

# THE EFFICIENCY OF DEVELOPING COUNTRY PUBLIC FINANCIAL MANAGEMENT SYSTEMS

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## ABSTRACT

*The objective of this paper is to demonstrate a procedure for measuring the technical efficiency of developing country public financial management (PFM) systems using available public expenditure and financial accountability (PEFA) assessments. Data envelopment analysis (DEA) is used to measure the relative technical efficiency of sixty-nine country based PFM systems. Technical efficiency is measured as the ratio of a PFM's PEFA score on budget credibility to its maximum possible score on budget credibility derived using DEA and the existing PEFA database.*

*This measure of technical efficiency involves applying DEA to the available database of PEFA assessments to construct a hypothetical PFM system that has a higher score on budget credibility and at least identical or lower scores on the other core dimensions of PFM performance. Accordingly, the relative technical efficiency of PFM systems investigated in this article is based on the achievement of budget credibility as defined by the PEFA framework. This notion of technical efficiency is therefore quite unrelated and distinct from the achievement of international good practice in PFM that underly the PEFA assessments. Indeed it is possible that PFM systems operating well below what public finance experts would regard as good or best international practice may achieve relatively high technical efficiency scores while others operating close to what is perceived as good or best international practice may be found to be less technically efficient.*

*In the present database of sixty-nine PFM systems, thirteen are identified as operating at 100% technical efficiency. The DEA identifies efficiency benchmarks for the remaining less technically efficient PFM systems.*

**Keywords** – *Data Envelopment Analysis (DEA), Performance Benchmark, Public Expenditure and Financial Accountability (PEFA), Public Financial Management (PFM), Technical Efficiency*

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## INTRODUCTION

According to the public financial management (PFM) performance measurement framework there are six critical or core dimensions of PFM performance. These are<sup>1</sup>:

1. *Credibility of the budget* - The budget is realistic and is implemented as intended.
2. *Comprehensiveness and transparency* - The budget and fiscal risk oversight are comprehensive and fiscal and budget information is accessible to the public.
3. *Policy-based budgeting* - The budget is prepared with due regard to government policy.
4. *Predictability and control in budget execution* - The budget is implemented in an orderly and predictable manner and there are arrangements for the exercise of control and stewardship in the use of public funds.
5. *Accounting, recording and reporting* – Adequate records and information are produced, maintained and disseminated to meet decision-making control, management and reporting purposes.
6. *External scrutiny and audit* - Arrangements for scrutiny of public finances and follow-up by the executive are operating.

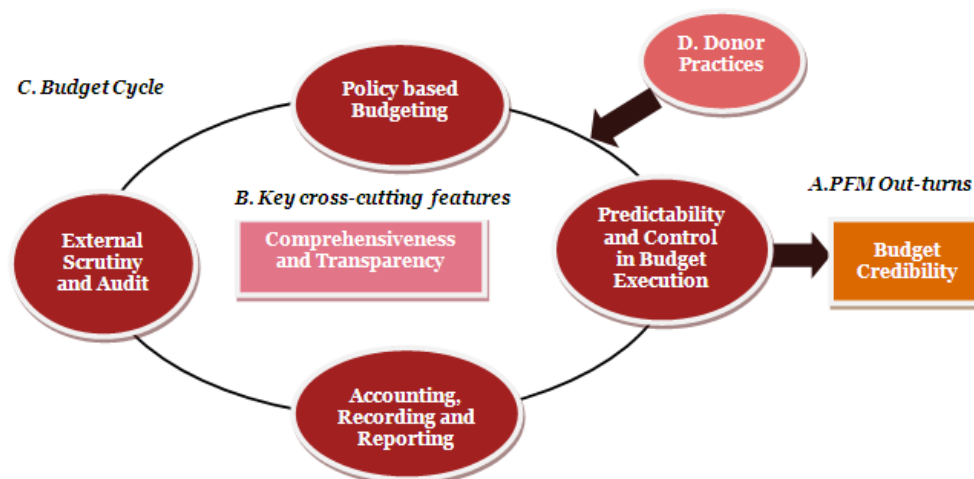
Each of these core dimensions has a set of high-level indicators that measure the operational performance of the key elements of associated PFM, systems, processes and institutions (annex 1). The PEFA indicators are largely designed to measure PFM performance of countries across a wide range of development over time. As acknowledged by the PEFA Secretariat, the performance measurement framework does not measure the factors impacting on performance, such as the legal framework or existing capacities within government.<sup>2</sup> The objective of the present paper is therefore to address this gap in PFM performance measurement by demonstrating a procedure that could be used to measure the relative efficiency of PFM systems utilising the available PEFA assessments.

