PENSION RESERVES INVESTMENT MANAGEMENT BOARD

Minutes of the PRIM Investment Committee Meeting
Tuesday, May 1, 2018

Committee member attendees:

- Treasurer Deborah B. Goldberg, Chair
- Sue Perez, Esq.
- Joseph C. Bonfiglio
- C. LaRoy Brantley
- Michael Even, CFA (left at 12:15p.m.)
- Constance M. Everson, CFA
- Ruth Ellen Fitch, Esq.
- James B. G. Hearty
- Peter Monaco
- Paul E. Shanley, Esq.
- Glenn P. Strehle, CFA (arrived at 9:45 a.m.)

Committee members not present:

- Philip Rotner

The PRIM Investment Committee was called to order at 9:32 a.m.

Assistant Treasurer Sue Perez chaired the meeting until Treasurer Goldberg's arrival at 9:34a.m. after the first agenda item.

I. Approval of Minutes (Voting Item)

The PRIM Investment Committee unanimously approved the minutes of its January 30, 2018, meeting.

II. Executive Director/Chief Investment Officer Comments

Michael G. Trotsky, CFA, Executive Director and Chief Investment Officer, comments to the Committee included:

Market Summary

U.S. GDP growth slowed to 2.3% annualized in the first quarter of 2018 from 2.9% in the final quarter of 2017, a slight disappointment. Consumption growth was weak in the quarter, despite a surge in real disposable income, causing some economists to question the extent to which the recent tax cuts have stimulated any meaningful boost in business activity, but it may still be early. Recent business surveys and some data, such as a sharply lower March Purchasing Managers Index (PMI), suggest that advanced economies lost momentum at the beginning of 2018, but the US Federal Reserve (Fed) is still confident in the near-term economic outlook and have been more focused on the strong employment numbers (low unemployment), some first signs of wage growth, and a stronger than anticipated pick-up in inflation, the personal consumption expenditures (PCE) having hit 1.9% in March. Consensus is for three Fed Funds rate increases this year and a few economists are projecting four.

Financial markets do not typically respond well to rising interest rates and tighter monetary policy, especially if the data doesn't consistently confirm an expansion. Add to that the continued geopolitical concerns around a possible trade war with China and other trading partners, reciprocal tariffs, possible renegotiation or termination of the Iran nuclear pact, negotiations to denuclearize North Korea, and other stresses in the middle east, and it is easy to understand why volatility spiked and the markets sold off in

Q1. Perhaps this sell off was due, or even past due, after an outstanding year in 2017 and a strong start to the year in January.

Mr. Trotsky stated that while the final quarter of 2017 was strong, and it capped an outstanding year in the financial markets, the first calendar quarter ended March was more volatile, and markets were down. Domestic stocks were down, developed international equities were down, and bonds were down as yields and interest rates continued to rise modestly. A 60/40 mix of stocks and bonds, a common benchmark for diversified portfolios, was down more than 1% in the quarter. The lone bright spot was in emerging markets equities, which were up 1.3% in the quarter. The commitment to EM equities served PRIM well; it was the only equity sleeve that wasn't cut last year in PRIM's asset allocation decisions.

PRIT Fund Performance Summary

The PRIT Fund performed very well in the first quarter of 2018. For the quarter, the PRIT Fund was up 0.6% gross, or 0.5% net, outpacing the benchmark by 23 basis points. Mr. Trotsky mentioned earlier that a 60/40 split of stocks and bonds was down 1.3% in the quarter and staff have reason to believe that PRIM's performance will be very strong competitively.

Mr. Trotsky reminded the Committee that this outperformance was achieved with a significantly lower risk profile than PRIM's peers, who on average have a 50% allocation to global equities, versus PRIM's 40% allocation. PRIM is thankful for that very strong performance in an up market, but what is even more telling is that in the last 12-month downturn, which occurred when global equities were down more than 5% in our fiscal year 2016, PRIM was up 2.3%, while most other funds were either flat or down. In the down market of fiscal year 2016, PRIM knows of no other fund in the country PRIM's size or larger that outperformed PRIM. PRIM also significantly outperformed the endowments and foundations in those same years. This shows that PRIM's carefully constructed and de-risked portfolio is working exactly as intended, providing substantial outperformance in both challenging markets (down markets) like FY16, and Q1 of this year, and in rewarding markets (up markets) like CY17.

