7.265	2.989	4.276
Total	24.031	9.108	14.923

Table 4.8. Estimated Extra Interest Revenue on Deposit of Treasury with Revised New TSA

Another scenario is that the Treasury managed the revised new TSA, which does not cover the deposits of UIF, SDIF and Revenue Administration, and it remunerated its surplus with time-deposits with the interest rates (approximately 70% of the weighted average deposit interest rate) which are lower than the market rates to favor markets by subsidizing public banks. For this scenario, the average additional expected revenue on its deposits would be approximately 2.9 billion ₪ without bearing additional borrowing cost (Table 4.9).

Million ₺

	Expected Interest Revenue If Treasury Adopted "Gov't Cash Management Policy"	Realized Interest Revenue	Expected Net Interest Revenue
2014	4.348	1.548	2.800
2015	5.000	2.131	2.869
2016	5.150	2.440	2.709
2017	6.232	2.989	3.243
Total	20.730	9.108	11.621

Table 4.9. Estimated Extra Interest Revenue on Deposit of Treasury with Revised New TSA with Lower Interest

As a result, in any case, we see that the extension of TSA system provides significant value added to public cash management even to public financial management since the Treasury with the extension of TSA could generate additional substantial amount revenue without taking the risk. On the other hand, although we did not take place analysis of likely effects of the extension of TSA to borrowing costs in this study, we are sure that the extension of TSA will make a significant contribution on financing policy as well. The Treasury could follow its borrowing strategies and implement its financing program without considering its cash reserve in favor of having strong cash reserve. Moreover, by using its strong cash reserve as a trump card, it becomes more powerful against other players (creditors) when borrowing.

Table 1: Summary of Data			
Category	Sub-Category	Value 1	Value 2
A	B	10	20
	C	30	40
D	E	50	60
	F	70	80



CHAPTER V

CONCLUSION

Modern cash management is the strategy and whole processes for managing cost-effectively the government's short-term cash flows and cash reserve. With the adoption of modern cash management approach, it is possible to meet state's obligations in an effective and timely manner with lowest possible costs and risks.

An effective cash management approach is consisting of four main components. These are listed as i) possession of banking structure allowing all public resources to be observed and managed from a single source; ii) possession of cash information systems to ensure accurate forecasting cash flows; iii) remunerating cash surplus with alternative instruments; iv) using short-term cash borrowing instruments to adjust cash balance when necessary.

Especially in international good practices, public cash is professionally managed by countries' treasuries. As mentioned above, there is need to complete four main steps for achieving to professional cash management. All steps are quite important, but one of them is above the rest which is establishment of TSA. The creation of TSA is prerequisite for the transition from traditional approach to modern cash management approach. In this regard, having comprehensive TSA coverage is essential for Turkey to reach those targets mentioned above.

In this study, TSA models are categorized according to different banking accounts and managerial structures. The managerial discrepancy in TSA models generally stems from countries' different budget implementation process, accounting structure, and division of responsibility. The differentness of TSA models from the point of the banking-account and managerial structure is related to where main and sub-TSA

accounts are held at (central bank or other banks) and who are responsible for managing those accounts.

In Turkey, TSA system, which is the most crucial step to make the transition from traditional to modern cash management, was started to be implemented in 1972; but in that time, the function of the TSA was different from its international practices. Since its establishment, the TSA has been revised many times to converge to international good practices in line with requirements and technological development.

After the establishment of TSA in 1972, in line with technological development and requirements, TSCA system was established, but it was not enough to face requirements as like TSA in 1972. And then, PEPS and new TSA applications started to be officially implemented in 2011. With PEPS, it is realized that all transactions started to be made electronically. Thus, it can easily say that Turkish TSA system converged to ideal TSA system with PEPS. However, although it does better Turkish TSA system, there are some deficiencies in PEPS, as well. Limited coverage can be shown as the main deficiency of PEPS. Its coverage is limited to general budget transactions so PEPS should be redesign to cover all public institutions and their transactions.

The extension of TSA coverage is considered as one of the key indicators of cash management effectiveness. In this regard, ideal TSA should cover all public institutions without considering what their function is or what type organizational structure they have. That is, TSA should include general budget institutions, special budget institutions, budgetary funds, extra-budgetary funds, autonomous institutions and organizations, local governments, special accounts, revolving funds and similar structures. However, in Turkey, the TSA coverage is limited only with the central

and provincial units of general budget institutions. In this context, the TSA coverage should be extended in order to manage government cash resources centrally and efficiently.

Extending the scope of existing TSA enables public resources to be utilized in a more efficient way through economies of scale (by collecting them in a single pool), reduces unnecessary borrowing and ensures that public resources are remunerated with the appropriate rate of return and instruments to earn interest income in accordance with active cash management objectives.

Different TSA models can be suggested to reach the specified targets. No matter which model is chosen, it is obvious that for Turkey, some regulations in the field of the integrated information system, accounting system, banking account structure and legislative arrangements should be made to extend the scope of current TSA system.

In this study, we propose the new TSA system which has more extensive coverage than the current one. We allege that the new TSA system will make a significant contribution to Turkish public financial management. In this context, we analyzed the deposits of institutions currently out of the scope of the TSA but recommended to include in the TSA in detailed. And then, by applying new cash management model to Treasury, which is created by modified the Miller-Orr model, we tried to calculate what the possible effects of the extension of the TSA to public financial management would be under the certain assumptions.

The results show that the Treasury could manage significant amount of public resources (approximately ₺ 70-85 billion on average) which is almost 2.2-2.7 times of current Treasury cash reserve with the adoption of the new TSA. Besides, our study shows that under the assumption that cash reserve was managed with a reasonable safety level, the Treasury could remunerate a substantial amount of cash

reserve with alternative investment instruments, and it could earn a considerable amount of extra interest revenue on its deposit (annual average varies from ₦ 2.9 billion to ₦ 4.4 billion) if it had the new TSA with extensive coverage as we proposed.

In short, we assert that public resources are utilized better with the appropriate rate of return and instruments if all public resources are managed by single hand. Furthermore, we allege that managing a significant amount of reserve without bearing any cost also impedes over borrowing since the Treasury can reach a significant amount of public resources without bearing any cost, thus borrowing costs will be reduced. Besides, in addition to the tangible benefits of TSA, it will also contribute to achieving efficiency, discipline, and transparency in public financial management considerably.