The relationships between the core dimensions of PFM performance as outlined above are illustrated by figure 1<sup>3</sup>. The output or out-turn of the PFM system is budget credibility measured by scores on its associated high-level indicators. The inputs are the high-level indicators: (1) comprehensiveness and transparency; (2) policy based budgeting; (3) predictability and control in budget execution; (4) accounting, recording and reporting; and (5) external audit and scrutiny. Accordingly, we will refer to budget credibility as the output dimension of the PFM system and the remaining five core dimensions as the input dimensions of the PFM system. Donor practices are seen as having an impact on the output of the PFM system via the five input dimensions.

The data on the 69 country PFM systems were derived from the *Public Expenditure and Financial Accountability (PEFA)* website<sup>4</sup>. The preparation of these PEFA assessments was carried out by many different agencies including ministerial staff, staff and consultants working for international agencies such as the UN, EU, ADB and the World

Bank. The resulting PEFA scores for individual countries cover different years and the weightings of the individual indicators comprising core dimensions are assumed equal. Readers are therefore asked to exercise caution in interpreting the results of the analysis and particularly in making cross-country comparisons.

*Figure 1: Core Dimensions of the PFM System*



In the PEFA reports, each indicator is assessed according to a 4-point calibration scale from A (highest) to D (lowest). However for the purposes of the present exercise, each of the PEFA indicator scores has been converted to a 4-point numerical calibration scale from 4 (highest) to 1 (lowest). The score on each core dimension is then calculated as the sum of the related PEFA indicator scores divided by the maximum possible score for the core dimension. In other words, the scores for the six core dimensions of PFM performance are expressed as percentages of what is perceived as good international practice. The resulting scores for sixty-nine PFM systems evaluated at a national level are provided in Table 1.

*Table 1: Scores on Core Dimensions of PFM Performance (%)*

PFM system	Budget credibility	Comprehensiveness & transparency	Policy based budgeting	Predictability & control in budget execution	Accounting, recording & reporting	External audit & scrutiny
Afghanistan (Jun2008)	44	50	68	56	56	58
Albania (Jan 2012)	44	82	81	68	75	75
Armenia (Oct 2008)	88	80	84	72	56	50
Belarus (Apr 2009)	88	85	59	71	75	58
Benin (Sep 2007)	63	38	70	48	38	33
Bhutan (Jun 2010)	69	80	86	67	63	58
Bolivia (Oct 2009)	63	72	46	61	44	25
Botswana (Feb 2009)	56	67	66	50	69	50
Brazil (Dec 2009)	94	88	77	83	88	58

Burkina Faso (Jun 2010)	63	90	82	61	66	42
Burundi (Feb 2009)	69	50	51	32	31	25
Cape Verdi (Dec 2008)	81	70	73	60	53	42
Central African Republic (Jul 2010)	31	50	51	44	25	25
Columbia (Jun 2009)	69	78	81	67	69	67
Cook Islands (Aug 2011)	50	80	47	41	56	33
Costa Rica (Oct 2010)	81	97	78	62	75	67
Democratic Republic of Congo (March 2008)	44	50	33	30	44	33
Dominican Republic (Nov 2010)	63	55	61	63	56	25
El Salvador (May 2009)	75	77	61	76	84	42
Ethiopia (Sept 2010)	75	67	75	68	66	42
Georgia (Nov 2008)	63	75	78	52	56	50
Ghana (Jun 2006)	69	65	58	47	44	50
Grenada (Mar 2010)	50	65	54	50	50	42
Honduras (Apr 2009)	81	50	77	58	69	42
India (Mar 2010)	56	87	42	49	69	50
Indonesia (Oct 2007)	69	62	69	40	50	50
Jamaica (Jun 2007)	63	72	69	44	41	58
Jordan (Apr 2007)	63	77	78	75	53	67
Kenya (Mar 2009)	81	55	57	61	41	33
Kosovo (Mar 2009)	56	55	60	58	69	42
Kyrgyzstan (Dec 2009)	56	65	61	38	50	33
Lao PDR (Jun 2010)	63	40	51	40	38	42
Madagascar (May 2006)	69	70	73	51	34	33
Malawi (Jun 2008)	63	62	64	56	59	42
Maldives (Nov 2009)	38	70	50	39	56	25
Mali (Mar 2010)	69	50	75	51	41	42
Mauritania (Jun 2008)	75	43	80	44	41	42
Mauritius (Aug 2011)	75	68	70	78	100	50
Moldova (Jul 2008)	88	75	83	61	69	50
Montserrat (Mar 2010)	88	55	42	44	50	25
Montenegro (Jul 2009)	63	60	66	65	75	50
Morocco (May 2009)	75	70	74	73	69	42
Mozambique (Feb 2008)	63	57	74	69	50	50
Nepal (Feb 2008)	63	50	57	46	53	25
Niger (Dec 2008)	50	47	54	47	31	42
Norway (Jun 2008)	100	85	81	88	66	67