Mr. Trotsky made reference in his remarks to the following charts:

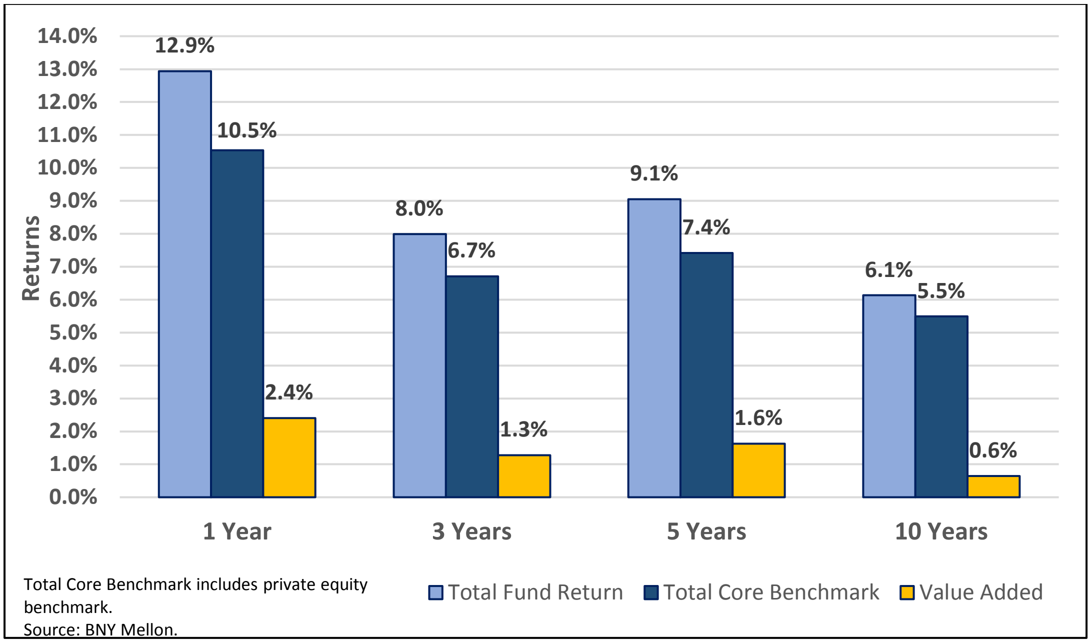
As of March 31, 2018, the PRIT Fund net asset value stood at $71.6 billion. For the one-year ended March 31, 2018, the PRIT Fund rose 12.9% gross (12.5% net), outperforming the total core benchmark of 10.5% by 240 basis points (192 bps net).

- This performance equates to an investment gain of $8.1 billion, net of fees.
- This outperformance equates to $1.2 billion of value above the benchmark return, net of fees.
- All seven major asset classes outperformed their respective benchmarks.
- Net total outflows to pay benefits for the one-year ended March 31, 2018, were approximately $1.5 billion.

Mr. Trotsky referred to the following charts:

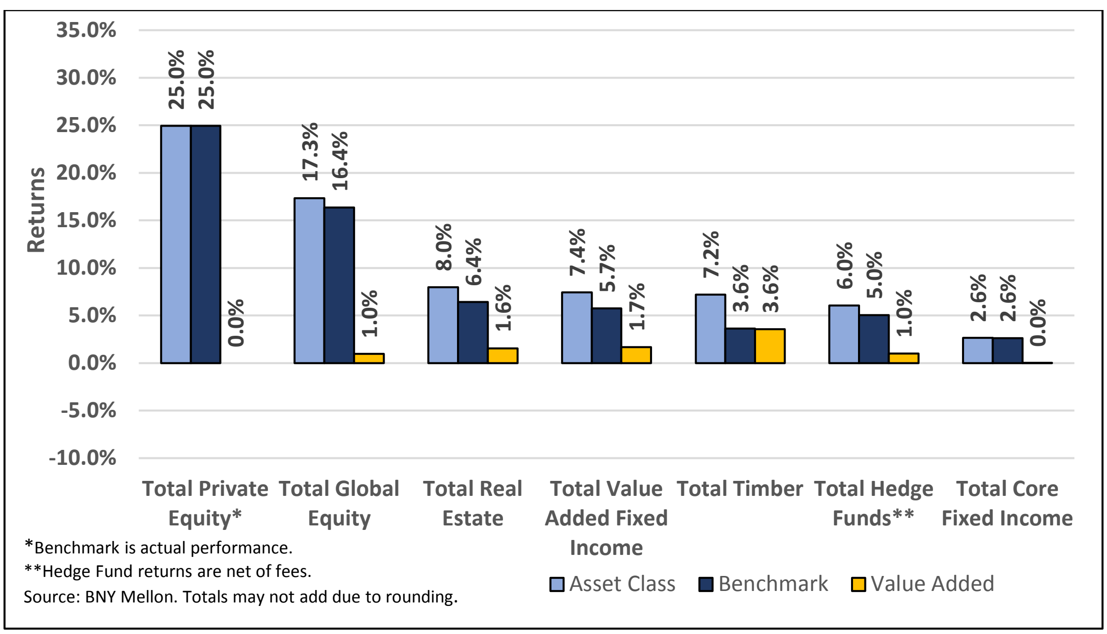
Total PRIT Fund Returns

Annualized Returns as of March 31, 2018 (Gross of Fees)



PRIT Asset Class Performance

Trailing 1-year Performance as of March 31, 2018 (Gross of Fees)



PRIT Core Fund Performance Summary

Trailing 1-Year Performance as of March 31, 2018 *(Gross of Fees)*

Trailing 1-Year Performance: March 31, 2018	Return	Benchmark Return	Over/(Under) Benchmark (bps)	$Value (millions)	% of PRIT Fund
Total PRIT Fund	**12.9%**	**10.5%**	**240**	**71,628**	**100%**
Total Global Equity	**17.3%**	**16.4%**	**96**	**30,984**	**43.3%**
Domestic Equity	*14.3%*	*13.8%*	*49*	*13,390*	*18.7%*
International Developed	*16.8%*	*15.8%*	*100*	*12,396*	*17.3%*
Emerging Markets	*26.5%*	*24.9%*	*169*	*5,198*	*7.3%*
Private Equity	**25.0%**	**25.0%**	**0**	**7,536**	**10.5%**
Real Estate	**8.0%**	**6.4%**	**155**	**6,121**	**8.5%**
Total Timberland	**7.2%**	**3.6%**	**357**	**2,548**	**3.6%**
Hedge Funds	**6.0%**	**5.0%**	**100**	**5,944**	**8.3%**
Value Added Fixed Income	**7.4%**	**5.7%**	**168**	**5,855**	**8.2%**
Core Fixed Income	**2.6%**	**2.6%**	**2**	**9,122**	**12.7%**

PRIT Asset Class Performance

Annualized Returns as of December 31, 2017 *(Gross of Fees)*

1 Year	3 Year	5 Year	10 Year
PRIVATE EQUITY 25.0%	PRIVATE EQUITY 19.1%	PRIVATE EQUITY 19.6%	PRIVATE EQUITY 13.1%
GLOBAL EQUITY 17.3%	GLOBAL EQUITY 9.3%	REAL ESTATE 10.5%	VALUE-ADDED FIXED INCOME 7.0%
REAL ESTATE 8.0%	REAL ESTATE 8.8%	GLOBAL EQUITY 9.9%	REAL ESTATE 6.5%
VALUE-ADDED FIXED INCOME 7.4%	VALUE-ADDED FIXED INCOME 5.7%	TIMBER 6.8%	GLOBAL EQUITY 6.5%
TIMBER 7.2%	TIMBER 5.0%	HEDGE FUNDS (NET OF FEES) 4.8%	TIMBER 4.4%
HEDGE FUNDS (NET OF FEES) 6.0%	HEDGE FUNDS (NET OF FEES) 2.5%	VALUE-ADDED FIXED INCOME 4.4%	CORE FIXED INCOME 4.1%
CORE FIXED INCOME 2.6%	CORE FIXED INCOME 0.7%	CORE FIXED INCOME 3.4%	HEDGE FUNDS (NET OF FEES) 3.4%

Constance Everson, CFA, provided an update to the stock market outlook. She described the fundamental situation typical of a stock market decline, rather than a situation that is simply a return of volatility. The difference is generally an accompanying economic problem, either of slowdown or recession proportions. Ms. Everson described vulnerabilities in the global economy, and noted the Federal Reserve remained undeterred in their intention to slow the economy, despite a downshift in consumer spending, slow growth in incomes, stock market selloffs, and negative implications of newly-imposed tariffs. The

Treasurer pointed out that the retail situation was showing weakness in areas that until heretofore had been strong, including retailers that cater to higher-income shoppers.