Considering that the extension of TSA provides multi-dimensional contributions to public financial management, some reforms regarding the enlargement of TSA should be carried into effect as a priority.

BIBLIOGRAPHY

Allen, Richard, and Daniel Tomassi (2001). *Managing Public Expenditure: A Reference Books for Transition Countries*. France: OECD Publications.

<http://www1.worldbank.org/publicsector/pe/oecdpehandbook.pdf>

Allen, Richard, and Dimitar Radev. (2006). "Managing and Controlling Extrabudgetary Funds." International Monetary Fund Fiscal Affairs Department, *IMF Working Paper*, issue no. WP/06/286

<https://www.imf.org/external/pubs/ft/wp/2006/wp06286.pdf>

Baumol, J. William. 1952." The Transactions Demand for Cash: An Inventory Theoretic Approach." *The Quarterly Journal of Economics* vol. 66, issue no. 4 (November 1952): 545-556

Bessette, Franck. (2011). "Treasury Single Account: A Revolutionary Idea...in 1806!" Public Financial Management Blog. Accessed May 15, 2017.

<http://blog-pfm.imf.org/pfmblog/2011/02/treasury-single-account-a-revolutionary-ideain-1806.html>

Bozkurt, Fatih. (2007). "Aktif Nakit Yönetimi Ülke Uygulamaları ve Türkiye" (Unpublished Treasury Expertise Thesis, Undersecretariat of Turkish Treasury), 104.

Brealey, R.A. & Myers, S.C. (2005). *Principles of Corporate Finance*. 8th Edition London: McGraw-Hill.

Bureau of Economic Growth, Education and the Environment Office of Economic Policy Capacity Building Division. (2014). *Guide to Public Financial Management*.

USAID. http://pdf.usaid.gov/pdf_docs/PA00K55Q.pdf

Can, Barış. (2017). "Genişletilmiş Yeni Tek Hazine Hesabı Modeli Önerisi" (Unpublished Treasury Expertise Thesis, Undersecretariat of Turkish Treasury), 161.

Cangiano, Marco. "Treasury Core Functions" (presented at the Conference, Rome, February 6-8, 2017).

http://www.rgs.mef.gov.it/Documenti/VERSIONE-I/Comunicazione/Workshop-e-convegna/Seminario_2017-02-6_8/08_-

[Treasury Functions and Cash Management - Cangiano.pdf](#)

Central Bank of the Republic of Turkey. "Electronic Data Delivery System."
Central Bank of the Republic of Turkey. Accessed August 8, 2017.

http://evds.tcmb.gov.tr/index_en.html

Central Bank of the Republic of Turkey. "Public Electronic Payment System"
(presented at the Conference on PEMPAL TCOP thematic group on cash
management, Turkey, March 16-18, 2016).

<https://www.pempal.org/events/pempal-tcop-thematic-group-meeting-cash-management>

Contingencies Fund Account 2014-15. (2015). National Audit Office. London:
National Audit Office Press.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/447810/Contingencies_fund_201415.pdf

Dr. Cangöz, M. Coşkun. (2014). "Tek Hazine Hesabı: Kavramsal ve Operasyonel
Çerçeve." *Uzman Bakış* 1, no.2 (April 2014),

http://www.mud.org.tr/uploads/yuklemeler/Uzman_Bakis_Sayi_2.pdf

Dr. Cangöz, M. Coşkun, and Dr. Emre Balıbek. (2012). "Kamu Borç Yönetiminin
Genel Çerçevesi: Yeni Eğilimler ve Türkiye'ye Yansımaları." In *Hazine İşlemleri ve
Çağdaş Hazine Yönetimi*. edited by Dr. M. Coşkun Cangöz and Dr. Emre Balıbek,
17-44. Ankara: Şeçkin Yayıncılık.

Erdener, Gonca, and Seçil Çiçek. (2012). "Hazine Nakit Yönetiminin
Modernizasyonu: Türkiye Deneyimi." In *Hazine İşlemleri ve Çağdaş Hazine
Yönetimi*. Şeçkin Yayıncılık, edited by Dr. M. Coşkun Cangöz and Dr. Emre Balıbek,
243-278. Ankara: Şeçkin Yayıncılık.

Erdener, Gonca and Mahmut Kara, Emrah Yaşartürk. (2013). "Hazine Nakit
Yönetiminin Borç, Risk ve Likidite Yönetimiyle Etkileşimi." *Kamu Borç Yönetimi
Raporu*, July 15, 2013.

<http://www.treasury.gov.tr/en-US/Reports-Page?mid=739&cid=22&nm=712#>

Fainboim Yaker, Israel, and Claudiano Manoel de Albuquerque, José Adrián Vargas. (2015). "The Treasury Single Account in Latin America: An Essential Tool for Efficient Treasury Management." In *Public Financial Management in Latin America The Key to Efficiency and Transparency*, edited by Carlos Pimenta and Mario Pessoa, 129-180. Washington DC: The Institutions for Development Sector of the Inter-American Development Bank.

<https://publications.iadb.org/handle/11319/7123>

General Guidelines for the Development of Government Payment Programs. (2012). Financial Infrastructure Series Payment Systems Policy and Research. Washington DC: The World Bank.

https://siteresources.worldbank.org/FINANCIALSECTOR/Resources/General_Guidelines_Govt_Payment_Aug2012.pdf

Kaplan Financial Limited. (2012). *Working capital management*. Kaplan Financial Knowledge Bank, Kaplan Financial Limited. Last modified September 15, 2017.

<http://kfknowledgebank.kaplan.co.uk/wiki%20pages/home.aspx>

Karabulut, Adem. (2013). "Tek Hazine Hesabı, Seçilmiş Ülke Uygulamaları ve Türkiye Örneği" (Unpublished Treasury Expertise Thesis, Undersecretariat of Turkish Treasury), 164.

Köksal, Mahmut. (1989). "Merkez Bankası - Hazine İlişkileri" (Government Budget Expertise Research Report, Ministry of Finance), 46.

Lienert, Ian. (2009). *Modernizing Cash Management*. IMF Technical Notes and Manuals. Washington DC: International Monetary Fund Fiscal Affairs Department.