Pakistan (Jun 2009)	56	70	73	50	66	33
Paraguay (Apr 2008)	69	58	65	47	56	50
Peru (Apr 2009)	69	90	80	71	66	67
Rwanda (Nov 2010)	75	75	70	74	41	67
Samoa (Apr 2010)	63	55	64	41	38	25
Sao Tome and Principe (Mar 2010)	56	58	34	39	25	25
Senegal (Jun 2011)	69	45	76	49	44	33
Serbia (Nov 2010)	75	63	75	64	100	42
Seychelles (Jun 2011)	56	65	67	63	53	33
Sierra Leone (Nov 2010)	50	65	46	48	75	42
Solomon Islands (Nov 2008)	69	40	42	30	38	42
South Africa (Sep 2008)	100	93	78	79	84	83
Tajikistan (Jun 2007)	69	58	55	39	50	33
Tanzania (Nov 2010)	56	55	51	49	47	50
Timor-Leste (Aug 2010)	50	50	48	42	50	33
Tonga (May 2010)	81	80	71	64	44	25
Trinidad and Tobago (Dec 2008)	75	82	60	62	63	33
Tunisia (Jun 2010)	81	78	69	78	72	58
Uganda (Mar 2008)	63	72	77	44	56	50
Ukraine (Mar 2007)	81	67	67	44	63	42
Vanuatu (Jul 2006)	100	58	60	46	69	33
Yemen (Jun 2008)	50	70	84	43	56	50
Zambia (Dec 2005)	50	47	65	42	53	58

### THE MEASUREMENT OF TECHNICAL EFFICIENCY

As illustrated in figure 1, budget credibility is perceived as the outcome of the five input related core dimensions of PFM performance.<sup>5</sup> Technical efficiency is defined as measuring the maximum score on budget credibility from the given set of inputs. A PFM system is regarded as fully (100%) efficient on the basis of the available PEFA assessments if and only if the operational performances of the other PFM systems do not show that the output dimension, budget credibility, can be improved without increasing the scores of some of its input dimensions.<sup>6</sup> This measure of technical efficiency involves using available PEFA assessments to construct a hypothetical PFM system that uses input dimensions in, at least, the same proportions as the target PFM system.<sup>7</sup> The technical efficiency of a PFM system is measured as the ratio of the system's existing score on budget credibility ( $y_j$ ) to its potential score on budget credibility ( $y^*_j$ ) if it were operating at 100% technical efficiency. A PFM system is regarded as operating at 100% technical efficiency if its existing score on budget

credibility is equal to its maximum potential score on budget credibility calculated from the available database of PEFA assessments.

At a broad intuitive level the technical efficiency of a PFM system measures the extent to which a PFM system can improve its score on budget credibility without increasing the PEFA scores on any of the input dimensions. An advantage of this measure of technical efficiency is that the comparison is relative to the actual performances of PFM systems rather than to what public financial experts regard as good or best international practice. If additional PFM systems are introduced into the analysis, these may reduce, but cannot increase the technical efficiency of a given PFM system.<sup>8</sup>

### DATA ENVELOPMENT ANALYSIS

Data envelopment analysis (DEA) was initially proposed by Charnes, Cooper and Rhodes (1978, 1979) as a mathematical programming technique which could be used to identify best practice performance and thereby to measure the technical efficiency of decision making units. Since its introduction DEA has been used on numerous occasions and in many different contexts for estimating the efficiency and productivity of public and private sector activities.<sup>9</sup>

In the present application of DEA there are 69 developing and developed country PFM systems each attempting to achieve *budget credibility* ( $y_j$ ), based on existing institutional capacities for *comprehensiveness and transparency* ( $x_{1,j}$ ), *policy based budgeting* ( $x_{2,j}$ ), *predictability and control in budget execution* ( $x_{3,j}$ ), *accountability, recording and reporting* ( $x_{4,j}$ ) and *external scrutiny and audit* ( $x_{5,j}$ ). The subscript  $j$  refers to the  $j^{\text{th}}$  PFM system.

The potential maximum *budget credibility* ( $y^*_j$ ) of the PFM system ( $j$ ) is calculated as the solution to the basic DEA model outlined in box 1. This is a simple linear programming model which maximises the score on *budget credibility* by varying the weights ( $s_i$ ). So maximum potential *budget credibility* for PFM system  $j$  will be calculated as the weighted sum of the scores on the core dimensions of PFM performance of relevant technically efficient PFM systems. The solution to the linear program outlined in box 1 is the set of non-zero weights  $s_i$ . As these weights are constrained to sum to unity, the value of each weight ( $s_i$ ) will measure the proportional contribution of the relevant benchmark PFM system to potential maximum *budget credibility* for PFM system ( $j$ ).