Organizational Update

Mr. Trotsky provided the Committee with an organizational update, including:

Earlier this month PRIM began an in-depth study on diversity and inclusion, which will outline and help plan any needed actions. Anthony J. Falzone, Chief Operating Officer, Deb Coulter, CPA, Chief Financial Officer, and Christina Marcarelli, Investment Officer are working closely with outside consultants from IBIS Consulting Group to conduct this organizational assessment. Anonymous surveys were completed in mid-April, and in mid-May IBIS will conduct in-person interviews. PRIM chose IBIS because of their 30 years of experience combined with their unparalleled knowledge of emerging best practices. The more PRIM can embrace differences—diversities of thinking style, experience, race, gender, sexual orientation, faith, ability and more—the better PRIM can serve the diverse citizens of Massachusetts, both now and in the future. PRIM staff will report back to the Committee at future meetings.

Mr. Trotsky and Christina Marcarelli will be traveling to NYC in May to participate in the CFA Institute's Diversity and Inclusion roundtable event. After Mr. Trotsky's term ended as a Governor of the CFA Institute last September, he was asked to join an advisory committee of CEOs, CIOs, and other investment industry executives from across the nation to develop a best practice guide for companies in the investment industry to use to increase diversity in the investment industry. The investment industry lags most others in terms of diversity, but industry leaders are finally banding together and are very serious about addressing the issue. Mr. Trotsky noted that he would be able to share some of the results of this work this fall. Mr. Trotsky mentioned that working on this project with the CFA Institute and other CEOs across the country has been a very fulfilling activity.

Mr. Trotsky stated that increasing the diversity of PRIM staff is a priority and demonstrated PRIM's recent successes. He added that of the 6 new hires over the last 12 months, 5 are diverse in either race, gender or both. He added that the intern pool at PRIM is equally as diverse. Of the 5 interns hired last year, all were diverse in either race, gender or both. PRIM is planning to add another 5 interns this year and they are all diverse in either race, gender or both, with all 5 intern candidates in this year's class being women.

Mr. Trotsky reminded the Committee that PRIM's experience shows that turnover and recruitment efforts disproportionally affect diverse candidates because all private sector employers in the investment industry are targeting diverse candidates and the pool from which to choose is not large. It is hyper-competitive for diverse employees in this industry.

Mr. Trotsky concluded his organizational update by providing an update on the ongoing searches for three open positions at PRIM, Director of Human Resources, Director of Information Technology, and Private Equity Investment Analyst. Mr. Trotsky informed the Committee that The Director of Human Resources and the Director of Information Technology searches are nearly complete with the Private Equity Investment Analyst not very far behind.

PRIM received approximately 585 applications for these three positions and Mr. Trotsky told the Committee there is no greater compliment that PRIM can receive—to receive so many highly qualified applicants.

III. Public Markets Performance Summary

David Gurtz, CPA, CFA, Deputy Chief Investment Officer – Director of Public Markets and Andre Clapp, Ph.D. CFA, Senior Investment Officer – Public Equities, and Chuck LaPosta, Senior Investment Officer – Fixed Income, provided the Committee with the Public Markets Performance Summary.

Mr. Gurtz updated the Committee on the following team activities:

U.S. Micro Cap Equity RFP – As of the April 19th deadline, PRIM had received 54 proposals. The team, led by Andre Abouhala, have been logging and evaluating these proposals and a recommendation is likely to occur at the October 30th meeting. Mr. Gurtz invited any committee member interested and/or available to join the evaluation committee.

State of the Industry research project – The genesis of this project is that over the last 10-15 years, the asset management industry has undergone lots of change and we don't expect to see that pace of change to slow over the next 10-15 years. Since PRIM is a big buyer of these asset management services, PRIM staff wanted to take a step back and see if and how potential future changes in this industry may impact the way PRIM invests.

In order to gain insights on future changes, the public markets team is speaking with senior executives at all types of asset management firms from the very large ones to the very small, emerging managers. PRIM staff is asking them for their perspectives on how their business has changed over the last decade, but more importantly, how they are managing their business for the next decade. We ask them where they see future growth in their firm and industry and how they are allocating their resources – both human capital and dollars – to achieve future growth. Andrew Gromer has been helping led this project and later this year we plan to summarize these conversations and link them to how these might impact PRIM.

Last, Project SAVE Phase II – Internal Asset Management, the public markets team has been working closely with Committee member Michael Even, researching possible areas of internal asset management and the necessary logistics to implement. We plan to update this committee soon on the work we've done there.