<https://www.imf.org/external/pubs/ft/tnm/2009/tnm0903.pdf>

Marcelo Botelho da Costa Moraes, Marcelo Seido Nagano, and Vinicius Amorim Sobreiro. (2015). "Stochastic Cash Flow Management Models: A Literature Review Since the 1980s." In *Decision Models in Engineering and Management*. edited by Patricia Guarnieri, Chapter 2, 11-28. Switzerland: Springer International Publishing.

https://link.springer.com/chapter/10.1007%2F978-3-319-11949-6_2

Michalski, Grzegorz. (2009). "Target Liquid Balances and Value of the Firm." *Zagreb International Review of Economics & Business*, vol. 12, issue no. 1.
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1841812&rec=1&srcabs=1917755&alg=1&pos=9

Miller Merton .H. and Orr Daniel. (1966). "A Model of the Demand for Money by Firms." *Quarterly Journal of Economics*, vol. no. 80, issue no.3.413-435.

Mu, Yibin. (2006). *Government Cash Management: Good Practice & Capacity-Building Framework*. Washington DC: The World Bank Financial Sector Discussion Series.
<http://documents.worldbank.org/curated/en/918791468179361162/Government-cash-management-good-practice-and-capacity-building-framework>.

Mullins D. and Homonoff R. (1976). "Applications of Inventory Cash Management Models." In *Modern Developments in Financial Management*. edited by S.C. Myers. New York: Frederick A. Praeger Inc.

Official Letter of Directorate of Treasury and General Secretariat of International Economic Cooperation. Date: 06.30.1972 and No of Letter: 31109

Pattanayak, Saliendra and Israel Fainboim. (June 2010). "Treasury Single Account: Concept, Design, and Implementation Issues." International Monetary Fund Fiscal Affairs Department, *IMF Working Paper*, issue no. WP/10/143.
<https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Treasury-Single-Account-Concept-Design-and-Implementation-Issues-23927>

Pattanayak, Saliendra and Israel Fainboim. (August 2011). *Treasury Single Account: An Essential Tool for Government Cash Management*. IMF Technical Notes and Manuals. Washington DC: International Monetary Fund Fiscal Affairs Department. <https://www.imf.org/external/pubs/ft/tnm/2011/tnm1104.pdf>

PEMPAL. "Improving Treasury Single Account Operations and Cash Management" (presented at the Videoconference on PEMPAL TCOP thematic group meeting on Cash management, October 29, 2015).
<https://www.pempal.org/events/videoconference-pempal-tcop-thematic-group-cash-management>

PEMPAL. "Turkish Taxation System" (presented at the PEMPAL TCOP thematic group meeting on Cash management, October 11, 2016).

<https://www.pempal.org/node/3090>

Public Financial Management and Control Law No. 5018. Date of Adoption: 10/12/2003, Publication Date in the Official Gazette: 24/12/2003, No of the Official Gazette: 25326.

<https://www.sgb.gov.tr/Mevzuat/01.Kanun/Public%20Financial%20Management%20and%20Control%20Law%20No.%205018.pdf>

Republic of Turkey Ministry of Finance Directorate General of Public Accounts. "Public Account Bulletin." *Republic of Turkey Ministry of Finance Directorate General of Public Accounts*. Accessed August 8, 2017.

<https://www.muhasabat.gov.tr/content/public-accounts-bulletin>

Republic of Turkey Prime Ministry Undersecretariat of Turkish Treasury. "Public Finance Statistic." *Republic of Turkey Prime Ministry Undersecretariat of Turkish Treasury*. Accessed August 8, 2017.

<http://www.treasury.gov.tr/en-US/Stat-List?mid=738&cid=12&nm=684>

Ross, Stephen, and Randolph Westerfield, Bradford Jordan. (2010). "Cash and Liquidity Management." In *Fundamentals of Corporate Finance*, Nine edition, Part Seven Chapter 19, 612-642. New York: McGraw-Hill/Irwin.

<http://www.aep.neu.edu.vn/FileManager/ThuVien/166085925-Ross-Westerfield-Jordan-Fundamentals-of-Corporate-Finance-9th-Ed-20101.pdf>

Shah, Anwar. (2007). *Public Sector Governance and Accountability Series: Budgeting and Budgetary Institutions*. Washington DC: The World Bank.

<https://siteresources.worldbank.org/PSGLP/Resources/BudgetingandBudgetaryInstitutions.pdf>

Stone, Bernell K. (1972). "The Use of Forecasts and Smoothing in Control-Limit Models for Cash Management." *Financial Management*, Spring vol. 1, issue no .1. 72-84. https://www.jstor.org/stable/3664955?seq=1#page_scan_tab_contents

Storkey, Ian. (July 2003).” Government Cash and Treasury Management Reform.” Asian Development Bank, *The Governance Brief*, issue no. 7.
<https://www.adb.org/publications/series/governance-briefs?page=2>

Storkey, Ian. "Cash Management Practices in APEC Economies" (presented at the Conference on APEC Workshop, Russian Federation, March 25-27, 2012).
http://www.storkeyandco.com/files/6113/8731/5973/Ian_Storkey_Cash_Management_Practices_in_APEC_Economies_March_2012.pdf

Varea, Marco and Adriana Arosteguiberry. (2015). “Treasury Management Efficiency Indicators.” In *Public Financial Management in Latin America The Key to Efficiency and Transparency*, edited by Carlos Pimenta and Mario Pessoa, 25-73. Washington DC: The Institutions for Development Sector of the Inter-American Development Bank. <https://publications.iadb.org/handle/11319/7123>

Williams, Mike. (2004). *Government Cash Management: Good and Bad Practice*. The World Bank.
<http://treasury.worldbank.org/bdm/pdf/CM-V2-Aug04MikeWilliams.pdf>

Williams, Mike. (2009).” Government Cash Management: International Practice.” *Oxford Policy Management*, issue no. 1
http://www.opml.co.uk/sites/default/files/wp2009-01_0.pdf

Williams, Mike. (2010). *Government Cash Management: Its Interaction with Other Financial Policies*. Washington DC: International Monetary Fund Fiscal Affairs Department. <https://www.imf.org/external/pubs/ft/tnm/2010/tnm1013.pdf>

Williams, Mike. "The Treasury Single Account (TSA)" (presented at the Conference on Budget Execution and Cash Management - Middle East Regional Technical Assistance Center IMF - METAC, Beirut, July 2-4, 2013).