**Box 1: The Basic DEA model**

Maximise  $y_j^*$

subject to  $y_j^* = s_1y_1 + s_2y_2 + \dots + s_iy_i + \dots + s_{69}y_{69}$

$$X_{1,j} \geq s_1X_{1,1} + s_2X_{1,2} + \dots + s_iX_{1,i} + \dots + s_{69}X_{1,69}$$

$$X_{2,j} \geq s_1X_{2,1} + s_2X_{2,2} + \dots + s_iX_{2,i} + \dots + s_{69}X_{2,69}$$

$$X_{3,j} \geq s_1X_{3,1} + s_2X_{3,2} + \dots + s_iX_{3,i} + \dots + s_{69}X_{3,69}$$

$$X_{4,j} \geq s_1X_{4,1} + s_2X_{4,2} + \dots + s_iX_{4,i} + \dots + s_{69}X_{4,69}$$

$$X_{5,j} \geq s_1X_{5,1} + s_2X_{5,2} + \dots + s_iX_{5,i} + \dots + s_{69}X_{5,69}$$

$$s_1 + s_2 + \dots + s_i + \dots + s_{69} = 1$$

$$s_i \geq 0 \quad (i = 1, \dots, 69)$$

and technical efficiency of PFM system  $j$  ( $TE_j$ ) is calculated

$$TE_j = y_j / y_j^* \quad 0 \leq TE_j \leq 1$$

The vector  $s^j = (s_1, \dots, s_{69})$  represents the weights that each PFM system contributes to the determination of maximum budget credibility ( $y_j^*$ ).

The linear program is run for each of the 69 PFM systems. Conceptually the DEA constructs a hypothetical technically efficient PFM system ( $j$ ) which is the weighted sum of other relevant technically efficient systems. These relevant technically efficient systems form the *benchmark* for the target PFM system ( $j$ ).

Note that DEA generates a unique *benchmark* or *solution* for each PFM system. Within a more homogeneous database, the component systems comprising the derived benchmarks could be conceived as providing potential benchmark partners for the target PFM systems. However given the heterogeneous nature of the existing PEFA database the results of the DEA exercise, outlined in Box 1, may need to be interpreted more carefully.



This measure of technical efficiency involves applying DEA to the available database of PEFA assessments to construct a hypothetical PFM system that has a higher score on budget credibility and at least identical or lower scores on the other core dimensions of PFM performance. Accordingly, the relative technical efficiency of PFM systems is based on the achievement of budget credibility as defined within the PEFA framework. This notion of technical efficiency is therefore quite unrelated and distinct from the notion of international good practice in PFM that underlies the PEFA assessments. Indeed it is possible that PFM systems operating well below what public finance experts would regard as good or best international practice may achieve relatively high technical efficiency scores while others operating close to what is perceived as good or best international practice may be found less technically efficient.

### TECHNICALLY EFFICIENT PFM SYSTEMS

The technically efficient PFM systems according to the DEA results are listed in Table 2. These are the systems that achieve technical efficiency scores of 100 per cent and contribute to the benchmarks of other PFM systems. Given the present data base derived from available PEFA assessments and a mathematical programming model with the constraints outlined in box1, the (100%) technically efficient systems have no possibility for improving budget credibility given their existing operational capacities (i.e. scores on input dimensions).

The technically efficient systems do not necessarily have to achieve a perfect 100% score on *budget credibility*. Montserrat scores 88% on budget credibility but still appears in more benchmarks than Norway and South Africa, the latter both scoring 100% on budget credibility. The systems appearing in table 2 are simply making better use of their existing operational capacities than the less efficient PFM systems.

**Table 2: Technically efficient PFM systems**

Country	Budget Credibility (%)	Appearance in Benchmarks (No)
Vanuatu	100	35
Montserrat	88	30
Norway	100	26
Burundi	69	18
Kenya	81	12
Solomon Islands	69	7
South Africa	100	6
Mauritania	75	2
Sao Tome and Principe	56	2
Tonga	81	2
Benin	63	1



PFM systems may also score 100 per cent technical efficiency because they are unlike any other system within the sample, so there is no basis for comparison. Also these PFM systems do not appear in any best-practice reference set. These systems, listed in table 3, are called outlier systems. While these systems are operating at 100% technical efficiency according to the present database (table1), it is possible that as the database is expanded, new benchmark systems may be identified, so that these outlier systems and indeed some of the technically efficient PFM systems listed in table 2 may fall below 100% technical efficiency.