Mr. Gurtz, CPA, CFA then provided high-level themes that drove public markets investment performance over the last year/quarter:

- Volatility returned to reality in Q1 of 2018 after being almost completely absent in 2017. In 2017, the VIX averaged 11, a historic low average, while in Q1 2018 the VIX spiked, averaging 18, with the long-term average closer to 20. Concerns over inflation, rising interest rates, trade wars, data privacy issues, war in Syria finally broke the lack of volatility.
- Over this 1-year period ending in March 2018, Global Equities performed strongly returning 17.3% gross (17.1% net), outperforming its benchmark by 96 bps (70 bps net). However, in Q1 0f 2018 – only Emerging Markets returned positive performance, with Domestic and International Equities posting negative returns for the quarter. This was the first negative quarter for Domestic Equities in over 2-years (last negative quarter was Q3 2015).
- Emerging Markets lead both International and Domestic Equities returning 26.5%, 16.8% and 14.3%, respectively, for the 1-year period ending March 2018. Emerging Markets were buoyed by a weaker US dollar, stable and rising commodity prices and the tailwind of global growth.

Dr. Clapp updated the Committee on the PRIT Fund's Global Equity portfolio and his comments included the following:

- PRIT Fund's U.S. Equity, International Equity and Emerging Markets Equity all outperformed both for the quarter and the trailing year. Over this period, PRIM active equity managers outperformed in both up and down markets.
- Emerging Markets portfolio was up 26.5%, outperforming the benchmark by 1.7% gross of fees, or roughly 1.1% net of fees. Dr. Clapp reminded the Committee that three years ago PRIM replaced its Emerging Market managers, and the end of Q1 was the three-year anniversary for this new group of managers. Since inception these managers have outperformed as a group by 3.4% annualized.

- PRIM has completed its transition to 100% active management in Emerging Markets from its 75% active/25% passive split. PRIM has successfully reallocated approximately $1 billion out our passive portfolio to active managers T. Rowe Price, AQR and Pzena.
- International Equities, over the 1-year ended March 31, 2018, returned 16.8%, 16.6% net of fees, with much of this gain due to foreign currency with approximately 9% of this return coming from currency appreciation. Compare that to Emerging Markets – where less than 3% of the 26% return was due to currency appreciation.
- PRIM made a $900 million allocation to International Small Cap one year ago, which is included in this International Equity number. EAFE small cap significantly outperformed EAFE over this period, returning 24% vs. 15% for EAFE. Additionally, PRIM's International Small Cap active managers outperformed their EAFE small cap benchmark by 2.3%. Therefore, the $900 million allocation to International Small Cap a year ago was a big positive.

Mr. LaPosta updated the Committee on the PRIT Fund's Fixed Income portfolio and his comments included the following:

- Emerging Markets also led the way in PRIM's fixed income portfolio. Emerging Markets Debt (EMD) in local currency returned 13% for the last 12-months. Currency appreciation contributed 5% to the return while coupon at 6% and bond price appreciation added another 2%. Dollar denominated EMD also performed well and PRIM's managers were able to beat the benchmark by 120 bps net of fees.
- In credit sensitive sectors like Bank Loans, High Yield and Core Fixed Income PRIM's managers were able to beat the benchmark on a gross basis by riding the favorable environment for riskier assets. However, when adjusted for fees the performance is close to flat versus the benchmark.
- Over the trailing 12-months, ending March 2018, credits spreads are tighter by 10-15 bps for investment grade and high yield but during this period is the 15-20 bps of spread widening that occurred in 1Q18.
- For the most part, rates have risen over the trailing 12-months with the exception of 30-year yields where rates are 4 bps lower. This has helped the STRIPS portfolio return 6.7%. Interestingly, rates have risen over the trailing twelve months but only short-term rates are higher than the market anticipated a year ago. As of March 31, 2018, yields on longer maturity bonds were lower than was priced into the market on March 31, 2017.

Committee member Mr. Brantley asked if PRIM has a policy or view on currency hedging. Mr. Gurtz and Dr. Clapp reminded the Committee of the research done a few years ago by Dr. Clapp regarding the costs and limited benefits of currency hedging.