Yaşartürk, Emrah. “Tek Hazine Hesabının Uluslararası Uygulamalar Perspektifinde Değerlendirilmesi.” *Kamu Borç Yönetimi Raporu*, August 4, 2016,
<http://www.treasury.gov.tr/en-US/Reports-Page?mid=739&cid=22&nm=712#>

APPENDIX

A.1. Public Institutions

A1.a. Chart No I - Public Administrations within the Scope of General Budget

- 1) Turkish Grand National Assembly
- 2) Presidency of Republic
- 3) Prime Ministry
- 4) Constitutional Court
- 5) Supreme Court of Appeals
- 6) Council of State
- 7) Council of Judges and Prosecutors
- 8) Court of Accounts
- 9) Ministry of Justice
- 10) Ministry of National Defense
- 11) Ministry of Interior
- 12) Ministry of Foreign Affairs
- 13) Ministry of Finance
- 14) Ministry of National Education
- 15) Ministry of Health
- 16) Ministry of Transport, Maritime Affairs and Communications
- 17) Ministry of Labor and Social Security
- 18) Ministry of Energy and Natural Resources
- 19) Ministry of Culture and Tourism
- 20) Ministry of Family and Social Politics
- 21) Ministry for EU Affairs
- 22) Ministry of Science, Industry and Technology
- 23) Ministry of Environment and Urbanization
- 24) Ministry of Economy
- 25) Ministry of Youth and Sports
- 26) Ministry of Food, Agriculture and Livestock
- 27) Ministry of Customs and Trade
- 28) Ministry of Development
- 29) Ministry of Forestry and Water Affairs
- 30) General Secretariat of National Security Council
- 31) Undersecretariat of National Intelligence Organization
- 32) General Commandership of Gendarmerie
- 33) Commandership of Coastal Security
- 34) General Directorate of Security
- 35) Presidency of Religious Affairs
- 36) Undersecretariat of Treasury
- 37) Undersecretariat of Public Order and Security
- 38) Prime Ministry High Auditing Board
- 39) State Personnel Presidency
- 40) Turkish Statistical Institute
- 41) Presidency of Revenue Administration
- 42) Disaster and Emergency Management Presidency
- 43) General Directorate of Land Registry and Cadastre
- 44) General Directorate of Migration Management
- 45) Turkish State Meteorological Service
- 46) Directorate General of Press and Information

A.1.b. Chart No II - Special Budget Administrations

A.1.b.i. Council of Higher Education, Universities and High Technology
Institutes

- 1- Council of Higher Education
- 2- Measuring, Selection and Placement Center
- 3- Istanbul University
- 4- Istanbul Technical University
- 5- Ankara University
- 6- Karadeniz Technical University
- 7- Ege University
- 8- Ataturk University
- 9- Middle East Technical University
- 10- Hacettepe University
- 11- Bogaziçi University
- 12- Dicle University
- 13- Çukurova University
- 14- Anadolu University
- 15- Cumhuriyet University
- 16- İnönü University
- 17- Fırat University
- 18- 19 Mayıs University
- 19- Selçuk University
- 20- Uludağ University
- 21- Erciyes University
- 22- Akdeniz University
- 23- 9 Eylül University
- 24- Gazi University
- 25- Marmara University
- 26- Mimar Sinan Fine Arts University
- 27- Trakya University
- 28- Yıldız Technical University
- 29- Van 100. Yıl University
- 30- Gaziantep University
- 31- Abant İzzet Baysal University
- 32- Adnan Menderes University
- 33- Afyon Kocatepe University
- 34- Balıkesir University
- 35- Manisa Celal Bayar University
- 36- Çanakkale 18 Mart University
- 37- Dumlupınar University
- 38- Gaziosmanpaşa University
- 39- Gebze High Technology Institute
- 40- Harran University
- 41- Izmir High Technology Institute
- 42- Kafkas University
- 43- Kahramanmaraş Sütçü İmam University
- 44- Kırıkkale University
- 45- Kocaeli University
- 46- Mersin University
- 47- Muğla University
- 48- Mustafa Kemal University
- 49- Niğde Ömer Halisdemir University
- 50- Pamukkale University

- 51- Sakarya University
- 52- Suleyman Demirel University
- 53- Bulent Ecevit University
- 54- Eskişehir Osmangazi University
- 55- Galatasaray University
- 56- Ahi Evran University
- 57- Kastamonu University
- 58- Düzce University
- 59- Mehmet Akif Ersoy University
- 60- Uşak University
- 61- Recep Tayyip Erdoğan University
- 62- Namık Kemal University
- 63- Erzincan University
- 64- Aksaray University
- 65- Giresun University
- 66- Hitit University
- 67- Bozok University
- 68- Adıyaman University
- 69- Ordu University
- 70- Amasya University
- 71- Karamanoğlu Mehmetbey University
- 72- Ağrı Dağı University
- 73- Sinop University
- 74- Siirt University
- 75- Nevşehir Hacı Bektaş Veli University
- 76- Karabük University
- 77- Kilis 7 Aralık University
- 78- Çankırı Karatekin University
- 79- Artvin Çoruh University
- 80- Bilecik Şeyh Edebali University
- 81- Bitlis Eren University
- 82- Kırklareli University
- 83- Osmaniye Korkut Ata University
- 84- Bingöl University
- 85- Muş Alparslan University
- 86- Mardin Artuklu University
- 87- Batman University
- 88- Ardahan University
- 89- Bartın University
- 90- Bayburt University
- 91- Gümüşhane University
- 92- Hakkari University
- 93- Iğdır University
- 94- Şırnak University
- 95- Munzur University
- 96- Yalova University
- 97- Türk-Alman University
- 98- Ankara Yıldırım Beyazıt University
- 99- Bursa Teknik University
- 100- Istanbul Medeniyet University
- 101- Izmir Katip Çelebi University
- 102- Necmettin Erbakan University
- 103- Abdullah Gül University
- 104- Erzurum Technical University
- 105- Adana Science and Technology University
- 106- Social Science University of Ankara

- 107-University of Health Sciences
- 108-Bandırma 17 Eylül University
- 109-İskenderun Technical University
- 110- Alanya Alaaddin Keykubat University
- 111- Turkey International Islamic, Science and Technology University
- 112-Izmir Bakırçay University
- 113-Izmir Democracy University
- 114-Ankara Fine Arts University
- 115-Higher Education Quality Board