**Table 3: Outlier PFM Systems**

Country	Budget credibility (%)
Democratic Republic of Congo	44
Central African Republic	31

### LESS TECHNICALLY EFFICIENT PFM SYSTEMS

The less-technically efficient country PFM systems are listed in Table 4. According to the DEA results, these systems achieve technical efficiency scores of below 100 percent. This means that these systems could, hypothetically, improve their budget credibility by emulating the performances of the relevant technically efficient PFM systems in their benchmark set. The benchmark reference sets and the technical efficiency scores of the less-efficient PFM systems are listed in Table 4.

**Table 4: Less-technically efficient PFM systems**

Country	Technical efficiency (%)	Budget credibility (%)	Benchmark Reference Set
Afghanistan	51	44	Mauratania 45%, Solomon Islands 9%, Vanuatu 46%.
Albania	44	44	Norway 52%, Vanuatu 48%.
Armenia	94	88	Kenya 24%, Norway 55%, Monserrat 21%.
Belarus	88	88	Montserrat 6%, Vanuatu 94%.
Bhutan	71	69	Montserrat 25%, Norway 50%, Vanuatu 25%.
Bolivia	97	63	Burundi 64%, Sao Tome & Principe 36%.
Botswana	56	56	Vanuatu 100%.
Brazil	94	94	South Africa 6%, Norway 66%, Vanuatu 28%.
Burkina Faso	63	63	Montserrat 12%, Norway 28%, Vanuatu 60%.
Cape Verde	90	81	Kenya 16%, Norway 30%, Montserrat 54%.
Columbia	69	69	South Africa 8%, Norway 42%, Vanuatu 49%.
Cook Islands	59	50	Solomon Island 30%, Vanuatu 28%, Montserrat 42%.
Costa Rica	81	81	South Africa 28%, Norway 16%, Vanuatu 56%.
Dominican Republic	89	63	Tonga 10%, Burundi 90%.

Ethiopia	76	75	Montserrat 12%, Norway 28%, Vanuatu 60%.
El Salvador	75	75	South Africa 6%, Vanuatu 94%.
Georgia	68	63	Montserrat 64%, Norway 16%, Vanuatu 20%.
Ghana	83	69	Kenya 54%, Burundi 6%, Montserrat 40%.
Grenada	57	50	Kenya 13%, Norway 8%, Montserrat 79%.
Honduras	81	81	Norway 25%, Vanuatu 75%.
India	64	56	Montserrat 100%.
Indonesia	81	69	Burundi 46%, Vanuatu 45%, Montserrat 9%.
Jamaica	79	63	Kenya 22%, Burundi 39%, Montserrat 39%.
Jordan	69	63	Norway 50%, Kenya 50%.
Kosovo	56	56	Vanuatu 100%.
Kyrgyzstan	68	56	Burundi 27%, Solomon Islands 27%, Vanuatu 46%.
Lao PDR	91	63	Solomon Islands 100%.
Madagascar	94	69	Kenya 33%, Burundi 67%.
Malawi	66	63	Norway 26%, Vanuatu 28%, Montserrat 46%.
Maldives	56	38	Burundi 89%, Sao Tome & Principe 11%.
Mali	86	69	Kenya 55%, Burundi 22%, Montserrat 23%.
Mauritius	75	75	Norway 38%, Vanuatu 62%
Moldova	88	88	Norway 36%, Vanuatu 64%.
Montenegro	63	63	South Africa 1%, Norway 5%, Vanuatu 94%.
Morocco	75	75	Norway 25%, Vanuatu 75%.
Mozambique	71	63	Kenya 56%, Norway 34%, Montserrat 10%.
Nepal	71	63	Montserrat 100%..
Niger	73	50	Burundi 100%.
Pakistan	57	56	Norway 4%, Montserrat 16%, Vanuatu 80%.
Paraguay	75	69	Norway 5%, Vanuatu 29%, Montserrat 66%.
Peru	69	69	Montserrat 7%, Norway 60%, Vanuatu 33%.
Rwanda	92	75	Kenya 100%.
Samoa	83	63	Burundi 66%, Tonga 2%, Montserrat 32%.
Senegal	83	69	Kenya 38%, Burundi 14%, Montserrat 48%.
Serbia	75	75	Norway 19%, Vanuatu 81%.
Seychelles	63	56	Norway 20%, Montserrat 80%.
Sierra Leone	55	50	Montserrat 78%, Vanuatu 22%.
Tajikistan	82	69	Burundi 42%, Solomon Islands 9%, Vanuatu 46%.
Tanzania	66	56	Kenya 29%, Burundi 2%, Montserrat 69%.
Timor-Leste	60	50	Mauritania 1%, Benin 4%, Solomon Islands 34%, Vanuatu 26%, Montserrat 35%.
Trinidad & Tobago	78	75	Montserrat 32%, Norway 8%, Vanuatu 60%.
Tunisia	81	81	South Africa 23%, Norway 15%, Vanuatu 62%.