IV. Portfolio Completion Strategies (PCS) Performance Summary

Eric Nierenberg, Ph.D., Chief Strategy Officer, Bill Li, CFA, CAIA, Senior Investment Officer for Portfolio Completion Strategies, reviewed PCS performance, which included the following comments:

- The hedge fund industry has been resilient for first quarter. Even though both developed country equities and fixed income markets experienced great turbulence, overall the hedge fund industry delivered a moderately positive quarter.
- PRIT Total Hedge Fund was up 0.1% Quarter-To-Date and the Direct Portfolio was up 0.3%. Both slightly lagged the benchmark. For the trailing one year ending March 2018, Total Hedge Fund portfolio was up 5.9% and Direct Hedge Fund rose 6.6%, outperforming the benchmark by 170 bps, net of fees.
- The 6.6% annual return, divided by a volatility of only 2.8%, earned a Sharpe Ratio of 1.9. Usually, any Sharpe Ratio above one is good. On the other hand, PRIM Hedge Fund's market betas to both equity and bonds remain very low, serving the purpose of an economical diversifier to the whole PRIT Fund.

- Dispersion has been good. Contributors include Credit Relative Value; Fundamental Macro; EQ L/S and Event-Driven managers that are good at isolating market risk. On the detractor side, two systematic CTAs that was directionally long equity due to trend signal. Overall, we are comfortable with its position in the portfolio, as systematic CTA is supposed to capture gradually-evolving market trends but could be choppy in sudden market reversal.
- The Put Spread Collar (PSC) strategy targets to preserve capital in market downturn by reshaping distribution of stock returns, where the outcome is tighter. The PSC strategy consists of three options that sit on top of S&P 500 exposure. The PSC includes purchasing At-The-Money puts to protect equity exposure, while simultaneously selling Out-Of-The-Money calls and Out-Of-The-Money puts to finance the protection put. As a result, there is no cost assembling together the strategy.
- For the whole quarter, PSC delivered -1.5%, and underperformed the benchmark by 90bps. Throughout 1Q 2018, the strategy weathered through two unavoidable market scenarios we tried to be mindful of, namely extreme rally in January until the 26th and sizable volatility spike in early February. In January, until the 26th, the benchmark rallied 6%, while strategy delivered only 2.4%. The PSC strategy relies on selling Out-Of-The-Money call options to finance buying protection, and selling call options was costly in the irrational rally scenario. As a result, the strategy underperformed by 360 bps, as market rode to peak on the 26th.
- Then, a market correction happened and volatility spiked up. Since the PSC strategy inherently has a short volatility bias, the headwind of huge volatility spike partially offsets the profit generated by the put protection. As a result, from January 26th peak until the end of March 2018, the benchmark lost -6.2%, and the overall strategy outperformed 260bps. So, the strategy did help preserve capital during a market downturn.

Committee member, Ms. Fitch asked if the 3-months was reasonable period for the strategy to catch up with January's underperformance. Dr. Nierenberg answered that yes, given the magnitude of underperformance during the equity rally in early January 3-months was a reasonable length of time for the strategy to catch up.

V. Private Equity Performance Summary

Michael Bailey, Senior Investment Officer – Director of Private Equity, provided an update on private equity performance.

Mr. Bailey said the 1-year portfolio returns for year ended March 31, 2018 was 24.95% (gross). Private Equity outperformed public equity and a private equity industry benchmark.

Mr. Bailey credited the buyouts segment of the portfolio as a performance driver.

Mr. Bailey noted robust distributions activity, although lower than the fourth quarter of 2017

Mr. Bailey described how PRIM staff works for many years to build relationships with private equity firms. He mentioned the value of a stable team and PRIM's reputation as contributors to PRIM's earning a larger allocation to a top performing managers in the past few months.

Mr. Bailey noted that Private Equity is expecting a robust pipeline for 2018, and with the Committee's approvals today, PRIM will be investing with seven investments, committing $790 million, year to date. Many of these recommendations are consistent with PRIM's goal of adding small buyouts and growth equity categories to PRIM's manager roster.

Mr. Bailey corrected an error on the Expanded Agenda, on page 4, where the total goal reads as $2.1 billion, but the correct amount should be a $1.8 billion target in commitments for 2018.

Mr. Bailey advised the committee that consistent with the Board vote and the current contract, PRIM will extend Hamilton Lane's private equity advisory services contract for one year. The Private Equity team is also is in process to hire a fourth investment team member.

The PRIM Investment Committee meeting adjourned at 11:12 a.m.

List of documents and other exhibits used at the meeting:

- *Minutes of the PRIM Investment Committee Meeting of January 30, 2018*
- *PRIT Fund Performance Report*
- *BNY Mellon Gross of Fees Performance Report*
- *Handout – Charts for Constance M. Everson, CFA Discussion*