A.1.b .ii. Other Special Budget Administrations

- 1- Undersecretariat of Defense Industry
- 2- Atatürk Supreme Council for Culture, Language and History
- 3- Atatürk Research Center
- 4- Atatürk Culture Center
- 5- Turkish Language Association
- 6- Turkish Historical Society
- 7- Turkey and Middle-East Public Administration Institute
- 8- The Scientific and Technical Research Council of Turkey
- 9- Turkey Sciences Academy
- 10-Turkey Justice Academy
- 11-General Directorate of Credit and Dormitories Agency
- 12-General Directorate of Highways
- 13-General Directorate of Sports
- 14-General Directorate of State Theatres
- 15-General Directorate of State Opera and Ballet
- 16-General Directorate for Forestry
- 17-General Directorate of Foundations
- 18-General Directorate of Health for Borders and Coasts
- 19-General Directorate of Mining Study and Research
- 20-Directorate General of Civil Aviation
- 21-Turkish Accreditation Agency
- 22-Turkish Standards Institute
- 23-Turkish Patent and Trademark Office
- 24-National Boron Research Institute
- 25-Turkish Atomic Energy Agency
- 26-Presidency of Development and Support of Small and Medium Size Enterprises Administration
- 27-Turkish Cooperation and Coordination Agency
- 28-Presidency of GAP Regional Development Administration
- 29-Presidency of Privatization Administration
- 30-Public Audit Institution
- 31-Agency for Workshops in Punishment and Execution Establishments and Custodies
- 32-Vocational Proficiency
- 33-Turks Abroad and Related Communities
- 34-Manuscript institution of Turkey
- 35-Presidency of Doğu Anadolu Project Regional Development Administration
- 36-Presidency of Konya Ovası Project Regional Development Administration
- 37-Presidency of Doğu Karadeniz Project Regional Development Administration
- 38-General Directorate of State Hydraulic Works
- 39-Turkish Water Institute
- 40-Turkish Medicines and Medical Devices Agency
- 41-Human Right Joint Platform
- 42-Health Institutes of Turkey

A.1.c. Chart No III - Regulatory and Supervisory Agencies

- 1- Radio and Television Supreme Council
- 2- Information and Communication Technologies Authority
- 3- Capital Markets Board of Turkey
- 4- Banking Regulation and Supervision Agency
- 5- Energy Market Regulation Board
- 6- Public Procurement Agency
- 7- Tobacco and Alcohol Market Regulatory Authority
- 8- Public Oversight Accounting and Auditing Standards Authority
- 9- Personal Data Protection Authority

A.1.d. Chart No IV - Social Security Institutions

- 1- Social Security Institution
- 2- Turkish Labor Agency



A.2. Deposits and Securities Statistics of Institutions within the Scope of General Communiqué for Public Treasurership

(Million ₺)