Uganda	68	63	Burundi 6%, Vanuatu 39%, Montserrat 55%.
Ukraine	86	81	Burundi 9%, Solomon Islands 9%, Vanuatu 82%.
Yemen	55	50	Montserrat 18%, Burundi 24%, Vanuatu 58%.
Zambia	57	50	Burundi 30%, Montserrat 23%, Vanuatu 47%.

Each of these less-efficient PFM systems has a unique benchmark. The benchmark is a weighted sum of relevant technically efficient PFM systems in Table 2. For instance, the benchmark for Armenia consists of contributions from Norway and Vanuatu. The major contributor (52%) is Norway with Vanuatu contributing 48% of the benchmark. Likewise the benchmark set of Afghanistan consists of three PFM systems: Mauritania (45%), Solomon Islands (9%) and Vanuatu (46%). Together these three PFM systems are combined by DEA (box 1) to create a unique technically efficient benchmark for the Afghan PFM system. Afghanistan (existing scores), Afghanistan operating at maximum technical efficiency and the three PFM systems in the benchmark set are compared in table 5.

*Table 5: Technical efficiency and reference set for Afghanistan*

PFM system	y	x1	x2	x3	x4	x5
	(%)	(%)	(%)	(%)	(%)	(%)
Afghanistan	44	50	68	56	56	58
Afghanistan at 100% technical efficiency	86	50	68	44	53	38
Mauritania	75	43	80	44	41	42
Solomon Islands	69	40	42	30	38	42
Vanuatu	100	58	60	46	69	33

It is interesting that Afghanistan starts out with the highest PEFA scores on predictability and control in budget execution ( $x_3$ ) and external scrutiny and audit ( $x_5$ ) and yet has a much lower PEFA score on budget credibility than its benchmark partners. The DEA results suggest that, all else being equal, Afghanistan could improve its budget credibility score from 44% to 86% by emulating the performance of the three benchmark systems. In fact, Afghanistan operating at 100% technical efficiency would exceed the budget credibility scores of both Mauritania and the Solomon Islands.

Likewise Lao PDR outscores its single benchmark, the Solomon Islands, on both policy based budgeting ( $x_2$ ) and predictability and control in budget execution ( $x_3$ ) and yet scores less on budget credibility.

**Table 6: Technical efficiency and reference set for Lao PDR**

<b>PFM system</b>	<b>y</b>	<b>x<sub>1</sub></b>	<b>x<sub>2</sub></b>	<b>x<sub>3</sub></b>	<b>x<sub>4</sub></b>	<b>x<sub>5</sub></b>
	(%)	(%)	(%)	(%)	(%)	(%)
Lao PDR	63	40	51	40	38	42
Lao PDR at 100% technical efficiency	69	40	42	30	38	42
Solomon Islands	69	40	42	30	38	42

This means that, all else being equal, Lao PDR could improve its budget credibility by emulating the performance of the Solomon Islands PFM system.

As a final example, the DEA suggests that, all else being equal, Brazil could reach 100% budget credibility by emulating the performance of South Africa, Norway and Vanuatu.

**Table 7: Technical efficiency and reference set for Brazil**

<b>PFM system</b>	<b>y</b>	<b>x<sub>1</sub></b>	<b>x<sub>2</sub></b>	<b>x<sub>3</sub></b>	<b>x<sub>4</sub></b>	<b>x<sub>5</sub></b>
	(%)	(%)	(%)	(%)	(%)	(%)
Brazil	94	88	77	83	88	58
Brazil at 100% technical efficiency	100	78	75	76	68	58
South Africa	100	93	78	79	84	83
Norway	100	85	81	88	66	67
Vanuatu	100	58	60	46	69	33

However, all else is not necessarily equal. As Matt Andrews points out, there are a range of factors that can impact on the performance of PFM systems other than simply technical efficiency as defined narrowly above. These factors include country characteristics such as economic growth, stability, commitment to reform, political and institutional influences, and possibly colonial heritage.<sup>10</sup> Paolo de Renzio has highlighted factors such as the level of income, country size in terms of population and the degree of aid dependency as having a measurable impact on PEFA scores.<sup>11</sup> We have already noted that the influence of differential donor practices could have a direct impact on the operational efficiencies of PFM systems. Accordingly it is important to disentangle the effects of these other exogenous factors before proceeding directly to the policy prescriptions seemingly indicated by the relative efficiency scores.