	DEPOSITS AND SECURITIES STATISTICS OF INSTITUTIONS WITHIN THE SCOPE OF GENERAL COMMUNIQUE FOR PUBLIC TREASURERSHIP* (million TL)	GENERAL BUDGET INSTITUTIONS	SPECIAL BUDGET INSTITUTIONS	REGULATORY AND SUPERVISORY AGENCIES	SOCIAL SECURITY INSTITUTIONS	FUNDS	REVOLVING FUNDS	LOCAL ADMINISTRATIONS	STATE-OWNED ENTERPRISES	OTHER PUBLIC INSTITUTIONS AND ESTABLISHMENTS	TOTAL
February-14	DEPOSITS	9.740	9.891	1.442	7.603	11.884	2.960	16.320	14.262	3.341	77.481
	TOTAL	9.826	10.065	1.447	7.603	88.881	3.055	16.440	15.939	3.607	166.962
March-14	DEPOSITS	11.054	9.922	1.447	6.978	9.959	2.891	12.281	14.431	3.191	71.662
	TOTAL	11.147	10.091	1.450	6.978	87.658	2.967	12.357	15.288	3.527	160.862
April-14	DEPOSITS	17.883	9.796	629	7.721	9.612	2.870	12.757	14.528	3.550	78.106
	TOTAL	17.778	9.961	633	7.721	89.613	2.964	12.807	15.275	3.844	160.896
May-14	DEPOSITS	10.023	9.433	728	3.675	11.596	2.745	13.101	14.944	3.402	88.846
	TOTAL	10.114	9.626	733	3.675	93.533	2.842	13.148	14.958	3.783	162.410
June-14	DEPOSITS	17.021	9.742	873	7.145	9.265	2.597	13.299	14.390	3.402	77.016
	TOTAL	17.098	9.921	878	7.145	91.524	2.655	13.256	14.384	3.851	160.024
July-14	DEPOSITS	22.823	8.642	763	6.656	10.107	2.529	12.405	14.262	3.478	81.462
	TOTAL	22.884	8.736	766	6.657	90.704	2.610	12.468	14.289	3.906	162.810
August-14	DEPOSITS	9.606	9.810	843	3.115	12.903	2.549	12.816	11.796	3.348	88.844
	TOTAL	9.701	9.770	850	3.634	97.084	2.660	13.139	14.351	3.628	166.017
September-14	DEPOSITS	9.606	9.548	859	7.368	11.161	2.719	11.601	11.518	3.590	87.890
	TOTAL	8.714	9.701	863	7.368	85.781	2.860	11.837	11.568	4.057	163.728
October-14	DEPOSITS	9.877	10.099	564	7.894	10.872	2.788	12.724	12.908	3.224	70.949
	TOTAL	10.029	10.300	568	7.895	96.930	2.866	12.875	12.957	3.690	169.228
November-14	DEPOSITS	10.592	9.801	578	4.257	10.297	2.858	12.893	12.332	3.438	86.643
	TOTAL	10.748	9.997	579	4.257	89.505	2.979	12.971	12.378	3.858	167.212
December-14	DEPOSITS	9.589	9.029	963	6.193	11.684	2.591	14.043	12.818	3.485	72.414
	TOTAL	9.771	9.220	962	6.194	101.545	2.721	14.301	12.824	3.905	163.473
January-15	DEPOSITS	9.717	10.188	813	4.795	12.898	2.372	14.808	13.340	2.793	71.821
	TOTAL	9.805	10.406	815	4.795	104.511	2.442	15.205	14.829	3.463	168.376
February-15	DEPOSITS	18.540	10.602	1.842	4.728	15.117	3.159	15.792	13.864	3.173	84.911
	TOTAL	18.721	10.843	1.844	4.724	107.585	3.273	16.105	15.282	3.908	190.284
March-15	DEPOSITS	10.736	9.759	1.834	7.139	13.463	3.198	17.495	17.521	3.782	84.887
	TOTAL	10.822	9.840	1.835	7.140	107.118	3.332	17.750	17.601	4.700	190.341
April-15	DEPOSITS	11.751	9.777	1.096	9.065	13.092	3.090	18.230	14.910	4.062	84.078
	TOTAL	11.958	9.893	1.101	8.068	108.162	3.228	18.537	14.982	4.691	180.818
May-15	DEPOSITS	10.096	10.694	1.178	3.752	15.972	2.873	18.774	14.884	4.148	81.772
	TOTAL	10.297	10.828	1.180	3.754	111.680	3.031	19.122	14.888	5.025	178.204
June-15	DEPOSITS	11.275	9.281	1.333	7.740	13.824	2.820	18.421	14.218	4.100	82.765
	TOTAL	11.455	9.365	1.326	7.740	111.100	2.974	18.806	14.229	5.190	182.208
July-15	DEPOSITS	25.381	9.064	835	10.657	13.726	2.636	17.587	12.849	4.023	86.838
	TOTAL	25.561	9.235	838	10.657	112.690	2.780	18.016	13.916	5.032	198.740
August-15	DEPOSITS	11.466	9.579	922	8.381	15.262	2.523	17.927	13.733	4.295	84.097
	TOTAL	11.609	9.744	926	8.382	114.467	2.663	18.350	13.899	5.240	186.306
September-15	DEPOSITS	22.006	9.639	978	9.411	17.053	2.663	17.590	14.373	4.216	87.831
	TOTAL	22.157	9.807	983	9.412	116.238	2.727	17.959	14.378	5.194	189.867
October-15	DEPOSITS	9.691	10.122	709	4.412	17.568	2.702	17.873	14.130	4.317	81.628
	TOTAL	9.968	10.295	712	4.413	118.836	2.841	18.253	14.135	5.264	184.606
November-15	DEPOSITS	20.265	9.959	845	9.939	18.677	3.015	18.032	15.682	4.414	89.813
	TOTAL	20.410	10.181	841	8.840	120.084	3.190	18.333	15.688	5.339	203.066
December-15	DEPOSITS	10.237	8.803	1.317	8.749	21.953	3.127	18.343	14.178	4.851	82.448
	TOTAL	10.372	8.902	1.318	8.750	124.356	3.187	18.650	14.181	5.518	198.138
January-16	DEPOSITS	11.889	10.970	924	4.449	17.830	3.161	18.409	14.480	4.192	85.874
	TOTAL	12.025	10.775	927	4.450	121.591	3.333	18.603	15.280	5.117	182.300
February-16	DEPOSITS	20.386	10.971	1.800	10.068	18.387	3.601	18.364	16.177	4.674	104.478
	TOTAL	20.569	11.150	1.863	10.069	122.944	3.750	18.742	16.357	6.128	211.659
March-16	DEPOSITS	12.147	11.081	1.850	10.110	16.715	4.185	18.533	15.358	4.519	84.486
	TOTAL	12.330	11.187	1.850	10.111	123.200	4.228	18.938	15.384	5.973	203.178
April-16	DEPOSITS	11.722	10.291	1.341	3.918	18.883	3.889	19.321	16.520	4.600	87.384
	TOTAL	11.888	10.441	1.344	3.917	128.069	4.071	18.756	16.526	5.874	197.896
May-16	DEPOSITS	12.330	10.484	1.459	8.534	18.920	3.680	18.140	16.213	4.522	89.481
	TOTAL	12.472	10.833	1.481	8.534	127.488	4.022	18.575	16.215	5.969	207.388
June-16	DEPOSITS	12.933	10.653	1.681	10.189	16.441	3.007	17.861	15.638	4.788	83.001
	TOTAL	13.082	10.732	1.682	10.190	126.277	3.164	18.054	15.640	6.323	205.144
July-16	DEPOSITS	12.010	10.774	787	3.652	17.680	2.835	18.033	16.815	5.233	86.829
	TOTAL	12.153	10.888	799	3.653	128.192	2.805	18.420	16.433	6.952	200.286
August-16	DEPOSITS	11.800	10.165	873	8.813	19.309	2.782	17.588	16.715	5.308	88.001
	TOTAL	11.744	10.287	876	8.814	130.029	2.957	17.958	16.715	6.891	208.280
September-16	DEPOSITS	11.327	10.909	958	9.498	19.427	3.490	16.925	18.117	5.458	88.108
	TOTAL	11.474	11.055	965	9.497	131.527	3.587	17.324	18.118	7.017	210.682
October-16	DEPOSITS	12.939	11.584	705	8.130	20.106	3.608	16.602	19.027	5.406	89.117
	TOTAL	13.086	11.741	709	8.130	132.358	3.741	16.970	19.028	7.134	212.898
November-16	DEPOSITS	27.173	11.855	832	8.997	21.634	3.364	17.429	18.688	5.278	116.218
	TOTAL	27.328	12.027	837	8.996	133.528	3.512	17.804	18.686	7.218	228.907
December-16	DEPOSITS	12.752	11.536	1.298	4.859	24.569	3.182	17.716	20.206	4.633	100.763
	TOTAL	12.909	11.838	1.308	4.860	135.653	3.203	18.132	20.825	7.813	216.140
January-17	DEPOSITS	17.285	11.833	1.031	6.439	18.784	3.653	18.223	20.889	3.770	102.894
	TOTAL	17.453	12.013	1.035	6.440	133.238	3.694	18.660	21.003	7.280	220.834
February-17	DEPOSITS	24.108	13.796	2.025	6.797	18.112	3.736	18.479	20.809	3.153	111.814
	TOTAL	24.280	13.950	2.030	6.796	133.279	3.786	18.919	21.211	7.487	231.701
March-17	DEPOSITS	17.052	12.807	2.307	7.063	19.574	3.656	18.623	20.170	2.816	104.080
	TOTAL	17.195	12.969	2.307	7.064	135.637	3.738	19.108	21.009	7.338	228.382
April-17	DEPOSITS	18.884	11.607	1.082	3.677	18.213	3.522	18.520	21.381	2.880	87.698
	TOTAL	17.038	11.747	1.085	3.678	135.217	3.678	18.993	21.792	7.189	220.326
May-17	DEPOSITS	18.204	11.703	1.195	9.076	17.727	3.576	18.384	20.812	2.450	104.106
	TOTAL	18.351	11.836	1.201	9.077	136.051	3.631	18.837	20.924	7.070	227.878
June-17	DEPOSITS	16.769	11.820	1.400	11.380	18.598	3.482	18.773	20.474	2.709	105.163
	TOTAL	16.970	11.775	1.411	11.381	136.931	3.531	19.272	20.822	7.033	228.106
July-17	DEPOSITS	19.668	12.112	859	9.254	20.077	3.531	18.482	21.208	2.742	107.842
	TOTAL	19.816	12.233	861	9.255	139.867	3.588	19.000	21.422	6.980	233.020
August-17	DEPOSITS	15.870	11.801	987	5.182	20.685	3.095	18.686	18.456	2.610	86.812
	TOTAL	16.009	11.729	973	5.182	141.712	3.855	17.053	19.858	6.570	222.389
September-17	DEPOSITS	17.644	12.522	1.020	4.382	22.338	3.448	18.027	21.485	2.711	100.666
	TOTAL	17.844	12.589	1.028	4						

A.3. Treasury Cash Realizations

													(\$Million)
2017 CASH REALIZATIONS													
	January	February	March	April	May	June	July	August	September	October	November	December	TOTAL
BORROWING (NET)	12,532	3,639	4,199	7,402	8,775	8,272	508	8,091	13,949	6,120	4,612	394	78,390
FOREIGN BORROWING (NET)	7,882	-1,506	-432	3,832	6,504	3,168	-9,774	-614	3,697	-868	800	-561	12,389
Borrowing	8,485	4,851	0	4,593	6,192	3,905	0	0	6,906	0	1,666	2,737	30,002
Payment	602	6,157	432	761	678	737	8,774	514	2,209	868	756	3,289	25,687
DOMESTIC BORROWING (NET)	4,869	6,146	4,431	3,670	3,271	6,104	9,280	8,696	10,250	8,908	3,712	858	68,982
Borrowing	12,212	7,302	17,832	3,745	5,429	15,157	16,448	10,278	11,904	16,471	4,809	2,742	126,327
Payment	7,542	2,157	13,201	175	2,158	10,053	7,169	1,670	1,654	11,861	1,067	1,807	60,344
2016 CASH REALIZATIONS													
	January	February	March	April	May	June	July	August	September	October	November	December	TOTAL
BORROWING (NET)	1,925	-1,868	6,806	548	6,797	3,539	1,847	2,896	-1,892	5,889	2,645	-259	29,290
FOREIGN BORROWING (NET)	-389	-2,661	2,732	-689	3,862	2,521	-428	-245	-8,286	3,943	-372	-678	1,343
Borrowing	0	0	4,332	0	4,210	2,896	0	0	0	4,621	0	0	16,058
Payment	389	2,661	1,600	689	328	374	429	245	6,286	678	372	678	14,700
DOMESTIC BORROWING (NET)	2,313	894	4,174	1,217	2,914	1,017	2,076	3,141	4,696	1,956	3,017	429	27,942
Borrowing	14,365	12,630	4,596	3,074	5,965	2,500	10,250	4,571	14,076	2,807	11,435	5,063	91,101
Payment	12,052	11,636	392	1,857	3,050	1,483	8,174	1,430	9,380	652	8,418	4,634	63,159
2015 CASH REALIZATIONS													
	January	February	March	April	May	June	July	August	September	October	November	December	TOTAL
BORROWING (NET)	4,787	4,035	-6,692	7,982	210	109	3,562	260	2,716	-992	974	-990	17,050
FOREIGN BORROWING (NET)	2,602	-181	-7,626	3,227	-395	-380	-431	-276	-334	-631	-280	-1,371	-5,695
Borrowing	3,432	0	0	4,053	0	0	1	0	0	0	0	0	7,466
Payment	931	181	7,525	827	335	360	432	275	334	631	280	1,371	13,482
DOMESTIC BORROWING (NET)	2,285	4,218	1,834	4,755	545	489	3,894	536	3,050	-361	1,253	391	23,046
Borrowing	10,775	14,235	4,494	11,917	9,795	8,963	6,779	5,198	3,050	7,405	3,737	4,062	90,401
Payment	8,490	10,019	2,500	7,162	9,290	8,514	2,799	4,632	0	7,786	2,484	3,681	67,355
2014 CASH REALIZATIONS													
	January	February	March	April	May	June	July	August	September	October	November	December	TOTAL
BORROWING (NET)	4,161	617	1,106	2,427	2,840	-4,172	-321	-1,168	2,657	3,191	4,339	529	15,405
FOREIGN BORROWING (NET)	1,403	86	-376	2,083	-364	-199	-144	-280	1,304	600	1,838	-661	5,277
Borrowing	5,618	3,234	0	2,892	0	217	289	0	1,654	1,325	2,224	2	17,656
Payment	4,215	3,169	375	909	354	417	433	280	549	628	389	503	12,379
DOMESTIC BORROWING (NET)	2,758	662	1,481	344	2,893	-3,973	-177	-888	753	2,691	2,504	1,090	10,129
Borrowing	11,205	14,184	17,027	13,619	11,636	11,452	11,125	9,058	10,878	11,249	5,415	1,090	127,917
Payment	8,447	13,612	15,546	13,274	8,643	15,425	11,302	9,945	10,124	8,557	2,911	0	117,788