DEA can be extended to cope with these conditions that are beyond the control of public financial management by introducing non-discretionary variables and constraints. Categorical variables can also be introduced into the DEA to control for differential country characteristics. In this way the factors listed by Andrews and others as impacting on PFM operating performance could be accommodated.<sup>12</sup> The procedure outlined above therefore, more or less, represents a starting point for a benchmarking

process that could conceivably provide a useful complement to the PFM improvement programmes currently being undertaken by multilateral and bilateral agencies.

### CONCLUSIONS

The purpose of this paper has been to demonstrate a procedure that may be used to measure the technical efficiency of PFM systems using available PEFA assessments. The technical efficiency of a country PFM system is measured as the ratio of the system's existing PEFA score on budget credibility to its maximum possible score on budget credibility. The latter is derived from the PEFA assessment data by using DEA to construct a technically efficient benchmark for each of the sixty-nine country based PFM systems. According to our DEA results, thirteen of the PFM systems are found to be operating at 100% technical efficiency given the existing PEFA database. The remaining fifty-six PFM systems have technical efficiency scores ranging from 44 to 97%. This means that these systems could conceivably improve their PEFA scores on budget credibility by between 3 to 127% by emulating the performance of relevant benchmark partners. However, it is acknowledged that there are a number of factors beyond the control of individual PFMs that may impact on the resulting PEFA scores and consequently the resulting estimates of technical efficiency. Accordingly, the next step would be to extend the DEA by introducing non-discretionary and categorical variables to control for any significant country characteristics that may be impacting on the resulting PFM scores on technical efficiency.

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## NOTES

- <sup>1</sup> PEFA Secretariat, PEFA Public Expenditure and Financial Accountability: Public Financial Management, Performance Measurement Framework', World Bank. Washington DC, June 2005.
- <sup>2</sup> PEFA (2005).
- <sup>3</sup> PEFA (2005).
- <sup>4</sup> <http://web.worldbank.org/WBSITE/EXTERNAL/PEFA/0,,contentMDK:22687152~menuPK:7313203~pagePK:7313176~piPK:7327442~theSitePK:7327438,00.html>
- <sup>5</sup> The explicit influence of donor practices is ignored in the present analysis. Therefore the differential impact of donor practices will be subsumed in resulting estimates of technical efficiency.
- <sup>6</sup> This definition of the technical efficiency of PFM systems based on the core dimensions of PFM performance is derived from the definition of relative efficiency by Cooper, Seiford and Zhu (2004, p.3).
- <sup>7</sup> Farrell (1957, p. 256)
- <sup>8</sup> Farrell (1957, p.260)
- <sup>9</sup> Emrouznejad, Parker and Tavares (2008, p.152), for instance, identify more than 4,000 research articles published in journals or book chapters up to the year 2007 with a large percentage published in the period since the year 2001.
- <sup>10</sup> Andrews (2010, pp.66-67).
- <sup>11</sup> Paolo de Renzio (2009, p16).
- <sup>12</sup> Cooper, Seiford and Zhu (2004, p.6).

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**APPENDIX 1: THE PFM HIGH-LEVEL PERFORMANCE INDICATOR SET**

<i>Performance Indicators</i>	<i>Description</i>
<b>A. PFM Out-Turns: Budget Credibility</b>	
PI-1	Aggregate expenditure out-turn compared to original approved budget
PI-2	Composition of expenditure out-turn compared to original approved budget
PI-3	Aggregate revenue out-turn compared to original approved budget
PI-4	Stock and monitoring of expenditure arrears
(i)	Stock of expenditure arrears
(ii)	Availability of data for monitoring the stock of expenditure arrears
<b>B. Key Cross-Cutting Issues: Comprehensiveness and Transparency</b>	
PI-5	Classification of the budget
PI-6	Comprehensiveness of information included in budget documents
PI-7	Extent of unreported government operations
(i)	The level of extra budgetary expenditure (other than donor funded projects) which is reported
(ii)	Income/expenditure information on donor-funded projects which is included in fiscal reports
PI-8	Transparency of inter-governmental fiscal relations
(i)	Transparent and rules -based systems in horizontal allocation among lower level governments of unconditional and conditional transfers (both budgeted and actual allocations)
(ii)	Timeliness of reliable information to lower level governments on their allocations for the coming year
(iii)	Extent to which consolidated fiscal data (at least on revenue and expenditure) is collected and reported for general government according to sector categories
PI-9	Oversight of aggregate fiscal risk from other public sector entities
(i)	Extent of monitoring public enterprises
(ii)	Extent of central government monitoring of sub-national governments' fiscal position
PI-10	Public access to key fiscal information
<b>C. Budget Cycle</b>	
<b>C(i) Policy-Based Budgeting</b>	
PI-11	Orderliness and participation in the budget process
(i)	Existence and adherence to a fixed budget calendar
(ii)	Guidance on preparation of budget submissions
(iii)	Timely budget approval by the legislature
PI-12	Multi-year perspective in fiscal planning, expenditure policy, and budgeting
(i)	Preparation of multi-year fiscal forecasts and functional allocations
(ii)	Scope and frequency of debt sustainability analysis
(iii)	Existence of sector strategies with multi-year costing of recurrent and development/investment expenditure
(iv)	Linkages between investment budgets and forward expenditure estimates

<i>Performance Indicators</i>	<i>Description</i>
<i>C(ii) Predictability and Control in Budget Execution</i>	
PI-13	Transparency of taxpayer obligations and liabilities
(i)	Clarity and comprehensiveness of tax liabilities
(ii)	Taxpayer access to information on tax liabilities and administrative procedures
(iii)	Existence and functioning of a tax appeals mechanism
PI-14	Effectiveness of measures for taxpayer registration and tax assessment
(i)	Controls in the taxpayer registration system
(ii)	Effectiveness of penalties for non-compliance with registration and declaration
(iii)	Planning and monitoring of tax audit and fraud investigation programs
PI-15	Effectiveness of collection of tax payments
(i)	Collection ratio for gross tax arrears being the percentage of tax arrears at the beginning of a fiscal year (average of the last two fiscal years)
(ii)	Effectiveness of transfer of tax collections to the Treasury by the revenue administration
(iii)	Frequency of complete accounts reconciliation between tax assessments collections, arrears records and receipts by Treasury
PI-16	Predictability in the availability of funds for commitment of expenditures
(i)	Extent to which cash flows are forecasted and monitored
(ii)	Reliability and horizon of periodic in-year information to MDAs on ceilings for expenditure commitment
(iii)	Frequency and transparency of adjustments to budget allocations, which are decided above the level of management of MDAs.
PI-17	Recording and management of cash balances, debt and guarantees
(i)	Quality of debt recording and reporting
(ii)	Consolidation of government's cash balances
(iii)	System for contracting loans and issuance of guarantees
PI-18	Effectiveness of payroll controls
(i)	Degree of integration and reconciliation between personnel records and payroll data
(ii)	Timeliness of changes to personnel records and the payroll
(iii)	Internal controls over changes to personnel records and the payroll
(iv)	Existence of payroll audits to identify control weaknesses and/or ghost workers
PI-19	Competition, value for money and controls in procurement
(i)	Evidence on the use of open competition for award of contracts that exceed the nationally established monetary threshold for small purchases (percentage of the number of contract awards that are above the threshold).
(ii)	Extent of justification for use of less competitive procurement methods
(iii)	Existence and operation of a procurement complaints mechanism
PI-20	Effectiveness of internal controls for non-salary expenditure
(i)	Effectiveness of expenditure commitment controls
(ii)	Comprehensiveness, relevance and understanding of other internal control

<i>Performance Indicators</i>	<i>Description</i>
	rules/procedures
(iii)	Degree of compliance with rules for processing and recording transactions
PI-21	Effectiveness of internal audit
(i)	Coverage and quality of the internal audit function
(ii)	Frequency and distribution of reports
(iii)	Extent of management response to internal findings
<i>C(iii) Accounting, Recording and Reporting</i>	
PI-22	Timeliness and regularity of accounts reconciliation
(i)	Regularity of bank reconciliation
(ii)	Regularity of reconciliation and clearance of suspense accounts and advances
PI-23	Availability of information on resources received by service delivery units
PI-24	Quality and timeliness of in-year budget reports
(i)	Scope of reports in terms of coverage and compatibility with budget estimates
(ii)	Timeliness of issue of reports
(iii)	Quality of information
PI-25	Quality and timeliness of annual financial statements
(i)	Completeness of financial statements
(ii)	Timeliness of submission of financial statements
(iii)	Accounting standards used
<i>C(iv) External Scrutiny and Audit</i>	
PI-26	Scope, nature, and follow-up of external audit
(i)	Scope/nature of audit performed (including adherence to auditing standards)
(ii)	Timeliness of submission of audit reports to legislature
(iii)	Evidence of follow up on recommendations
PI-27	Legislative scrutiny of the annual budget law
(i)	Scope of legislature's scrutiny
(ii)	Extent to which the legislative procedures are well established and respected
(iii)	Adequacy of time for the legislature to provide a response to budget proposals
(iv)	Rules for in-year amendments to the budget without ex-ante approval by the legislature
PI-28	Legislative scrutiny of external audit reports
(i)	Timeliness of examination of audit reports by the legislature
(ii)	Extent of hearings on key findings undertaken by the legislature
(iii)	Issuance of recommended actions by the legislature and implementation by the executive

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