A.4. Average Cost of Domestic Borrowing

		Average Cost of Domestic Borrowing					
		Zero Coupon		Fixed Interest		Cash Borrowing	
		Monthly Average Cost (Annual Compound, %)	Cumulative Cost (Annual Compound, %)	Monthly Average Cost (Annual Compound, %)	Cumulative Cost (Annual Compound, %)	Monthly Average Cost (Annual Compound, %)	Cumulative Cost (Annual Compound, %)
2014	January	10,22	10,22	10,81	10,81	10,39	10,39
	February	11,19	10,64	10,87	10,84	10,21	10,29
	March	11,34	10,78	11,07	10,93	10,47	10,36
	April	9,96	10,59	10,43	10,82	9,87	10,24
	May	8,72	10,16	9,17	10,52	9,13	10,04
	June	8,37	9,89	8,67	10,24	8,94	9,88
	July	8,33	9,72	8,57	10,02	8,79	9,74
	August	9,55	9,70	9,24	9,93	9,67	9,74
	September	9,22	9,62	9,35	9,87	9,74	9,74
	October	8,80	9,55	9,82	9,86	9,26	9,69
	November	-	9,55	8,28	9,76	8,28	9,63
	December	8,81	9,48	8,81	9,75	8,81	9,62
2015	January	7,77	7,77	7,83	7,83	7,71	7,71
	February	8,39	8,07	8,06	7,96	7,90	7,82
	March	-	8,07	8,20	8,01	8,20	7,87
	April	9,03	8,34	9,70	8,44	9,27	8,26
	May	9,88	8,72	9,64	8,66	9,28	8,46
	June	10,10	8,97	9,85	8,85	9,50	8,61
	July	-	8,97	9,63	8,95	9,63	8,71
	August	11,02	9,28	10,47	9,09	10,47	8,84
	September	-	9,28	11,33	9,18	10,92	8,92
	October	11,09	9,50	10,84	9,32	10,25	9,04
	November	10,32	9,58	10,26	9,38	10,26	9,09
	December	-	9,58	10,93	9,46	10,93	9,17
2016	January	11,19	11,19	11,14	11,14	10,76	10,76
	February	11,13	11,17	10,95	11,05	10,51	10,64
	March	-	11,17	10,13	10,87	10,13	10,56
	April	-	11,17	9,56	10,71	9,56	10,47
	May	9,36	10,67	9,63	10,51	9,63	10,34
	June	-	10,67	9,32	10,42	9,32	10,28
	July	9,18	10,34	9,11	10,15	8,65	9,94
	August	-	10,34	9,73	10,11	9,73	9,92
	September	8,63	9,93	9,25	9,97	9,15	9,77
	October	-	9,93	9,66	9,96	9,66	9,77
	November	9,94	9,94	10,66	10,05	10,56	9,87
	December	-	9,94	11,42	10,14	11,42	9,95
2017	January	10,98	10,98	11,33	11,33	10,63	10,63
	February	11,36	11,18	11,10	11,22	11,10	10,81
	March	11,67	11,34	11,42	11,31	10,89	10,84
	April	-	11,34	10,92	11,27	10,92	10,85
	May	11,65	11,40	11,23	11,26	11,23	10,90
	June	11,25	11,36	10,79	11,15	10,60	10,82
	July	11,56	11,40	11,00	11,12	10,83	10,82
	August	-	11,40	11,03	11,11	11,15	10,86
	September	11,83	11,46	11,10	11,11	10,62	10,83
	October	12,40	11,59	11,96	11,22	11,25	10,90
	November	-	11,59	13,22	11,31	13,22	10,98
	December	-	11,59	13,02	11,35	13,02	11,03

**A.5. Weighted Average Interest Rates for Deposits in Turkish Lira By Banks
(Stock Data, All Deposits Types Included)**

Year-Month	Up to 1 Month	Up to 3 Month	Up to 6 Month	Up to 1 Year
2014-02	9,54	10,41	9,56	9,63
2014-03	10,06	11,30	10,27	9,91
2014-04	9,81	11,12	10,92	10,20
2014-05	9,25	10,65	10,91	10,48
2014-06	8,74	10,14	10,59	10,38
2014-07	8,12	9,43	10,05	10,27
2014-08	8,01	9,11	9,73	10,12
2014-09	8,40	9,18	9,36	9,80
2014-10	8,37	9,34	9,44	9,51
2014-11	8,42	9,48	9,39	9,36
2014-12	9,22	9,87	9,67	9,25
2015-01	8,76	9,89	9,74	9,23
2015-02	8,80	9,70	9,89	9,25
2015-03	9,13	9,95	9,71	9,30
2015-04	9,20	10,18	9,70	9,35
2015-05	9,21	10,26	10,04	9,45
2015-06	9,52	10,47	10,48	9,62
2015-07	9,52	10,64	10,61	9,85
2015-08	9,30	10,86	10,55	10,17
2015-09	10,13	11,32	10,59	10,38
2015-10	9,88	11,50	10,73	10,46
2015-11	9,89	11,23	11,03	10,50
2015-12	10,26	11,77	11,59	10,72
2016-01	10,04	11,90	11,84	11,10
2016-02	10,05	12,02	12,44	11,51
2016-03	10,28	12,09	12,58	11,65
2016-04	9,84	11,82	12,50	11,63
2016-05	9,62	11,41	12,02	11,57
2016-06	9,38	11,16	11,48	11,43
2016-07	9,15	10,88	11,19	11,13
2016-08	8,90	10,87	11,10	10,91
2016-09	8,98	10,90	10,97	10,57
2016-10	8,89	10,82	10,88	10,21
2016-11	8,80	10,54	10,77	10,17
2016-12	8,76	10,57	10,62	10,32
2017-01	8,86	10,64	10,75	10,34
2017-02	9,08	10,91	10,86	10,42
2017-03	9,63	11,26	10,96	10,71
2017-04	10,10	11,78	11,45	11,12
2017-05	10,66	12,58	12,37	11,71
2017-06	11,00	13,09	13,24	12,39
2017-07	11,15	13,17	13,53	12,90
2017-08	10,90	13,01	13,51	13,21
2017-09	11,06	13,03	13,42	13,37
2017-10	11,40	13,08	13,29	13,50
2017-11	11,49	13,15	13,25	13,53
2017-12	11,52	13,59	13,55	13,53

A.6. CBRT's Policy Rates (1 One Week Repo)

DATE	Borrowing	Lending
20.05.2010	-	7.00
17.12.2010	-	6.50
21.01.2011	-	6.25
05.08.2011	-	5.75
19.12.2012	-	5.50
17.04.2013	-	5,00
17.05.2013	-	4.50
29.01.2014	-	10.00
23.05.2014	-	9.50
25.06.2014	-	8.75
18.07.2014	-	8.25
21.01.2015	-	7.75
25.02.2015	-	7.50
25.11.2016	-	8.00